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essays on the nature and construction of
reality under the challenge of Zeno's
Paradox**

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AN ATTITUDE OF COMPLEXITY:

**Thirteen Essays on
the Nature and Construction of Reality
under the Challenge of Zeno's Paradox**

By Scott A. Albers

For Kate

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For the positions taken and the methods used herein I alone am responsible

Scott Albers
Great Falls, Montana
April 17, 2019

S.D.G.

Note to the Reader:

This PDF file is intended to be read as a “two-pages per view” document,
odd numbered pages to the left and
even numbered pages to the right.

In several essays charts are placed opposite text so as to convey information via this format.

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Socrates: “(I)f someone had, for example, ordered men who don’t see very sharply to read little letters from afar and then someone had the thought that the same letters are somewhere else also, but bigger and in a bigger place, I suppose it would look like a godsend to be able to consider the littler ones after having read these first, if, of course, they do happen to be the same...

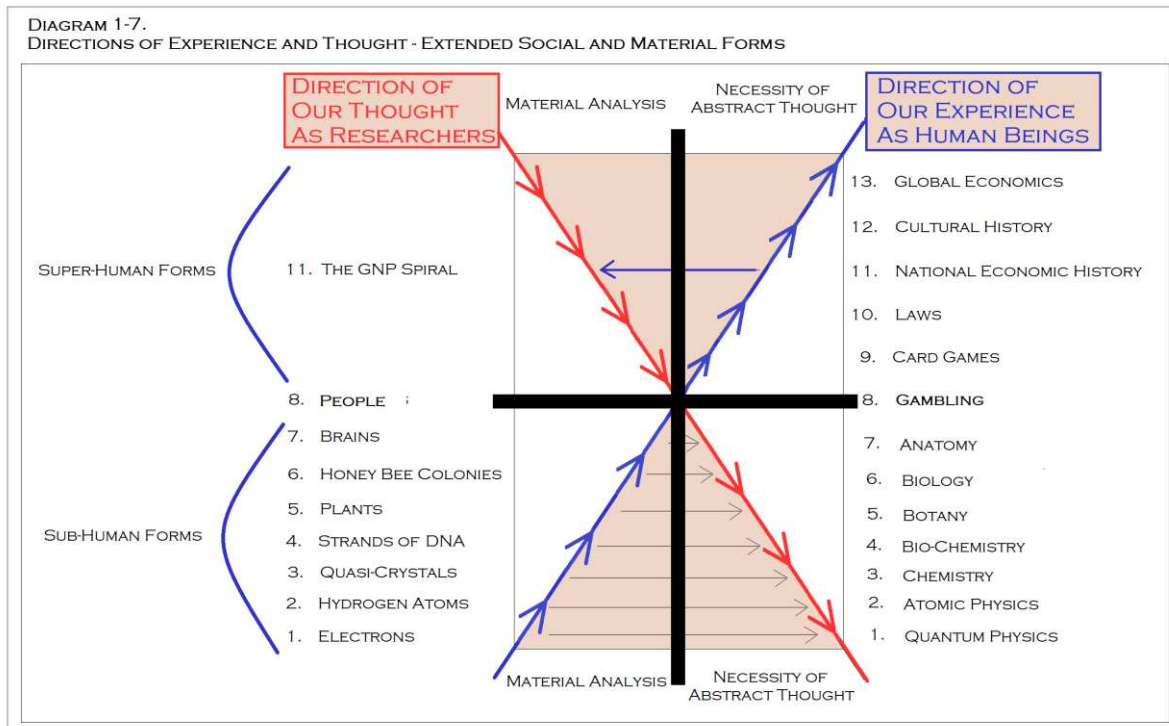
“(So) perhaps there would be more justice in the bigger and it would be easier to observe in the bigger and it would be easier to observe closely. If you want, first we’ll investigate what justice is like in the cities. Then we’ll also go on to consider it in individuals, considering the likeness of the bigger in the idea of the littler?”

Plato’s *The Republic*

Essay One: Introduction

This book is about the construction of reality. The central aim of this study is to understand how gravity works and how it may be focused and manipulated. While I do not have an answer to this question, the discoveries along the way have been worth collecting into a single volume for future reference.

The basic plan for reality outlined in these essays is presented in the following diagram.



The *material* part of reality, the part in which things “exist,” is to the left.

The *mental* part of reality, that part of reality which exists as a mental image or otherwise “exist as ideas” in our minds, is to the right. (The word “ontology” for “being” might loosely be associated with the left half, and “epistemology” for “the knowledge of being” might loosely be associated with the right half.)

Above the horizontal line are those levels of reality which, as one extends upward, are increasingly social and involving larger and larger groups of individual human beings. As one moves higher and away from the origin of the intersection, the topic becomes more abstract and more remote from immediate individual human experience: i.e. “super-human.”

Below this intersection are levels of reality which, as one extends downwards, are increasingly unrelated to immediate human existence. Again the abstractness and remoteness of these more extreme levels is indicated by the broadening of the distance between the blue and the red end point or various levels: i.e. “sub-human.”

The center of the intersection between material and mental, and superhuman and subhuman, is the human individual which comprises all aspects of these divisions. The diagonal lines extend both toward and away from this individual human being.

The blue line represents the way in which we *experience* the world. In our subhuman characteristics we experience reality as a material existence, and in our superhuman characteristics we experience reality as social beings engaged in a world of ideas as we deal with increasingly large social groups.

The red diagonal represents how we *analyze* a particular level. In our superhuman efforts to understand the economy we analyze large numbers of material persons in aggregate. At lower levels we reach the more intangible aspects of personal human psychology. From there, continuing down, we face ever more abstract and “ideal” understandings of the phenomena of physics, gravity, electricity, subhuman chemical compounds, atoms and subatomic particles, etc.

From top to bottom are the broadest groupings of those parts of reality which affect our daily lives. Everyone lives within the context of a Global Economy and everyone experiences the ups and downs of that economy; this level is placed on top.

From bottom to top are the broadest groupings of those parts of reality which comprise the material substance of our human bodies and the reality in which we live. Everyone understands that biology is an outgrowth of chemistry, and that chemistry is an outgrowth of physics, and that physics is an outgrowth of subatomic particles. Consequently the lowest level of a structure of reality is that of the most abstract – and the most numerous – particles.

In order to describe more completely how this scheme of reality works, I present this introduction as divided into five parts. These parts are:

- Part One – The Idea
- Part Two – Human Consciousness
- Part Three – Personal History
- Part Four – The Genesis of the Papers
- Part Five – The Goal

At this point in the Introduction to these essays I would like to present a simple, ordinary moment in time, one which is intended to illustrate how we perceive and participate in reality.

Part One – The Idea

A Café in Paris

There is a small and pleasant cafe not far from the Eiffel tower on the avenue de la Bourdonnais in Paris, a block or two from the River Seine which flows through the middle of the city. On an afternoon in spring you can sit and watch the world go by, sipping your tea and dreaming about whatever you want.

Across the street from the cafe towards the river is a bakery filled with pastries, breads of different sorts, cakes, tarts, cream-filled Mille Feuilles, baguettes and demi-baguettes, holiday treats for Easter, Lent or Christmas, rolls, croissants, Pain-au-chocolates, and fine bars of white chocolate, dark chocolate, and liquor-filled chocolate. A stern-faced yet attractive girl hands out purchases never smiling - unless she has just been speaking to an unseen but probably young man in the back room.

Next to this bakery one step closer to the river is a small grocery shop filled with exotic meats and vegetables, coffees, candies, salmon, caviar, wines and liquors, some cheeses, brightly packaged cookies, expensive and rare teas and herbal teas, baskets full of oranges, boxes full of pears and apples, hundreds of small toys from around the world - all pleasantly served by a man and his wife and all *tres cher* ... *very* expensive.

If you walk toward the river you will come to a footbridge which crosses the Seine in a pair of arches, formerly black, today powder blue. A map of the city will tell you that the name of the bridge is “Passerelle de Billy.” The bridge is otherwise unmarked.

From the arches hangs suspended a wooden platform stretching across the river, one which makes a solid clapping sound as you walk across. On cold and foggy mornings standing on the bridge, the Eiffel tower rises behind you and you can watch the boats drift up and down the river beneath you without seeing a soul or hearing a sound.

If you are lucky and have some money in your pocket, you might take the metro to the Latin Quarter where food is cheaper than the avenue de la Bourdonnais. There you will find plenty of Greek pastry shops filled with baklava dripping with honey and sugar and almonds, meat sandwiches cut from large legs of lamb hanging upright in small white booths, and crowds of foreign-looking people strolling, chatting in French or Greek or Arabic or German, maybe Persian or Aramaic, all seeming to have struggled somehow to arrive at the crossroads wherein the middle ages and the modern world have yet to untangle themselves from one another. You will find churches, knots of roads and half-roads, streets narrow and cockeyed, each one butting into the next in a sort of perpetual surprise and cacophony of movement. Hidden between stone houses are elegant hotels and behind forbidding-looking gates are pleasant gardens and terraces surrounding glass rooms.

If you are bored you could walk across the river to see Notre Dame, the largest cathedral in Paris. If you are out late you might visit Saint Severin. Perhaps they will be giving a late-night master class in the organ and you can hear the tones of great masters booming out eerily in the darkness of the chapel.

Now imagine that you and I are sitting at this cafe along the avenue de la Bourdonnais sharing an afternoon cup of tea. We sit outside and watch the corner of the intersection. Watching the parade of people, dogs, automobiles, trees, language, events and lives passing by, we present ourselves with a question: *How many distinct and recognizable forms of order do we see?*

Perhaps, we both wonder, there are too many gradations and mixtures or organizations to define them all distinctly. Shall we count the arrondissements of Paris - its subdivisions laid out in the gentle spiral of a Nautilus seashell - a social, a legal, a geographic or an architectural “organization”?



No, by “distinct” and “recognizable” levels of organization we refer to the broadest categories of reality - the levels which unify planetary populations, traverse national boundaries, which tie us together as human beings living out a life on this earth. Like containers, these levels of organization are themselves independent of the members of their categories, as “religion” is a category of thought containing but not contained by Islam, Christianity, Buddhism, Confucianism, Taoism, Judaism and others.

Perhaps, we agree, the electric wires overhead, carrying computer, telephone, telegraph, or other electronic information would be considered a form of metal, of synthetic laminate, of tension, of electricity. We ask ourselves more directly, “How many levels of reality, of organization, are there, and by what basic elements do they combine together?” It seems an interesting question.

And so the question is posed.

The Social Sciences

The most obvious level of organization is the pleasant peacefulness of the scene. Consider the people hurrying in front of us, the lady reading quietly at the next table, the waiters taking orders and the customers reading small menus, ourselves in a discussion, and the general populace before us - all moving about their business, busy with their day to day travails, running home or to work, walking by more-or-less absorbed in their own lives, their own interests, their own occupations.

This peacefulness is one born of a *philosophy* which, in Paris, unifies much of existence. It is an aged blend of medieval and modern Christianity, modern urbanism, socialism, capitalism, a host of other “-isms,” and in particular a general good will towards oneself and one’s fellow human beings. It is the broadest form of social organization - the notion that peacefulness is a good and worthy pursuit.

Beneath this philosophic order one finds that we are all using the same currency. That is, whether one is American, French or Himalayan, the shopkeeper will expect payment in the European currency, the Euro. This Euro is exchanged in return not only for tea from our pleasant Cafe but for salmon from Alaska, wine from the Loire valley, Peruvian chocolate mixed perhaps in Switzerland with sugar from Haiti or Cuba - all items found just down the street. Through the use of this basic and internationally recognized currency enormous volumes of goods, services and ideas daily exchange hands. This currency is truly a marvelous invention of society and the human mind.

There may be exceptions periodically of course - the payment of gold, of diamonds, the signature of a Picasso. But very likely the cafe owner will expect our purchase to be paid for in the amount specified and with good solid Euros. There is then an *economic* order tying together our afternoon in Paris.

Beneath the interconnections of the world economy one might detect that the people around us are predominantly of a white complexion. The clerk, the waiter, the passers-by on the street are all likely to share similar skin color, hair type, facial and body structure, etc. This *cultural* similarity is an important part of European and particularly French organization. It is one which ties together the city of Paris and connects it with the rest of the continent of Europe and Russia, much of North and South America and Australia. The attitudes and perspectives of this group of people vary widely across the globe, and yet they share a common cultural origin which separates them from the other cultures of this planet.

Underlying this cultural order is the fact that to obtain our coffee we must make our request of the waiter in French. The avenue de la Bourdonnais is not friendly to persons who, speaking English with an American accent, believe that they are entitled to order coffee in whatever language they like. No, we must order in French.

I make this point to indicate that there is an intense nationalism in Paris, the capital of France. This then is one aspect of order within the scene before us. The concept of “Nation” originated in France, at least as early as Joan of Arc, just as the power of the nation-state emerged with the reign of Louis XIV. This form of order - the *nation-state* - is a central part of the order which we see before us. We detect this order of the nation-state in the character of the street, the lovely tree-lined boulevard, the Mansard roofs, the stone architecture, the small cars, the stylishness of the dress, the air and character of the people, the care for language, speech and diction, the love of discussion.

We might define the nation-state as a geographically organized group of people unified by language, religion and culture. The history, future, ups and downs of the nation-state are shared by all its citizens in one way or another. Here we have a very specific form of order, one written and charted for centuries in the Roman alphabet as adopted into the French way of life.

On a more intimate level we might notice that the society in which we find ourselves is one in which green and red lights dictate the motion of automobiles. A red octagonal stop sign seems to be capable at least of slowing down drivers as they turn left and right at our intersection. A woman comes out and carefully hoses down the debris which has collected over the day. She will do the same the following morning, almost like clockwork. A school lets out and suddenly the street before the entrance is flooded with students leaving class, all at once, a tide of young individuals dispersing like atoms of chlorine in a warm atmosphere.

The regular, socially expected, legally imposed society in which we find ourselves is type of order in the scene before us. No one uses force to make the automobiles stop; they just do. Should they violate the laws which dictate “green for go” and “red for stop” there may be consequences. But we do not find the use of physical force necessary to order our lives absent unusual circumstances which do not seem pertinent as we watch the traffic flow before us. Just as the students leave classes when permitted, as the shop keeper cleans the street as expected, as the automobiles stop and go as legally ordained, the *laws* of our society - written and unwritten - form a type of order which separates itself from the other forms of order discussed so far.

So now we have described five forms of order as we sit in our cafe. These are a philosophic order, an economic order, a cultural order, a national order, and a legal order.

The Physical Sciences

But perhaps you have had training in the “hard” sciences and count still more levels of organization. You point out that both you and I are organized by the *psychology* of individuals, and that our dialogue is a type of social game, a type of discourse wherein we share the joys and sorrows, insights and developments of our independent and yet converging lives. We would spot this form of order in each of our fellow individuals sipping tea or coffee at the cafe, playing a game of chess in the park, or strolling along the avenue de la Bourdonnais. The fact that a woman and man stroll hand in hand under the trees is as much a type of order as the nation-state. Union of individual man and woman in lasting relationships ensures the survival of culture and civilization through home life, marriage and the family. This basic truth underlies all other forms of social order.

Beneath the psychological independence which we share as sane individuals, you say, we share a common history with the plants and birds and animals found along the street. That is, we are alive. We are biologic organisms - functioning, deciding, loving, hating, emotional, breathing, eating, drinking, sleeping, working and energized beings - living in the present. This common *biology* underlies our individuality, but it forms a broader form of order, one which ties us to the reality around us in ways unlike that of the doctrines of Christianity, an international currency, the history of Europe, the rise and falls of kings, the morality of cleanliness, the pleasantness of our cup of tea. This biology dictates the types and numbers of fingers upon our hands, the height of our bodies, their weight, their appearance, and their function, as well as their diseases, their aging, their development as living organisms, etc. This biology and its universality in the living things before us unites us to a living - not a dead - planet, one in which we - you and I - both function as credible biologic contributors.

Moreover - you point out - the solidity and liquidity of our bodies and their functions present a still broader form of order - the order of *chemistry*. The color of a woman's hair, the smell of a perfume, the taste of a cup of tea, the solid flexibility of a tire along the curb, the concrete beneath our feet and the smooth-cut limestone of the architecture around us - these blocks of the reality we see before us are combinations of molecules and atoms which are as important to our cafe as they are to our bodies or to the chemical composition of the Seine and the sea beyond.

You have pointed out now a psychologic order of independent individuals, a biologic order of organisms, a chemical order of compounds. But surely we will both notice that each of the persons walking upon the street are walking quite successfully. That is, they are held to the ground by a form of physical attraction denominated "gravity." The operation of the constants and forces of *physics* presents a form of order operable - so they tell us - upon human beings, planets, stars, galaxies and the heavens themselves. And we both agree that this is so.

Combining with this gravity discussions of light, inertia, force, energy and electricity, we find ourselves in a physical universe of order, one permeating space and time as we know and experience it through the motions of our own bodies and lives.

Finally, we might notice that the number of persons passing by on the street are countable. That is, should you and I decide upon a contest by which to count the number of cars stationary at the traffic light - now! - we should arrive at the same number. This stems from our common conception of the number "one" and its additive properties. We will find this ordering of reality useful when the waiter requests that we pay the correct number of Euros, for the specified cups of coffee, at the appropriate time. This *mathematic* order is a basic order, one which Pythagoras - and perhaps Bertrand Russell - would tell us underlies each and every other order in existence.

And so we have counted ten forms of order, these being:

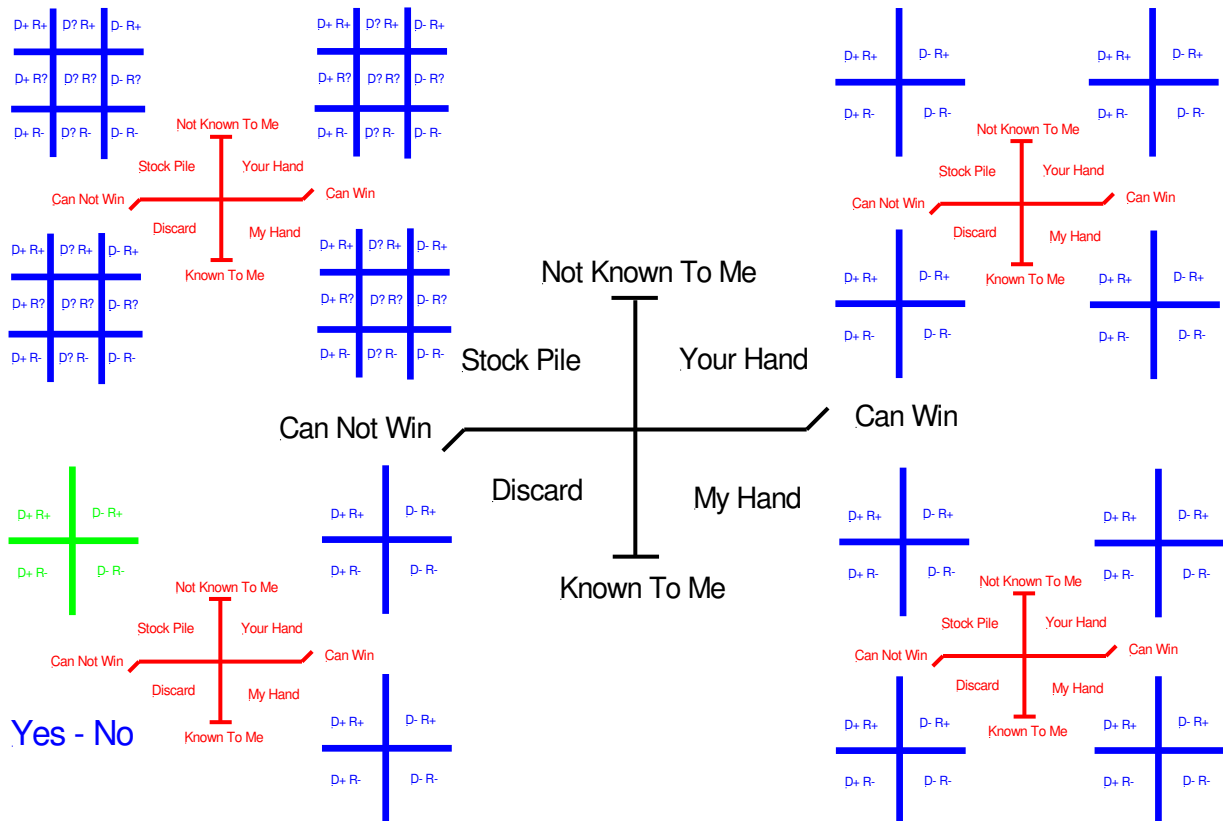
Philosophy
Economics
Culture
Nation
Law
Psychology
Biology
Chemistry
Physics
Mathematics

Perhaps there are others. But these, for our conversation of an hour, will do.

We have posed the question: "How many levels of reality, of organization, are there, and by what basic elements do they combine together?" Putting a slightly different question before us, as we consider these ten different levels, is it possible to find within them a pattern common to all?

A System of Movement

In this book the “pattern common to all” is as follows, referred to herein as “a system of movement.” This pattern appears to repeat at each of the levels of reality discussed, and it further assists in the understanding of the logical relationships necessary within that level of reality.

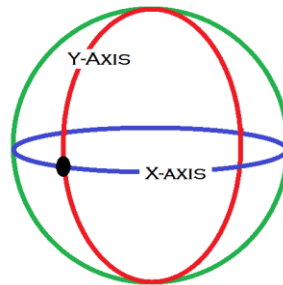


The fundamental proposition of this book is that each of the levels of reality described is really a separate level of organization, and each level shares a common organizational form with the rest. This organizational form is referred to herein as a “system of movement” of one hundred distinct and essential parts.

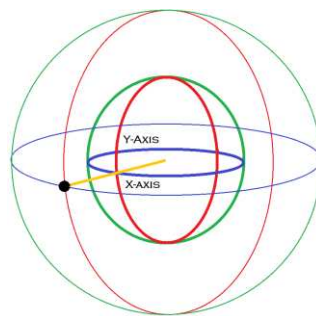
- As these are demonstrated in the necessary aspects of a game of Gin Rummy,
- the northwest quadrant always represents “inherent uncertainty,”
 - the northeast and southeast quadrants always represent “stability,” and
 - the southwest quadrant always represents “inherent arbitrariness.”

The basis for this similarity between levels is a fifth dimension of consciousness which ties each level together. The idea that “consciousness” might constitute an actual physical “dimension” may be understood as follows.

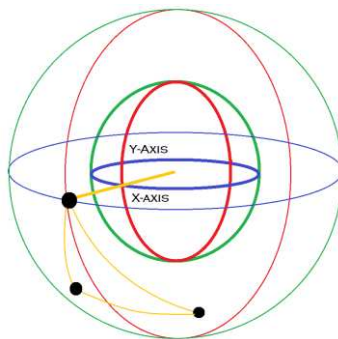
Imagine that the placement of a particular point on the face of the globe is given by two circles, one for longitude (in red) and one for latitude (in blue). We have in this description two dimensions of space upon the surface of the green sphere.



If we add to this a point which is somewhere above the surface of the sphere, we add a radial distance from the center to this point as a third dimension of the green sphere, altitude.

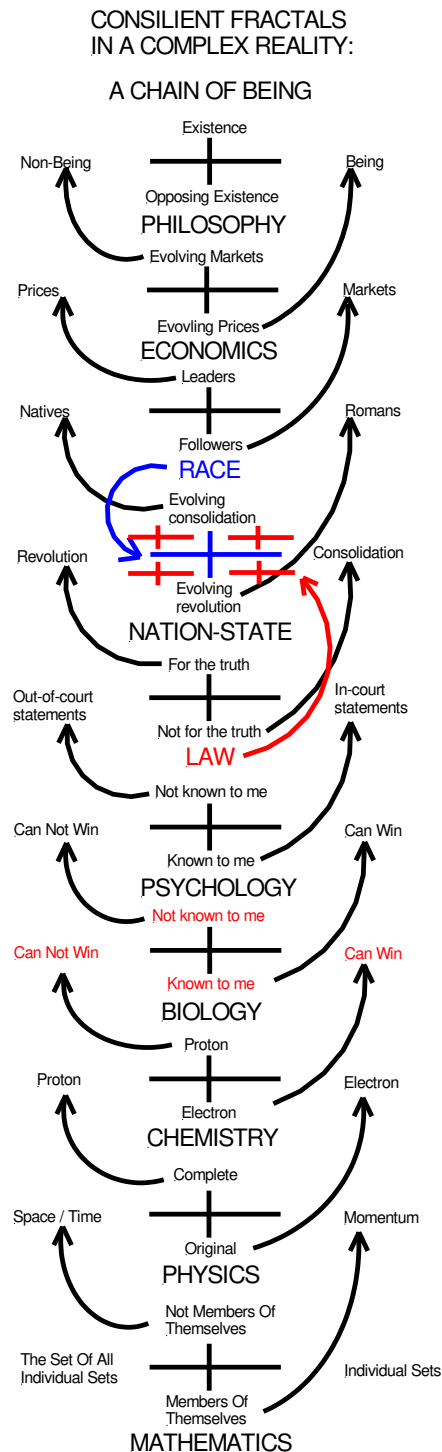


If we add to this new point a relationship in space between all the other points in the sphere the dimension of time is added as a fourth dimension, i.e. the time it takes to arrive at a one point vs. a different point.



To add a fifth dimension to this system would be to explore the diagram *as it exists* – its ontology – and compare this to the way in which *we know* that it exists – its epistemology. This unavoidably brings up the way in which we “know” anything, and a discussion of our consciousness as a dimension is raised.

This “dimension of consciousness” may be envisioned as a “chain of being” by which all levels of reality create the next higher level. In this way the inherent uncertainty of one level gives rise to a new, higher level whereby the consequences of that uncertainty are controlled.



The chain of being will be developed throughout this book. But to give an example of its interpretation briefly, the following will suffice.

At the level of the nation-state, and in a democracy such as the United States, individuals are free to meet and discuss the economic, political and social difficulties which they face. It serves to reason that as individuals form into small groups of persons, and as they use their minds together to come to conclusions affecting their group and the interaction of that group with its environment, they will adopt those rules for themselves which most conform to their own personalities and understandings, and they will reject rules which are not in conformity to themselves, their personalities, and their understandings. The laws adopted by a group of people – including their substantive laws against crime and for the conduct of trials – proceed from the “consciousness” of that people.

If this is true, then it further stands to reason that *the laws of the group in question will eventually display the structure of the individual minds which create it*, that is, the structure of the minds of the individual members themselves. The organization of the rules and operating procedures of the group will take on the same “shape” as the smaller minds within it. This process will be similar to that of a crystal “taking on” precisely the same shape as the molecules which compose it.

If these group functions - in some manner - display the same pattern of the individual mind, then it stands to reason that the *Laws* which produce a given *Nation-State* will impose upon that Nation-State the same pattern - not only of the individual mind - but of the group mind, in the same sort of crystal building. Those minds which are in harmony with the basic understandings demanded by the “crystal-izing” social system will survive because the groups and nations which they create will be sound, enduring and attractive. Those minds which are out-of-harmony with the basic understandings of such a system will not survive, because the groups which are composed of such minds will breed disaster, and the nations which are composed out of these groups will perish.

Moreover the legal development of the United States is always an outcome of the simplest matters heard in the district courts repeated on appeal and re-considered at the highest levels of society. Consequently the common law of England, as developed in the United States, may be particularly adept at creating, and useful in “drawing out,” “complex” relationships between social levels in fractal form. Following upon the same idea, *Cultural History*, comprising the sum of its underlying *Nations*, will portray the same structure, in a larger form of recurring crystal. The Law of Nations, International Law, as the Private Law “writ large,” shares this approach of crystal building. Beyond this, and comprising all cultures, the *Economy* itself must take on a similar pattern in a similar, larger and equally necessary structure. Finally, all things which might be considered real must fall under a single *Philosophy*, a single governing idea or set of ideas.

If we see that the laws of a particular group of people are the consciousness “writ-large” the individuals in the group, we have a basis from which to begin our study of reality as the outcome of “consciousness.” Once these dynamics are understood, “consciousness” may be incorporated as a formal part of the physical sciences directly.

It may be helpful to describe briefly the nature of “consciousness” which will be explored in this book as a fundamental tool in the understanding of reality itself.

Part Two - Human Consciousness

Human consciousness, our awareness of something, is generally considered to be a dependent variable, something arising from a mass of complex biologic neural connections within the brain attaching us to the reality in which we live. The natural consequence of this view is that when death removes the physical mechanism of consciousness, consciousness and awareness must end as well. The view is well-stated by William Shakespeare in the character of Macbeth in the final act.

Tomorrow, and tomorrow, and tomorrow
Creeps in this petty pace from day to day
To the last syllable of recorded time,
And all our yesterdays have lighted fools
The way to dusty death. Out, out brief candle!
Life's but a walking shadow, a poor player
That struts and frets his hour upon the stage
And then is heard no more. It is a tale
Told by an idiot, full of sound and fury,
Signifying nothing.

Macbeth, Act 5, Scene 5, lines 22-31

This view might be contrasted with the opposing point of view, i.e. that consciousness is an independent variable vaguely synonymous with “soul” or “spirit” and that this incorporeal, non-material animus or life-spirit collects around it the material components necessary for it to take part in a material world of persons, places and events. Victor Hugo summed up this point of view very well.

I am a soul. I know well that what I shall render up to the grave is not myself.
That which is myself will go elsewhere. Earth, thou art not my abyss!

Victor Hugo

The question arises: How does a material organism – “the brain” – generate or connect to a non-material psychological state “awareness”?

This set of three volumes argues that the mind – human consciousness – may be measured by considering mathematically the aggregate of that consciousness, i.e. social history. From this beginning theme of discussion three questions must arise.

1. *How might this measurement be made?*
2. *Of what value is this measurement?* and
3. *How does this measurement affect our present understanding of the reality in which we live?*

Each of these three volumes attempts to provide answers to one of these questions.

It may be helpful at the outset to give a simple example to illustrate the idea of human consciousness which will be used in these essays.

Imagine that a set of wooden blocks is constructed such that each of the six sides of the block are given the same letter. Imagine that these 26 “alphabet blocks” are placed into a bag and that a person is asked to pick from the bag each of the blocks and place them in order of first chosen to last chosen. My question to the reader is to calculate the odds of selecting randomly the standard alphabet order of A, B, C, D, E, F, etc.

The answer is that the odds of this occurring are 1 to 26 factorial, or roughly:

1 out of 400,000,000,000,000,000,000,000 chances.

If we can agree that the statistical odds against selecting randomly these blocks in their correct order is enormous, then a second question may be asked. What is the likelihood of doing the same thing twice in a row? If this is calculated as well, we must conclude that the statistical likelihood of such an accomplishment is exponentially even more remote.

In fact, the answer is the above number squared, or roughly:

1 out of $400,000,000,000,000,000,000,000^2$ chances.

We must conclude further that for every turn we take at this task, the likelihood of success becomes ever more statistically removed from our common experience.

Imagine next that we ask a five year old child who has been taught his or her “A, B, Cs” to open the bag, pull out the letters one by one in their correct order and place the blocks lined up correctly on the table. It would seem very likely that a child of ordinary intelligence could perform this task repeatedly, even ten times in an hour, as long as the attention span of the child is maintained.

From this simple example I propose that the mind of the child – the child’s consciousness – has overcome the vast statistical impossibility of the first task, i.e. the selection of the same order as a matter of random occurrence.

Therefore I propose that that the sure and only importance of consciousness is its ability to order things correctly.

It may be argued that there is no evidence whatsoever of a pre-life or post-death existence for consciousness which cannot fully be explained by a strictly material understanding of the brain, the physical world, etc. In response to this view, I would ask regarding the following two video clips: What understanding of matter, energy, time, etc. permits the following very young children to so completely master complicated musical works so beyond the scope of their peers?

Regarding the second video, the following comments from six-year old Emily Bear are particularly interesting. She states: “This comes out to me. It comes out.” In response to the question “Where does it come from?” she states: “I don’t know. Probably my heart.”

http://www.youtube.com/watch?v=bI_xx82oTO8
<http://www.youtube.com/watch?v=vUx4t4W4eVY>

I suggest in these essays that the ability of consciousness to create order from chaos may be considered an actual dimension of our experience, albeit exhibited at different levels of reality. In these three volumes consciousness is presented as an ordering force in the universe, one which is as real, as inherent and as universal as latitude, longitude, altitude and time are to a sphere, in effect, an investigate-able, measurable fifth dimension of reality.

Consequently each volume of this work seeks to answer one of the above questions.

1. *How might this measurement be made?*

Essays 2-5 construct a pattern common both to the world of economics and to the Rings of Saturn. In this first set the economic and social history of the United States is shown to be a “system of movement,” i.e. a logical and mathematic progression of events which may be analyzed according to a set formula. The model proposed demonstrates that the citizen’s individual “consciousness” is writ large in U.S. macroeconomic statistics and thereby made available for inspection at other levels of reality.

2. *Of what value is this measurement?*

Essays 6-10 present five other systems of movement, demonstrating that the pattern displayed in this first volume may be found at other levels of reality including set theory, chemistry, psychology, law and culture.

3. *How does this measurement affect our present understanding of the reality in which we live?*

Essays 11-13 presents a formal theory of reality which incorporates the “consciousness” examined in the first two volumes as a formal “fifth dimension” of our experience. This is given in detail for music, and then used to re-analyze the economic material of the first and second volumes.

This arrangement of connected ideas provides the basis for stating the relationship of three things – Mind, Consciousness, Reality – as formulated herein. Although the three volumes may be read in any order, they are presented with the following understandings.

Reality is that set of logical relationships which give rise to Consciousness as an essential aspect of that Reality as a coherent, functional, operating level of related ideas and facts. A set of ideas and facts which are not functionally related, coherent and operating towards some goal will not seem “real.” Conversely, any set of ideas and facts which meet these expectations will be deemed to be “real” at some level of understanding.

Consciousness is that pattern which arises out of Reality and which gives a repeated and systematic understanding to every level of Reality.

Mind is that localized version of Consciousness which actively orders a particular level of Reality in a specific and testable fashion.

These ideas are unusual and some explanation must be given for their development.

Part Three – Personal History

St. Petersburg High School

Sometime during my freshman and sophomore years of high school, circa 1973-1974, I came across the entry “Philosophy” in the *Encyclopedia Britannica*. The following paragraphs, taken from this article, are the genesis of the three volumes of essays which follow this introduction.

Parmenides of Elea (flourished first half of the 5th century BC) ... insisted that “what is” cannot have come into being and cannot pass away because it would have to have come out of nothing or to become nothing, whereas nothing by its very nature does not exist. There can be no motion either; for it would have to be a motion into something that is - which is not possible since it would be blocked - or a motion into something that is not - which is equally impossible since what is not does not exist. Hence everything is solid, immobile being. The familiar world, in which things move around, come into being, and pass away, is a world of mere belief (*doxa*). ... Parmenides tried to give an analytical account of this world of belief, showing that it rested on constant distinctions between what is believed to be positive - i.e. to have real being, such as light and warmth - and what is negative - i.e. the absence of positive being, such as darkness and cold.

I found this discussion absolutely impenetrable, completely beyond my ability to understand. The situation changed with the next paragraph. The article continues:

(O)f very great importance in the history of epistemology was Zeno of Elea (flourished mid-5th century), a younger friend of Parmenides. Parmenides had, of course, been severely criticized because of the strange consequences of his doctrine that in reality there is no motion and no plurality either because there is just one solid being. To support him, however, Zeno tried to show that the assumption that there is motion and plurality leads to consequences that are no less strange. This he did by means of his famous paradoxes, saying that the flying arrow rests since it can neither move in the place in which it is nor in a place in which it is not and that Achilles cannot outrun a turtle because when he has reached its starting point, the turtle will have moved to a further point, and so on *ad infinitum* - *that, in fact, he cannot even start running, for, before traversing the stretch to the starting point of the turtle, he will have to traverse half of it and again half of that and so on ad infinitum.* ...

All of these paradoxes are derived from the problem of the continuum. Although they have often been dismissed as logical nonsense, many attempts have also been made to dispose of them by means of mathematical theorems, such as the theory of convergent series or the theory of sets. *In the end, however, the difficulties inherent in his arguments have always come back with a vengeance, for the human mind is so constructed that it has two ways of looking at a continuum that are not quite reconcilable.* (emphasis added)

My Approach

It is not too much to say that the above lines in italics have shaped virtually all of my intellectual life. Raised as the German-Norwegian eldest-child son of an eldest son and an eldest-child daughter in a devout Missouri Synod Lutheran family of four ministers and four Lutheran school teachers (two of whom were missionaries), there can be no doubt that the concept of *an INFINITE* (i.e. God), standing between any point and the placement of any “next” point, must be taken as absolutely key.

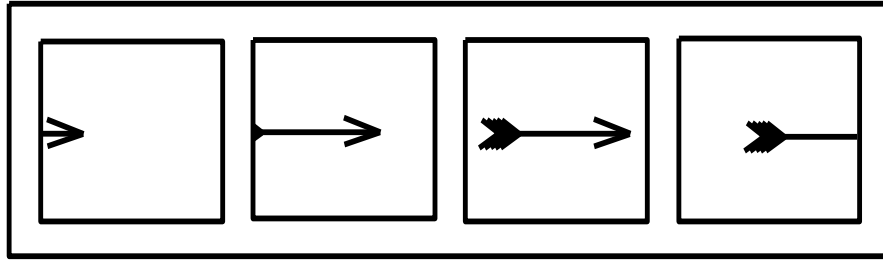
In so far as *any* point on the line has next to it an *infinite* number of points, and in so far as this infinity compounds itself with *every* possible division of the line and that this possibility of division is itself infinite, Zeno must be taken as absolutely correct:

Motion from point A to point B on the line is impossible in as much as nothing finite may translate, transmit, transfer or move itself across an infinite in any fashion.

To say otherwise struck me as a contradiction *ab initio*, wrong from the get-go. One might as well insist that a ruler marked out in inches can measure the distance between the atomic core and the first shell of an electron. The finite and the infinite cannot and do not mix. To state otherwise would be to insult God, the source and creator of the universe itself. Consequently the obvious correct-ness of Zeno’s logic, as contrasted with its obvious “wrongness” in so far as it flies in the face of all experience, have led me to develop the three volumes of essays presented here.

I came across quickly the idea that the Paradox might be resolved by considering the possibility of a “blinking” universe, not unlike a three dimensional movie. As viewed in this light, each point along the line described by Zeno is actually a picture of the universe taken at that particular moment. It would appear that Zeno’s Paradox actually compels this view of reality if the Paradox is to be reconciled with the observation of the motion which we see around us. This idea is presented almost exactly in the book *Infinity and the Mind* by Rudy Rucker.

The basic intuition about an Absolutely Continuous line is that such a line cannot be conceived of as a set of points. Zeno expresses this intuition in his paradox of the arrow. The paradox of the arrow seems to constitute a proof that space is not made of points. For, Zeno argues, consider an arrow that flies from the bow to the target. If space is made up of points, then the flight of the arrow can be decomposed into an infinite set of frozen movements, movements where the tip of the arrow successively occupies each of the points between bow and target. The problem is that while the arrow is at any one fixed point, say the halfway point, the arrow is motionless. How can the flight of the arrow be a sequence of motionless stills? Where did the motion go?



A movie of an arrow's flight is, of course, a sequence of motionless stills. But this does not disturb us, as we realize that the arrow moves in between the pictures. The problem Zeno raises is that if space is made of points, and if a still is taken at each point, then there is no possibility of "moving between the pictures" ... *because there is nothing between the pictures.*

My answer to Zeno's Paradox is that the arrow in flight is represented in the physical sciences as a combination of four dimensions, three of space, one of time. Our ability to grasp each of these frames of the "movie" of an arrow's flight brings into these four dimensions a new fifth dimension, that of consciousness, i.e. a consideration of the viewer watching the movie.

This consciousness is one born of necessity, the idea that just as the thing tying together the frames of the movie is the person watching the movie, so must the universe have some additional force of consciousness which itself is capable of overcoming Zeno's Paradox which exists throughout the three dimensions of space and one dimension of time. In short, there must be some overarching consciousness which ties together the universe, just as the consciousness of the person watching the movie ties together the frames of the movie into a single, believable whole perception and experience of motion, albeit motion on the screen.

Zeno's Paradox has not been relegated to the category of solved issues in mathematics. According to Rucker, various mathematicians have come to the conclusion that the line segment as described is a set of distinct points between which an infinite number of additional points might be plotted.

This view of space has been held by several philosophers since Zeno, notably C. S. Pierce and, perhaps, Kurt Godel. Godel distinguishes between the set of points described in set theoretic analysis and the continuous line of space intuition: 'According to this intuitive concept, summing up all the points, we still do not get the line; rather the points form some kind of scaffold on the line.'

Pierce goes further than this. According to him, a truly continuous line is so richly packed with points that no conceivable set, no matter how large, can exhaust the line. There should not just be one point between all of $1/2$, $2/3$, $3/4$, $4/5$, $5/6$, ... and 1. There should be ∞ points, \aleph points, Absolutely Infinitely many!

Roberto Torretti describes Plato's view of motion as follows.

... Plato obviously countenances a purely mathematical theory of motion, which it would be appropriate to call kinematics or phoronomy. He conceives it quite broadly. "Motion- he says- presents not just one, but many forms. Someone truly wise might list them all, but there are two which are manifest to us." One is that which is imperfectly illustrated by celestial motions.

The other is the "musical motion" (enarmonics phore), studied by Pythagorean acoustics. This science, says Plato, has been justly regarded as astronomy's "sister science." Exact observation- not to mention experiment-is completely out of place here too. Plato pours ridicule on "those gentlemen who tease and torture the strings and rack them on the pegs of the instrument." Generally speaking, "if anyone attempts to learn anything about the objects of sense, I do not care whether he looks upwards with mouth gaping or down-wards with mouth shut, he will never, I maintain, acquire knowledge, because nothing of this sort can be the object of a science."

Mr. Torretti describes Aristotle's view as follows.

Aristotle's solution of Zeno's paradoxes depends essentially on the premise that, even though a point can always be determined which divides a given segment into two parts in any assigned proportion, such a point need not exist before it is actually constructed. ...

Aristotle was well aware that his finite universe might appear to be incompatible with geometry. But, in his opinion, it was not. "Our account does not rob the mathematicians of their science," he writes "by disproving the actual existence of the infinite in the direction of increase. ... In point of fact they do not need the infinite and do not use it. They postulate only that the finite straight line may be produced as far as they wish. It is possible to have divided in the same ratio as the largest quantity another magnitude of any size you like. Hence, for the purposes of proof, it will make no difference to them to have such an infinite instead, while its existence will be in the sphere of real magnitudes."

Isaac Newton refers to Zeno's Paradox in the opening chapter of his *Mathematical Principles of Natural Philosophy*, Book One, Section I, Lemma 1.

Lemma 1

Quantities, and the ratios of quantities, which in any finite time converge continually to equality, and before the end of that time approach nearer to each other than by any given difference, become ultimately equal.

If you deny it, suppose them to be ultimately unequal, and let D be their ultimate difference. Therefore they cannot approach nearer to equality than by that difference D; which is contrary to the supposition.

Einstein similarly ignores Zeno's Paradox. Regarding the concept of a continuum Einstein writes:

The surface of a marble table is spread out in front of me. I can get from any one point on this table to any other point by passing continuously from one point to a "neighboring" one, and repeating this process a (large) number of times, or, in other words, by going from point to point without executing "jumps." I am sure the reader will appreciate with sufficient clearness what I mean here by "neighboring" and by "jumps" (if he is not too pedantic). We express this property of the surface by describing the latter as a continuum.

Davis and Hersch mention the contest between a mathematics of observation and a mathematics of logic using the same progression described in Zeno's Paradox.

The infinite is that which is without end. It is the eternal, the immortal, the self-renewable, the *aperion* of the Greeks, the *ein-sof* of the Kabbalah, the cosmic eye of the mystics which observes us and energizes us from the godhead.

Observe the equation

$$1/2 + 1/4 + 1/8 + 1/16 + \dots = 1$$

On the left-hand side we seem to have incompleteness, infinite striving. On the right-hand side we have finitude, completion. There is a tension between the two sides which is a source of power and paradox. There is an overwhelming mathematical desire to bridge the gap between the finite and the infinite. We want to complete the incomplete, to catch it, to cage it, to tame it.

Mathematics thinks it has succeeded in doing this. The unnamable is named, operated on, tamed, exploited, finitized, and ultimately trivialized. Is, then, the mathematical infinite a fraud? Does it represent something that is not really infinite at all?"

One way of stating Zeno's Paradox in numeric form might be to recognize that the number "1" in Base Two is "1," and that fraction $\frac{1}{2}$ in Base Two is 0.1, and that fraction $\frac{1}{4}$ in Base Two is 0.01, and that the fraction $\frac{1}{16}$ in Base Two is 0.001, etc. Simply stating the number "0.000...0001 in Base Two" should be sufficient to indicate that the infinite number of zeros which can be placed between the first ".0" and the final "1" describes an infinitely small distance from the number zero on the positive side of the number line, thereby "proving" the validity of Zeno's Paradox. Since this small, positive number cannot be equal to zero or have the properties of zero, the number can never equal zero. Perhaps this idea condenses Zeno's Paradox in numeric form, i.e. that Achilles "cannot even start running, for, before traversing the stretch to the starting point of the turtle, he will have to traverse half of it and again half of that and so on ad infinitum."

And yet, according to very accepted mathematic proofs, the inverse of the above number - “0.11111111... in Base Two” - is always deemed to equal 1 exactly despite the very different appearance of the numbers themselves. So it would seem that the first number “0.000...0001 in Base Two” is not recognized as a legitimate number, and the second number “0.111... in Base Two” is set equal to the very number intended to be set off as distinct.

I reasoned that if we set out to explore consciousness as the thing linking up the frames of the movie, we may find a way to dissect this consciousness by looking at various levels of consciousness, including a legal level, an economic level, a psychologic level, a national level, a cultural level, etc. It did not strike me as unreasonable to think that the consciousness of a group of people might be reflective of the underlying consciousness of a single person within the group itself. If these larger areas of consciousness beyond the small group follow the same sort of “fractal” development, the patterns of consciousness might be more obvious, rather than less obvious, as we go to higher and higher levels of group activity.

Moreover, if this pattern in fact exists, it may also be evident in the organization of other levels of reality as well, i.e. chemistry, mathematics, physics, etc.

And if such a congruent pattern between levels exists, it may be provable by experiment.

And so, about the time of 9th or 10th grade in St. Petersburg, Florida, I set off to determine an answer to Zeno’s Paradox through an understanding of the structure of consciousness, consciousness understood as an operable fifth dimension of our reality.

The significance of the Fifth Dimension

My use of the term “fifth dimension” arises independently of any established expertise in the physical sciences. I viewed it as simply obvious that the typical Cartesian coordinate system provides us with a proper way of viewing space vis-à-vis the x, y and z coordinate axes, and the addition of time to this picture provides the possibility of a three-dimensional moving hologram, a three dimensional movie in which all the universe takes place and may be considered. A fifth dimension would simply add into this picture the possibility of joining these various frames into the single, unbroken “movie” of the reality which we see around us.

In the effort to write about such a topic it has been my privilege to employ a number of tutors of physical science to review these papers and help to improve them. Through one, Jeremy Marcq of the Imperial College of London and Harvard University, it has come to my attention that in 1919 Theodor Kaluza re-wrote the equation for general relativity using an additional “fifth dimension” the characteristics of which were (1) that it must be “space-like” and (2) that it must always equal “1” and therefore be undetectable by experiment. The resulting equations replicated the original equations for general relativity but included an additional set of equations which duplicated Maxwell’s equations for electro-magnetism precisely. In this fashion gravity and electro-magnetism have been unified, but on the hypothesis of a space-like “fifth dimension” which can not be detected by any physical experiment.

It appears to me that if consciousness can be taken as this fifth dimension, which Rucker’s analogy of the cinematic arrow suggests, then the investigation of consciousness proposed may bear fruit. To repeat, if we understand reality as a set of congruent tiers of organization – mathematic, atomic, chemical, biologic, psychologic, legal, national, cultural, economic, philosophic – the very congruence examined may lead us in the direction of an

understanding of consciousness which is far more amenable to experiment and testing than we have at the present time. In this fashion Zeno's Paradox may be answered and explored further and as a fundamental part of the universe which I suggest Zeno's logic merits. It is also possible that if a successful connection between this effort and the mathematics of general relativity and electro-magnetism as re-written and re-interpreted by Kaluza may be made, a new interpretation of the entire scope of our understanding of "reality" might be achieved.

A brief history of "the Fifth Dimension"

The papers presented here propose that five dimensions are necessary to describe any event. If one imagines the information necessary to schedule an office meeting we have:

- | | |
|--|---|
| 1) 1st dimension, X-axis, | Central Avenue, running in an east-west direction, |
| 2) 2nd dimensions, Y-axis, | Fourth Street, running in a north-south direction |
| 3) 3rd dimension, Z-axis, | Sixth Floor, running in an up-down direction, |
| 4) 4th dimension, Time, | At 2:30 p.m., |
| 5) 5 th dimension, Consciousness, | With Jones, running in an in-out direction,
the meeting's purpose. |

The person "Jones" introduces "consciousness" into our description of the universe, an "in-out" spatial dimension. The "out" characteristic is the ontologic fact of the meeting, its "being," the fact that it is supposed to take place in "reality" as an existing thing. The "in" characteristic is the epistemologic understanding one derives from the meeting, its "awareness" or "understanding," the knowledge or perspective obtained from the meeting.

While the first four dimensions and their interaction are studied throughout the physical sciences, the fifth dimension and its place in our present understanding of the universe is less well known and is presented here in the following eight points given in summary form.

1) In 1687 Sir Isaac Newton published his work *Principia*. In this book the force of gravity was presented as an unknown force operating under a fixed set of mathematic principles.

2) In 1861-1862 James Clerk Maxwell published his equations for electro-magnetism, in effect performing for electricity that which Newton had accomplished for gravity.

3) In 1905 Albert Einstein published his Special Theory of Relativity, stating the famous relationship between mass and energy, $e = mc^2$.

4) In 1914 Gunnar Nordstrom published his theory of gravity. As a part of this publication he introduced the possibility of a (as yet unobserved) fifth dimension. Using this device he was able to unify both his understanding of gravity and Maxwell's equations. The characteristics of this "fifth" dimension were left un-described and have remained unobserved.

5) In 1916 Einstein presented his General Theory of Relativity, describing gravity.

6) In 1919 Theodor Kaluza unified Einstein's General Theory of Relativity with Maxwell's equations, using a fifth dimension not unlike Nordstrom's effort five years earlier.

7) In 1921, with Einstein's endorsement, Kaluza published his unification of the General Theory of Relativity with Maxwell's equations.

8) In 1926 Werner Heisenberg published his "Principle of Electron Uncertainty," the discovery that the statistical probability of discovering the electron at any given location was balanced against the researcher's knowledge of the mass-energy of the same electron.

The disjoint between the unification of gravity with electromagnetism and the need to connect this also with the quantum mechanics of the subatomic world has created a situation in which science has failed to unify the four known forces of reality, these being the strong force (holding together the nucleus of the atom), electromagnetism, the weak force (which degrades the nucleus) and the weakest force of them all, gravity. In the words of one author:

In the second half of the 20th century, the electromagnetic and weak nuclear forces have been bound together as an electroweak force; a powerful scheme was devised to also include the strong interaction (chromodynamics), and led to the standard model of elementary particle physics. Unification with the fourth fundamental interaction, gravitation, is in the focus of much present research in classical general relativity, supergravity, superstring, and supermembrane theory but has not yet met with success. (Goenner, 2004)

Kaluza's original work proposed that the fifth dimension was, by its very nature, not discoverable.

"Kaluza made two assumptions on this metric; that $g_{yy}=1$, and that all other components of the metric are independent of y . Herein lies the greatest detractor to Kaluza's theory: built into this metric is the condition that we cannot detect this fifth dimension with any experiment. This is a problem for two reasons: one is that this condition seems fairly artificial, on the face of it. Secondly, and probably more importantly, the theory appears guaranteed to do nothing better than reproduce equations (1) (Maxwell's equations) and (2) (Maxwell's effect on Einstein). There is no Kaluza equivalent of the experiments Einstein suggested to test General Relativity, e.g. the deflection of light by the sun, or the precession of Mercury's orbit. ..." (Duffell, _____)

These papers hope to demonstrate a method whereby the fifth dimension may be understood in social realms, thereby leading by analogy to an understanding of this same dimension in physical reality. As one researcher concluded a brief biography of Kaluza:

Above and beyond the epistemological components, Einstein considered Kaluza's theory a serious contender for achieving real physical unification of electromagnetism and gravitation. In this conviction he labored on constructing theories based on Kaluza's model until 1943. Einstein's main objection to Kaluza's unifying concept seems to have been the nonexistence of a fifth dimension – an objection which, owing to the continuing impossibility of empirical proof, still stands today. (Wuensch, _____)

Consciousness as a Circuit

After arriving at the above program I began to look at the things in my life which displayed motion. I was a student of the artist-in-residence Nuita Isserlin of Eckert College at the time, and music definitely displays a form of motion. Each note may be analogized to a point in a continuum, and the consciousness of the performer links these notes together in the right spot at the right time with the right dynamics.

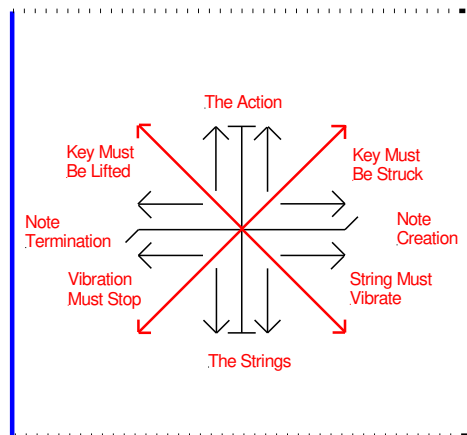


Perhaps a systematic understanding could be given to motion under the challenge of Zeno's Paradox if we admit that motion across a scaffold of points is possible only with a new understanding of the scaffold. I suggest that the notes in a piece of music display a form of consciousness which may be investigated. The analogy is as follows.

There are four essential aspects of playing a musical note on the piano. These are:

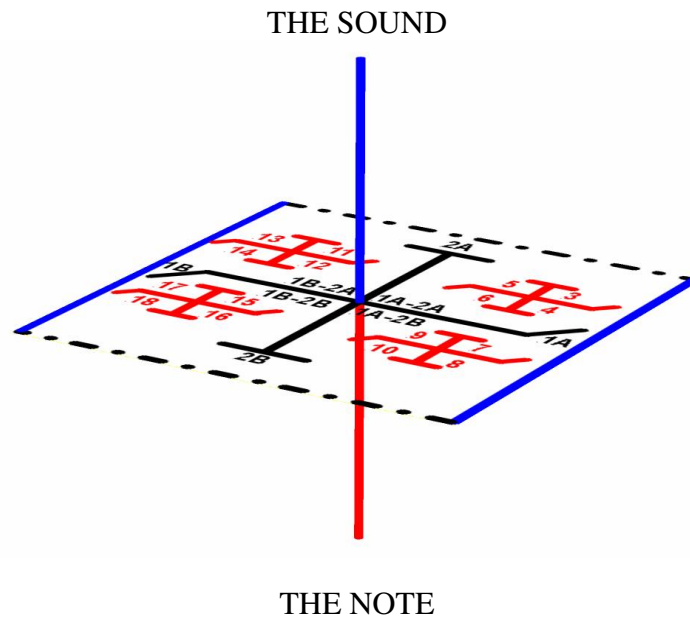
1. The key must be struck.
2. The string must vibrate.
3. The key must be lifted.
4. The string's vibration must stop.

The formulation of these four points is presented as follows, and the central terms of the figure perhaps can be anticipated by the reader.



On the right hand we have a vertical blue line representing the tension which exists between the key being struck and the string vibrating. On the left hand we have a vertical blue line representing the tension between a key being lifted and the vibration stopping.

An “Image Axis” may be added to this model, one which contrasts the “sound” of vibrating strings with a finished “note” of music as terminated by the performer at a particular time.



In this regard it must be emphasized that the termination of a sound by the performer is of equal significance as the creation of the note itself. The introductory bars of Beethoven’s Fifth Symphony are meaningless without the swift repetition of three notes, each short, followed by a sustained fourth note a major third lower in pitch.

Consequently three dichotomies are conjoined in the above model:

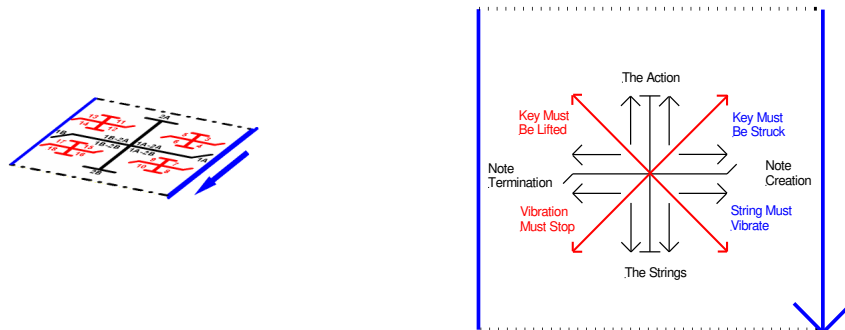
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|--------------|-----|------------------------|
| (1) creation | vs. | termination, |
| (2) action | vs. | vibrating strings, and |
| (3) sound | vs. | finished note. |

The interaction of these three necessary oppositions are key in the understanding of the three volumes of essays which follow.

The “scaffold” upon which notes are built (and which by analogy points along a line must possess as well) is as follows.

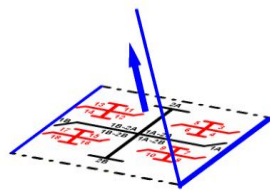
Each note in a piece of music is connected by way of a similar underlying circuit.

- 1) The key/hammer strikes the string, which then vibrates.



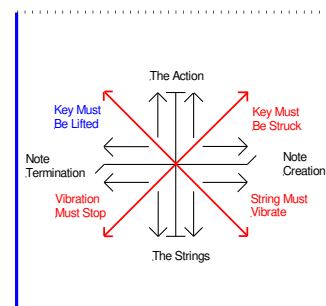
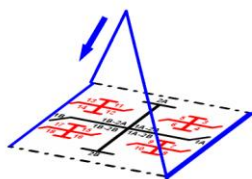
- 2) This vibration creates the sound of piano performance.

THE SOUND



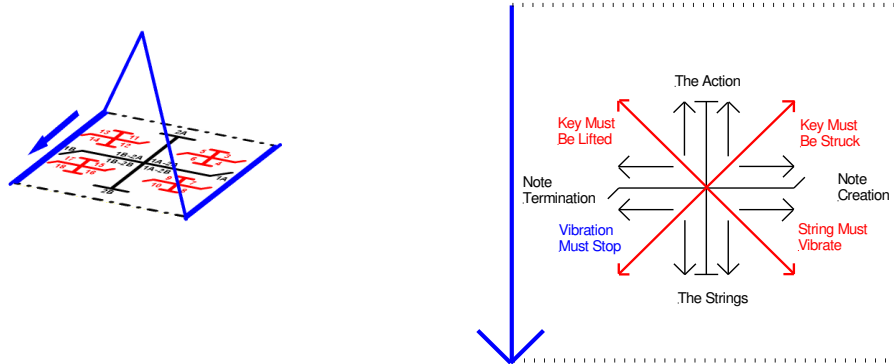
- 3) A note - a sound which has ended on time - is created by lifting of the key...

THE SOUND



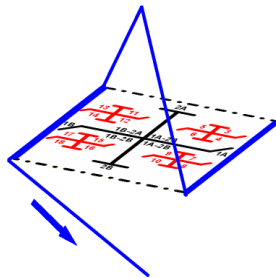
4) ... Which permits the damper to fall onto the string, thereby stopping the vibration and the sound at a particular time in the piece of music.

THE SOUND



5) This in turn terminates the duration of the note and provides a basis to understand the relationship of the note to the rest of the piece of music,

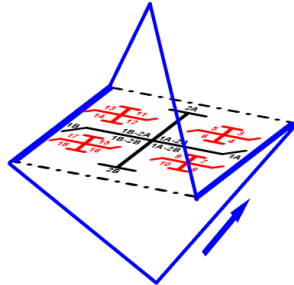
THE SOUND



THE NOTE

6) ... Which in turn gives rise to a new understanding of the note, i.e. it is now a particular note in the context of the rest of the piece.

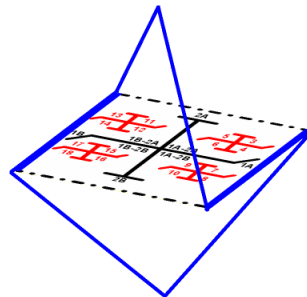
THE SOUND



THE NOTE

7) Each note of music represents a circuit of relationships, as follows.

THE SOUND



THE NOTE

This simple circuit describes the main attributes of playing a note of music on the piano, and it also suggests a manner in which to connect the flow or movement of music to a set of mechanical operations which themselves “blink” on and off. So, as of my first two years in high school at St. Petersburg High School in Florida (1973-1975), I had a simple framework for further thought on a matter – Zeno’s Paradox – of which I was quickly becoming quite passionate.

Consequently I began to consider various well-known organizations of the world around us as demonstrating various kinds of movement.

1																	2
1 H 1.0079																	2 He 4.0026
3 Li 6.941	4 Be 9.0122											13 B 10.811	14 C 12.011	15 N 14.007	16 O 15.999	17 F 18.998	18 Ne 20.180
11 Na 22.990	12 Mg 24.305	3 3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.912	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.13	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #															
* Lanthanide series			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 161.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
# Actinide series			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)			

[illegible]

38

Kirkwood High School

About this time, just before the beginning of my junior year, we left St. Petersburg and returned to St. Louis. I joined a book study group in which Plato's Republic was the main point of study. The following conversation, taken from the work, focused my approach specifically on the plan given here. Bloom (1968).

(By Socrates)

"It looks to me as though the investigation (of justice) we are undertaking is no ordinary thing, but for a man who sees sharply. Since we're not clever men, " I said "in my opinion we should make this kind of investigation of it: if someone had, for example, ordered men who don't see very sharply to read little letters from afar and then someone had the thought that the same letters are somewhere else also, but bigger and in a bigger place, I suppose it would look like a godsend to be able to consider the littler ones after having read these first, if, of course, they do happen to be the same."

"Most certainly," said Adeimantus. "But, Socrates, what do you notice in the investigation of the just that's like this?"

"I'll tell you," I said. "There is, we say, justice of one man; and there is, surely, justice of a whole city, too?"

"Certainly," he said.

"Is a city bigger than one man?"

"Yes, it is bigger," he said.

"So then, perhaps there would be more justice in the bigger and it would be easier to observe in the bigger and it would be easier to observe closely. If you want, first we'll investigate what justice is like in the cities. Then we'll also go on to consider it in individuals, considering the likeness of the bigger in the idea of the littler?"

"What you say seems fine to me," he said.

"If we should watch a city coming into being in speech," I said, "would we also see its justice coming into being, and its injustice?"

"Probably," he said.

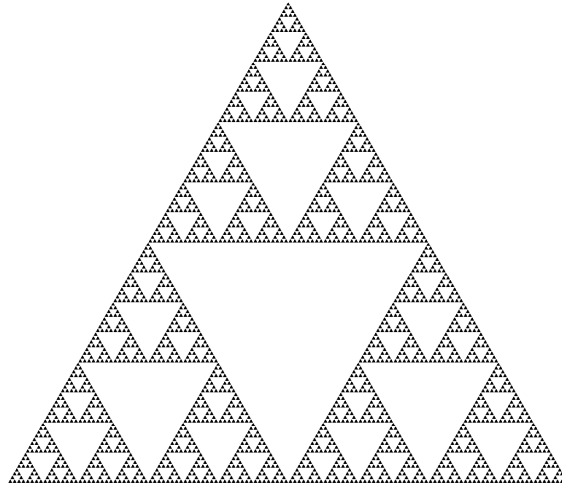
"When this has been done, can we hope to see what we're looking for more easily?"

"Far more easily."

"Is it resolved that we must try to carry this out? I suppose it's no small job so consider it."

"It's been considered," said Adeimantus. "Don't do anything else."

In modern terms, Plato proposes that the city is a larger “fractal” of the individual. A “fractal” is a geometric construction which, through the multiplication and repetition of a simple and uncomplicated basic pattern, develops additional patterns considerably more complex than the original shape. A common example is the Sierpinsky Triangle, as follows.



Plato’s suggestion that social organization is a “fractal” of the human individual is mirrored in remarks made by Benoit Mandelbrot, the inventor of the term “fractal.”

“It cannot be accidental that so many fractal shapes suggest snails, jellyfish, or other forms of life. It raises a basic question of biology: How much genetic coding is needed to obtain the diversity and richness of shape we observe in living beings? ... (F)ractal shapes of great complexity can be obtained merely by repeating a simple geometric transformation, and small changes in the parameters of that transformation provoke global changes. This suggests that a small amount of genetic information can give rise to complex shapes and that small genetic changes can lead to a substantial change in shape. ... What will the next ten years bring? I don’t know; I’ve only scratched the surface of everything. Ultimately it’s a matter of how much unity can be created by this one idea. And the ultimate test is the test of time.” Mandelbrot (1984).

The possibility that reality might exist as a set of congruent levels of organization as described by Plato in *The Republic*, each one born of a similar pattern and each addressing Zeno’s Paradox in a new way, intrigued me.

Four Discoveries

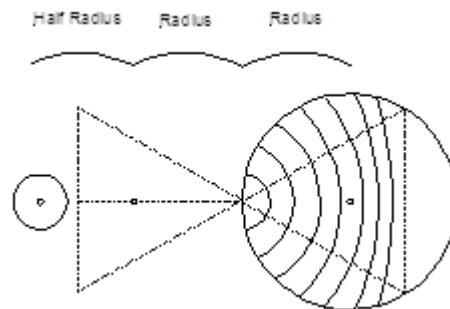
As I considered the possibility that this approach might be confirmed by some sort of experiment or demonstration I came across three additional discoveries which bear on the papers in this set. These are, in chronologic order:

1. That the Prime Number series appears to relate to the Periodic Table of Elements. (mentioned previously)
2. That the Rings of Saturn, and the Roche limit which sets the point at which the rings begin, may be explained through an understanding of the universe as “blinking on-and-off” in a fashion expected under Zeno’s Paradox.
3. That the cultural development of France may be mathematically analyzed and resembles the periodic charge or chemical elements in its construction.
4. That the economic development of the United States may be placed in a 56-year spiral from which various political predictions may be made very reliably.

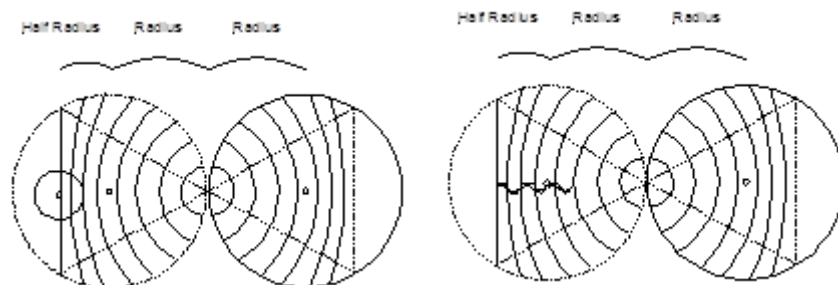
I present these at greater length in these papers, but summarize them here briefly.

2. If the Universe “blinks” on an off, I reasoned that this blinking might be best seen if we look at very massive bodies and investigate their behavior.

To accomplish this I took a circular pizza pan, filled it with water, and tapped gently at one point on the circumference to see what wave pattern would form. As is very well known, the wave flattens out in an equilateral triangle with the point creating the wave as one of the angles of the triangle. I reasoned that if there is a “reflective” characteristic to this wave which might be internal to Saturn as created by the approach of a smaller moon, then the point at which this moon becomes a part of Saturn may occur as this triangle is reversed into the space surrounding Saturn.



This would mean that a moon disintegrates in the gravitational attraction of Saturn at 2.5 radians of the larger planet. A library book confirmed that, as of 1975, the outer ring of Saturn began at something like 2.5 radians, but it was not clear from the photograph whether this might be the case.



Indeed, the Roche Limit, http://en.wikipedia.org/wiki/Roche_limit, defines the point at which these rings will commence. Objections were raised at the time that if the Rings of Saturn were really created by wave action, the very action itself would cause the rings to disintegrate. Nevertheless the Rings of Saturn do indeed demonstrate very large waves, ones which may be explained by a Fifth Dimension investigated the lines of Zeno’s Paradox suggested here.

On this point see <http://saturn.jpl.nasa.gov/photos/imagetdetails/index.cfm?imageId=4891>

<http://blogs.discovermagazine.com/badastronomy/2009/06/11/saturns-rings-do-the-wave/#.UySu-oVNjsI>

<http://www.universetoday.com/10034/density-waves-in-saturns-rings/>

3. The third discovery was that the development of France falls into very distinct and mathematically precise periods, as follows. This is the subject of a paper later, but in 1977 the final two periods, these being estimated as beginning in 1981 and 1989, had yet to occur. The model predicted that between 1989 and 1991 a revolution similar to the Revolution of 1848 should sweep across Europe.

Diagram 26: Modern France - Historic Catch Phrases, Slogans				
	CENTRAL.	CABINET	PARLIAMENT	CHAOS
KINGS 1643-1804 161 years	Louis XIV 1643-1715 "L'etat, c'est moi."	Louis XV 1715-1774 "Après nous, le deluge."	Louis XVI 1774-1793 "Laissez-les manger les gateaux."	French Revolution 1789-1804 15 years "Liberte, Egalite, Fraternite!"
NOBLES 1804-1852 48 years	Napoleon I 1804-1814 "Ma femme."	Bourbon Restoration 1814-1830 "They have learnt nothing, and they have forgotten nothing."	Louis-Phillippe 1830-1848 "The Bourgeois King"	Revolution of 1848, Second Republic 1848-1852 4 years "Workers of the World Unite! You have nothing to lose but your chains!"
BOURG. 1852-1958 106 years	Napoleon III 1852-1870 "The Bourgeois Emperor."	Third Republic First Half 1870-1919 "To The Day!"	Third Republic Second Half 1919-1940 "Better Hitler the Blum."	World War II and aftermath 1940-1958 18 years "Blood, Toil, Tears, and Sweat."
PEASANTS 1958-1989 + 31 years	De Gaulle 1958-1968 "Vive la France!"	Pompidou, d'Estaing 1968-1981 "The Technocrats."	Mitterand 1981-	Soviet Implosion 1989-1991 26 months

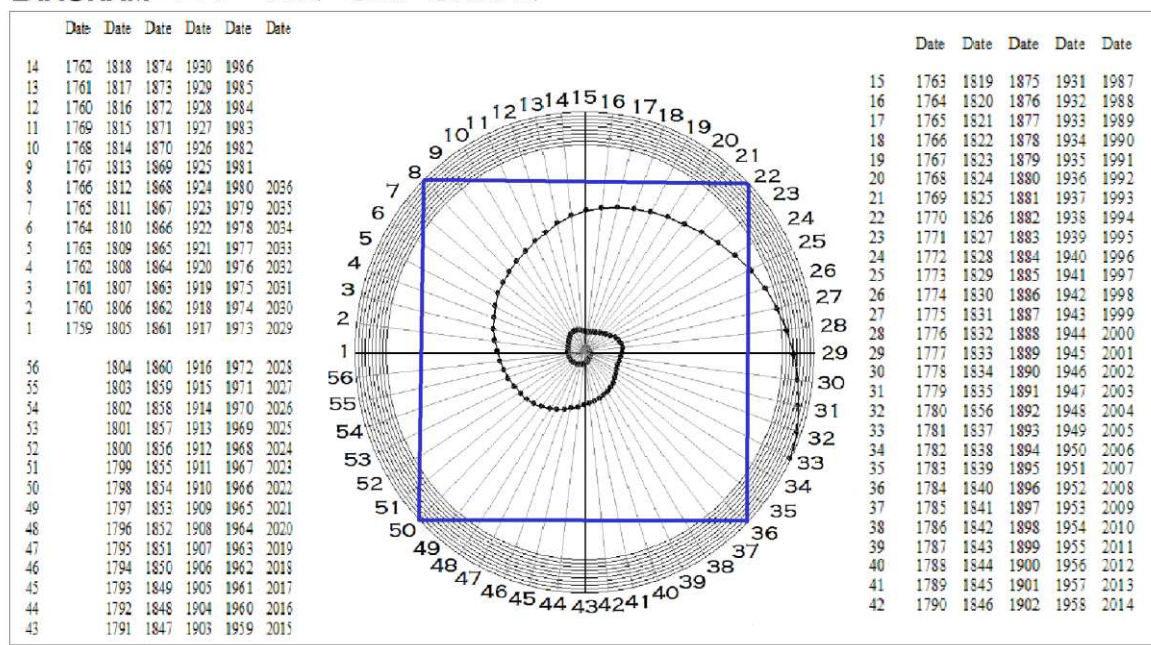
4. The fourth discovery was that the development of the United States was very likely a spiral of 56 years. This idea is explored in a number of the papers herein but it took root in my mind as of Spring 1977. This model predicted several things:

(1) that the liberal wave during which up to that time my entire 18 year old life had been spent would end in 1980, three years hence;

(2) that the date horizontal from the year 1973 – 2001 – would be a date of crisis, perhaps along the lines of August 6 and 9, 1945, the nuclear bombings of Hiroshima and Nagasaki; and

(3) that – like several years along axis 33 these being 1781, 1837, 1893, 1949 – the year 2005 would be a date of profound crisis for the United States.

DIAGRAM 4-7. THE "GNP SPIRAL"



It was with this collection of ideas I went to college as a Freshman at the University of Colorado at Boulder, a very liberal and even radical college at the time.

The University of Colorado at Boulder

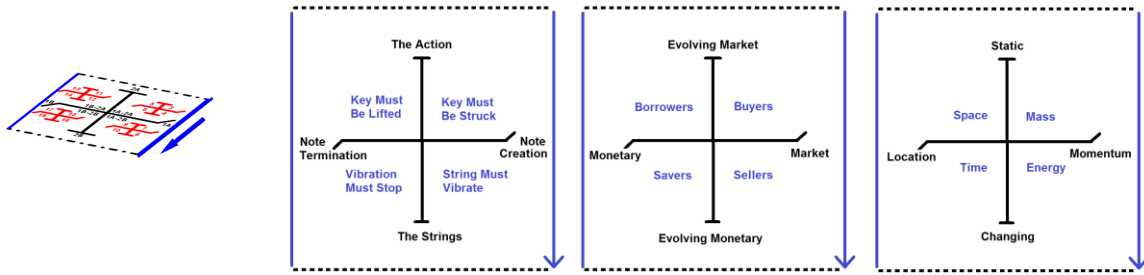
I began my study of economics and natural philosophy as a freshman in college in 1977. It became clear that this circuit could be used to explore these two very different phenomena simultaneously. I reasoned as follows.

Economics is the study of money and its relationship to the things money buys. Physics is the study of space and time and the things which these two contain.

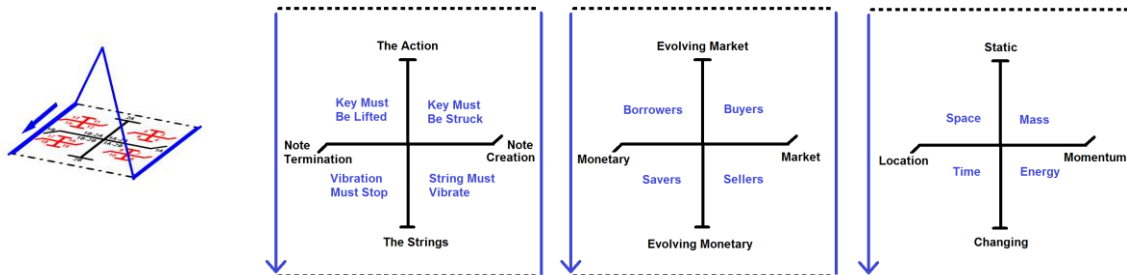
In economics it is impossible to both pay for something and keep the cash paid. One may either keep one's cash and forego the item, or possess the item and release the money.

In the study of the electron one may obtain complete information about the location (space-time coordinate) of an electron but in doing so one loses the ability to obtain complete information about its momentum (mass-energy coordinate).

If we let "mass-energy" and "buyer-seller" represent the physical-ness of physics and "real" sector of goods and services in economics respectively, these may both be associated with the "note creation" part of the circuit above.



Conversely, we may let "space-time" and "savers-borrowers" represent the non-physical part of physics (location) and the monetary sector of the economy in the circuit above, in connection with "note termination."



Viewed in this way the un-availability of both a space-time and mass-energy coordinate for the electron makes the same sort of sense that the purchase of an object requires parting with the cash necessary for the purchase. The oppositional aspects of economics, electron behavior and piano performance are thereby quite clearly laid out in a fashion which is both simple and direct.

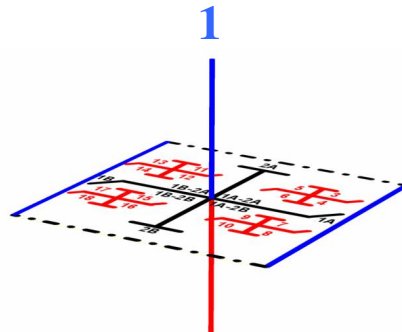
Consciousness as a Number

If success in fundamental physics and economics is obtained with this simple circuit then a re-examination of the concept of music may bring about further insights. Below is the melody of the song “Pop Goes the Weasel.”

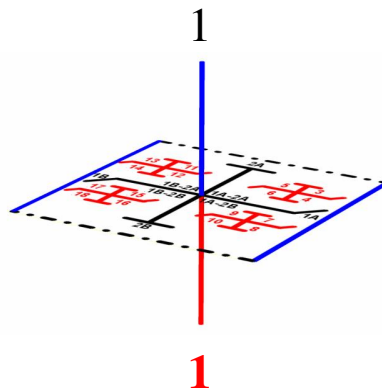


We may unify the notion of Sound and Note mathematically if we use this “Image Axis” to generate a series of numbers which can be used to join these two poles. For example, if we give the number “one” to the first vibration of the piece

First string vibrates.



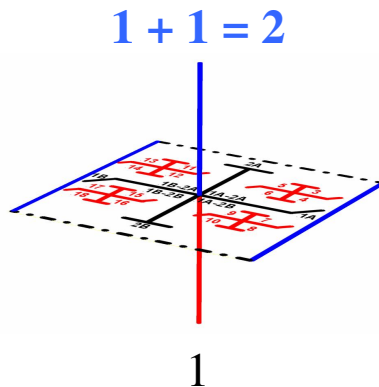
... we can see that the “note” itself revolves entirely upon the sense that the sound has ended.



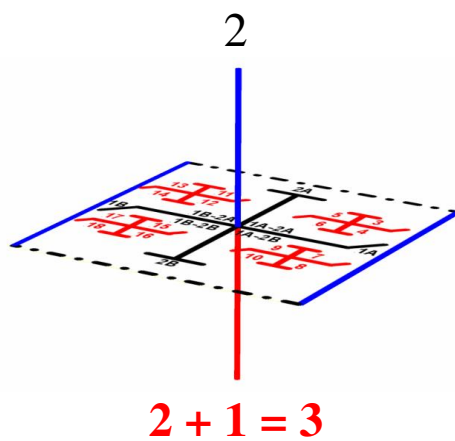
First note is heard.

Once this “note” has ended, a new sound in the melody follows:

Second string vibrates.



The combination of the second sound with the first note is something other than a simple addition of notes. Once the second sound terminates, it creates a new sense of both notes. It brings about a new understanding of the note previously heard in combination with itself.

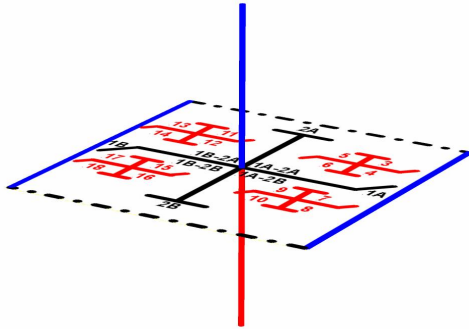


Second note is heard.

And then a third sound becomes part of the melody,

Third string vibrates.

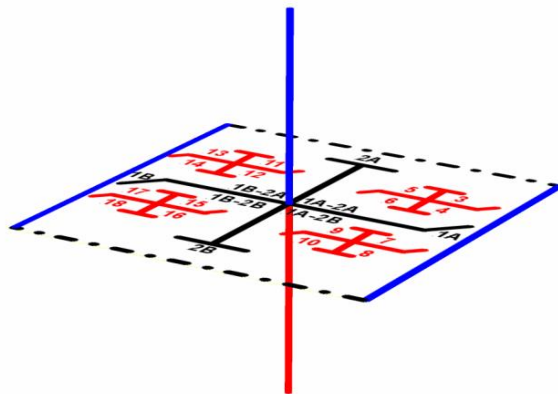
$$2 + 3 = 5$$



3

And followed, upon its termination, by the understanding of the three notes collectively:

5



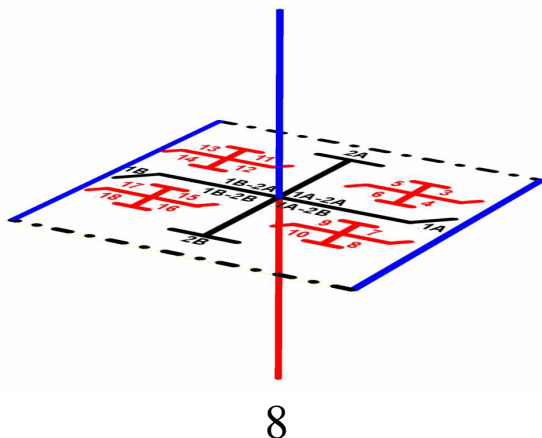
$$3 + 5 = 8$$

Third note is heard.

And then a fourth note...

Fourth string vibrates.

$$5 + 8 = 13$$



By extending this series of sums into a pattern we have the Fibonacci series, to wit:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc.

Joining these numbers into fractions in an effort to determine a common ratio, we have:

$$\frac{1}{1} \quad \frac{2}{1} \quad \frac{3}{2} \quad \frac{5}{3} \quad \frac{8}{5} \quad \frac{13}{8} \quad \frac{21}{13} \quad \frac{34}{21} \quad \frac{55}{34} \quad \frac{89}{55} \quad \dots$$

The mathematic significance of this set of fractions was unknown to me at the time.

The Rocky Flats Truth Force

The possibility that social behavior might have some characteristic lending itself to the mathematic “consciousness” underlying reality led me to become involved – between April 29, 1978 through the end of the year – in an anti-nuclear weapons protest group engaged in non-violent, civil disobedience at the Rocky Flats Nuclear Weapons Facility. I became a charter member of *the Rocky Flats Truth Force*, was arrested three times, spent 2.5 weeks in jail and participated actively in the group. I was able to investigate personally the direct relationship between the individual member and the group activity. I also was able to predict that the chance to engage in this activity was coming to an end, if the spiral of American History I had thought might be possible was accurate.

The American College in Paris

My interest in these connections between levels of reality led me to study international affairs, international law and macroeconomics at the American College in Paris, 1979-1981. One of the central maxims of international law goes very well with this study of different levels of reality, i.e. "International Law is but Private Law writ large." This tied in very well with the ideas of Plato's *The Republic* mentioned earlier.

It was at this time I became aware of Okun's Law. This principle of macroeconomics dictates that to lower the rate of unemployment by 1% GNP must be increased by 3%. I was surprised that there was no real interest in divining the method behind what appeared to be one of the foundational parts of macroeconomics. I suspected at the time that the stability of the relationship might have to do with the trigonometry of a circle and an underlying $1 : \pi$ relationship, but I went no further at that time.

One of the most important aspects of my time in Paris was the notion that the card game Gin Rummy might add quickly to the presentation and consolidation of these ideas as a single theory. The four quadrants northeast, southeast, southwest and northwest might relate to the four hands of a game of Gin Rummy, these being "Your Hand," "My Hand," "The Throw-Away Pile," and "The Top Card of the Draw Pile," respectively. If this was the case the clarity and competition of the eastern portions of the game "Your Hand" and "My Hand" might relate to the conservative and oppressive nature of history during these periods. The idea of arbitrary choice which typifies the "Throw-Away Pile" might represent the choice of values made by American in the historic periods of the southwest portion of the graph. And the inherent uncertainty of "The Top Card of the Draw Pile" might account for the sudden onset of inflation as of 1973.

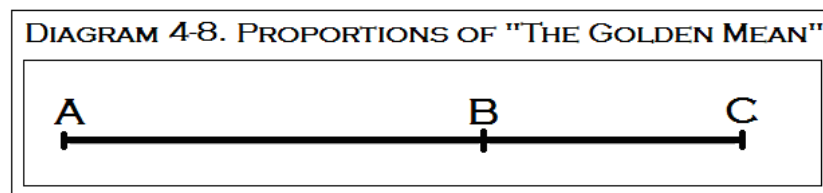
I noticed as well that this pattern could order the first 100 elements of the periodic table.

St. Louis University

It was in my final year of undergraduate school, 1981-82, that an interest in the ontology and epistemology of things began. It was clear that established philosophies of many types dealt at length with the distinction between that *which is* and that *which is known*. This proved to be an essential part of putting together the ideas in this book.

Another key point which developed at this time was a better understanding of the Golden Mean, as derived from the set of fractions developed earlier in Boulder. This continuing series renders the constant "phi" $\phi = 1.6180...$ Geometrically, the proportion derived by this approach is "The Golden Mean," as follows:

A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the lesser.



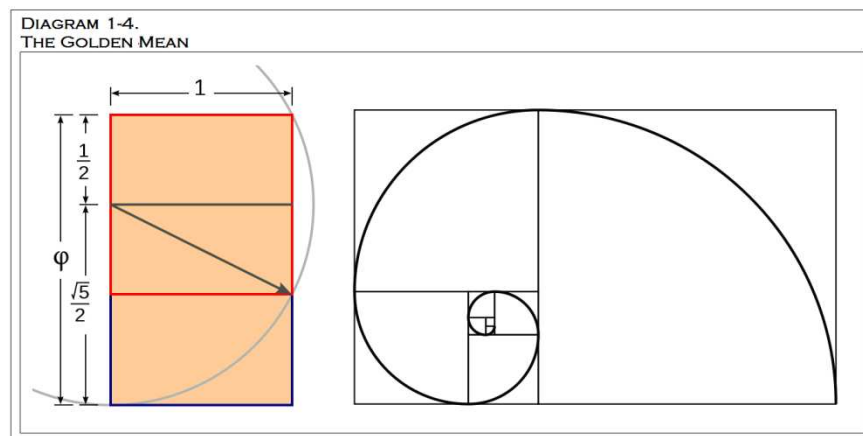
The exploration of this mathematic ratio is of enormous importance to the history of science. As discovered by Johannes Kepler in 1611, if the Fibonacci series is taken as a set of ratios, these ratios oscillate around the constant 1.6180... as follows: (Livio, 2002:101)

1.	1/1	1.000000
2.	2/1	2.000000
3.	3/2	1.500000
4.	5/3	1.666666
5.	8/5	1.600000
6.	13/8	1.625000
7.	21/13	1.615385
8.	34/21	1.619048
9.	55/34	1.617647
10.	89/55	1.618182
11.	144/89	1.617978
12.	233/144	1.618056
13.	377/233	1.618026
14.	610/377	1.618037
15.	987/610	1.618033

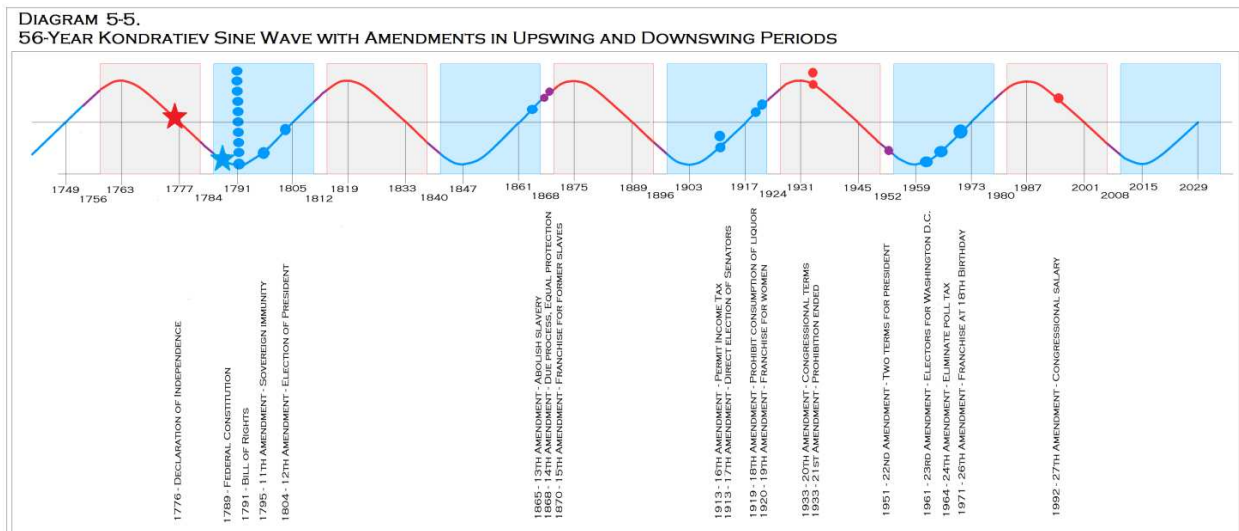
Best known for his work in astronomy and the development of laws regarding planetary motion, Kepler once famously noted: (Livio 2002:62)

“Geometry has two great treasures: one is the theorem of Pythagoras, the other the division of a line into mean and extreme ratio. The first we may compare to a mass of gold, the second we may call a precious jewel.”

Geometrically, the proportion of $1 : \phi$ may be created by the construction below left. A spiral may be obtained from this construction below right. This spiral and its relationship to the economy of the United States is a central interest within this series of essays.

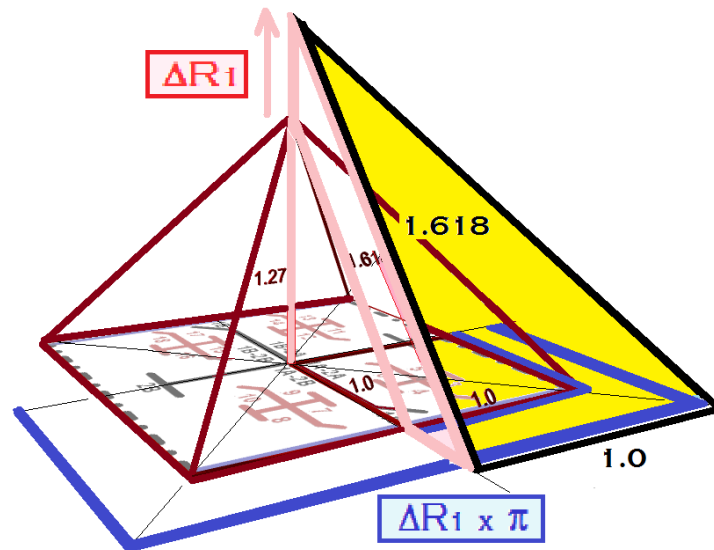


As will become apparent throughout these essays, the economic development of the United States demonstrates both of these mathematic proportions – π and ϕ – repeatedly. Indeed, a 56-year sine wave of political development within the history of the United States will be fundamental in the development of these essays. If the historic course of amendments to the federal constitution of the United States is tracked according to their placement in a 56-year sine wave in accordance with this model, we have the following. (Diagram 5-5) A strict periodicity may be associated with the upswing of a 56 year sine wave and the creation of new and important amendments. The purpose of these essays is to describe, explain and make use of these correlations over a very broad spectrum of research.



The University of Missouri School of Law at Columbia

These interests collided in my second year of law school during a course on evidence. It became very clear to me that the patterns I had noticed throughout this study of various levels of reality were incorporated, as if by crystallization, in the Prohibition Against Hearsay. The ability of this pattern to be useful in evaluating Russell's Paradox of set theory led me to look serious at the possibility that the picture of reality I had been developing might make sense. I therefore went to the school library and looked at the dimensions of the Great Pyramid. There I found that the proportions of the Great Pyramid were exactly those of the interests I had.



My interest in law was not typical. I was fundamentally intrigued by the nature of the decisions which were made in a court and the evolution of the common law of England into a set of quite distinct rules. This evolution of ideas is quite apparent to any trained lawyer, but it is not generally the topic of science as such. In any event it showed that the consciousness of people being governed had an unquestionable affect upon the laws under which they are governed. Nevertheless the pattern which I had noticed regarding Gin Rummy, and as I had applied it to the Periodic Table of Chemical Elements, showed up quite clearly in the well-known legal rule The Prohibition Against Hearsay.

Part Four – The Genesis of these Papers

The changes proposed by this course of inquiry are radical, and the predictions made as a result of these models were quite long term. I published nothing at all of these interests.

The fall of the Berlin Wall in 1989, however, was so extraordinarily on point as to the final square of the analysis regarding France that as of 1989 I no longer wanted to ignore my own interests. I began to write these essays – previously dropped in 1981 – in 1990.

In the summer of 2001 I mentioned to my brother and a good friend, as well as my immediate family, that if these essays are worth anything, there should be a monumental crisis hitting the United States sometime around August, 2001, later that summer, akin to the nuclear bombings of Hiroshima and Nagasaki. On September 11, 2001 the World Trade Center attack took place, an event which in my view meets the expectation of the prediction.

On December, 2003, while at a café in Great Falls, Montana Senator Max Baucus and his aids were visiting. At this time Senator Baucus was the chairman of the Senate Finance Committee. I asked if the Senator might be interested in reading a draft of a portion of these essays and my prediction of a financial and/or diplomatic panic in 2005; I was invited to send them to his aid Jim Foley. I sent the paper on December 8, 2003 and received a brief acknowledgement. The abstract of the paper stated:

A 56-year spiral of American economic growth demonstrates the Fibonacci Series, thereby illustrating the mathematic and biologic relationship between the American economy and the natural phenomena underlying it. This spiral provides the basis for a prediction that the year 2005 will mark a tremendous diplomatic and financial panic throughout the world. The chief advantage of this approach is that it provides exact dates as to when change will occur, and hints as to what sort of change will occur. This approach anticipates that the years 1781, 1837, 1949 and 2005 will be analogous to one another, each year presenting a sudden, dramatic challenge to the United States.

Ten months later, on September 17, 2004, the FBI also warned that a financial crisis was imminent. <http://www2.fbi.gov/congress/congress04/swecker100704.htm>

The potential impact of mortgage fraud on financial institutions and the stock market is clear. If fraudulent practices become systemic within the mortgage industry and mortgage fraud is allowed to become unrestrained, it will ultimately place financial institutions at risk and have adverse effects on the stock market. Investors may lose faith and require higher returns from mortgage backed securities. This may result in higher interest rates and fees paid by borrowers and limit the amount of investment funds available for mortgage loans.

Often times, mortgage loans are sold in secondary markets or are used by financial institutions as collateral for other investments. Repurchase agreements have been utilized by investors for protection against mortgage fraud. When loans sold in the secondary market default and have fraudulent or material

misrepresentation, loans are repurchased by the lending financial institution based on a "repurchase agreement." As a result, these loans become a non performing asset. In extreme fraud cases, the mortgage backed security is worthless. Mortgage fraud losses adversely affect loan loss reserves, profits, liquidity levels and capitalization ratios, ultimately affecting the soundness of the financial institution.

I mentioned to my family that this might be the beginning of the crisis which I had been expecting. The surprise which I had at the time, and which I am unable to explain to my own satisfaction, is why this crisis was delayed to the year 2008.

Nevertheless the first prediction above precedes by ten months the warning given by the FBI to Congress in September, 2004. Both warnings highlight the historic precedents and imminent nature of the crisis, i.e. 2005. To put in perspective the significance of these predictions in light of subsequent experience, one author has written:

How did the official leaders of capitalist economic strategy act before, during and after the Great Recession?

Before 2007, no official strategist of economic policy forecast any crisis. US Fed Chairman Greenspan in 2004 told us that "a national severe price distortion is most unlikely in real estate." In 2006, he told us that "the worst may be over for housing," just the housing bubble burst. US treasury secretary Hank Paulson said the crisis in the overall economy "appears to be contained," March 2007.

During the crisis, in October 2008, the great financial maestro Greenspan told the US Congress, "I am in a state of shocked disbelief." He was questioned: "In other words, you found that your view of the world, your ideology was not right, it was not working?" (House Oversight Committee Chair, Henry Waxman). "Absolutely, precisely, you know that's precisely the reason I was shocked, because I have been going for 40 years or more with very considerable evidence that it was working exceptionally well. (Roberts 2011)

It has become clear to me that the present and quite on-going Global Financial Crisis may profitably be understood in terms of the papers herein.

In January, 2011 I began to look in earnest for a publisher. My son Andrew agreed to join me as a co-author. Our first paper was published as a peer-reviewed research article on August 8, 2011 in *The Middle East Studies Online Journal*, H. Karoui, editor, at <http://www.middle-east-studies.net/?p=22639>, Issue 6, Volume 3, pp. 199-253.

On March 31, 2012 an extensive update of this first paper was deposited in the Munich Personal RePEc Archive, at <http://mpra.ub.uni-muenchen.de/37771/>. We received a request to publish this article on February 12, 2013. Subsequently this article was included as one of nine peer-reviewed articles in the monograph "Globalization of World System Research," *Entelequia: Revista Interdisciplinar*, University of Malaga, Malaga, Spain, Issue 15, April, 2013, pp. 37-124, <http://www.eumed.net/entelequia/en.art.php?a=15>.

This paper is located at <http://www.eumed.net/entelequia/en.art.php?a=15a02>.

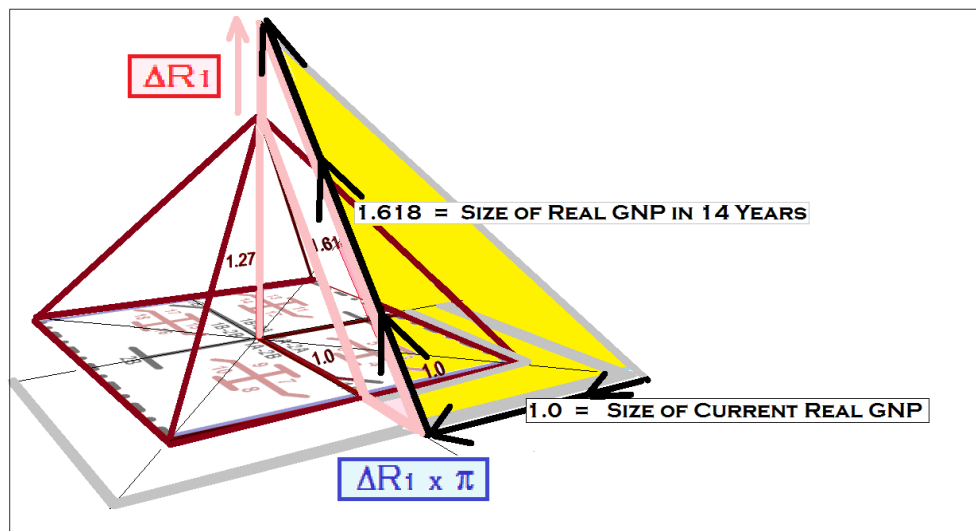
I then began an extensive analysis of the data set underlying Okun's Law. The second article is entitled "Okun's Law as a Pi-to-One Ratio: a harmonic / trigonometric theory as to why Okun's Law works." <http://mpira.ub.uni-muenchen.de/46633/> The original of this paper on Okun's Law is found at <http://mpira.ub.uni-muenchen.de/46633/> This sequel to the first paper is a reply to Dr. Edward Knotek's theoretical question "How Useful is Okun's Law?", <http://www.kc.frb.org/publicat/econrev/PDF/4q07Knotek.pdf> To my knowledge it is the only paper which attempts to explain the 3:1 proportion between changes in GNP and changes in the rate of employment in trigonometric terms.

"The Pyramid Economy"

The striking feature of this line of investigation is that the two insights into economics it presents – the first as to the Kondratiev Wave and the second as to Okun's Law – lead to ratios which are virtually identical to the Great Pyramid of Giza. I present these briefly here in this Introduction.

The Kondratiev Wave

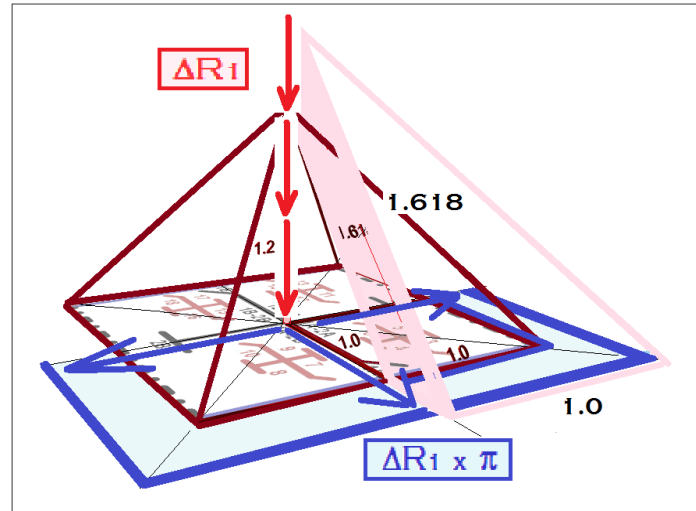
At any midpoint along this square perimeter will lie an apothem, a 90 degree angle returning to the pinnacle of the Pyramid. The distance from any corner of the Base to this midpoint, representing the GNP production of any given year, taken as a "1," will lie in a 1:φ ratio – a 1 : 1.6180... ratio – between this amount and the GNP of a year 14 years hence, as represented by the ratio between the half-segment to the apothem itself.



This 14-year period appears to be foundational to a $4 \times 14 = 56$ year circuit, known historically as "the Kondratiev Wave," otherwise known as a "Long Wave" of evolving social and economic relationships. The study of the Kondratiev Wave is key to the understanding of the economy of the United States, its history and its future.

Okun's Law.

Okun's Law states that there is a 3:1 ratio between changes in the size of GNP and changes in the rate of employment. I argue that the proportions given by Okun's Law may be transferred to the Great Pyramid of Giza on the suggestion that if the rate of employment is taken as a downward thrust from the top of the Pyramid, then the expansion of any measurement of GNP, represented by the perimeter of base of the Pyramid, will result in a π :1 ratio as between half the perimeter and the height.

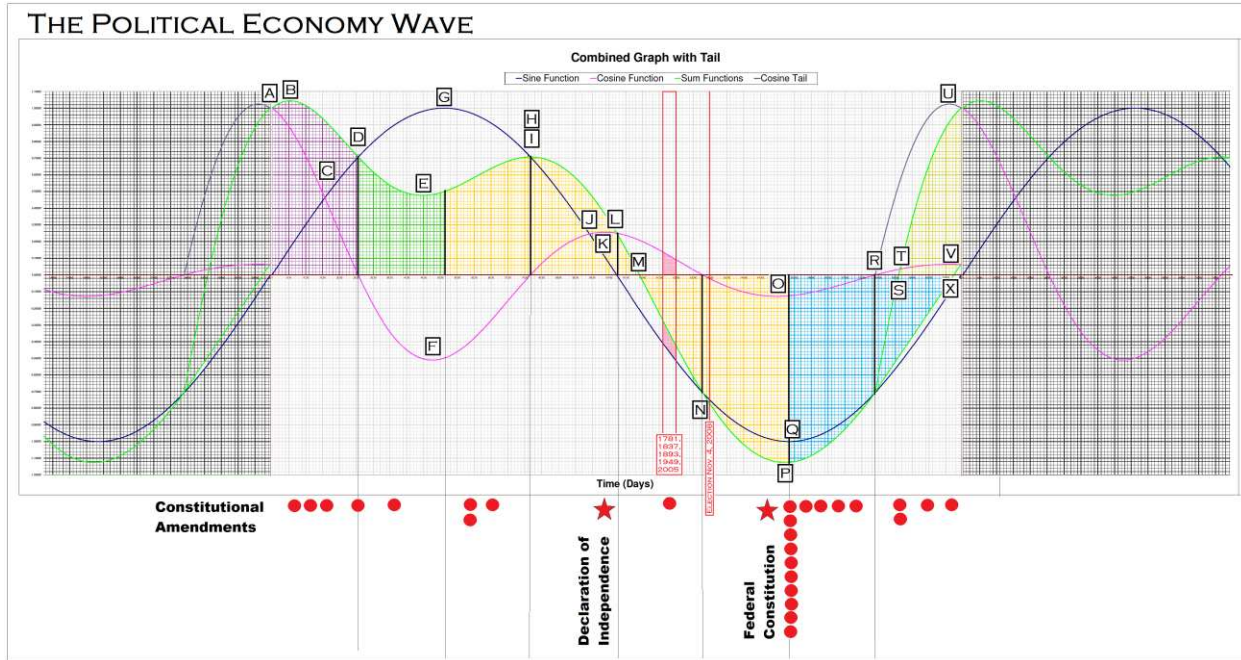


I argue that these two proportions govern the economic development of the United States beginning in 1801 to the present time.

Furthermore it appears that the study of “the laws of consciousness” must begin with the proposition that this ancient monument – the Great Pyramid – appears to hold a direct connection to our best way of dissecting consciousness, i.e. through an examination of social history and macroeconomic data. See additional materials at: http://www.scribd.com/scott_albers_1

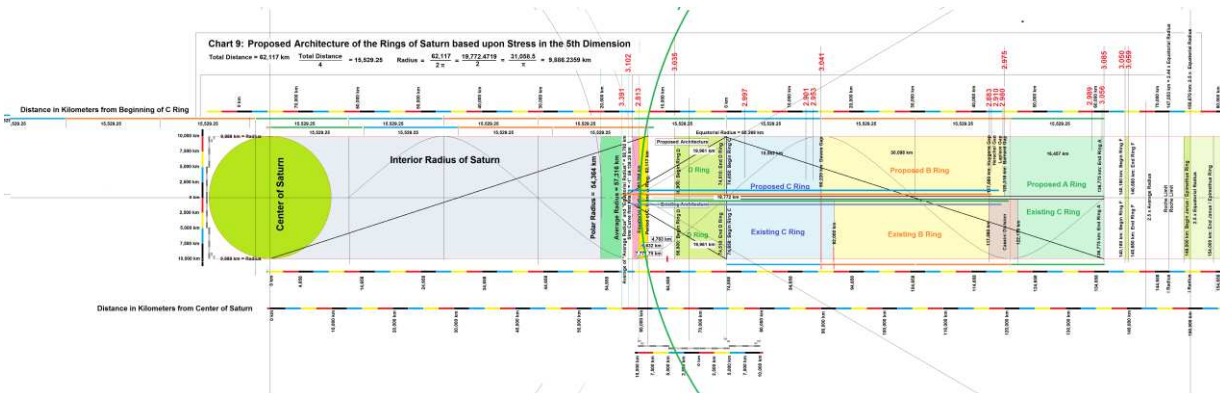
The Political Economy Wave

Using the same color scheme given for the previous models we will examine in these essays the creation of the following mathematic wave running through American economic and social history.



Gravity and the Rings of Saturn

The success of this program in macroeconomics has led to an exploration of the Rings of Saturn. Simply put, if this fifth dimension helps to explain the realm of macroeconomics, the possibility exists that consciousness also organizes gravitational attraction in physics. This has led to the following analysis of these rings, one which re-categorizes them according to the same principles used in the other levels of this study.



The Material Being Counting Machine

In order to make these ideas more expansive and over a broad range of phenomena, let us imagine that we construct a machine to count the number of material “beings” in the universe: the “Material Being Counting Machine.” It can count, instantly and accurately, the number of anything which we ourselves can count with our own senses or the magnification of our senses through technologic innovation and extension.

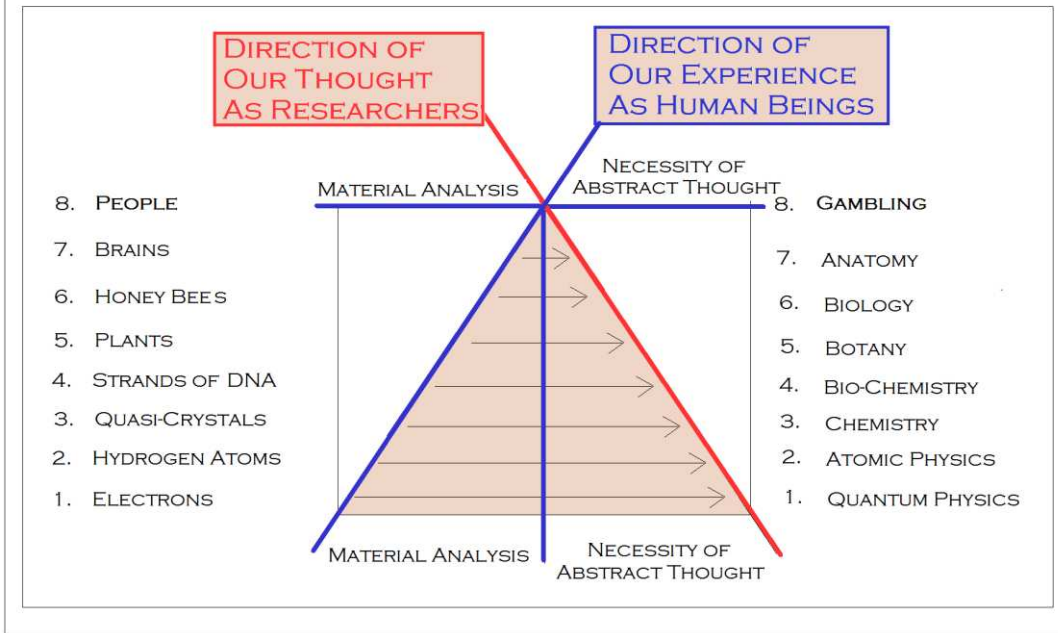
We might organize the work of the “Material Being Counting Machine” with reference to the Golden Mean. The Golden Mean has a solid, if at present a sometimes coincidental and unconnected, place in:

- 1) the study of quantum mechanics, Coldea, et al. (2010-01-07);
- 2) recent discoveries regarding the first excited state of the hydrogen atom, Petrushevski (2006);
- 3) the composition of quasi-crystals, Shechtman, et al. (1984), Lifshitz (____), Shechtman (2010), Senechal (2011), Steuer (2010), Steinhardt (____);
- 4) the structure of DNA, Perez (1991), Yamagishi (2007), Perez (2010);
- 5) patterns seen repeatedly in botany and the form of plants, Brousseau (1968), Brousseau (1971);
- 6) sex selection characteristics of honeybees, Yanega (1966);
- 7) the study of brain waves, Weiss (2003), Roopun (2008); and
- 8) the gambling patterns of patrons of thoroughbred races. Cameron (2002)

Following upon the above list of references to the Golden Mean one would anticipate that the Material Being Counting Machine would count a vast number of electrons and - in decreasing order - a lesser number of hydrogen atoms, quasi-crystals, strands of DNA, plants, honey bees, brains and people. If this is true we can state with some assurance that as the more numerous beings at the lower tiers of reality build themselves into tiers of ever-increasing harmonization and dependence on lower levels, the number of examples in the sample pool decreases, i.e. we count fewer people than electrons.

Conversely as we break down the more complicated structures which are easily visible to our eyes and senses into their component parts, the type and amount of thought which must be used to understand and correlate realms not immediately within our experience becomes ever more abstract. In short the urge to gamble is more immediately understandable to us than is the quantum mechanical construction of the electron.

DIAGRAM 1-5.
DIRECTIONS OF EXPERIENCE AND THOUGHT - MATERIAL FORMS

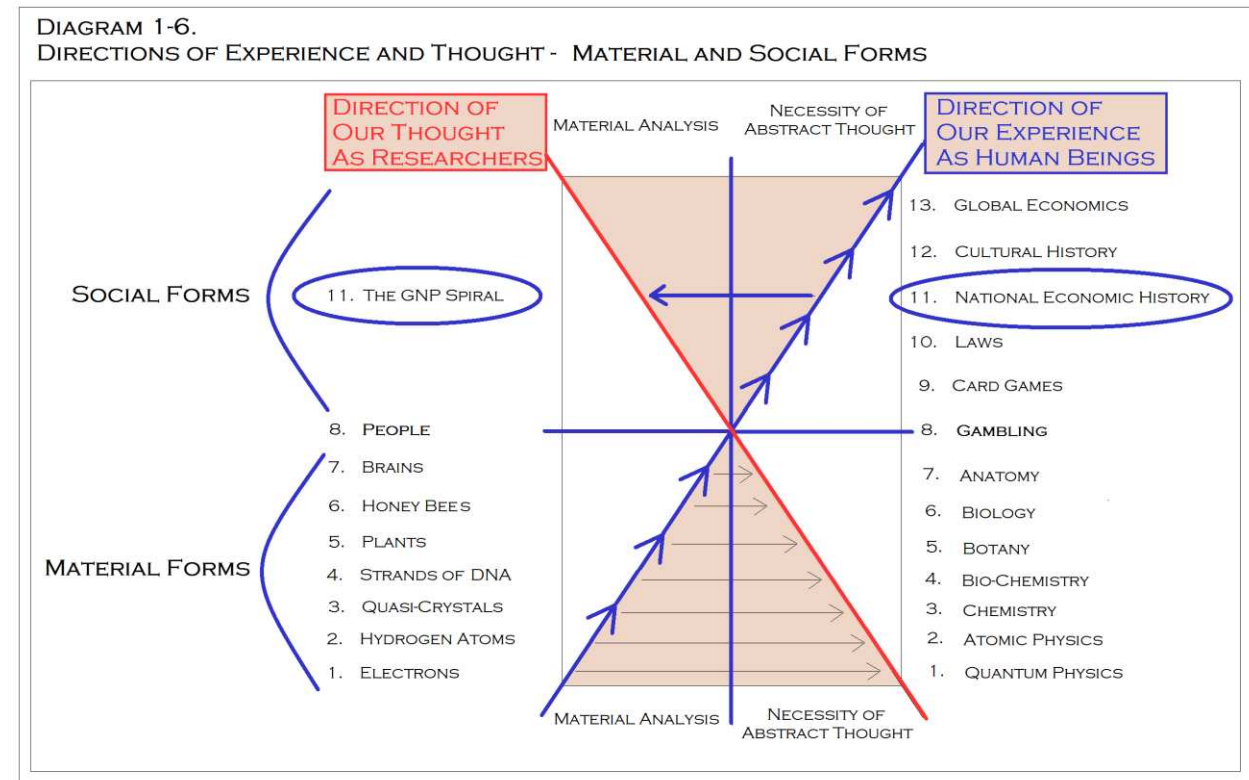


The machine must stop, however, when we come to organizations which cannot be observed using our senses. The machine can count all which is physical, including individual human beings. However the size and number of interest rates, inflation rates, rates of currency exchange etc. which inform the study of economics cannot be counted. Since these topics of study cannot be “sensed,” they cannot be numbered by the machine. Nor can it sense a “government,” the presence of “sovereignty,” the nature of a law, the harmony of a group of human beings, and the operation of a global trading center. Since the stuff of these levels of social relationship are not available to the senses of any human being, they cannot be considered “material beings” by the machine.

On the other hand as researchers we can determine a hierarchy of social organization which is not unlike that of the material world. A card game is less wide-ranging socially than is a legislature. In turn the legislature is less wide-ranging than the economic history of the nation. The history of the United States is encompassed by the cultural history of Europe which includes as a connecting sub-part the colonization of the Americas and imperialism as a part of its own history. And all of this is encompassed by a world economy which must include within it all nation-states as they strive for productive and peaceful trade-relationships with one another. Although none of this may be “sensed” by the “material being counting machine” we nevertheless know these things to be real and important because we, ourselves, are sub-sets of their operation.

A ratio which occurs repeatedly in the lower “material” tiers – “the Golden Mean” – may also be found in the upper “social” tiers. Using the abstract thought which tells us that there exists such a thing as “national economic history,” we will move to a material demonstration of this history and the Golden Mean as a central regulating factor (blue left-pointing arrow above).

¹ ²



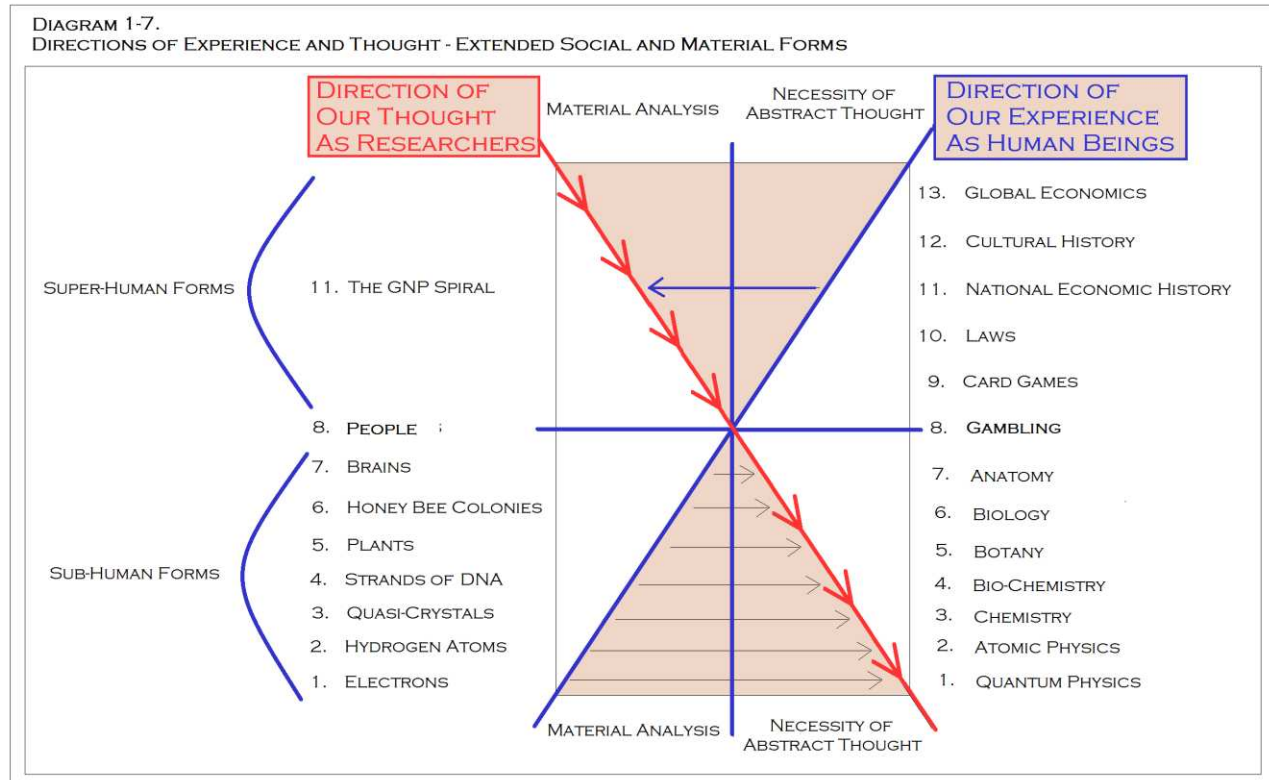
¹ The Golden Mean is presented by Euclid of Alexandria, in Elements, Book VI, Definition 3, circa 300 b.c. A broad array of texts may be suggested describing the well-known associations between the Golden Mean and patterns discovered in Nature. See e.g. Livio, 2002; Skinner, 2006; Hemenway, 2005.

² See comments by nuclear physicist Wolfgang Pauli and Neils Bohr as to the nature of scientific investigation in general.

(Pais, 2000, quoting Pauli): “It is my personal opinion that in the science of the future reality will neither be “psychic” nor “physical” but somehow both and somehow neither.”

(Pais, 2000, quoting Bohr): “There is no quantum world. There is only an abstract quantum physical description. It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature. ... What is it that we humans depend on? We depend on our words. Our task is to communicate experience and ideas to others. We are suspended in language.”

One additional use of the “map” of the above social logic is its potential for adding to our understanding of lower levels. In other words, by considering the material analysis which might be given to social forms, we may gain a new understanding of structural and mathematic analysis of material forms.



Using this approach we may be able to investigate measurable “waves” of social development, each of which possess an effect upon the body politic. As these waves are investigated – wherein we ourselves are the subsets which create them – we may be able to understand waves of physical phenomena better and, through analogy, predict the ultimate behavior of physical forces more specifically.

Part Five – Goal.

I propose in the following essays to dissect the concept of motion (development, evolution) in each of the above forms of order to find within each a pattern common to all. We will investigate the possibility that a single, uniform pattern exists in nature which coordinates all levels of reality into a single, comprehensive whole.

The central thesis of these essays is that each of the levels given above builds upon the previous level, and repeats its underlying structure. Thus a clear understanding of the key relationships and elements of philosophy assists in the understanding of the key elements of economics, the key elements of racial history, and next of national history, law, psychology, biology, chemistry, physics and mathematics. This linking of similar levels, a “chain of being,” is an ancient and modern idea, as we shall see.

In order to sum up the goal of these essays the following terms may be helpful.

Consilience

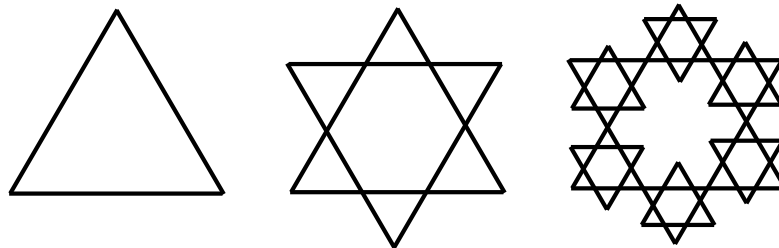
The term “consilience” is taken from Dr. E. O Wilson. “Consilience” means a form of scientific inquiry which seeks to unify in one pattern or understanding both the living and non-living areas of our lives. Dr. Wilson’s book *Consilience* states the idea very well:

The greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities. The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world, but artifacts of scholarship.

In other words if the levels described above are “consilient” then the insights which we gain in the world of living creatures should add directly to our understanding of the structure of the lower non-living levels of scientific inquiry, and vice versa.

Fractal

The term “fractal” is taken from Benoit B. Mandelbrot and his work *The Fractal Geometry of Nature*. A “fractal” is a geometric pattern which repeats itself, potentially infinitely, ever breaking apart in structures which are similar to the initial figure, as follows:



If the levels I suggest operate as “fractals” of a basic structure, then as we progress DOWN the chain of being we may speculate and predict the structure of the underlying studies because we have discovered the necessary pattern inherent in all reality. Conversely, an understanding of the most basic principles of the lower levels adds directly to our understanding of the higher levels as we move UP.

Complexity

The term “complexity” refers to a view of reality in which all levels of scientific inquiry relate themselves to underlying and therefore universal concepts. Roger Lewin’s book, *Complexity: Life At The Edge Of Chaos*, describes this approach as follows.

“It’s a question of structure, of organization,” (Chris Langton) said. “The gas in this room is a chaotic system, very random, very little order. The science of Complexity has to do with structure and order.”

Order, such as you see in the social organization of (the ancient and departed civilization at) Chaco? “Yes.” Order, like when an embryo develops to become a fully formed adult? “That too.” What about patterns of evolution? “Yep.” And ecosystems? “Absolutely.” If that’s so, I wondered why (the Santa Fe Institute for the study of complexity) isn’t full of anthropologists and biologists rather than physicists and computer jocks.

“Because we’re looking for the fundamental rules that underlie all these systems, not just the details of any one of them.” (quoting Chris Langton)

My goal is to describe the above ten levels as “consilient fractals in a complex reality.”

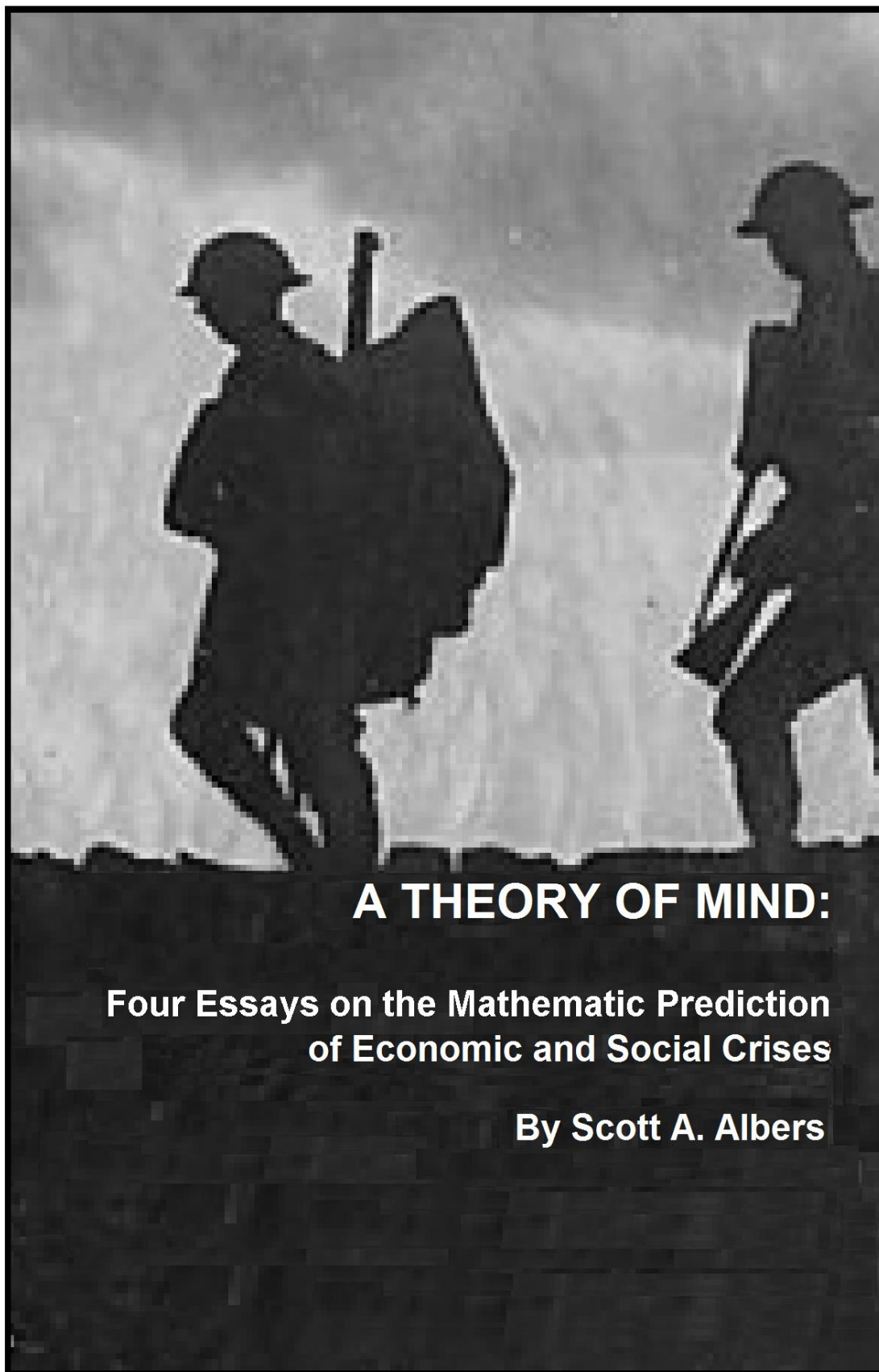
Conclusion

I argue that this ordering power of consciousness as displayed in macro-economics is operable also in the physical sciences as “the fifth dimension.” This as yet undiscovered “fifth dimension” was hypothesized to exist by Theodor Kaluza in 1919 in addition to the three well-known dimensions of space and one dimension of time. This “fifth” dimension allowed him to unify Maxwell’s equations on electro-magnetism with Einstein’s General Theory of Relativity.

Consequently an understanding of the historic macro-economic and social development of the United States – its “consciousness” – may provide insight into the operation of the physical universe through the similar operation of consciousness throughout reality as its fifth dimension.

These essays are written in the hope that serious research may begin as to the relationship between the construction of the Great Pyramid of Giza and its apparently direct relationship with the macro-economic structure of the United States and the combination of electro-magnetism and gravity as found in the thought of Theodore Kaluza. In this manner it is perhaps possible that the earliest insights of Parmenides and Zeno will bear remarkable fruit in the science of the 21st century.

Scott Albers
Great Falls, Montana
May 23, 2015



On the Mathematic Prediction of Economic and Social Crises: Toward a Harmonic Interpretation of the Kondratiev Wave

revised and corrected, with a new Appendix, March 21, 2014

By Scott A. Albers* and Andrew L. Albers**

Abstract: *In Part One of this paper we use the harmonic analogy of a musical octave to analyze mathematic ratios of U.S. real GNP. These ratios are generated by bringing together figures for U.S. real GNP over intervals of time – “spreads of years” – as numerator and denominator in a single fraction.*

Using a range of 7-year to 18-year “spreads,” we find that this approach provides strong evidence that American economic history is composed of four 14-year quarter-cycles within a 56 year circuit in the real GNP of the United States, 1869-2007. These periods correlate closely with analysis by Nickolai Kondratiev and provide a framework for predicting an annual steady state rate of growth for the United States falling between 3.4969% and 3.4995% per year.

In Part Two of this paper we provide three postscripts including:

(1) correlations / speculations on the political and social consequences of this model,

(2) simplification / expansion of the geometries implied, and

(3) analysis / prediction based upon this approach

*as concluded by a brief afterword and
an extensive Appendix.*

These post-script refinements narrow the steady state rate of growth predicted to between 3.4969% and 3.4973% per year correlating closely with the 3.4971% rate for annualized quarterly data calculated for Okun’s Law, 1947-2007. The size and interconnectedness of world economies, and the virtually exact correlations provided herein, suggest that the dates predicted for future crises will see changes which are unexpectedly global, dramatic and fierce.³

* Scott Albers is a criminal defense attorney practicing law in Northwest Montana, U.S.A. (1994 –present), and previously Missouri (1986 - 1994). He obtained a Juris Doctorate degree in 1986 at the University of Missouri School of Law in Columbia. He may be contacted at scott_albers@msn.com.

** Andrew Albers is a 2010 graduate at the Montana State University of Bozeman, U.S.A., with a Bachelor of Science degree in the teaching of mathematics and minors in computer science and the teaching of history.

³ Acknowledgements. Conceptually this article is the first of a three-part series.

Portions of the first paper were originally published as a peer-reviewed research article on August 8, 2011 in *The Middle East Studies Online Journal*, H. Karoui, editor, at <http://www.middle-east-studies.net/?p=22639>, Issue 6, Volume 3, pp. 199-253. This paper was entitled “The Golden Mean, the Arab Spring and a 10-Step Analysis of American Economic History.” Our first thanks go to Professor Karoui and the board members of the MESOJ for accepting this first paper so promptly.

JEL classification: B41, B5, C01, C02, C50, C63, E00, E01, E10, E19, E30, N00, N01, N11, Z10, Z13

Keywords: Real GNP, Golden Mean, Phi, Kondratiev Wave, Global Financial Crisis, American Economic History, GNP Spiral, Okun's Law, Revolution

On March 31, 2012 a more extensive paper was deposited in the Munich Personal RePEc Archive, at <http://mpra.ub.uni-muenchen.de/37771/>. We received a request to publish this article on February 12, 2013. Subsequently this article was included as one of nine peer-reviewed articles in the monograph "Globalization of World System Research," *Entelequia: Revista Interdisciplinar*, University of Malaga, Malaga, Spain, Issue 15, April, 2013, pp. 37-124, <http://www.eumed.net/entelequia/en.art.php?a=15>. Special thanks go to editor of this issue Dr. Arno Tausch, [Privatdozent Universität, Innsbruck, Austria and Institut für Politikwissenschaft, Faculty of Economics, Corvinus University, Budapest](http://www.eumed.net/entelequia/en.art.php?a=15a02), Hungary, for his kind help and encouragement throughout this process. See <http://www.eumed.net/entelequia/en.art.php?a=15a02>. Additional work was published on December 30, 2012 at <http://mpra.ub.uni-muenchen.de/43484/>. The first article of this three-part set is entitled "On the mathematic prediction of economic and social crises – as revised March 21, 2014." It will be referred to in this paper as "Albers & Albers 2014." It is located at <http://mpra.ub.uni-muenchen.de/54653/>.

The second article is entitled "Okun's Law as a Pi-to-One Ratio: a harmonic / trigonometric theory as to why Okun's Law works – Revised March 21, 2014." <http://mpra.ub.uni-muenchen.de/54654/> The original of this paper on Okun's Law is found at <http://mpra.ub.uni-muenchen.de/46633/> It replies to Dr. Edward Knotek's rhetorical question: "How Useful is Okun's Law?", <http://www.kc.frb.org/publicat/econrev/PDF/4q07Knotek.pdf>, (*Economic Review* 2007). This article was made possible only because Dr. Knotek has been so generous with his time, information, insights and explanations vis-à-vis that article. It will be referred to as "Albers 2014" in this set.

The third article is entitled "Of 'The Pyramid Economy' and 'The Political Economy Wave': towards the study of consciousness as a predictive science," located at <http://mpra.ub.uni-muenchen.de/54655/> A draft is found at <http://mpra.ub.uni-muenchen.de/43484/>. It will be referred to as "Albers 2014" in this set.

See http://www.scribd.com/scott_albers_1 for extensive additional materials.

As to the complete set, we would like to thank the research assistance of Dr. Edward Knotek, Vice President and Economist in the Economic Research Department of the Federal Reserve Bank of Kansas City; Dr. Fallaw Sowell, Associate Professor of Economics Tepper School of Business Carnegie Mellon University; Dr. Kenneth Boulding, Department of Economics of the University of Colorado at Boulder; Dr. Lawrence Barman, Department of American Studies at St. Louis University, St. Louis, Missouri; Dr. Leonard Mascot Blumenthal of the Mathematics Department, and Edward Hunvald, Peter Wiedenbeck and Carl Rowley of the Law School of the University of Missouri at Columbia; Dr. Gregory St. George and Dr. George McRae, Department of Mathematics, University of Montana, Missoula, Montana; Dr. Andrey Korotayev, Anthropology of the East Center at the Russian State University for the Humanities, Moscow; Jeremy Marcq of Boston University. We would also like to thank Linda Angeloni, Yvon Gelinas and Morgan McInville for their editing assistance; Mia Erickson, Lorien Lietz and Jennifer Bain for their assistance in creating the spreadsheets used herein; and Mary Stelling, Alex Huffield and Stelling Engineers, Inc. of Great Falls, Montana for the creation of "the Political Economy Wave" in a graph of 20,454 lines of script in at least five separate versions.

This article is comprised of 18,713 words with a 239 word abstract. It is paginated for a two sided, left to right pdf view, odd numbered pages to the left, even numbered pages to the right.

Need for revision. This first paper is the foundation for a great deal of further research. In this paper we present the raw data and spread sheets underlying our findings to ensure that our results stand up to close scrutiny. The Appendix corrects errors which have been found, and provides the complete spreadsheets which have been used to create the diagrams and analysis of this paper. This effort has confirmed, and made even stronger, the findings of the previous paper, i.e. that there is an "octave" of relationships which occur at the 14-year spread and that the Median Average of the 14-year Spreadsheet falls between 1.618200 and 1.618590, almost exactly the Golden Mean.

Because this work is the revision of various prior editions, the numbering of diagrams has been left as originally given. When additional diagrams have been used this has been indicated by "Diagram No. __, Revision of 2014." When the material is located also in the Appendix, this is indicated on the title of the graph.

For the positions taken and the methods used herein we are alone responsible.

Introduction: The Global Financial Crisis

*There is geometry in the humming of the strings,
there is music in the spacing of the spheres.*

Pythagoras

On March 7, 2012 Professor William Black, Associate Professor of Economics and Law at University of Missouri - Kansas City, summarized in testimony before Congress the economic theory leading to the Global Financial Crisis. (Black, 2012) He states:

*Neo-Classical Economic Policies are Criminogenic:
They Cause Control Fraud Epidemics*

Neo-classical economics (has) failed ... to develop a coherent theory of fraud, bubbles, or financial crises (Black 2005). It continued to rely on a single methodological approach (econometrics) that inherently produces the worst possible policy advice during the expansion phase of a bubble. ...

A lender optimizes accounting control fraud through a four-part recipe. Top economists, criminologists, and the savings and loan (S&L) regulators agreed that this recipe is a “sure thing” – producing guaranteed, record (fictional) near-term profits and catastrophic losses in the longer-term. Akerlof & Romer (1993) termed the strategy: *Looting: Bankruptcy for Profit*. The firm fails, but the officers become wealthy (Bebchuk, Cohen & Spamann 2010). ...

The remarkable fact is that economists dominated financial policy and despite the success of the S&L regulators ... neo-classical economists continues to ignore even the existence of accounting control fraud. They argued that such frauds could not exist because markets were “efficient.” ...

The claim that no one could have foreseen the crisis is false. Unlike the S&L debacle, the FBI was far ahead of the regulators in recognizing that there was an “epidemic” of mortgage fraud and that it could cause a financial crisis. The FBI warned in September 2004 (CNN) that the “epidemic” of mortgage fraud would cause a “crisis” if it were not contained.^{4, 5}

⁴ At the present time, and in the wake of the Global Financial Crisis, a large body of criticism of macroeconomics and its various models may be cited in support of this view. See e.g. Krugman, 2009: “So here’s what I think economists have to do. First, they have to face up to the inconvenient reality that financial markets fall far short of perfection, that they are subject to extraordinary delusions and the madness of crowds. Second, they have to admit .. that Keynesian economics remains the best framework we have for making sense of recessions and depressions. Third, they’ll have to do their best to incorporate the realities of finance into macroeconomics. ... To some economists (the “beauty” of their theories) will be a reason to cling to neoclassicism, despite its utter failure to make sense of the greatest economic crisis in three generations.”

See also Solow, 2010. “(W)hen it comes to matters as important as macroeconomics, a mainstream economist like me insists that every proposition must pass the smell test: does this really make sense? I do not think that the currently popular DSGE (“Dynamic Stochastic General Equilibrium”) models pass the smell test. They take it for granted that the whole economy can be thought about as if it were a single, consistent person or dynasty carrying out a rationally designed, long-term plan, occasionally disturbed by unexpected shocks, but adapting to them in a rational, consistent way. I do not think that this picture passes the smell test. The protagonists of this idea make a claim to respectability by asserting that it is founded on what we know about microeconomic behavior, but I

This paper argues that a fundamental financial crisis could be expected to take place in 2005 based upon a 56-year cycle in American history of economic meltdowns in 1781, 1837, 1893, 1949 and – subsequently – in 2005.⁶

think that this claim is generally phony. The advocates no doubt believe what they say, but they seem to have stopped sniffing or to have lost their sense of smell altogether.”

See also Stiglitz, 2011. “Prediction is the test of a scientific theory. But when subject to the most important test - the one whose results we really cared about - the standard macroeconomic models failed miserably. Those relying on the Standard Model did not predict the crisis; and even after the bubble broke, the Fed Chairman argued that its effects would be contained. They were not. ... Monetary authorities allowed bubbles to grow, partly because the Standard Models said there couldn't be bubbles. They focused on keeping inflation low, partly because the Standard Model suggested that low inflation was necessary and almost sufficient for efficiency and growth. They focused on *n*th-order distortions arising from price misalignments that might result from inflation, ignoring the far larger losses that result (and have repeatedly resulted) from financial crises. ... (It was repeatedly claimed that it would be cheaper to clean up the aftermath of any bubble that might exist than to interfere with the wonders of the market. Thus, while financial markets and regulators have been widely blamed for the crisis, some of the blame clearly rests with the economic doctrines on which they came to rely (Stiglitz 2010a).”

⁵ A candid appraisal of graduate education in economics is found at Smith, 2011. “(In spite of all the mathematical precision of these (economic) theories, very few of them offered any way to *calculate* any economic quantity. In physics, theories are tools for turning quantitative observations into quantitative predictions. In macroeconomics, there was plenty of math, but it seemed to be used primarily as a descriptive tool for explicating ideas about how the world might work. ...

That was the second problem I had with the course: it didn't discuss *how we knew if these theories were right or wrong*. ... (E)mpirics were only briefly mentioned, if at all, and never explained in detail. When we learned RBC (real business cycle), we were told that the measure of its success in explaining the data was - get this - *that if you tweaked the parameters just right, you could get the theory to produce economic fluctuations of about the same size as the ones we see in real life*. When I heard this, I thought “You have got to be kidding me!” ...

The editors of *Econometrica*, the *American Economic Review*, the *Quarterly Journal of Economics*, and the other top journals are the ones who publish paper after paper on these subjects, who accept “moment matching” as a standard of empirical verification, who approve of pages upon pages of math that tells “stories” instead of making quantitative predictions, etc.”

⁶ The predictions outlined in this paper were made publicly to Senator Max Baucus, Chairman of the Senate Finance Committee, in a draft entitled “The Coming Panic of 2005” on December 8, 2003. The abstract states:

A 56-year spiral of American economic growth demonstrates the Fibonacci Series, thereby illustrating the mathematic and biologic relationship between the American economy and the natural phenomena underlying it. This spiral provides the basis for a prediction that the year 2005 will mark a tremendous diplomatic and financial panic throughout the world. The chief advantage of this approach is that it provides exact dates as to when change will occur, and hints as to what sort of change will occur. This approach anticipates that the years 1781, 1837, 1949 and 2005 will be analogous to one another, each year presenting a sudden, dramatic challenge to the United States.

Ten months later, on September 17, 2004, the FBI also warned that a financial crisis was imminent. <http://www.cnn.com/2004/LAW/09/17/mortgage.fraud/> Testimony from Chris Swecker on October 7, 2004 to the House Financial Services Subcommittee is as follows. <http://www.austincc.edu/rrobert/mortgagefraud.pdf>

The potential impact of mortgage fraud on financial institutions and the stock market is clear. If fraudulent practices become systemic within the mortgage industry and mortgage fraud is allowed to become unrestrained, it will ultimately place financial institutions at risk and have adverse effects on the stock market. Investors may lose faith and require higher returns from mortgage backed securities. This may result in higher interest rates and fees paid by borrowers and limit the amount of investment funds available for mortgage loans.

We argue that the FBI's warning in September 2004 that a financial crisis was imminent correlates to predictions based upon this analysis to within a period of months. This analysis is useful because, in addition to predicting dates for expected crises, it permits an explanation of the U.S. steady-state rate of growth presently calculated at 3.4971% per year for annualized quarterly data, 1947-2007. (Knotek, 2007)

Although this economic approach is of distinctly Russian vintage, in this article it will be applied to the economic history of the United States alone.

The Kondratiev Wave

In his 1925 work *The Major Economic Cycles* Nikolai Kondratiev postulated a long-term wave running throughout the economic histories of various western countries of approximately 50 to 60 years.⁷ (Kondratiev, 1925) Kondratiev's plan analyzed European and even global patterns of economic development with the thesis that democratic capitalism may possess the tools necessary to save itself from the inevitable self-destruction predicted by Marx and many of

Often times, mortgage loans are sold in secondary markets or are used by financial institutions as collateral for other investments. Repurchase agreements have been utilized by investors for protection against mortgage fraud. When loans sold in the secondary market default and have fraudulent or material misrepresentation, loans are repurchased by the lending financial institution based on a "repurchase agreement." As a result, these loans become a non performing asset. In extreme fraud cases, the mortgage backed security is worthless. Mortgage fraud losses adversely affect loan loss reserves, profits, liquidity levels and capitalization ratios, ultimately affecting the soundness of the financial institution.

The first prediction above precedes by ten months the warning given by the FBI to Congress in September, 2004. Both warnings highlight the historic precedents and imminent nature of the crisis, i.e. 2005. To put in perspective the significance of these predictions in light of subsequent experience, see Roberts, 2011.

How did the official leaders of capitalist economic strategy act before, during and after the Great Recession?

Before 2007, no official strategist of economic policy forecast any crisis. US Fed Chairman Greenspan in 2004 told us that "a national severe price distortion is most unlikely in real estate." In 2006, he told us that "the worst may be over for housing," just the housing bubble burst. US treasury secretary Hank Paulson said the crisis in the overall economy "appears to be contained," March 2007.

During the crisis, in October 2008, the great financial maestro Greenspan told the US Congress, "I am in a state of shocked disbelief." He was questioned: "In other words, you found that your view of the world, your ideology was not right, it was not working?" (House Oversight Committee Chair, Henry Waxman). "Absolutely, precisely, you know that's precisely the reason I was shocked, because I have been going for 40 years or more with very considerable evidence that it was working exceptionally well.

⁷ Kondratiev's work originated in the dangerous political context of prior socialist discoveries (Van Gelderen (1913), DeWolff (1924) and Kautsky (1917)) and communist theories (e.g. Marx, Lenin, Trotsky, Stalin) as to the evils of capitalism and the nature of its inevitable demise. (Goldstein, 1988:30-31) Kondratiev's suggestion that democratic capitalism might avoid such demise brought to him the censure of Stalin and death in a prison camp.

Orthodox economics, on the other hand, maintains an enormous breadth of opinion as to whether considerations of political policy must, or must not, be a part of doctrinal discipline. This paper concludes that there is much in Kondratiev's work which is directly applicable to the economic history of the United States, but does so without reference to Marx, et al.

his disciples.⁸ Kondratiev's original plan (Korotayev & Tsirel, 2010) provided dates for "upswings," "transition periods" and "downswings"⁹ which Joseph Schumpeter's 1939 work *Business Cycles* acknowledged as significant to economics. (Schumpeter, 1939)

The academic search for evidence of "long waves" running through the economic history of various nation-states is long standing (Goldstein, 1988) and a central topic of heterodox economics. Indeed a 52-53 year cycle has been described in very extensive detail underlying the global meltdown (Korotayev and Tsirel, 2010) and incorporated into the study of the current revolutionary movements in the Middle East. (Tausch, 2011) As one modern researcher of Kondratiev Waves has remarked, "Altogether I think the idea of 55 year cycles in the behavior of our society is one of the most penetrating and useful in organizing social and economic facts." (Marchetti, 1988:7) However the dating and even existence of these periods are controversial.

Studies in globalization have attempted¹⁰ to merge evolutionary theories¹¹ with fractal geometry, "emergence," the study of complexity and a host of other mechanisms in explication

⁸ See Goldstein, 1988:30: "The Kondratieff-Trotsky long-wave debate ... revolved around the question of the stability of capitalism. Do 'universal crises' threaten the survival of capitalism (as Trotsky thought), or are they only a phase of a more stable capitalist dynamic (as Kondratieff argued)? Kondratieff, like Kautsky, presented a picture of capitalism as more stable over the long term than either Trotsky or Lenin saw it. This parallel between Kondratieff's approach and that of the hated Kautsky may help to explain the very negative reception given to Kondratieff by his fellow Soviet Marxists."

⁹ See Goldstein 1988:7. "Long waves (or Kondratieff cycles) are defined by alternating economic phases – an expansion phase (for which I will often use the more convenient term *upswing*) and a stagnation phase (which I will often call the *downswing*). These economic phase periods are not uniform in length or quality. The transition point from an expansion phase to a stagnation phase is called a peak, and that from stagnation to expansion is a trough. The long wave, which repeats roughly every fifty years, is synchronous across national borders, indicating that the alternative phases are a systemic-level phenomenon."

These terms are used in Korotayev and Tsirel, 2010:1-2, et seq. but may hide a diversity of views in light of contrasting research. See e.g. Korotayev and Tsirel, 2010:1-6, Goldstein 1988. See also Coccia, M. 2010:730-738. "(T)here are different long-wave chronologies and certain timings of long waves are often better for some countries but not for the world as a whole... These different cycles "do not have a synchronized rhythm across countries..."

¹⁰ Orthodox economics rejects Kondratiev as a fallacy. See e.g. Rothbard, 1984. See also, e.g. Solomou, 1990:61. "(T)he evidence rejects the Kondratieff wave phasing of post-1850 economic growth. This conclusion is valid for all the national case studies examined here. Whether one takes the 1856-1913 or 1856-1973 a Kondratieff wave phasing can not be supported. ... (O)bserved variations do not follow a Kondratieff wave pattern."

Mainstream analysis has focused rather on econometric measurements of other variables, i.e. the stochastic vs. deterministic effects governing the creation of real GNP itself. (See e.g. Nelson and Plosser, 1982) The distinction has been important for mainstream economics. (See e.g. Cochrane, 1988: "The distinction between a random walk ... and a trend-stationary series ... is extreme. Long-range forecasts of a random walk move one for one with shocks at each date, while long-range forecasts of a trend-stationary series do not change at all. There are two related ways to think about a series that lies between these two extremes.")

The significance of this inquiry however may be questionable. (Sowell, 1992: "The fact that postwar GNP series cannot distinguish between a time trend and a unit root model has important implications for theoretical models of the economy. Attention should be given to models where both the policy and theoretical implications of interest are not sensitive to the model of the trend. Ideally we would like a model which implies the same results if the trend is modeled as either a time trend or a unit root. Until such models are developed, further attention should be given to new statistical techniques which focus on discovering the long-run behavior of time series.")

¹¹ See e.g. Modelski, G. (2008:5) "(There are) two important implications of this evolutionary approach: first, there is reason to believe that an analysis drawing on evolutionary theory lends itself to modeling, simulation, and forecasting. Secondly, such an approach allows us to view globalization as an enterprise of the human species as a whole. ... The emphasis is not on broad based accounts of the course of world affairs but, selectively, on processes that reshape the social (including economic, political, and cultural) organization of the human species; processes such as urbanization, economic growth, political reform and world organization, and the making of world opinion; and the innovations that animate these developments."

of Kondratiev Waves. Calls for clarification have followed as to the research methods, dates and theories surrounding “long waves.”¹²

A Harmonic Interpretation of the Kondratiev Wave

This paper seeks to establish that a cycle of a fixed 56-year length has a significant impact upon the economy of the United States. The economic history of the United States is the sole topic of this paper inasmuch as:

- (1) the United States has not suffered from the invasions and border reductions which have typified virtually all other countries available for consideration, thereby permitting an equivalence between the data generated and the subject studied over the long term,
- (2) the economic data pertaining to the United States is long-standing, precise, self-consistent, authoritative and easily available, and
- (3) the combination of a single political sovereignty with the right to tax, a national legal jurisdiction of arbitrary finality and a monetary / fiscal policy orchestrated by a single government have been central characteristics of the economic history of the United States from at least 1868.

Frequently the effort is made to assert that the Kondratiev Wave is of international significance. However in this paper we deal only with the United States and no other political body.

We suggest that (1) these conflicts regarding the Kondratiev wave may be traced two common paradigms for economics – physics¹³ and biology¹⁴ – and that (2) these conflicts may be brought together in the analogy of musical harmony.^{15, 16}

¹² See e.g. Devezas, T., Corredine, J. (2001) “... Complexity theory and nonlinearity are currently hot topics of interdisciplinary interest among the natural and social sciences, but still fall short of explaining the cyclic and evolutionary dynamics of society. ... Although much has been published on K-waves, we must consider:

1 - a comprehensive and embracing theory of Kondratiev economic cycles still needs to be elaborated, while at least four major issues remain to be clarified:

i - why is there disregard among many contemporary economists and social scientists, some of them even stubbornly rejecting the existence of these waves?

ii - what is to be understood about the causality of the phenomenon - not just the mechanisms, but also the underlying causes?

iii- why the half-century beat? and since when? (only after, or even before the Industrial Revolution?, and more: where did the clock come from?).

iv- will there be more Kondratievs? Free-will or determinism? ...

3 - The use of new tools of science mentioned above may lead us to a better understanding of the causality of the phenomenon. ... But the question remains: is it something endogenous, inherent to social behavior of the human being? Or is there some kind of exogenous causality (external to human beings, even cosmic causes?). The understanding of all the above-mentioned aspects (not only in their economic character, but as a whole physical or social phenomenon), could contribute significantly to futures research, helping us trace the best trajectory through the coming millennium. ...”

¹³ See e.g. McCauley, 2009:9. “Econophysics, simply stated, means following the example of physics in observing and modeling markets.”

¹⁴ See e.g. Alfred Marshall (1842-1924) (1920:19) “The Mecca of the economist lies in economic biology rather than economic dynamics.”

In this analogy the physical sequence of moments in time (x-axis) is contrasted with their biologic importance in the development of the human person (y-axis). As this analogy expands to aggregates of many human beings – and particularly with reference to the nation-state – it may be anticipated that this larger dimension of human personality will bear within it the structural characteristics of its members as exhibited in the Kondratiev Wave.

In essence, the Kondratiev Wave is the snowflake, and the human being is the water molecule. Like the electric current which ties the larger snowflake to the associated water molecules in an ever balancing and perfect symmetry of both, so is the causation underlying the Kondratiev Wave one of balancing the energies of the individual with society, and society with the individual. A balancing, harmonic sort of causation is at work here, one in which the smaller forms the seed crystal of the larger but nevertheless congruent society.

See also Nicholas Georgescu-Roegen. (1906-1994) (1977:361) “The term (bio-economics) is intended to make us bear in mind continuously the biological origin of the economic process and thus spotlight the problem of mankind’s existence with a limited store of accessible resources, unevenly located and unequally appropriated.” (As quoted in Gowdy 1993:149)

See also Devezas, Tessaleno (2001). Tessaleno Devezas, George Modelski, (2003).

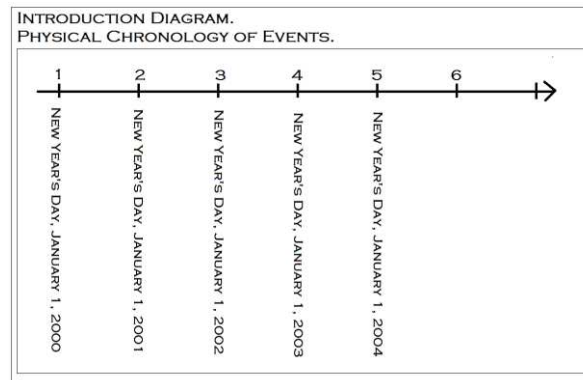
¹⁵ A third paradigm for economics which bears on this might be entitled “pure logic.” See e.g. Karl Marx and his use of the Hegelian dialectic. “The implications of the dialectic, for both Hegel and Marx, were that all history, and indeed all reality, is a process of development through time, a single and meaningful unfolding of events, necessary, logical, and deterministic; that every event happens in due sequence for good and sufficient reason (not by chance); and that history could not and cannot happen any differently from the way it has happened and is still happening today.” (Palmer 1969:498-499).

This approach went far beyond the realm of economics. See Ollman, 1976:53. “Marx’s own interest in the physical sciences were sufficiently strong to bring him regularly to the lectures of Liebig and Huxley. Darwin, to whom he wanted to dedicate Capital I, was a constant fascination. And though he never wrote on the physical sciences (other than in letters), there are a number of remarks which indicate clearly his agreement with Engel’s dialectical approach to nature. Such, for example, is his claim that the law of transformation from quantity to quality ... provides the basis of molecular theory in chemistry; and elsewhere, referring to the same law, he says, “I regard the law Hegel discovered ... as holding good both in history and in Natural Sciences.”

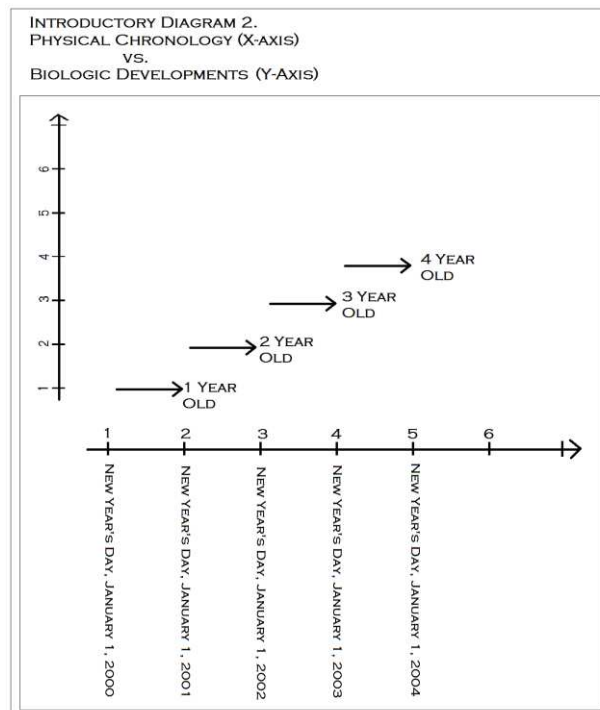
At the opposing end of the political spectrum see also Ludwig von Mises, founder of the Austrian school of economics and its study of “praxeology.” (von Mises 1949:32) “Praxeology is a theoretical and systematic, not historical, science. Its scope is human action as such, irrespective of all environmental, accidental, and individual circumstances of the concrete acts. ... Its statements ... are, like those of logic and mathematics, *a priori*. ... They are both logically and temporally antecedent to any comprehension of historical facts.” (von Mises 1949:34) “The fundamental logical relations ... are primary propositions antecedent to any nominal or real definition. ... The human mind is utterly incapable of imagining logical categories at variance with them. No matter how they may appear to superhuman beings, they are for man inescapable and absolutely necessary.”

¹⁶ As to requirements for a theory of causation for long waves, see Louca, F. (1999). “According to Kuznets, two conditions had to be met in order to establish the credibility of the Long Wave program: (for the “weak version of the recurrence requirement”) one must prove (i) that the oscillations are general, and (ii) that there are either external factors or internal peculiarities within the economic system that create the recurrence (Kuznets, 1940:267). ... A stronger version... means that the recurrence must conform to further definitions: a time variation in certain very precise limits and under well defined and stable causal relations – i.e. that the previous phase causes the next phase in the cycle or that sequence not only exists but also that causality can be exhaustively accounted for. This may be called the *strong version of the recurrence requirement*. ... Rosenberg and Frischtak prolonged (the debate) by requiring the research programme on Long Waves to indicate a specific form of *causality, timing, recurrence* – precisely what was implied by Kuznets and Lange – and *economy-wide repercussions* of such fluctuations in order to be valid.”

To introduce these ideas briefly, let us propose that a child is born at 1:00 a.m., January 1, 2000. On this day the child experiences his first New Year's Day. From this point we may chart the chronologic sequence of his second, third, fourth, etc. New Year's Day, as follows.

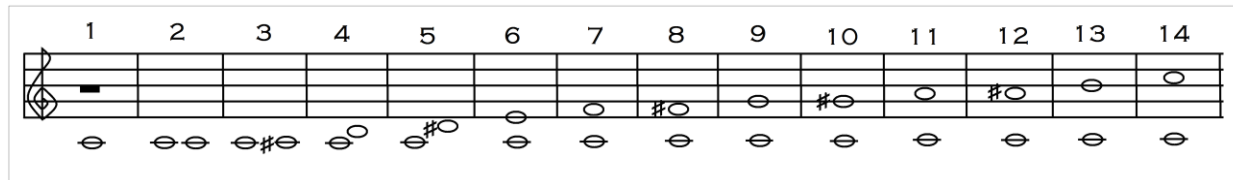


This counting of dates is to be distinguished from the counting of the child's birthdays. To experience one's first birthday party, or second, or third, etc. is a celebration of developmental growth. Each year claimed by a new birthday arrives with the celebration of a new biologic level of accomplishment. This concept of biologic development may be placed along the y-axis as follows.

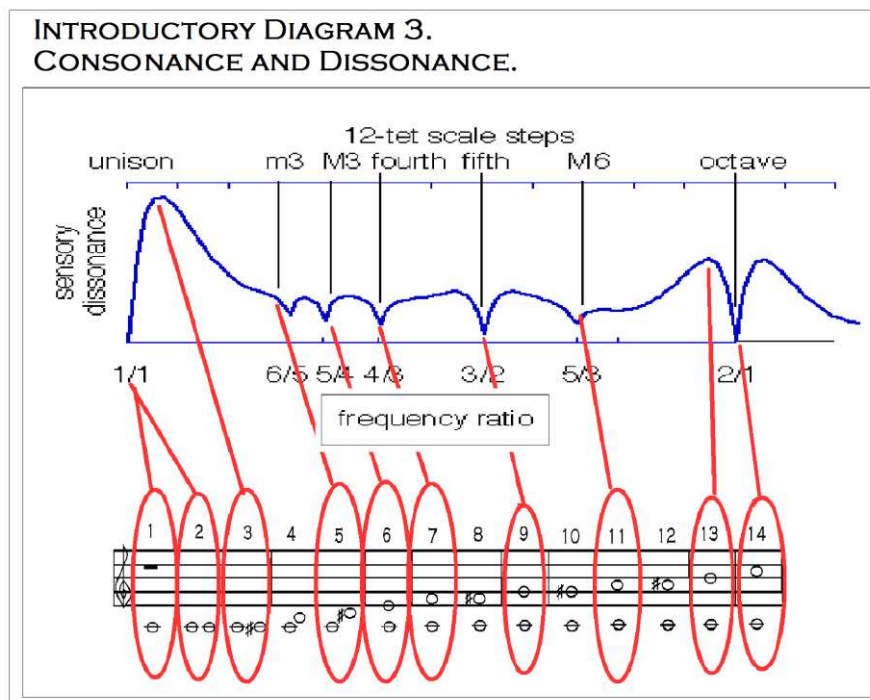


Arranging biologic development along the y-axis biologic growth, as contrasted with the chronologic sequencing of on-going New Year's Days along the x-axis, allows us to see in this simple example the merger of physical and biologic sequences typical of all human life, development and growth.

This ordering of physical dates against biologic development finds a parallel in the study of Pythagorean harmonics. It is well known that Pythagoras first developed the modal system of Western harmony upon noticing that a vibrating string, cut exactly in half, produced a pleasant, melodious sound, whereas even a slight alteration from the division of the string into perfect halves produced dissonant, unpleasant discording sounds. From this a spectrum emerged – the eight tones of the ancient modal scale made famous by Pythagoras, and the thirteen halftones of the modern chromatic scale made famous by J. S. Bach, each based upon the mathematic division of a vibrating string. Upon this modal system the entire spectrum of Western harmony has emerged.



The point in this comparison is that the physical structure of a vibrating string is to be distinguished from the “harmony” which one finds as a subjective individual listening to the relationships which exist in these vibrations as to “consonance” and “dissonance.” The “sensory dissonance” (measured below in blue) indicates the level of harmony vs. dissonance for each of the intervals above.



Of importance for this paper, between solitary note Middle C and its octave there exist 14 separate intervals. A similar span of fourteen distinct years of human development may be explored as human development passes through childhood and reaches adolescence.

As demonstrated below, of the 15.6 million “regular secondary school students” in the United States in 2007-2008, 12.5 million (79.7%) were enrolled in school systems which ended

primary school at eighth grade and began enrollment in secondary school at ninth grade. This break occurs generally at the age of 14. (total student population of these schools, including 9, 10, 11, 12 grade students in red lettering below).

		Student Population	School System ¹⁷
1.	Total, all secondary schools (post-primary)	16,184,724	24,426
2.	Total, all regular secondary schools	15,680,507	19,264
3.	Grades 7 to 8 and 7 to 9	1,578,163	3,047
4.	Grades 7 to 12	927,888	3,278
5.	Grades 8 to 12	451,656	777
6.	Grades 9 to 12	12,500,341	15,179
7.	Grades 10 to 12	418,850	748
8.	Other spans ending with Grade 12	41,545	378
9.	Other grade spans	266,281	1,409

The en masse separation of primary and secondary education into two completely different school systems tracks the tremendous difference between the end of childhood (in aggregate at the age of 14) and the beginning of adolescence and onset of procreative capabilities (in aggregate at the age of 14).¹⁸ Certainly the popularity of alternative systems to the 9-12 scheme, as measured by student enrollment, leaves little doubt that the preferred transfer date for students from primary to secondary education is at the age of 14. Other ages for transfer to secondary enrollment are less popular by ratios of 13:1, 27:1, 29:1, 46:1 and 300:1.

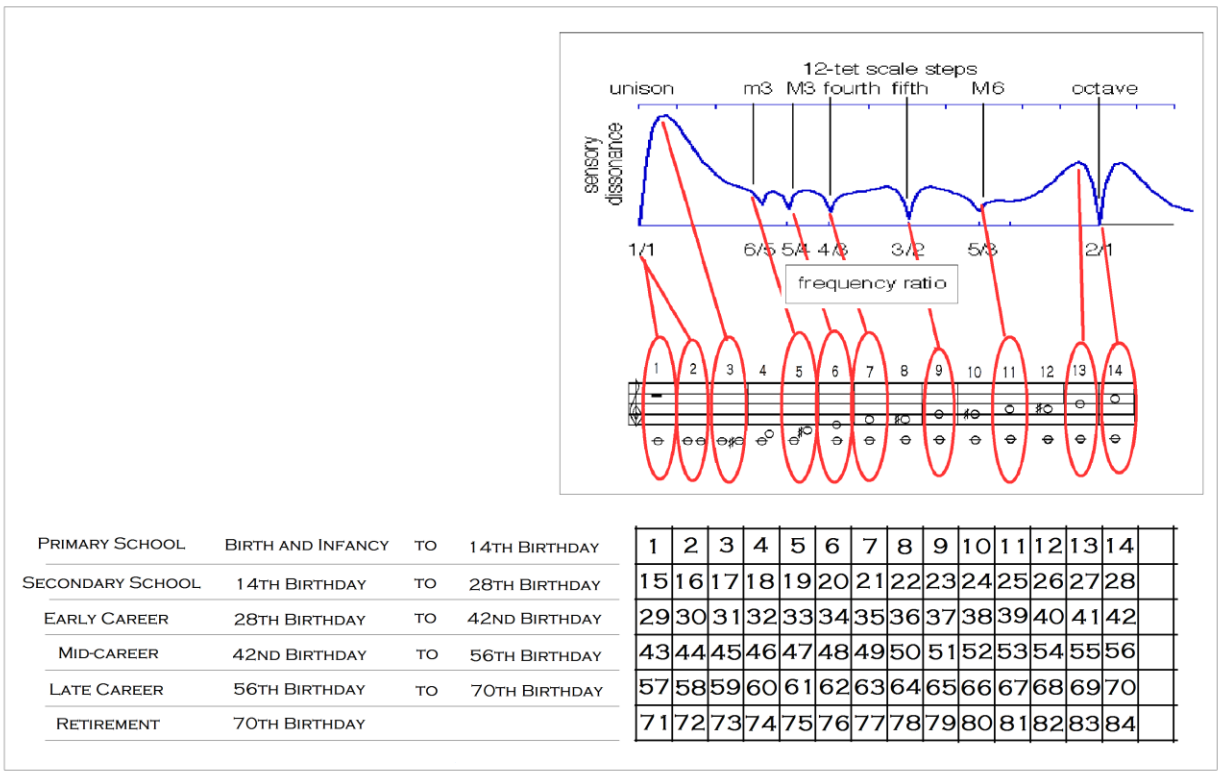
	Student enrollment	Comparative size to enrollment in 9-12 system
4.	Grades 7 to 12 927,888	1: 13.47
5.	Grades 8 to 12 451,656	1: 27.67
6.	Grades 9 to 12 12,500,341	1: 1
7.	Grades 10 to 12 418,850	1: 29.84
8.	Other spans ending with Grade 12 41,545	1: 300.88
9.	Other grade spans 266,281	1: 46.94

¹⁷ Taken from the Digest of Education Statistics, Table 99, Public secondary schools, by grade span, average school size and state or jurisdiction: 2007-2008, National Center for Education Statistics; and Enrollment of public secondary schools, by state, 2007-2008, collected at the request of the authors from the NCES on Friday, June 10, 2011. Data Set Six and Seven are at the conclusion of this paper.

¹⁸ This approach may parallel studies emphasizing the role of learning in the structure of globalization. See e.g. Marchetti, C. (1980) and Devezas, T., et al. (2008:32) "The framework proposed by Devezas and Modelski opens the door to conceptualizing the emergence of world organization and, more recently of globalization, as a process of systemic learning, which leads in turn to the concept of a learning civilization."

Viewed in aggregate, the 14th year of life may be a fundamental biologic rhythm, one which lays through biologic fertility the economic basis for a 14-year spread in the higher social level of the Kondratiev Wave.

INTRODUCTORY DIAGRAM 4.
CONSONANCE, DISSONANCE AND A 14-YEAR TIME SPAN



If this is true, then it should be possible to find in these repeated 14-year cycles a pattern of human development over time. These are provided in the graph to the left wherein the human development is separated by periods of 14 years stages of: “Primary School,” “Secondary School,” “Early Career,” “Mid-Career,” “Late Career” and “Retirement.” These stages are the “harmonies” of the economy as we move forward in aggregate through time.

An additional aggregate of human beings is their labor and the production of that labor. Consequently we suggest that there are “harmonies” within this productivity which – like the musical intervals above – occur over time.

The question arises: If this is so, may we demonstrate the “octave” of relationships within the economy, the fundamental building block of economics? If so, does this discovery provide the basis for an endogenous and biologic causality for the Kondratiev Wave, at least as understood within the context of the development of the American economy?

Part One: Economic Methodology

2. Hypothesis

Our hypothesis is that the 50-60 year Kondratiev Wave is in reality a wave form composed of a number of smaller well-defined parts. Possible wavelengths can be evaluated and distinguished from one another by examining the underlying ratios of real GNP in the United States over various “intervals of years” or “spreads of years” which make up the cycle itself.

3. Methods

1. Prices.

In the first section of this paper we establish a data set for prices in the United States for the period 1801 through 1993. The two data sets which provide this information have a clear splicing multiple of 3. This data set of 193 years is then analyzed by:

- a. collecting figures from two United States Federal Government data sets;
- b. splicing these figures together into a single data set by way of their “splicing multiple” of 3;
- c. placing the figures in centered moving 7-year averages;
- d. determining the annual change in these centered moving 7-year averages; and
- e. dividing this change in “d.” for any given year by the centered moving 7-year average for that year under the heading “Change / Average Inflation.”

Gross National Product.

We also establish a coherent and reasonable set of real GNP numbers for the United States for the period 1868 through 2007. This involves:

- f. collecting figures from two United States Federal Government data sets;
- g. examining the 23 years of overlap between these two data bases, i.e. 1947-1970;
- h. choosing the second of two proposed “splicing multiples” and then splicing these data sets into a single data set for the purposes of this paper.

2. In the second section of this paper we examine ratios of U.S. real GNP. A ratio of GNP is a numeric fraction which takes as its numerator the real GNP of one year and takes as its denominator the real GNP of an earlier year. The number of years between numerator and denominator is referred to as a “spread of years” or simply a “spread.”

We investigated spreads of years between numerator and denominator ranging from a 7-year spread between years to an 18-year spread between years. This range was chosen because it seemed likely to include the most eligible sub-cycles for a Kondratiev Wave of 50-60 years. We thought that if the Kondratiev Wave was in reality seven 7-year sub-cycles, or three 18-year sub-cycles, etc. this range of investigation might demonstrate such a finding.

This requires:

a. creating ratios between years of un-averaged figures U.S. real GNP as taken across spreads of years, (we use spreads of 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18 years),
b. placing them in Excel spread sheets wherein each year of the spread is given a row of the spreadsheet and the number of columns is in inverse proportion to the number of rows,

c. examining the patterns and variances which emerge as to the High, Midrange, Median Average and Low of the ratios generated in both rows and columns, and

d. using the concepts “General Dissonance,” “Used General Dissonance,” “Acute Dissonance” and “Claimed Dissonance” we determine the best sub-cycle from which to compose the larger, encompassing long wave.

3. In the third section of this paper we delineate which cycle best fits as a sub-cycle within a larger periodic wave.

4. In the fourth section of this paper, we examine the data set to find the fundamental Median Average between GNP values given by this analysis.

A first post-script is added to this paper wherein we correlate social and political changes to the Federal constitution according to the dynamics of this model and further speculate as to the underlying pattern involved.

A second post-script is provided wherein the model is simplified and expanded.

A third post-script provides a final analysis with predictions based upon the model provided.

A brief Afterword concludes this paper.

An extensive Appendix explains the methods and results in additional detail.

4. Data

We located two sources for US prices 1800 through 1993.

Series E 135-166, “Consumer Price Indexes (BLS - all items, 1800-1970, and by groups, 1913-1970), pp 210-211, of the book *Historical Statistics of the United States: Colonial Times to 1970, Part 1*, published by the United States Department of Commerce.

The Consumer Price Index of 1997, also published by the United States Department of Commerce, continues this series by dividing the historic series by 3, or a multiple of 1/3.

We located two sources for real US GNP.

Figures for U. S. Real GNP 1869-1970 may be found in the book *Historical Statistics of the United States: Colonial Times to 1970, Part 1*, published by the United States Department of Commerce. Series F 1-5 presents "Gross National Product" for the United States between the years 1869-1970 according to 1958 prices. The years 1869-1878, and 1879-1888 are given with decade averages of 23.1 billion and 42.4 billion dollars respectively.

Figures for U. S. Real GNP 1947-present are collected by the St. Louis Federal Reserve.¹⁹

Miscellaneous

Each spreadsheet is a mathematic arrangement of the figures given in “Data Set 2 – U.S. Real GNP.”

Data Set 3, *infra*, is a compilation of all “Midrange Minus Median Average” values which are created by the spreadsheets.

Data Set 4, *infra*, is a summary of all spreadsheets.

Data Set 5, *infra*, is a mathematic re-arrangement of Data Set 1.

Appendices.

Data Sets 6 and 7, *infra*, provide secondary school statistics mentioned in the Afterword.

¹⁹ These figures are available at: <http://research.stlouisfed.org/fred2/series/GNPC96>

5. Procedure

5.1. Section One: Establish Data Set

5.1.a. Collecting Data - Prices

We began with the Consumer Price Index listed in Series E 135-166 of the *Historical Statistics of the United States: Colonial Times to 1970, Part 1* (column 3) and compared this with the Consumer Price Index of 1960–1997. (column 1) The years of overlap clearly reduce the number for the historic series to a precise one-third of its value as the value given for the modern series. (column 2)

5.1.b. Splicing - Prices

We then spliced these two series into a single data set for prices based upon the values given in the historic series. We continued this data set past 1970 by multiplying the modern number by 3 and including this value in the final data set. (column 4)

5.1.c. Centered moving 7-year averages - Prices

We then figured centered moving averages for seven-year periods for the entire series. In this format a price index is averaged for seven sequential years and the average is placed at the middle term, e.g. the price indices for 1870, 1871, 1872, 1873, 1874, 1875, 1876 are averaged and placed as the figure for 1873. The process then continues to the next seven-year series by dropping the first and adding the next year in the chronology and beginning the averaging again. The technical term for this alteration of the data is “smoothing.” (column 5)

5.1.d. Annual Changes in running 7-year averages - Prices

We then found the annual change between 7-year running averages for each year, and placed these next to the centered moving average itself. (column 6)

5.1.e. “Change / Average Inflation” - Prices

We then divided the annual change in 7-year running averages for a given year by the 7-year running average for that year, to be denominated “Change / Average Inflation.” In this way the larger numbers for the Consumer Price Index found in later years were brought into conformity with the price patterns of prior years. (column 7)

The resulting “Data Set 1 – Prices” is as follows.

Data Set 1 – Prices.

Year	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Year	Consumer Price Index, Statistical Abstract 1997	Multiple	Consumer Price Index Historical Statistics of U.S.	Extended Series 1800-1993	7-Yr Average	Change	Change/Average
1801			50.00	50.00			
1802			43.00	43.00			
1803			45.00	45.00			
1804			45.00	45.00	45.57		
1805			45.00	45.00	45.29	-0.29	-0.006
1806			47.00	47.00	45.86	0.57	0.012
1807			44.00	44.00	46.14	0.29	0.006
1808			48.00	48.00	46.86	0.71	0.015
1809			47.00	47.00	47.71	0.86	0.018
1810			47.00	47.00	49.29	1.57	0.032
1811			50.00	50.00	52.00	2.71	0.052
1812			51.00	51.00	53.00	1.00	0.019
1813			58.00	58.00	53.57	0.57	0.011
1814			63.00	63.00	53.71	0.14	0.003
1815			55.00	55.00	53.14	-0.57	-0.011
1816			51.00	51.00	52.43	-0.71	-0.014
1817			48.00	48.00	50.14	-2.29	-0.046
1818			46.00	46.00	46.86	-3.29	-0.070
1819			46.00	46.00	44.71	-2.14	-0.048
1820			42.00	42.00	42.57	-2.14	-0.050
1821			40.00	40.00	40.43	-2.14	-0.053
1822			40.00	40.00	38.71	-1.71	-0.044
1823			36.00	36.00	37.00	-1.71	-0.046
1824			33.00	33.00	35.86	-1.14	-0.032
1825			34.00	34.00	34.86	-1.00	-0.029
1826			34.00	34.00	33.71	-1.14	-0.034
1827			34.00	34.00	31.14	-0.57	-0.017
1828			33.00	33.00	33.00	-0.14	-0.004
1829			32.00	32.00	32.43	-0.57	-0.018
1830			32.00	32.00	31.71	-0.71	-0.023
1831			32.00	32.00	31.14	-0.57	-0.018
1832			30.00	30.00	30.86	-0.29	-0.009
1833			29.00	29.00	31.00	0.14	0.005
1834			30.00	30.00	31.29	0.29	0.009
1835			31.00	31.00	31.29	0.00	0.000
1836			33.00	33.00	31.57	0.29	0.009
1837			34.00	34.00	31.71	0.14	0.005
1838			32.00	32.00	31.86	0.14	0.004
1839			32.00	32.00	31.57	-0.29	-0.009
1840			30.00	30.00	30.86	-0.71	-0.023
1841			31.00	31.00	30.00	-0.86	-0.029
1842			29.00	29.00	29.43	-0.57	-0.019
1843			28.00	28.00	28.71	-0.71	-0.025
1844			28.00	28.00	28.43	-0.29	-0.010
1845			28.00	28.00	27.71	-0.71	-0.026
1846			27.00	27.00	27.14	-0.57	-0.021
1847			28.00	28.00	26.71	-0.43	-0.016
1848			26.00	26.00	26.29	-0.43	-0.016
1849			25.00	25.00	25.86	-0.43	-0.017
1850			25.00	25.00	25.57	-0.29	-0.011
1851			25.00	25.00	25.43	-0.14	-0.006
1852			25.00	25.00	25.71	0.29	0.011
1853			25.00	25.00	26.00	0.29	0.011
1854			27.00	27.00	26.43	0.43	0.016
1855			28.00	28.00	26.57	0.14	0.005
1856			27.00	27.00	26.86	0.29	0.011
1857			28.00	28.00	27.14	0.29	0.011
1858			26.00	26.00	27.14	0.00	0.000
1859			27.00	27.00	27.43	0.29	0.010
1860			27.00	27.00	28.86	1.43	0.050
1861			27.00	27.00	31.57	2.71	0.086
1862			30.00	30.00	34.43	2.86	0.083
1863			37.00	37.00	36.86	2.43	0.066
1864			47.00	47.00	39.00	2.14	0.053
1865			46.00	46.00	40.86	1.86	0.043
1866			44.00	44.00	42.29	1.43	0.034
1867			42.00	42.00	42.43	0.14	0.003
1868			40.00	40.00	40.86	-1.57	-0.038
1869			40.00	40.00	39.43	-1.43	-0.036
1870			38.00	38.00	38.29	-1.14	-0.030
1871			36.00	36.00	37.14	-1.14	-0.031
1872			36.00	36.00	36.14	-1.00	-0.028
1873			36.00	36.00	35.00	-1.14	-0.033
1874			34.00	34.00	34.14	-0.86	-0.025
1875			33.00	33.00	33.14	-1.00	-0.030
1876			32.00	32.00	32.00	-1.14	-0.034
1877			32.00	32.00	31.00	-1.00	-0.032
1878			29.00	29.00	30.29	-0.71	-0.024
1879			28.00	28.00	29.71	-0.57	-0.019
1880			29.00	29.00	29.14	-0.57	-0.020
1881			29.00	29.00	28.43	-0.71	-0.025
1882			29.00	29.00	28.14	-0.29	-0.010
1883			28.00	28.00	28.00	-0.14	-0.005
1884			27.00	27.00	27.71	-0.29	-0.010
1885			27.00	27.00	27.43	-0.29	-0.010
1886			27.00	27.00	27.14	-0.29	-0.011
1887			27.00	27.00	27.00	-0.14	-0.005
1888			27.00	27.00	27.00	0.00	0.000
1889			27.00	27.00	27.00	0.00	0.000
1890			27.00	27.00	27.00	0.00	0.000
1891			27.00	27.00	26.86	-0.14	-0.005
1892			27.00	27.00	26.57	-0.29	-0.011
1893			27.00	27.00	26.29	-0.29	-0.011
1894			26.00	26.00	26.00	-0.29	-0.011
1895			25.00	25.00	25.71	-0.29	-0.011
1896			25.00	25.00	25.43	-0.29	-0.011
1897			25.00	25.00	25.14	-0.29	-0.011
1898			25.00	25.00	25.00	-0.14	-0.006
1899			25.00	25.00	25.14	0.14	0.006

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Year	Consumer Price Index, Statistical Abstract 1997	Multiple	Consumer Price Index Historical Statistics of U.S.	Extended Series 1800-1993	7-yr Average	Change	Change/Average
1894			26.00	26.00	26.00	-0.29	-0.011
1895			25.00	25.00	25.71	-0.29	-0.011
1896			25.00	25.00	25.43	-0.29	-0.011
1897			25.00	25.00	25.14	-0.29	-0.011
1898			25.00	25.00	25.00	-0.14	-0.006
1899			25.00	25.00	25.14	0.14	0.006
1900			25.00	25.00	25.43	0.29	0.011
1901			25.00	25.00	25.71	0.29	0.011
1902			26.00	26.00	26.00	0.29	0.011
1903			27.00	27.00	26.29	0.29	0.011
1904			27.00	27.00	26.71	0.43	0.016
1905			27.00	27.00	27.00	0.29	0.011
1906			27.00	27.00	27.14	0.14	0.005
1907			28.00	28.00	27.29	0.14	0.005
1908			27.00	27.00	27.43	0.14	0.005
1909			27.00	27.00	27.71	0.29	0.010
1910			28.00	28.00	28.10	0.39	0.014
1911			28.00	28.00	28.40	0.30	0.011
1912			29.00	29.00	28.89	0.49	0.017
1913			29.70	29.70	29.70	0.81	0.027
1914			30.10	30.10	31.19	1.49	0.048
1915			30.40	30.40	33.63	2.44	0.079
1916			32.70	32.70	36.89	3.26	0.088
1917			38.40	38.40	41.21	4.33	0.105
1918			45.10	45.10	44.57	3.36	0.075
1919			51.80	51.80	47.40	2.83	0.060
1920			60.00	60.00	50.03	2.63	0.053
1921			53.60	53.60	51.86	1.83	0.035
1922			50.20	50.20	52.91	1.06	0.026
1923			51.10	51.10	53.09	0.17	0.003
1924			51.20	51.20	51.94	-1.14	-0.022
1925			52.50	52.50	51.61	-0.33	-0.006
1926			53.00	53.00	51.77	0.16	0.003
1927			52.00	52.00	51.61	-0.16	-0.003
1928			51.30	51.30	50.81	-0.80	-0.016
1929			51.30	51.30	49.16	-1.66	-0.034
1930			50.00	50.00	47.13	-2.03	-0.043
1931			45.60	45.60	45.43	-1.70	-0.037
1932			40.90	40.90	43.97	-1.46	-0.033
1933			38.80	38.80	42.57	-1.40	-0.033
1934			40.10	40.10	41.57	-1.00	-0.024
1935			41.10	41.10	41.11	-0.46	-0.011
1936			41.50	41.50	41.21	0.10	0.002
1937			43.00	43.00	41.67	0.46	0.011
1938			42.40	42.40	42.24	0.57	0.014
1939			41.60	41.60	43.34	1.10	0.025
1940			42.00	42.00	44.81	1.47	0.033
1941			44.10	44.10	46.20	1.39	0.030
1942			48.80	48.80	47.84	1.64	0.034
1943			51.80	51.80	50.26	2.41	0.048
1944			52.70	52.70	53.81	3.56	0.066
1945			53.90	53.90	57.81	4.00	0.069
1946			58.50	58.50	61.04	3.23	0.053
1947			66.90	66.90	63.94	2.90	0.045
1948			72.10	72.10	67.53	3.59	0.053
1949			71.40	71.40	71.19	3.66	0.051
1950			72.10	72.10	74.27	3.09	0.042
1951			77.80	77.80	76.21	1.94	0.025
1952			79.50	79.50	77.37	1.16	0.015
1953			80.10	80.10	78.80	1.43	0.018
1954			80.50	80.50	80.54	1.74	0.022
1955			80.20	80.20	81.80	1.26	0.015
1956			81.40	81.40	82.91	1.11	0.013
1957			84.30	84.30	84.14	1.23	0.015
1958			86.60	86.60	85.44	1.30	0.015
1959			87.30	87.30	86.93	1.49	0.017
1960	29.60	2.99	88.70	88.70	88.40	1.47	0.017
1961	29.90	2.99	89.60	89.60	89.63	1.23	0.014
1962	30.20	3.00	90.60	90.60	90.76	1.13	0.012
1963	30.60	2.99	91.70	91.70	92.17	1.41	0.015
1964	31.00	2.99	92.90	92.90	93.79	1.61	0.017
1965	31.50	3.00	94.50	94.50	95.87	2.09	0.022
1966	32.40	3.00	97.20	97.20	98.61	2.74	0.028
1967	33.40	2.99	100.00	100.00	102.13	3.51	0.034
1968	34.80	2.99	104.20	104.20	106.21	4.09	0.038
1969	36.70	2.99	109.80	109.80	110.63	4.41	0.040
1970	38.80	2.99	116.30	116.30	115.77	5.14	0.044
1971	40.50	3.00	121.50	121.50	122.61	6.84	0.056
1972	41.80	3.00	125.40	125.40	126.79	8.17	0.062
1973	44.40	3.00	133.20	133.20	139.49	8.70	0.063
1974	49.30	3.00	147.90	147.90	148.84	9.36	0.063
1975	53.80	3.00	161.40	159.43	10.59	0.059	0.066
1976	56.90	3.00	170.70	172.63	13.20	0.076	0.078
1977	60.60	3.00	181.80	188.91	16.29	0.086	0.086
1978	65.20	3.00	195.60	206.74	17.83	0.086	0.086
1979	72.60	3.00	217.80	225.04	18.30	0.081	0.081
1980	82.40	3.00	247.20	241.34	18.30	0.043	0.043
1981	90.90	3.00	272.70	261.90	18.56	0.071	0.071
1982	96.50	3.00	289.50	280.07	18.17	0.065	0.065
1983	99.50	3.00	298.80	295.93	15.86	0.054	0.054
1984	103.90	3.00	311.70	309.30	13.37	0.043	0.043
1985	107.60	3.00	322.80	321.04	11.74	0.037	0.037
1986	109.60	3.00	328.80	332.83	11.79	0.035	0.035
1987	113.60	3.00	340.80	346.16	13.33	0.039	0.039
1988	118.30	3.00	354.90	360.00	13.84	0.038	0.038
1989	124.00	3.00	372.00	374.01	14.01	0.037	0.037
1990	130.70	3.00	392.10	388.97	14.96	0.038	0.038
1991	136.20	3.00	408.66				
1992	140.30	3.00	420.90				
1993	144.50	3.00	433.90				

5.1.f. Collecting Data – US Real GNP.

The United States Department of Commerce has published one set of numbers based upon 1958 prices running extending from 1869 through 1970. (column 2) The St. Louis Federal Reserve has published a different sequence of numbers based upon 2005 prices extending between 1947 through to the present day. (column 7)

Splicing multiples are quite necessary when considering two different series each of which proposes to calculate U.S. Real GNP over different periods of time. To “splice” or to “graft” these two sets together is necessary if an extended series running from 1869 to the present day is to be obtained. There does not exist at the present time such a series published by the United States Government. Consequently our first step in the analysis is to construct such a series as the foundation of this approach.²⁰

5.1.g. Dates of overlap – US Real GNP

We considered two possible multiples with which to splice these two series of U.S. Real GNP figures together. The first possible splicing multiple is 5.881696, the average of all 23 multiples between 1947-1970. These are the years during which these two separate series overlap. (column 6) This number is problematic in that there is a clear drift from 1947 through 1970 toward higher multiples. Figures from 1947-1960 range from 5.646318 (1953) to 5.977644 (1958) and average at 5.8239423. Figures from 1961-1970 range a bit higher, i.e. from 5.907649 (1962) to 6.071220 (1965).

A second possible splicing multiple is 5.962552, the average of the final ten years of overlap, i.e. between 1961-1970. This multiple is the one used to splice these series in this paper as it is nearer in time to the eventual cutoff between the series and includes only multiples found in the later and more recent multiples. (column four)

5.1.h. Splicing

For the purposes of the demonstration herein, more elaborate splicing techniques have not been deemed necessary. Data Set 2 figures an extended series for U.S. Real GNP in constant terms from 1868 to 2009. For the purposes of this paper only the second splicing multiple, 5.962552, will be used for calculations. (column 9)

The resulting “Data Set 2 – U.S. Real GNP” is as follows. We have highlighted in blue the GNP figures which will be used throughout this analysis.

²⁰ See e.g. Cochrane, 1988:902. “The presence of a splice in 1947 also does not drive the result. Every long series of GNP data contains at least one splice. The wide surveys used to construct later data are simply not available for earlier periods, so some projection using a restricted set of industries is unavoidable.”

Data Set 2 – U.S. Real GNP.

[illegible]

5.2.a. Section Two: Examine Ratios of un-averaged U.S. real GNP

If the Kondratiev wave is to be found within the economic data of the United States, it is necessary to locate within this wave the fundamental sub-cycles. In this second section of this paper we examine “ratios of U.S. real GNP” in order to determine whether such sub-cycles may be demonstrated empirically.

A ratio of GNP is a numeric fraction which takes as its numerator the real GNP of one year and takes as its denominator the real GNP of an earlier year. The number of years between numerator and denominator is referred to as a “spread of years” or simply a “spread.” In order to establish the possible period of the sub-cycle we took ratios of GNP at different spreads of years and placed these ratios in Excel spreadsheets based upon the number of years in the spread.²¹

For every year of the spread we constructed a single row within the spreadsheet. Because the data set is finite, a tighter spread between years results in a larger number of columns, and a broader spread between years results in a reduced number of columns.

We investigated spreads of years between numerator and denominator ranging from a 7-year spread to an 18-year spread. This range was chosen because it seemed likely to include the most eligible sub-cycles for a Kondratiev Wave of 50-60 years. We thought that if the Kondratiev Wave was in reality seven 7-year sub-cycles, or three 18-year sub-cycles, etc. this range of investigation might demonstrate such a finding.

The result of dividing figures for real GNP by one another is a third number, the quotient. The fraction $6/5$ represents the mathematic operation of division or $6 \div 5 = 1.2$, in which case the quotient is 1.2.

The spread between years is a measure of the passage of time. When the spread between years is slight, the quotients generated are generally quite close to the number one because the passage of time has been short. One would not expect the real GNP of 1888 to be significantly different than the real GNP of 1889 because only one year has passed between the two dates. Consequently, dividing one figure for real GNP by the other, we would expect to have a result which is close to the number one. When the spread between years is great, a larger period of time is being considered and the quotients generated are usually larger than one.

If a quotient is set as a ratio or proportion to the number one, it copies the proportion first stated as between the numerator and denominator in the first instance. Considering the example above, just as 6 is to 5, so is 1.2 to 1, or set mathematically, $6 : 5 = 1.2 : 1$. These numerators, denominators and quotients are considered “ratios of U.S. real GNP” because we are looking for the common patterns underlying the numbers themselves, the numerators and denominators given for the real GNP of the United States for any given year.

²¹ The data provided by the Federal Government commences with a series of GNP values for the nine year period of 1869-1877 of a single figure, i.e. 23.1. This is followed by an 11-year period of 1878-1888 of a single value, i.e. 42.4. We have extended this series back one year by giving the year 1868 the figure 23.1, thereby permitting the larger spreads to include data series dating back to 1868.

This has been helpful in that it allows the 14-year, 15-year, 16-year, 17-year and 18-year spreads to include both the most antique, as well as the most current data – through 2010 – in their spreadsheets. Given the significance of the 14-year spread as described in this paper, it has been important to use this 1868 value of 23.1 as the beginning point for each spreadsheet in an effort to provide uniformity in this approach.

A typical Excel spread sheet with this data is as follows:

		12 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																															
		1		2		3		4		5		6		7		8		9		10		11			A	B	C	D	E	F	G		
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP		Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average			
1	Year	1880	42,4000	1892	60,4000	1904	89,7000	1916	134,4000	1928	190,9000	1940	227,2000	1952	395,1000	1964	581,1000	1976	879,1138	1988	1303,1774	2002	1957,1959										
	Ratio	1.838473	23.11000	1.424523	66.40000	1.892438	113.70000	1.916123	142.00000	1.928013	190.90000	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.9281300	1.858488	1.901532	0.045346	1.512625	1.480339	1.505084	1.493636				
2	Year	1881	42,4000	1893	57,5000	1905	96,3000	1917	135,2000	1929	203,6000	1941	263,7000	1953	412,8000	1965	617,8000	1977	922,6696	1989	1360,3512	2005	2151,0247										
	Ratio	1.8584978	1.3591121	1.4074762	1.463994	1.5092512	1.5293866	1.5504534	1.5696053	1.5887123	1.6077800	1.6267000	1.6455700	1.6643900	1.6831600	1.7018800	1.7205500	1.7391700	1.7577400	1.7762600	1.7947300	1.8131500	1.8315200	1.8498900	1.8682600	1.8866300	1.9049900	1.9233600	1.9417300	1.9601000	1.9784700		
3	Year	1882	42,4000	1894	53,9000	1906	107,5000	1918	151,8000	1930	185,5000	1942	297,8000	1954	487,0000	1966	658,1000	1978	985,8821	1990	1418,0149	2006	2201,9891										
	Ratio	1.8584978	1.3118936	1.5232789	1.512091	1.5280272	1.5441200	1.5602128	1.5763056	1.5923984	1.6084912	1.6245840	1.6406768	1.6567696	1.6728624	1.6889552	1.7050480	1.7211408	1.7372336	1.7533264	1.7694192	1.7855120	1.8016048	1.8176976	1.8337904	1.8498832	1.8659760	1.8820688	1.8981616	1.9142544	1.9303472		
4	Year	1883	42,4000	1895	62,6000	1907	109,2000	1919	146,4000	1931	169,3000	1943	337,1000	1955	438,0000	1967	675,2000	1979	1001,7304	1991	1454,1409	2007	2272,1651										
	Ratio	1.8584978	1.3118936	1.5232789	1.512091	1.5280272	1.5441200	1.5602128	1.5763056	1.5923984	1.6084912	1.6245840	1.6406768	1.6567696	1.6728624	1.6889552	1.7050480	1.7211408	1.7372336	1.7533264	1.7694192	1.7855120	1.8016048	1.8176976	1.8337904	1.8498832	1.8659760	1.8820688	1.8981616	1.9142544	1.9303472	1.9464400	
5	Year	1884	42,4000	1896	53,3000	1908	100,2000	1920	140,0000	1932	144,2000	1944	361,3000	1956	446,1000	1968	706,6000	1980	995,8376	1992	1514,7394	2008	2198,6273										
	Ratio	1.8584978	1.4457541	1.4848484	1.4848484	1																											

The next ratio in the series, 1917 / 1905, or 135.2 / 96.3, gives the result of 1.40395. This is placed in Column Four Row Two of the 12-year spread spreadsheet.

This continues on for a period of 12 years, i.e. from 1916 through 1927. The final fraction in Column Four Row Twelve is $1927/1915$, or $189.9 / 124.5$, for a result of 1.5253. This result is placed in Column Four Row Twelve and the series continues on to the next column.

The next column, Column Five, begins in Row One with the ratio 1928 / 1916, for a ratio of 190.9 / 134.4 and a result of 1.42039. This is placed in Column Five Row One and the process continues. Notice that the numerator of the cell in Column Four Row One (“1916 = 134.4”) becomes the denominator of the cell immediately to the right, Column Five Row One.

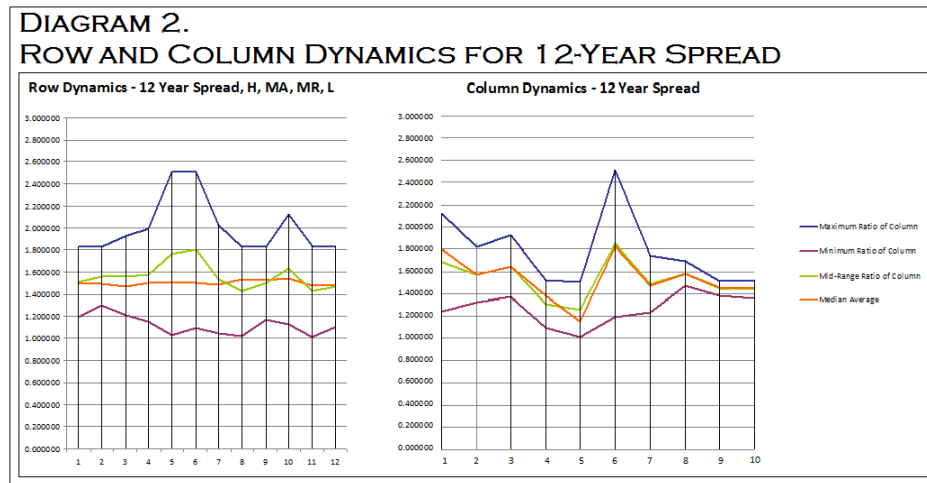
An Excel spread sheet may be generated for any given spread of years using “Data Base 2 – U.S. Real GNP” as its foundation.

For every Row and for every Column in every spread sheet there exists a High Ratio and a Low Ratio. For example, in the Columns and Rows mentioned previously regarding the 12-year spread, we have the following:

12-year Spread,	High		
Row One	1880/1868	= 42.4/23.1	= 1.8354978
Row Two	1881/1869	= 42.4/23.1	= 1.8354978
Row Twelve	1951/1939	= 383.4/209.4	= 1.8309455
Column Four	1927/1915	= 189.9/124.5	= 1.5253012
Column Five	1928/1916	= 190.9/134.3	= 1.4203869
12-year Spread,	Low		
Row One	1940/1928	= 227.2/190.9	= 1.1901519
Row Two	1941/1929	= 263.7/203.6	= 1.2951866
Row Twelve	1939/1927	= 209.4/189.9	= 1.1026856
Column Four	1921/1909	= 127.8/116.8	= 1.0941781
Column Five	1938/1926	= 192.9/190.0	= 1.0152632

We noticed that High Averages represent ratios which contrast a very dynamic year of growth in the numerator with a previous year of very slow or depressed growth in the denominator. Conversely Low Averages contrast a year of slow or depressed growth in the numerator with a previous year of growth in the denominator.

The full range of these contrasts is as follows as to the 12-year spread.



From the above charts it becomes clear that these spread sheets are characterized by “Row Dynamics” and “Column Dynamics.” From these dynamics we have calculated four additional points within both the Rows and the Columns of all spreadsheets. These are:

The “Mid-Range.” The mid-range is the mid-point lying between the high and low ratios in the sample, i.e. the average of the highest and lowest numbers in the set: $(H + L) / 2$.

The “Average” or “Arithmetic Mean.” The sample mean is the sum of all the observations divided by the number of observations.

The “Median.” The median is that number for which half the data is larger than it, and half the data is smaller. It is also called the 50th percentile. If the data has an odd number of members, the median will be the number in the center of these members; if an even number of members, the median will be the mid-point between the two numbers closest to the center.

The “Median Average.” The Median Average is the mid-point between the Median and the Average (Arithmetic Mean). It is figured as: $(\text{Median} + \text{Average}) / 2$ and is the approximation used throughout this paper – in conjunction with the Midrange – as the best estimate of the dynamics within Rows and Columns.

We then compared the High, Midrange, Median Average and Low of Row Dynamics for each Excel spread sheet. The following points are made as to this approach.

1) In every Row there exists a Highest Average of the possible averages in the Row. This Highest Average represents the greatest margin of growth over decline for the time period of that spread for that Row. Conversely the Lowest Average represents the greatest depth of decline over growth for the time period of the spread for that Row.

2) We noted that the Midrange between the Highest Average and the Lowest Average is simply the arithmetic division of the distance between these two. It lies half-way between them in any given row. The Midrange represents the arbitrary balance between these two extremes for that Row in any given spread of years. The Midrange is completely independent of, and unconnected to, the Median Average of the Row, other than the fact that they both include the Highest Average and the Lowest Average in their calculus.

3) The Median Average states the accumulated “weight” of all the ratios in the row. It is unconnected to the Highest Average and the Lowest Average other than it includes both of them as a part of its calculation. It is completely independent of, and unconnected to, the Midrange value and does not take it directly into account in its calculus.

4) When a particular spread of years generates Rows which contain Midrange values and the Median Average values which are quite close to one another, the spread has established a relationship between the most basic ratios of the economy which is balanced and uniform. In the context of our search herein, we use the term “harmonic” to indicate this balance.

5) When a particular spread of years generates Rows which contain Midrange values and Median Average values which are at relatively great distances from one another, the spread has failed to establish a relationship between these basic ratios of the economy. By comparison to the other spreads, the particular spread in question is relatively unbalanced and not uniform. In the context of our search herein, we use the term “dissonant” to indicate this discord, turbulence or lack of harmony.

6) The implication is that when a given spread of years generates Midrange and Median Average values which are proximate to one another and therefore “harmonious” or “balanced,” some underlying pattern or overriding logic may be at work to create this harmony as opposed to a random and disconnected set of processes and their resulting discordant and dissonant variables.

Diagram 2, left side, presents the Row Dynamics for the 12-year spread shown in Diagram 1. The x-axis indicates the row of the spreadsheet under consideration. The y-axis represents the figure presented by that row as its High, Low, Midrange or Median Average ratio.

DIAGRAM 3.
DISSONANCE BETWEEN MIDRANGE AND MEDIAN AVERAGE

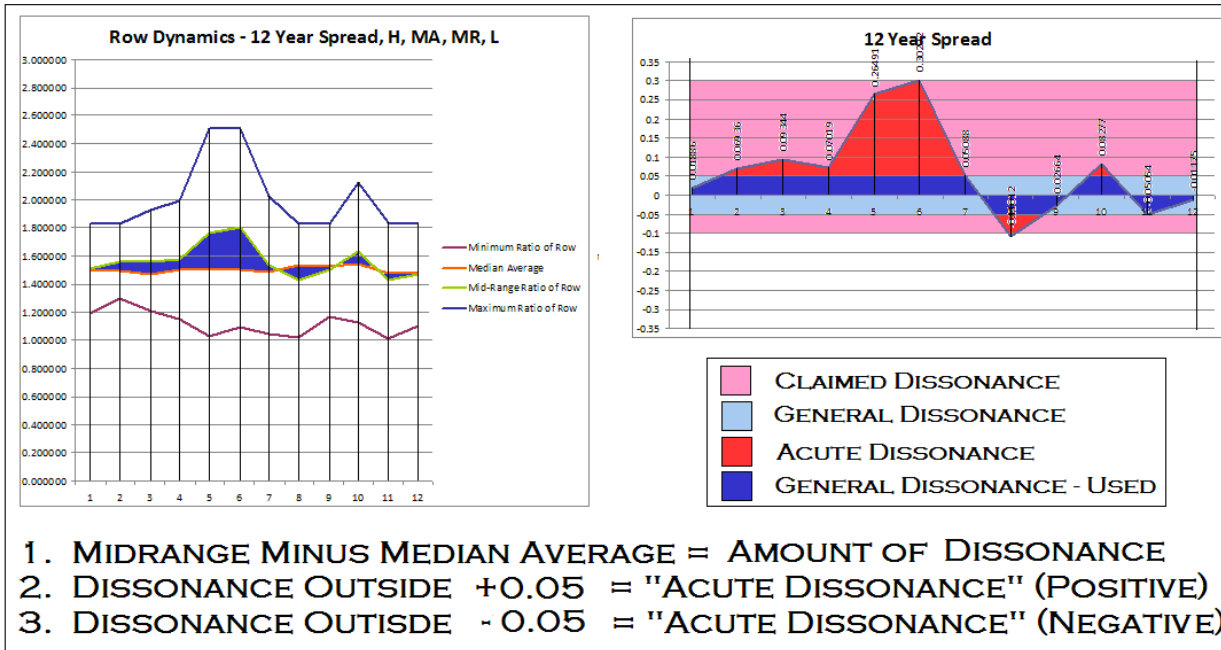


Diagram 2, right side, presents the graph of the

x-axis = Row of the Spread
y axis = Midrange minus Median Average

When the Median Average is greater than the Midrange, the score is negative; when the Median Average is less than the Midrange, the score is positive. The number along the x-axis again indicates the row of the spread sheet under consideration. The number along the y-axis represents an amount of difference between Midrange and Median Average as found in that row.

The effort to compare systematically the common characteristics of different spreads led us to invent four new terms. Referring to Diagram 2 above these are:

“General Dissonance.” The pale blue area running as a ribbon from left to right represents the notion of a “General Dissonance,” i.e. an arbitrary, acceptable distance between Median-Average and Midpoint. When a row possesses a Midrange and a Median Average which are in close proximity to one another, the distance between them will be found within the space designated by pale blue, “General Dissonance.” After reviewing all spreads of years, this number has been set at ± 0.05 in as much as it appears applicable to all spreads of years as general field of activity.

“Used General Dissonance.” The amount of dark blue is termed “Used General Dissonance,” i.e. that portion of “General Dissonance” which is actually used by the given row in stating the distance between the Midrange and the Median Average, either as a positive or negative amount surrounding $y = 0$.

“Acute Dissonance.” The portion in red represents an “Acute Dissonance.” When the distance between Midrange and Median Average falls outside the arbitrarily stated “General Dissonance” the excess is given in red shading. If the distance between the Midrange and the Median Average of a row is great, the “Acute Dissonance” so stated will be signified by large areas of red shading. Lesser amounts of “Acute Dissonance” generate less red shading.

“Claimed Dissonance.” The pink portion running as a ribbon from left to right is “Claimed Dissonance,” i.e. that volume of spread between the high point of “Acute Dissonance” and the low point of “Acute Dissonance.” This is the range of values necessary to accommodate the entire spectrum of variation between these two extreme points.

We then compared all spreads of years, from the 7-year spread to the 18-year spread using the “Midrange Minus Median Average” formula. The data for this formula is as follows.

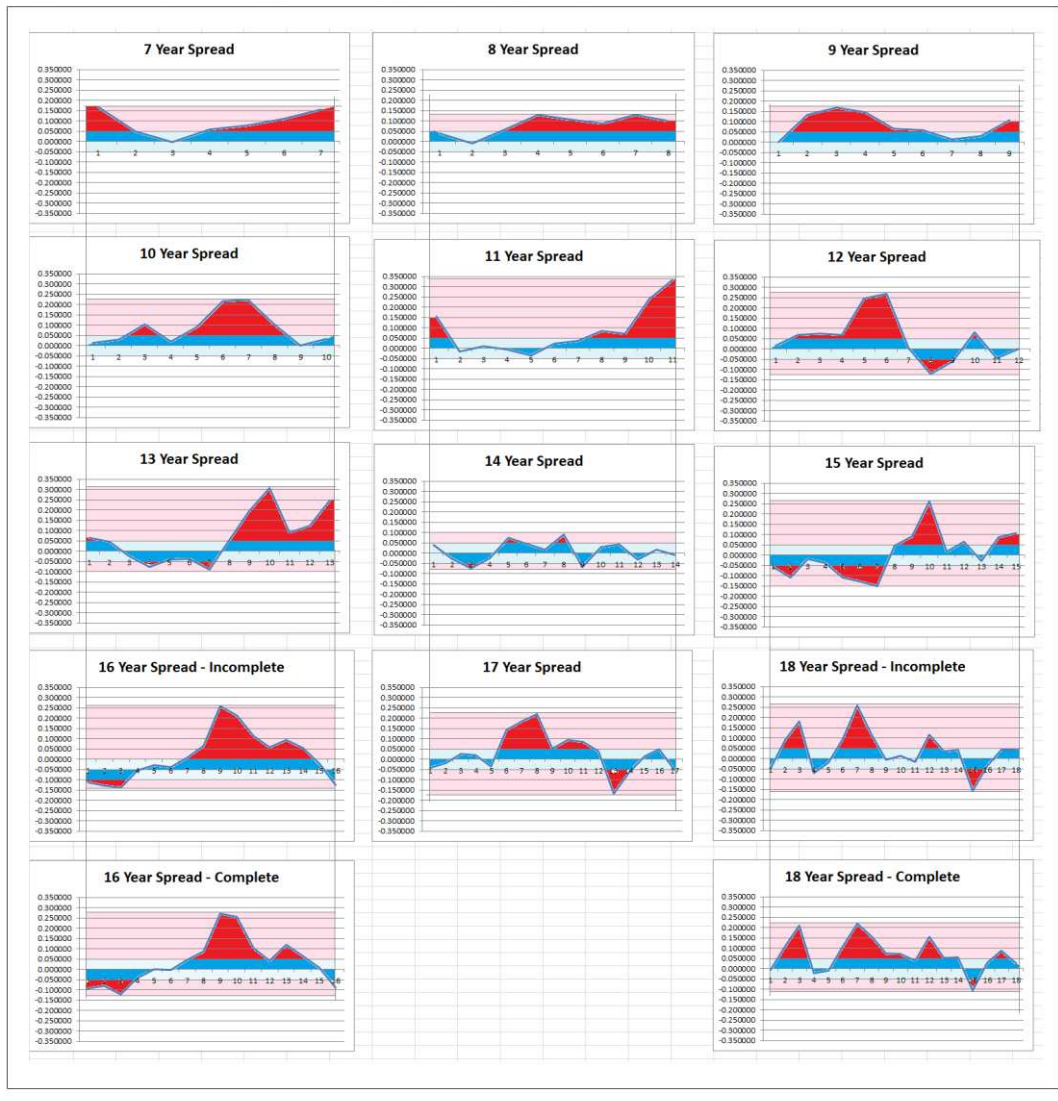
TAB 17
MIDRANGE MINUS MEDIAN AVERAGE

7 Year Spread				8 Year Spread				9 Year Spread				10 Year Spread			
Mid-Range Ratio of Row	Median Average of Row	Mid-Range Ratio of Minus Median Average		Mid-Range Ratio of Row	Median Average of Minus Median Average	Mid-Range Ratio of Minus Median Average		Mid-Range Ratio of Row	Median Average of Minus Median Average	Mid-Range Ratio of Minus Median Average		Mid-Range Ratio of Row	Median Average of Minus Median Average	Mid-Range Ratio of Minus Median Average	
1.420864	1.251559	0.189175		1.353198	1.112028	0.040470		1.352348	1.352292	0.000565		1.417179	1.405616	0.012132	
1.319564	1.271255	0.047489		1.261672	1.136888	-0.010716		1.427979	1.348224	0.131565		1.413193	1.406802	0.002918	
1.290117	1.291396	-0.001279		1.371056	1.130989	0.060066		1.522397	1.351740	0.168657		1.500597	1.398871	0.101764	
1.334015	1.260355	0.053630		1.448083	1.112139	0.123488		1.511834	1.365528	0.148306		1.494618	1.429794	0.062013	
1.329561	1.282952	0.073497		1.430010	1.127879	0.108311		1.428369	1.348474	0.084935		1.427711	1.319756	0.092645	
1.317171	1.280691	0.111026		1.404650	1.101979	0.148692		1.448995	1.391209	0.058756		1.440428	1.402381	0.038216	
1.417789	1.261655	0.150694		1.443162	1.114250	0.129112		1.591472	1.378660	0.212822		1.630934	1.414971	0.221296	
				1.427996	1.128026	0.099138		1.480312	1.379619	0.108893		1.520396	1.416816	0.103170	
								1.480915	1.371463	0.106551		1.425644	1.424030	0.006163	
												1.426787	1.419734	0.013033	
11 Year Spread				12 Year Spread				13 Year Spread				14 Year Spread			
Mid-Range Ratio of Row	Median Average of Row	Mid-Range Ratio of Minus Median Average		Mid-Range Ratio of Row	Median Average of Minus Median Average	Mid-Range Ratio of Minus Median Average		Mid-Range Ratio of Row	Median Average of Minus Median Average	Mid-Range Ratio of Minus Median Average		Mid-Range Ratio of Row	Median Average of Minus Median Average	Mid-Range Ratio of Minus Median Average	
1.616804	1.469999	0.155505		1.512825	1.494734	0.018991		1.609955	1.545540	0.064411		1.606805	1.566928	0.039957	
1.443208	1.449386	-0.015177		1.565342	1.496709	0.068573		1.607890	1.561299	0.045592		1.569385	1.597482	-0.028197	
1.455555	1.469347	-0.009747		1.563952	1.491400	0.074252		1.527502	1.553554	-0.026052		1.546874	1.426822	-0.073748	
1.402486	1.457491	-0.055045		1.537780	1.505383	0.038397		1.449425	1.577793	-0.078310		1.412062	1.618888	-0.248006	
1.425688	1.460782	-0.035114		1.521875	1.521875	0.000000		1.531646	1.571872	-0.040252		1.466742	1.593109	-0.077022	
1.466204	1.444554	0.021649		1.802213	1.535306	0.266907		1.531405	1.568648	-0.037243		1.681779	1.616840	0.049839	
1.475706	1.441038	0.034668		1.534246	1.529455	0.004790		1.648482	1.583431	-0.088957		1.639062	1.621106	0.017955	
1.544457	1.460301	0.084125		1.428399	1.548417	-0.120628		1.608231	1.554593	0.054230		1.688880	1.596660	0.092220	
1.531704	1.466230	0.070834		1.500830	1.562086	-0.061855		1.733446	1.550557	0.186889		1.615660	1.682817	-0.067158	
1.709719	1.461884	0.239235		1.629103	1.540546	0.082557		1.859757	1.548431	0.307564		1.679306	1.647804	0.028222	
1.794231	1.420848	0.338287		1.426875											

An important difficulty arises in this regard as each spreadsheet is composed of varying numbers of columns and rows. Consequently the frequency of repetition varies. The 18-year spread is 2.571 longer in duration than is the 7-year spread. This means that – taken to infinity – the 7-year spread may be anticipated to have 2.571 as many columns as the 18-year spread. Conversely, because the number of rows is always finite, the 18-year spread has approximately 2.5 as many rows as the 7-year spread.

In the chart below the number of years in the spread is equalized by stretching the horizontal frame so that all spreads between a 7-year and an 18-year spread take up the same total horizontal space. This balances large spreads (large number of rows, relatively few columns) with the smaller spreads (small number of rows, large number of columns).

TAB 18
MIDRANGE MINUS MEDIAN AVERAGE



One may notice above that some spreads have distinctly lower profiles as to claimed dissonance than the other spreads. We examined this finding in more detail by comparing the numbers generated by these different spreads and associating them with one another in a more systematic way.

Each value given as the sum or difference for equation “Midrange Minus Median Average” may be divided into two parts, i.e. positive and negative values. These parts are further sub-divided by those values for this number which fall close to the $y = 0$ axis and inside the range of ± 0.05 . This range is referred to as “General Dissonance.” Values which fall outside this range are referred to as “Acute Dissonance.”

“Claimed Dissonance” locates the High and the Low extremes of the “Midrange Minus Median Average” for a given Row. Once we locate the point at which the Midrange most exceeds the Median Average (High), and the point at which the Midrange is most exceeded by the Median Average (Low), we may draw the y-axis distance between these two extremes (column 13). This is then taken as the boundary of a pink ribbon denoting “Claimed Dissonance” against the y-axis for the entire spread.

“Claimed Dissonance” is a measurement of the extent to which any given spread of years generates turbulence and discord between the Midrange and the Median Average. Like harmonies with discord between them, a high value for Claimed Dissonance indicates that the GNP ratio in question would not function well as a fundamental building block for an economic system, whereas low values for Claimed Dissonance provide the underlying balance necessary.

“The Magic Fraction.”

All of these figures fit into the broader scheme of our effort to compare spreadsheets. Toward this end we have developed “the magic fraction,” i.e. that fraction which serves as a stretching or shrinking device to accomplish numerically for spreadsheets what stretching and shrinking the horizontal frame of graphs accomplished in Diagram 3.

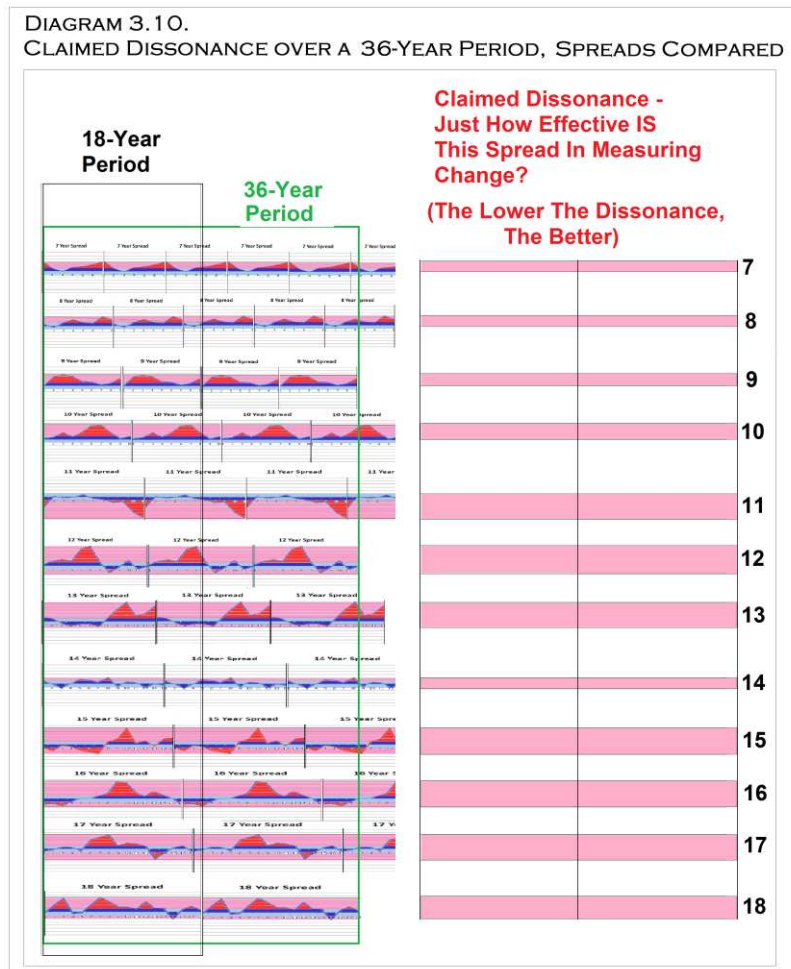
By way of example, in order to make the distance for “Claimed Dissonance” for the seven year spread equal that of the “Claimed Dissonance” for the 18-year spread, it must expand 2.571 times. If we used the fraction $18/7$ we would create this “magic fraction” and thereby “stretch” the data for the seven year spread accordingly.

Such a fraction may be used to equalize all figures for all spreadsheets. For example, an “Acute Dissonance” at the 7-year spread sheet exists within a pattern of time which repeats itself 10 times in a 70 year span. An “Acute Dissonance” of an equivalent amount in an 18-year spreadsheet repeats under four times in the same 70 year span. The following fractions were used to multiply the spreadsheet data into numeric representations which would be equivalent.

7-year spread x	14/7	2.0000
8	14/8	1.7500
9	14/9	1.5555
10	14/10	1.4000
11	14/11	1.2727
12	14/12	1.6666
13	14/13	1.0769
14	14/14	1.0000
15	14/15	0.9333
16	14/16	0.8750
17	14/17	0.8235
18	14/18.	0.7777

5.2.b. The Economic Octave

In Diagram 3-10 each spread is set into the repetition necessary to complete a 36-year period of time. One can see the pattern of Claimed Dissonance building to the 13-year spread, then suddenly dropping at the 14-year spread, and then immediately returning to a very high level of Claimed Dissonance at the 15-year Spread.

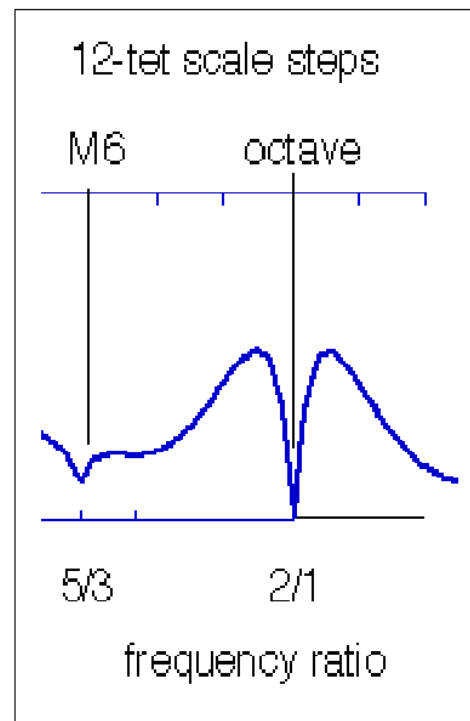
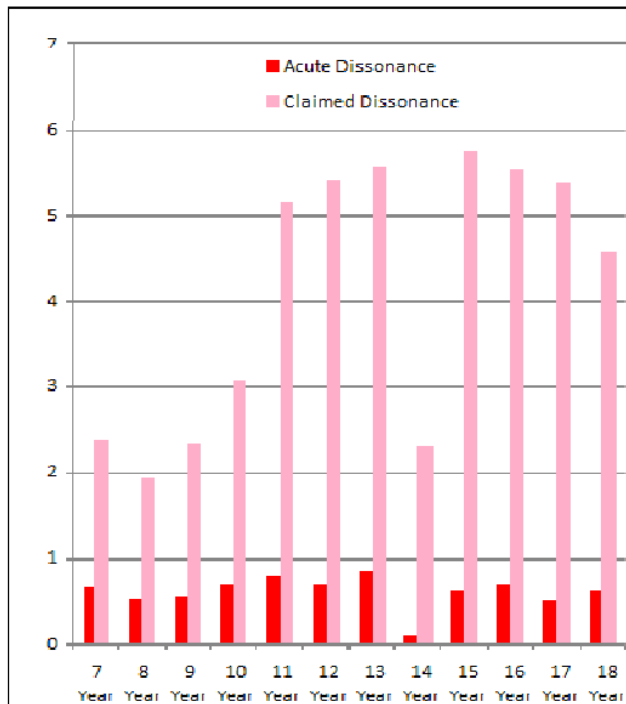


In addition, the spreads of three years before (11, 12, 13) and after (15, 16, 17) the 14-year spread generate the greatest amount of Claimed Dissonance, more than double that of the 14-year spread. One may demonstrate this conclusively by:

- (1) setting out each spread in direct proportion to the others,
- (2) repeating the spread as necessary to demonstrate the continual repetition of the spread itself over a given period of time, and
- (3) measuring the area of “Claimed Dissonance” taken up by each spread for the same period of years.

As demonstrated below, a remarkable and unexpected result occurs when a ratio of real GNP possesses a numerator and the denominator separated by 14 years. At this span of time, the level of Acute Dissonance is the least of all ratios (0.10682793) and the level of Claimed Dissonance is second-to-least (2.32355220). In addition, the spreads of three years before (11, 12, 13) and after (15, 16, 17) the 14-year spread generate the greatest amount of Claimed Dissonance, more than double that of the 14-year spread.

DIAGRAM 4B. TAKEN FROM THE APPENDIX: TAB 19B.
"ACUTE DISSONANCE" AND "CLAIMED DISSONANCE" WITH MUSICAL OCTAVE



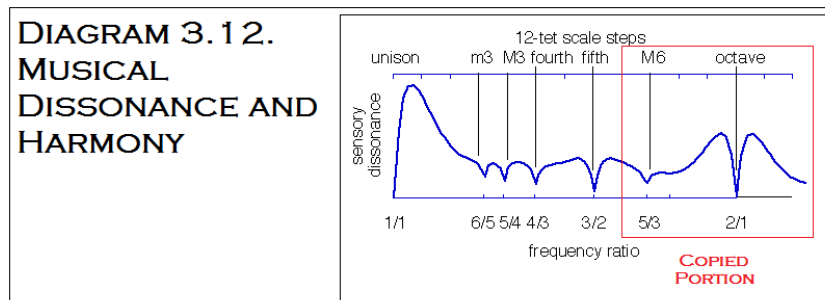
- RED	+ RED		Acute Dissonance	Claimed Dissonance
0.00000000	0.64710419	7 Year	0.64710419	2.38636208
0.00000000	0.54461218	8 Year	0.54461218	1.95758914
0.00000000	0.58384718	9 Year	0.58384718	2.36041529
0.00000000	0.68095806	10 Year	0.68095806	3.08490106
0.00000000	0.80581411	11 Year	0.80581411	5.16578384
-0.09646376	0.59136602	12 Year	0.68782978	5.42828771
-0.07244166	0.78931276	13 Year	0.86175442	5.55129001
-0.04090523	0.06592270	14 Year	0.10682793	2.32355220
-0.28312582	0.33837347	15 Year	0.62149929	5.77038878
-0.16258156	0.52695711	16 Year	0.68953867	5.54327070
-0.10784916	0.39431580	17 Year	0.50216496	5.40060912
-0.04361834	0.58559699	18 Year	0.62921532	4.58001012

The suggestion is that just as an octave²² is created by the equal division of a vibrating string into two harmonic parts, and just as a slight variation from this even division between the perfect center of the vibrating string results in intolerable out-of-tune sense of dis-harmony, so does the use of a 14-year interval between years when measuring GNP values result in great sympathy and proximity between Midrange and Median Average values for the entire economy, unlike every other spread of years. And also like the vibrating string, the most out-of-tune dissonance occurs immediately surrounding the perfect division of the string, while tapering off as one takes distances further from the center.

This “piling on” of Claimed Dissonance immediately before and after the 14-year spread is the origin of our selection of the term “dissonant,” i.e. the sense that at the 14-year spread an almost acoustic “octave” is sounded against an underlying reality.

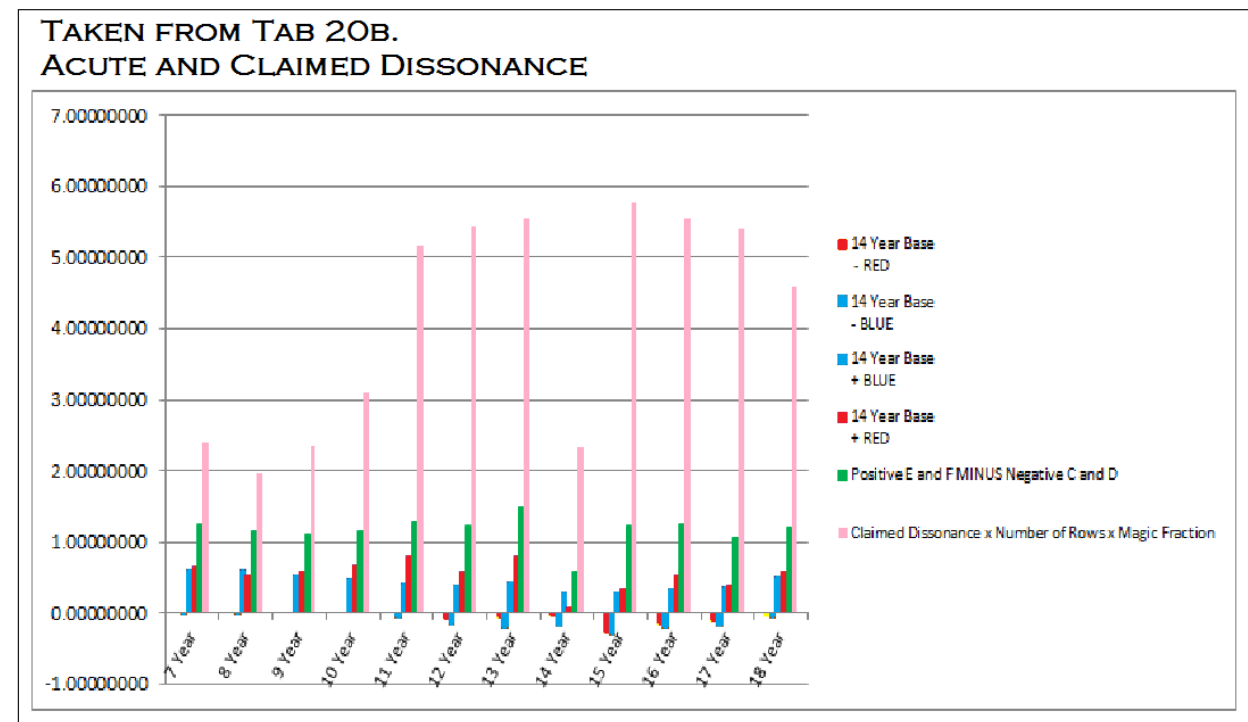
The similarity of “Claimed Dissonance” to the “octave” of musical relationships will be central to the remainder of these papers. The technique and spreadsheets used to obtain this graph are presented at length in the Appendix.

²² See e.g. William Sethares, Relating Tuning and Timbre, *Experimental Musical Instruments*: “To explain perceptions of musical intervals, Plomp and Levelt note that most traditional musical tones have a spectrum consisting of a root or fundamental frequency, and a series of sine wave partials that occur at integer multiples of the fundamental. Figure 2 depicts one such timbre. If this timbre is sounded at various intervals, the dissonance of the intervals can be calculated by adding up all of the dissonances between all pairs of partials. Carrying out this calculation for a range of intervals leads to the dissonance curve. For example, the dissonance curve formed by the timbre of figure 2 is shown below in figure 3.

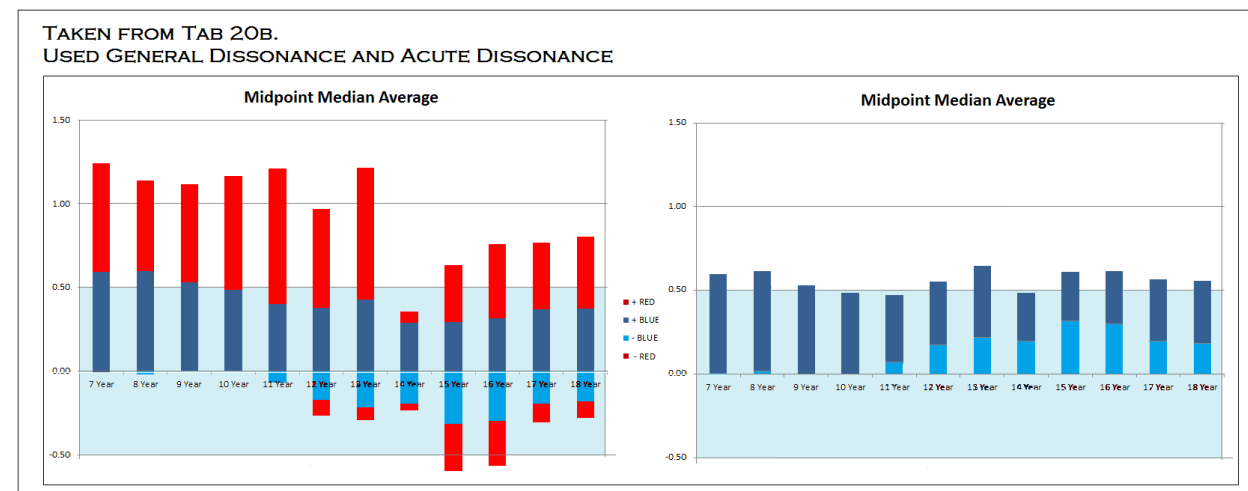


Observe that this curve contains major dips at many of the intervals of the 12 tone equal tempered scale. The most consonant interval is the unison, followed closely by the octave. Next is the fifth, followed by the fourth, the major third, the major sixth, and the minor third. These agree with standard musical usage and experience. Looking at the data more closely shows that the minima do not occur at exactly the scale steps of the 12 tone equal tempered scale. Rather, they occur at the “nearby” simple ratios 1:1, 2:1, 3:2, 4:3, 5:4, and 5:3 respectively, which are exactly the locations of notes in the “justly intoned” scales (see Wilkinson). Thus an argument based on tonal consonance is consistent with the use of just intonation (scales based on intervals with simple integer ratios), at least for harmonic timbres.”

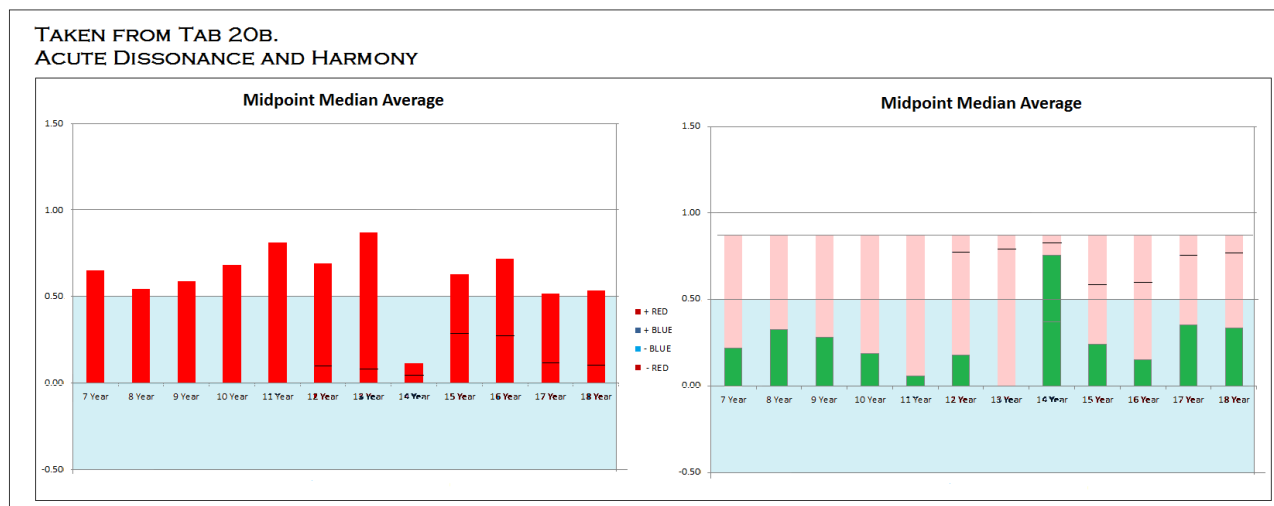
The spreadsheet approach evaluates varying levels of dissonance within different spreads. The “fingerprint” given by the spread (Tab 18 supra) may be related to various levels of dissonance in this octave. (Tab 20b below)



If we consider the positive and the negative values for “Used General Dissonances” (left) as a combined positive distance (absolute value, right), we can see that each spread of years comes to approximately the same amount of “Used General Dissonance” (dark blue columns below).

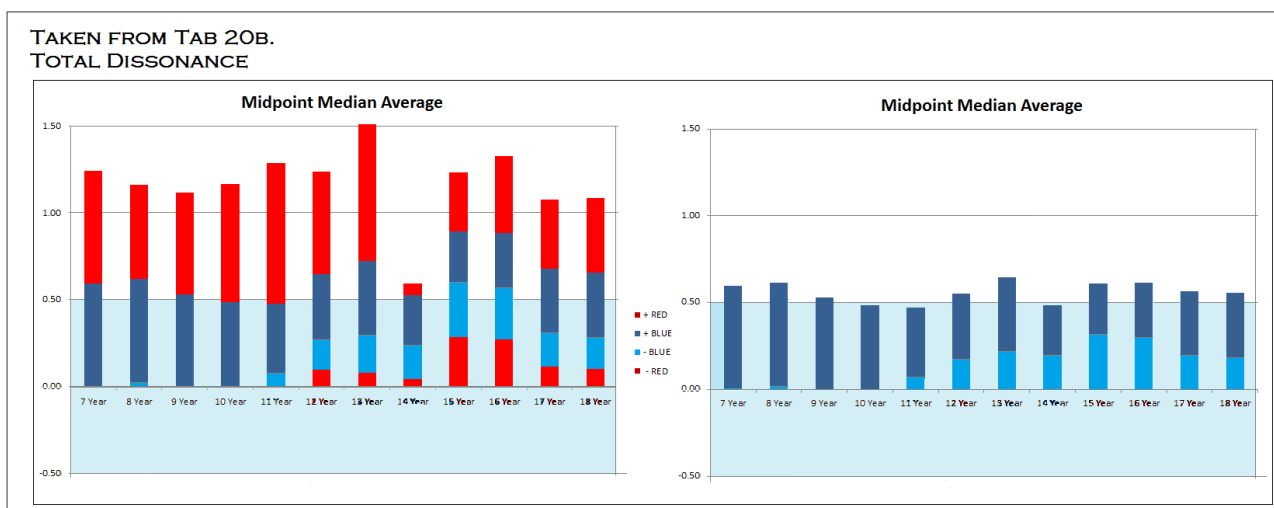


On the other hand, if we look at the amount of “Acute Dissonance” (that value which goes above or below the “Used General Dissonance”) we have the following. The diagram on the left represents the amount of Acute Dissonance created by the spread (absolute value), and the diagram on the right represents the amount of harmony of the spread, i.e. the difference between the greatest level of dissonance (13 year spread) and the year in question.



In both charts, the relative lack of dissonance in the 14 year spread, or conversely the striking harmony of the 14 year spread, is quite clear.

If we look at the combined total of these dissonances, we have an even stronger representation of that portion wherein harmony resides, as opposed to measurements of other spreads.



The charts above track the level of harmony/dissonance for twelve different spreads between years. It is quite clear that again the 14-year spread provides the most harmony and the least dissonance. Like a place on a ball bat where the “acoustics” of the bat provide a “sweet spot” where it is best to hit a baseball, the span of 14 years seems to bring with it a natural “sweet spot” in the harmonics of the economy.

By simply flipping the comparison, we can see the preferred harmony brought on by a 14 year spread between years with very little acute dissonance.²³

The suggestion is that, just as an octave is created by the equal division of a vibrating string into two harmonic parts, and just as a slight variation from this even division between the perfect center of the vibrating string results in intolerable out-of-tune sense of dis-harmony, so does the use of a 14-year interval between years when measuring GNP values result in great sympathy and proximity between Midrange and Median Average values for the entire economy, unlike every other spread of years. And also like the vibrating string, the most out-of-tune dissonance occurs immediately surrounding the perfect division of the string, while tapering off as one takes distances further from the center.

²³

The significance of a 14-year spread between years as a defining characteristic of the American economy finds at least tentative support in spectral analysis. Note that in both charts provided, the 14-year span is the most significant point of balance between the two charts, no matter how adjusted. (as taken from Korotayev and Tsirel, 2007:10) “As is easily seen in Figure 2A in both spectra one can detect distinctly the Kondratieff cycle (its period equals approximately 52-53 years), however, the cycle with a period of 13-14 years is detected even more distinctly. In the study by Claude Diebold and Cedric Doliger (2006, 2008) this wave is tentatively identified with Kuznets “swings.” ... Estimates of the length of Kuznet cycles will vary: here, 13-15 years but we note below estimates by others of 15-25 and later give our own estimate of 17-18 which agrees rather well with the original Kuznets’ estimate.”

5.2.c. An Alternative Approach

As described at greater length in the Appendix, the use of spreadsheets is problematic in several ways. First, the choice of a common date with which to begin all spreadsheets is an inherently arbitrary choice. Second in order to maintain the integrity of the “spreadsheet” approach, only columns which are complete within the spreadsheet have been used. The “fingerprint” thereby generated may be compared to other spreadsheets in a fashion which is consistent as to the method employed, i.e. “only completed columns will be considered.” However the exclusion of incomplete columns for analysis means that each spreadsheet excludes data which others may or may not use. Consequently the data being considered is not consistent and the results may be suspect.

To cross-check to this problem we created a computer program in which the spreads of time are considered independently of spread sheets. This method does not permit a comparison of “fingerprints” per spread (e.g. *supra* Tab 18). Note also that the use of the “expansion contraction fraction” may be deleted from the calculation; therefore the “octave” graph as to claimed dissonance is no longer congruent. However the result confirms the finding in that a striking decrease in dissonance occurs at the 14 year spread, as surrounded by much higher levels of dissonance (see red bar in the graph below, Diagram 3-18).

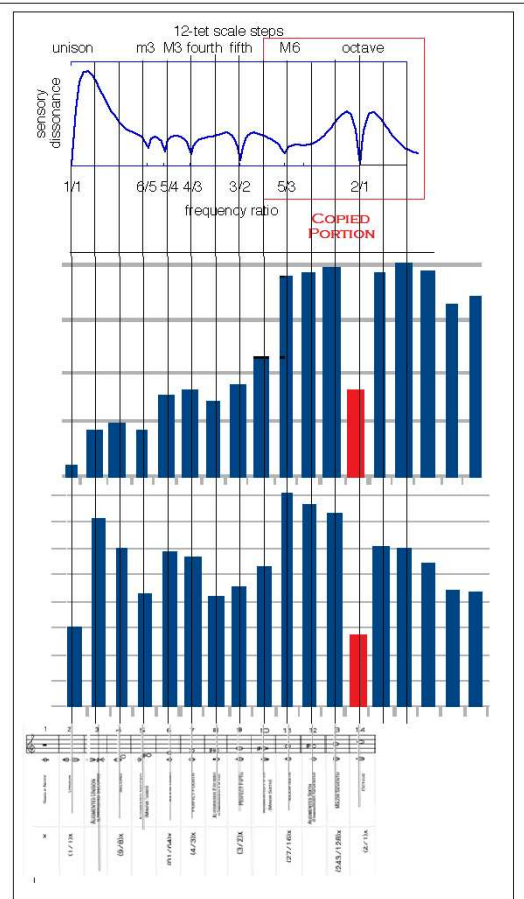
DIAGRAM 3-18.
COMPUTER GENERATED RATIO COMPARISONS

MUSICAL HARMONY AND DISSONANCE

**RATIO COMPARISONS WITHOUT
"EXPANSION CONTRACTION FRACTION"**

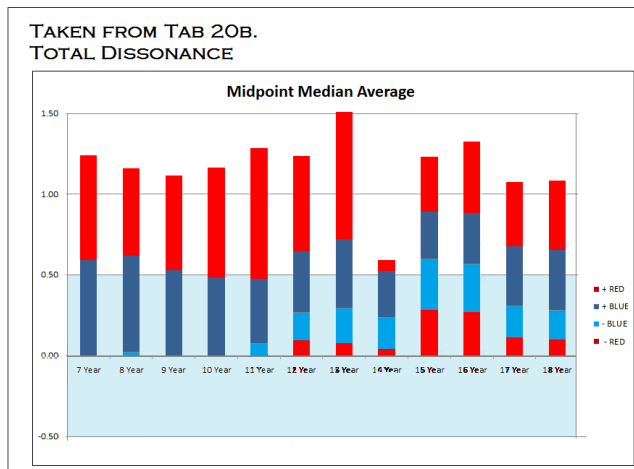
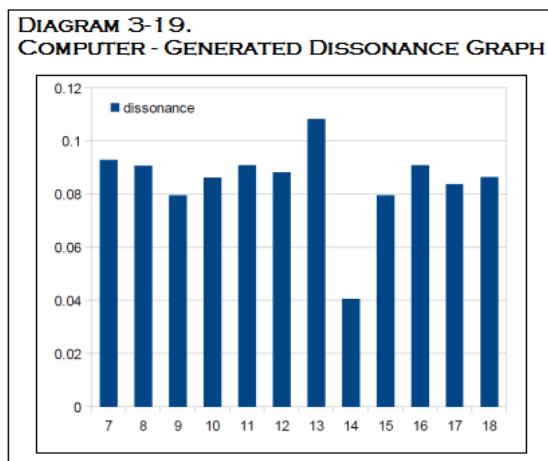
**RATIO COMPARISONS WITH
"EXPANSION CONTRACTION FRACTION"**

MUSICAL INTERVALS

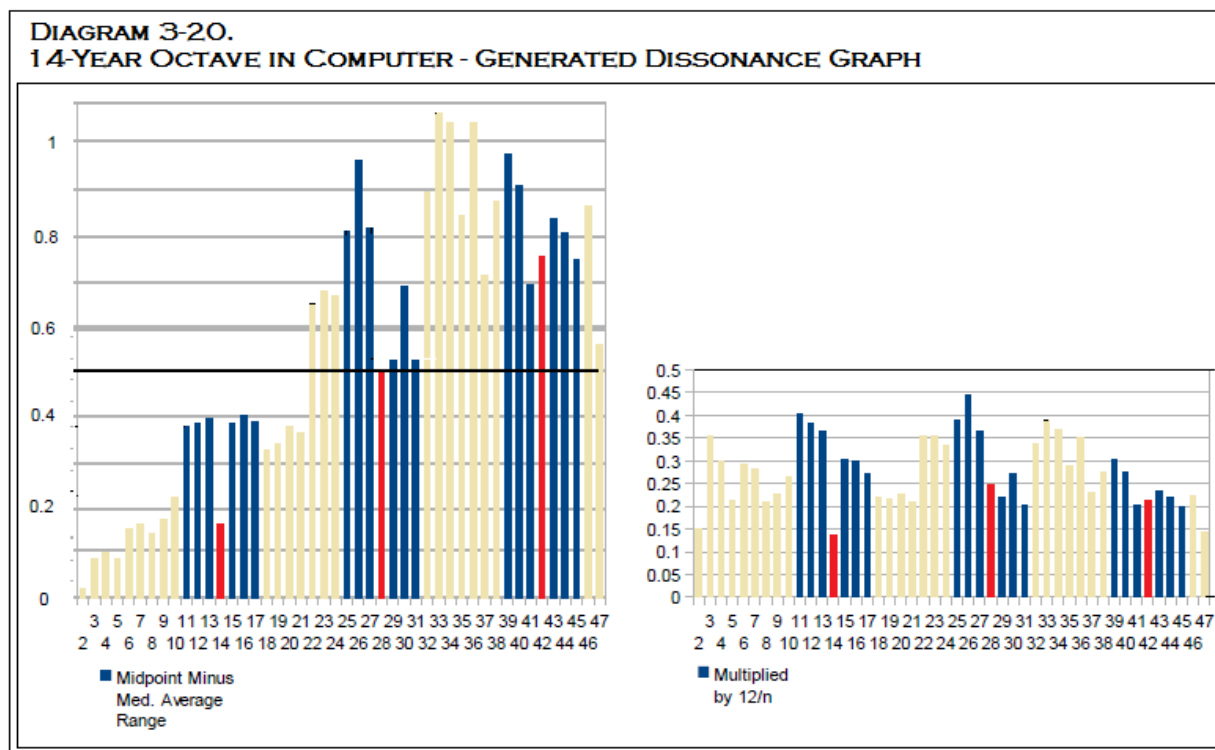


Using the computer program we are able to generate spreads of years with all available data in a consistent fashion. Although there are no “fingerprints” of different spreads to compare using this method, we are nevertheless enabled to see the same “octave” in the analysis generated.

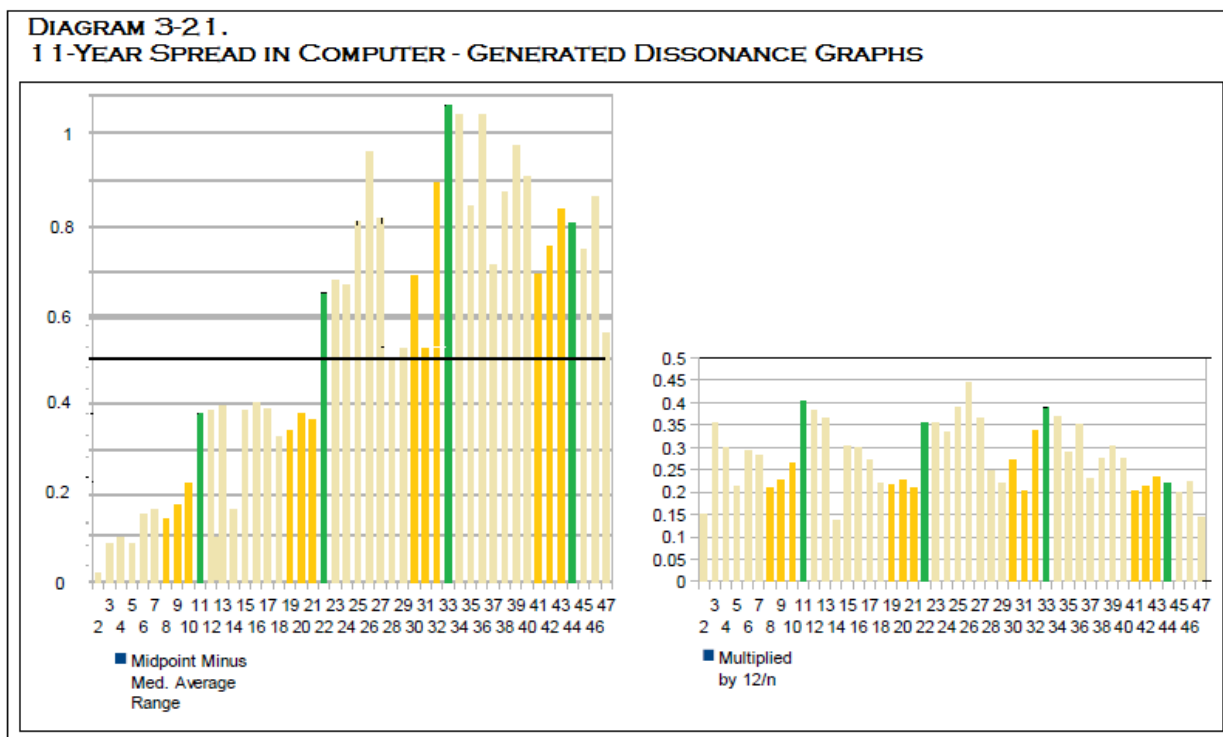
This dissonance graphs are virtually identical.



And the extension of this method into multiple years demonstrates that the 14-year period appears to be of significance for at least two additional multiples of 14 years.



Moreover we have in this method the ability to consider other spreads as well. For example if multiples of 11 years are considered a significant jump in dissonance occurs at 11, 22 and 33 years. (see green bar in the graph below, Diagram 3-21)



5.2.d. What accounts for the relatively small dissonance of the 14-year spread?

If we place all row dynamic charts next to one another, we have the following. This chart clearly shows that a rhythm exists in the economy at the 14-year spread such that the highest maximum ratio and the deepest minimum ratio balance. The resulting midranges and median averages cancel each other out leaving very little dissonance. In addition the least maximum ratio and the least minimum ratio again balance each other out.

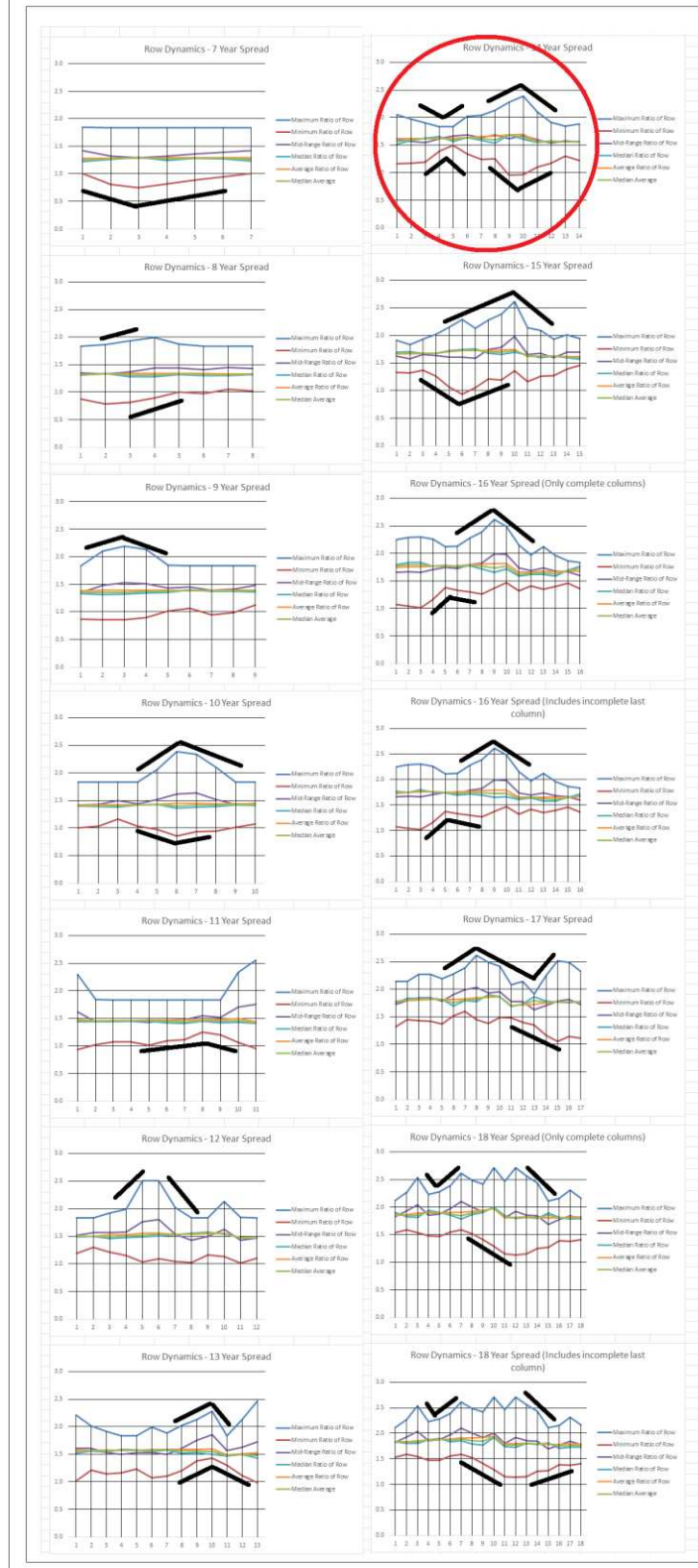
Every other spread contains peaks and troughs which do not counterbalance one another.

For example, the 12 year spread aligns the least minimum ratio with the greatest maximum ratio, resulting in significant dissonance.

Conversely, the 15 year, 16 year and 17 year spreads have a highest maximum ratio which is clearly “out of sync” or “out of phase” with the deepest minimum ratio.

In short the 14 year spread states a natural rhythm or phase within the economy of the United States, and this accounts for the “octave” shaped claimed dissonance graph.

Tab 16
Differences in Row Dynamics



5.2.e. Bio-Complexity as the foundation of economics

Significant evidence supports the proposition that the economy of the United States may be organized according to “octaves” of economic growth in connection with a 14-year spread between years. One possible basis underlying the 14-year period may be that this is the period of time necessary for human development to turn the individual citizen from an infant to a reproducing adult, a period which is indicated by the break which occurs in four fifths of American lives, i.e. the end of grade school and the beginning of secondary education.

It may be helpful to state specifically several points which may be taken from this section of the essay.

1. Just as bees are alive and contribute to the life of the larger hive, so must the hive have distinct similarities in time span and structure as imposed upon it by the biology of the bees themselves.

2. Just as human beings are subject to the requirements of their own biologic growth, so too is the economy of the United States the outgrowth of these human beings and their collective biologic forces, needs, limitations, etc.

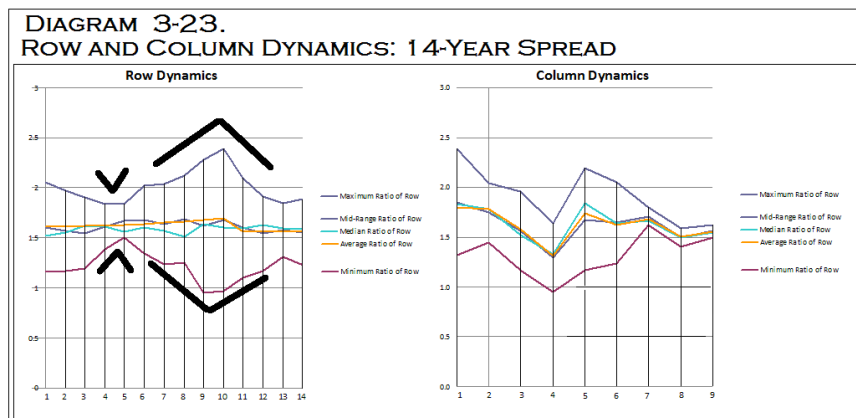
3. If the human beings which make up the economy are alive, then the economy itself is a living thing, something with its own rhythm and pace. In this essay we have proposed to seek out that rhythm and that pace.

4. As the product of living human beings who mature and grow, give birth and die, at fixed stages of biologic development, the collective economic product created by these people, year after year, will demonstrate a “tree-ring” type of development over time.

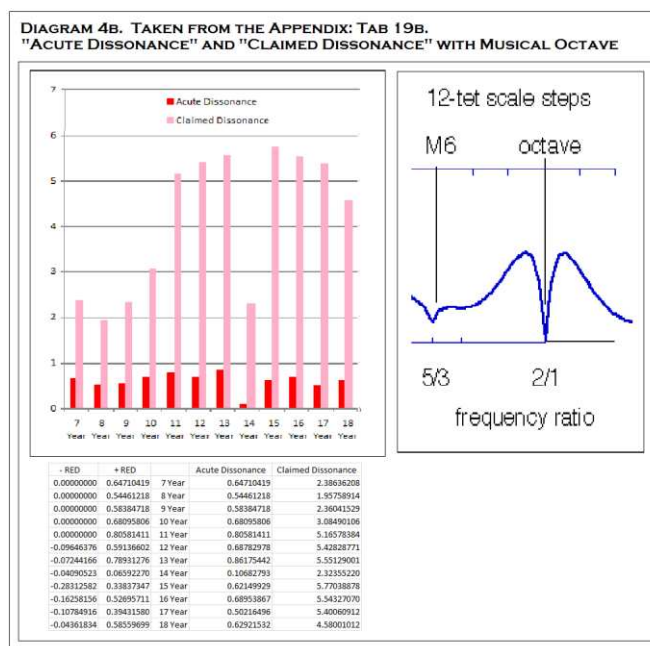
5. Human biology regulates the productive growth of the United States and draws it into accord with its own rhythm and pace. When the economic growth of the United States is excessive it is balanced by naturally occurring economic depression at a span of 14-years hence.

6. An “octave” is sounded in economic data when measurements of GNP ratios are in accord with the underlying scheme of human development, i.e. when a congruent “pace” is located between biology of the small (individual human) and the biology of the large (American economic history); it “makes sense.” Dissonance, chaos, wrong-answers and misunderstanding are sounded when measurements of economic data conflict with this scheme or when the scheme is ignored entirely.

7. We find in these essays that harmony is noted in the data which is congruent with the biologic pace of human beings, when they are viewed in a fashion which is synchronous. We further note that disharmony is noted in the data when these two “paces” are not synchronous.



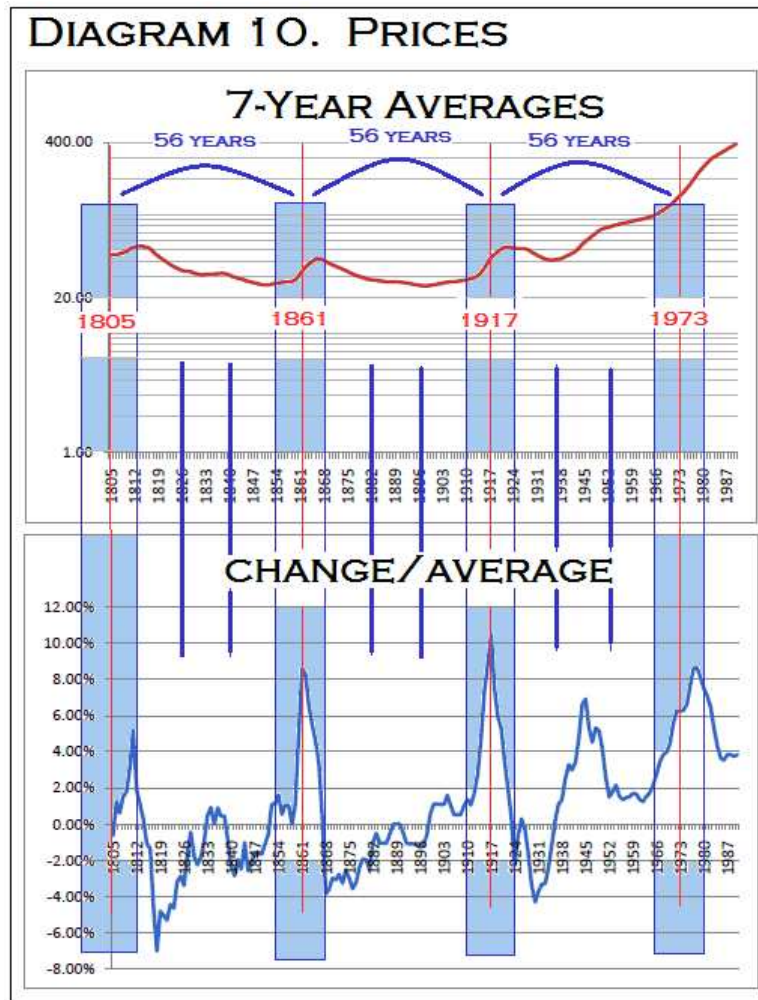
8. When the measurement of the economy takes into account the underlying biology of the economy, a picture of American economy history may be developed which is in accord with both the biology of the individual member as well as the larger and encompassing biology of the economy. When the measurement of the economy ignores the underlying biology of the economy, nothing but dissonance and chaos results.²⁴



²⁴ The significance of a 14-year spread between years as a defining characteristic of the American economy finds at least tentative support in spectral analysis. See e.g. Korotayev and Tsirel, 2007:10. Note that in both charts provided, the 14-year span is the most significant point of balance between the two charts, no matter how adjusted. (as taken from)

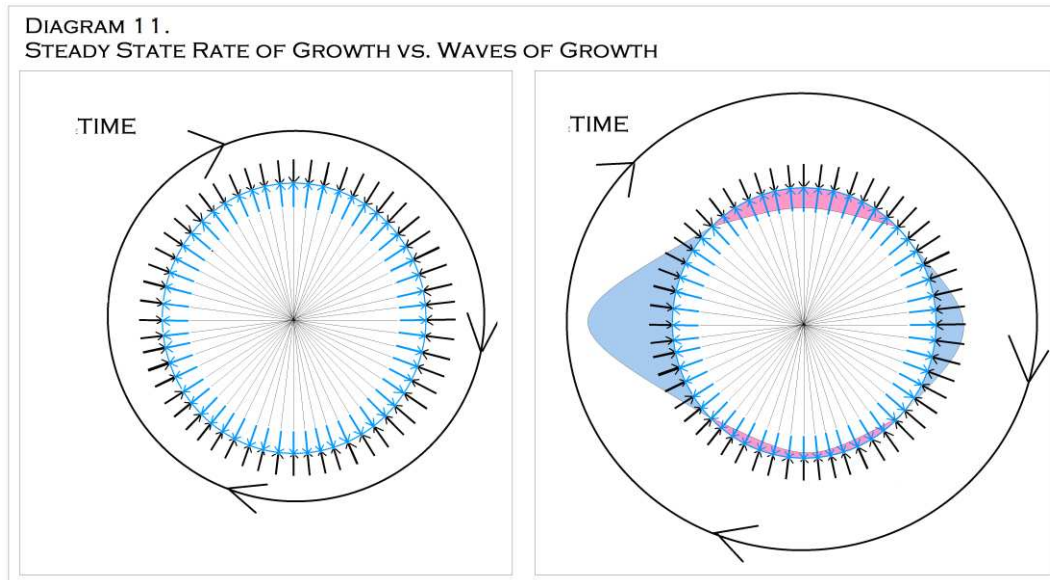
5.3 Section Three: Evaluate Period of Long Wave

Having established that a 14-year sub-period may be important in the evaluation of the Kondratiev wave, we examined the price indexes for the United States between 1800 and 1994. The figures from “Data Set 1 – Prices” are stated below (1) in 7-year running averages (red line, top graph, semi-logarithmic scale), and (2) the change between a given year’s seven-year average as divided by the average itself (blue line, bottom graph). The lower graph permits us to see the increasingly large inflationary price index values of later years (post-1966) as placed in a more consistent relationship with the preceding values of the series.



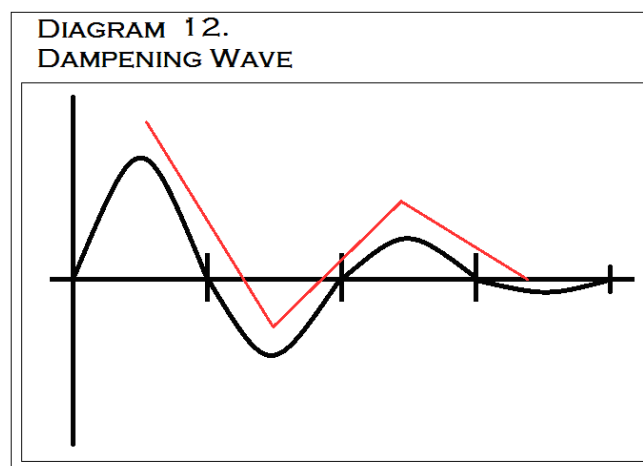
We noted in the above that the 56 year period ($14 \times 4 = 56$) between peaks at 1861 through 1917 suggests the possibility that similar periods of time might connect other peak points of inflation. If a 14-year span (blue rectangles above) is drawn around the years 1805, 1861, 1917 and 1973 (each of which is separated by periods of 56 years), virtually all inflationary peaks are contained in a single model.

As this relates to the productive capacity represented by US real GNP, if we divide a circle into 56-year rays, all things being equal, as the arrows of production move outward to meet the expectation of GNP per year (arrows of radii moving out from the center of the circle) this production should be met by uniform resistances (arrows moving toward the center of the circle) which balance the natural increase of production exactly.

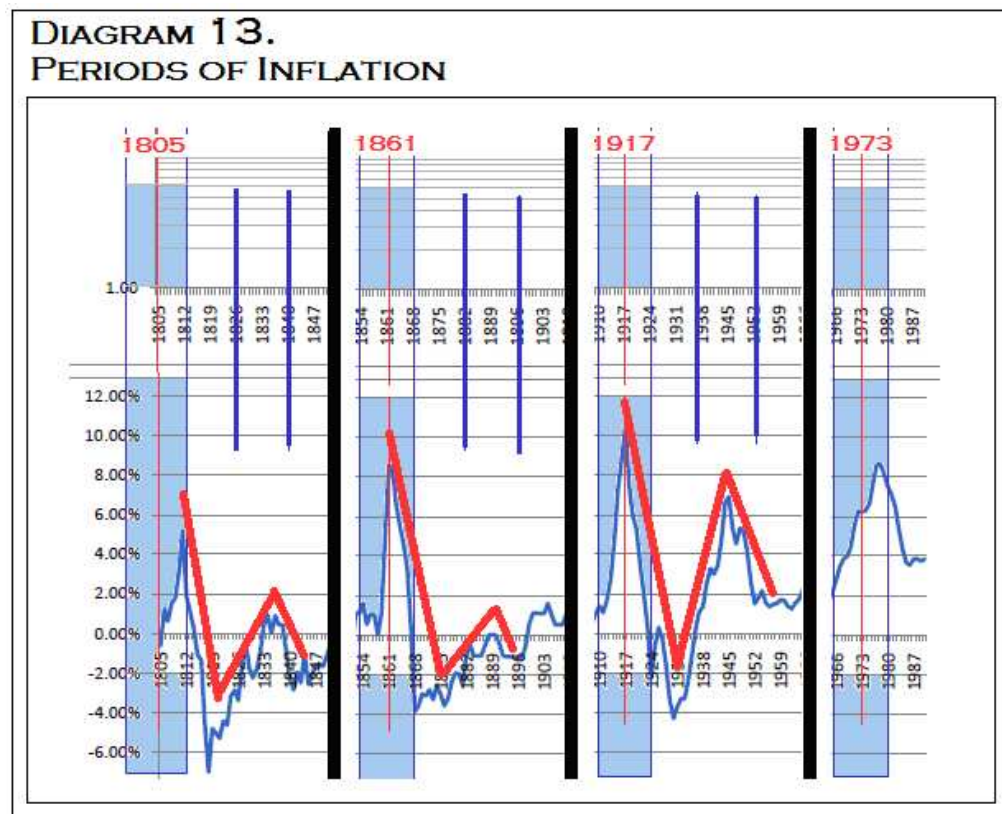


However if a particular period of time fails to offer uniform resistance to production, or if the strength of production for some reason is particularly strong, the inherent productivity of the citizenry will create a bulge in productivity which must then be balanced out by a depression at some other time in the course of the circuit. Only in this fashion can a constant of growth be maintained in the face of unequal strengths of production and resistance to production. A wave must then develop over time during which this bulge will even out as time goes on until the next unexpected opportunity for unusual productivity.

If this damping wave is placed along an x-axis, we have the following.



The damping wave has been noticed three times in the course of American economic history in consideration of prices.



Regarding the above chart, and as mentioned at the beginning of the paper, we concern ourselves here exclusively with the United States and the discovery of strong evidence that a Kondratiev Wave appears to have significant impact upon the US economy. A long-standing issue regarding Kondratiev Waves is the causation of the wave itself. This debate centers largely upon the "exogenous" vs. "endogenous" nature of the cycle. (see footnotes 6, 7 and 11)

From the "exogenous" point of view, it is difficult to understand how events which occur with an apparently chaotic randomness outside the United States can affect the American economy with dependable regularity.

From the "endogenous" point of view, although a form of biologic regularity might be granted to the American economy, it remains difficult to explain how such internal developments might affect with the same regularity international events over which the United States has no control whatsoever.

There can be no question that political events in Europe and throughout the world have had much to do with the inauguration of these cycles. Nor can there be serious question that the relationship between the economic development of the United States and that of Europe must be explored. The problem appears to be that two distinct yet interacting levels of economic life must be considered, one national (American) and one European. These concerns are dealt with in our separate paper entitled *"On Revolution and the Cultural Development of Europe: Toward a European "System of Movement."* (unpublished at this time)

We present as persuasive a $14 \times 4 = 56$ year cycle as found between the inauguration of the American Civil War and the entry of the United States into the First World War. As these relate to the "exogenous" / "endogenous" debate, the following points may be made.

1. The American Civil War began on April 12-13, 1861.
2. The First World War began in Europe on July 28, 1914.
3. 56 years after the inauguration of the American Civil War, almost to the day, the United States entered the First World War on April 2, 1917.

One can explore the "endogenous" vs. "exogenous" nature of the 56-year period by considering the price patterns within the United States leading up to the First World War. As taken from Data Set One, these are:

Year	Price Index	Change from previous year	
1910	28.00		
1911	28.00	+0.0	
1912	29.00	+1.0	
1913	29.70	+0.7	
1914	30.10	+0.4	World War I Between European States
1915	30.40	+0.3	
1916	32.70	+2.3	
1917	38.40	+5.7	United States Enters World War I
1918	45.10	+6.7	
1919	51.80	+6.7	
1920	60.00	+8.2	
1921	53.60	- 6.4	
1922	50.20	- 3.4	
1923	51.10	+0.9	

One can see from the above that the inauguration of World War I in Europe in 1914 did not impact dramatically upon the price structure of the United States. Examining the United States' price structure for the years of European conflict 1914, 1915 and 1916 (in blue) changes of $0.4 + 0.3 + 2.3 = 3.0$ may be noted.

The American entry into World War I in 1917 is associated with a spike in prices for the years 1917, 1918 and 1919 (in red) for a total of $5.7 + 6.7 + 6.7 = 19.1$, over six times the cumulative changes of the previous three years. This would indicate that the domestic decision to enter World War I had far more to do with the resulting inflation than did the existence of the war in Europe itself.

The "exogenous" aspects of the analysis simply admit that at a European level, a vast war was occurring into which the United States ultimately was drawn. The "endogenous" aspects of the analysis insist that the United States was governed by its own internal development as to whether and when to join the conflict.

A similar point may be made with regard to the Vietnam War. Below are contrasted the steadily casualty counts for American soldiers 1956-1980 (as taken from the National Archives at <http://www.archives.gov/research/military/vietnam-war/casualty-statistics.html>) with the change in price index from Data Set 1 which exceed the fraction 1.06 (highlighted in red).

We see below that the Vietnam War was not a strong inflationary factor throughout the years of its most ferocious conflict when the annual casualty count exceeded 1,000, i.e. between 1965-1971 (also highlighted in red). At no time during this period did the price index exceed a multiple of 1.06 over the previous year.

On the other hand as of 1973, a year when the annual casualty count had diminished to less than 200, the inflation rate suddenly increased by no less than a multiple of 1.06 for nine of the following ten years.

In a fashion similar to 1917, inflation during this period is associated with the United States passing through a particular phase of its development and is not directly connected with the previous existence of the War in Vietnam.

	Casualty count	Current year / Previous year	Price Index	Current year / Previous year
1956-1960	9		88.70	
1961	16	+ 1.77	89.60	1.0101
1962	52	+ 3.25	90.60	1.0111
1963	118	+ 2.26	91.70	1.0121
1964	206	+ 1.74	92.90	1.0130
1965	1,863	+ 9.04	94.50	1.0172
1966	6,143	+ 3.29	97.20	1.0285
1967	11,153	+ 1.81	100.00	1.0288
1968	16,592	+ 1.48	104.20	1.0420
1969	11,616	+ 0.70	109.80	1.0537
1970	6,081	+ 0.52	116.30	1.0591
1971	2,357	+ 0.38	121.50	1.0447
1972	641	+ 0.27	125.40	1.0320
<hr/>				
1973	168	+ 0.26	133.20	1.0622
1974	178	+ 1.05	147.90	1.1103
1975	161	+ 0.90	161.40	1.0912
1976	77	+ 0.47	170.70	1.0576
1977	96	+ 1.24	181.80	1.0650
1978	447	+ 4.65	195.60	1.0759
1979	148	+ 0.33	217.80	1.1134
1980	26	+ 0.17	247.20	1.1349
1981			272.70	1.1031
1982			289.50	1.0616
1983			298.80	1.0310
1984				

Placing in red inflation rates exceeding a multiple of 1.06 or greater from the previous year, we have:

Year	Price Index	Change from previous year	Year	Price Index	Change from previous year	Year	Price Index	Change from previous year
						1961	89.60	+1.01
						1962	90.60	+1.01
						1963	91.70	+1.01
						1964	92.90	+1.01
						1965	94.50	+1.01
						1966	97.20	+1.02
1854	27		1910	28.00		1967	100.00	+1.02
1855	28	1.03	1911	28.00	+1.00	1968	104.20	+1.04
1856	27	0.96	1912	29.00	+1.03	1969	109.80	+1.05
1857	28	1.03	1913	29.70	+1.02	1970	116.30	+1.05
1858	26	0.92	1914	30.10	+1.01	1971	121.50	+1.04
1859	27	1.03	1915	30.40	+1.00	1972	125.40	+1.03
1860	27	1.00	1916	32.70	+1.07			
<hr/>								
1861	27	1.00	1917	38.40	+1.17	1973	133.20	+1.06
1862	30	1.11	1918	45.10	+1.17	1974	147.90	+1.11
1863	37	1.23	1919	51.80	+1.14	1975	161.40	+1.09
1864	47	1.27	1920	60.00	+1.15	1976	170.70	+1.05
1865	46	0.97	1921	53.60	+0.89	1977	181.80	+1.06
1866	44	0.95	1922	50.20	+0.93	1978	195.60	+1.07
1867	42	0.95	1923	51.10	+1.01	1979	217.80	+1.11
						1980	247.20	+1.13
						1981	272.70	+1.10
						1982	289.50	+1.06
						1983	298.80	+1.03

56 years separates dates along a horizontal line. Given the striking inflationary trends noticed below the above horizontal line, we conclude that a 56-year Kondratiev Wave has much to offer in the analysis of decisions "endogenously" considered by the United States, while acknowledging the importance of the world wide "exogenous" factors which compel these decisions to be made.

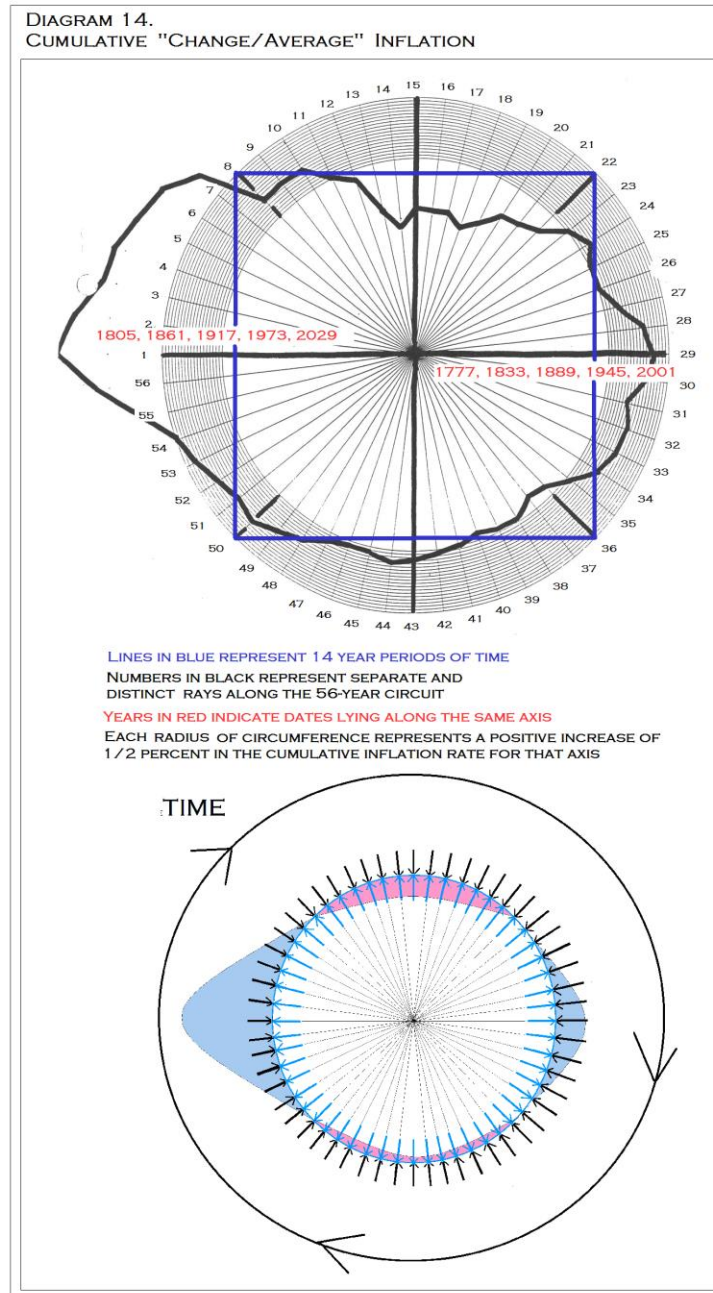
We then placed all change/average inflation (lower graph above) along a 56-year circuit shown below. In the following diagram 9 o'clock represents the midpoint of the cumulative average of all inflation along a 56 year cycle as contained within the blue rectangles above. (This is marked as “Year One” in Data Set 4.) 3 o'clock represents the midpoint of the cumulative average of all inflation rates 28 years later. (Line 29 in Data Set 4)

Data Set 5 - Inflation: Cumulative Averages.

	Col. 1		Col. 2		Col. 3		Col. 4		Col. 5	Col. 6.
Axis	Year		Year		Year		Year		Average %	Cumulative %
1	1805	-0.63%	1861	8.60%	1917	10.50%	1973	6.24%	6.1765%	24.71%
2	1806	1.25%	1862	8.30%	1918	7.53%	1974	6.29%	5.8409%	23.36%
3	1807	0.62%	1863	6.59%	1919	5.97%	1975	6.64%	4.9539%	19.82%
4	1808	1.52%	1864	5.49%	1920	5.25%	1976	7.65%	4.9799%	19.92%
5	1809	1.80%	1865	4.55%	1921	3.53%	1977	8.62%	4.6222%	18.49%
6	1810	3.19%	1866	3.38%	1922	2.00%	1978	8.62%	4.2970%	17.19%
7	1811	5.22%	1867	0.34%	1923	0.32%	1979	8.13%	3.5028%	14.01%
8	1812	1.89%	1868	-3.85%	1924	-2.20%	1980	7.52%	0.8402%	3.36%
9	1813	1.07%	1869	-3.62%	1925	-0.64%	1981	7.09%	0.9731%	3.89%
10	1814	0.27%	1870	-2.99%	1926	0.30%	1982	6.49%	1.0181%	4.07%
11	1815	-1.08%	1871	-3.08%	1927	-0.30%	1983	5.36%	0.2254%	0.90%
12	1816	-1.36%	1872	-2.77%	1928	-1.57%	1984	4.32%	-0.3451%	-1.38%
13	1817	-4.56%	1873	-3.27%	1929	-3.37%	1985	3.66%	-1.8843%	-7.54%
14	1818	-7.01%	1874	-2.51%	1930	-4.30%	1986	3.54%	-2.5715%	-10.29%
15	1819	-4.79%	1875	-3.02%	1931	-3.74%	1987	3.85%	-1.9253%	-7.70%
16	1820	-5.03%	1876	-3.57%	1932	-3.31%	1988	3.85%	-2.0184%	-8.07%
17	1821	-5.30%	1877	-3.23%	1933	-3.29%	1989	3.75%	-2.0169%	-8.07%
18	1822	-4.43%	1878	-2.36%	1934	-2.41%	1990		-3.0640%	-9.19%
19	1823	-4.63%	1879	-1.92%	1935	-1.11%	1991		-2.5561%	-7.67%
20	1824	-3.19%	1880	-1.96%	1936	0.24%	1992		-1.6351%	-4.91%
21	1825	-2.87%	1881	-2.51%	1937	1.10%	1993		-1.4281%	-4.28%
22	1826	-3.39%	1882	-1.02%	1938	1.35%	1994		-1.0174%	-3.05%
23	1827	-1.72%	1883	-0.51%	1939	2.54%	1995		0.1012%	0.30%
24	1828	-0.43%	1884	-1.03%	1940	3.28%	1996		0.6065%	1.82%
25	1829	-1.76%	1885	-1.04%	1941	3.00%	1997		0.0652%	0.20%
26	1830	-2.25%	1886	-1.05%	1942	3.43%	1998		0.0430%	0.13%
27	1831	-1.83%	1887	-0.53%	1943	4.80%	1999		0.8133%	2.44%
28	1832	-0.93%	1888	0.00%	1944	6.61%	2000		1.8947%	5.68%
29	1833	0.46%	1889	0.00%	1945	6.92%	2001		2.4598%	7.38%
30	1834	0.91%	1890	0.00%	1946	5.29%	2002		2.0674%	6.20%
31	1835	0.00%	1891	-0.53%	1947	4.54%	2003		1.3345%	4.00%
32	1836	0.90%	1892	-1.08%	1948	5.31%	2004		1.7132%	5.14%
33	1837	0.45%	1893	-1.09%	1949	5.14%	2005		1.5003%	4.50%
34	1838	0.45%	1894	-1.10%	1950	4.15%	2006		1.1681%	3.50%
35	1839	-0.90%	1895	-1.11%	1951	2.55%	2007		0.1777%	0.53%
36	1840	-2.31%	1896	-1.12%	1952	1.50%	2008		-0.6476%	-1.94%
37	1841	-2.86%	1897	-1.14%	1953	1.81%	2009		-0.7269%	-2.18%
38	1842	-1.94%	1898	-0.57%	1954	2.16%	2010		-0.1164%	-0.35%
39	1843	-2.49%	1899	0.57%	1955	1.54%	2011		-0.1275%	-0.38%
40	1844	-1.01%	1900	1.12%	1956	1.34%	2012		0.4875%	1.46%
41	1845	-2.58%	1901	1.11%	1957	1.46%	2013		-0.0020%	-0.01%
42	1846	-2.11%	1902	1.10%	1958	1.52%	2014		0.1717%	0.52%
43	1847	-1.60%	1903	1.09%	1959	1.71%	2015		0.3973%	1.19%
44	1848	-1.63%	1904	1.60%	1960	1.66%	2016		0.5461%	1.64%
45	1849	-1.66%	1905	1.06%	1961	1.37%	2017		0.2572%	0.77%
46	1850	-1.12%	1906	0.53%	1962	1.24%	2018		0.2175%	0.65%
47	1851	-0.56%	1907	0.52%	1963	1.53%	2019		0.4987%	1.50%
48	1852	1.11%	1908	0.52%	1964	1.72%	2020		1.1177%	3.35%
49	1853	1.10%	1909	1.03%	1965	2.18%	2021		1.4351%	4.31%
50	1854	1.62%	1910	1.37%	1966	2.78%	2022		1.9252%	5.78%
51	1855	0.54%	1911	1.06%	1967	3.44%	2023		1.6783%	5.04%
52	1856	1.06%	1912	1.68%	1968	3.85%	2024		2.1973%	6.59%
53	1857	1.05%	1913	2.74%	1969	3.99%	2025		2.5948%	7.78%
54	1858	0.00%	1914	4.76%	1970	4.44%	2026		3.0688%	9.21%
55	1859	1.04%	1915	7.26%	1971	5.58%	2027		4.6289%	13.89%
56	1860	4.95%	1916	8.83%	1972	6.25%	2028		6.6763%	20.03%

The circumference of each circle represents a positive increase in the cumulative change/average figure of 1/2 percent (for example, a change/average cumulative amount of 1805 + 1861 + 1917 + 1973 lying directly at 9 o'clock). Points found within the interior of the smallest circumference represent negative figures by a comparable amount.

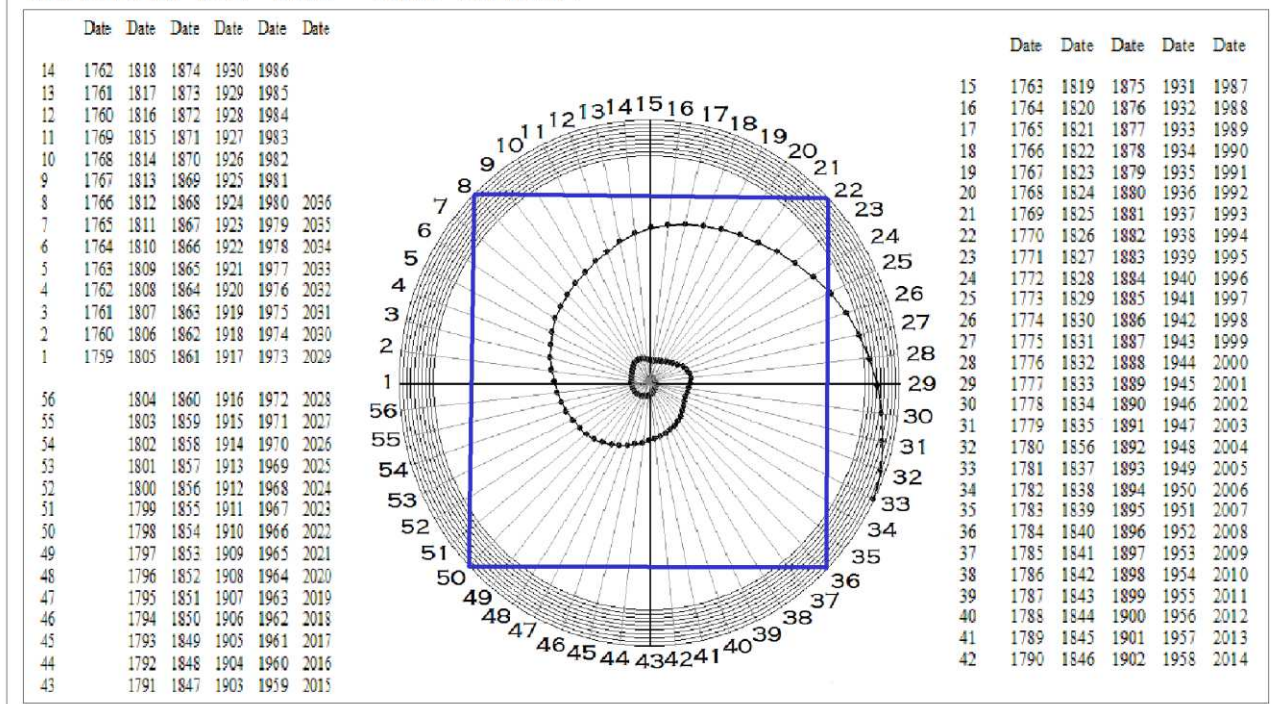
The blue square below represents the four 14-year segments of time set forth in Diagrams 10 and 13. The blue rectangles (previously given) are represented by the vertical left line segment (below). Taken together 4 x 14 periods of time create the 56 year circuit of time of this model. Note that the Great Depression of 1929-1940 is part of the deep indentation between axis 8 and 22, i.e. at the top horizontal of the blue square and interior to the smallest radii.



5.4 Section 4. Find fundamental average of the set

We then placed the U.S. real GNP figures given in “Data Set 2 – U.S. Real GNP” in a 56 year circuit, with the four 14-year quarter cycles indicated in blue, to create the spiral below. The center of the spiral, beginning at axis 9 = 1869, represents the real Gross National Product for that year of 23.10 billion dollars in 1958 prices. The Gross National Product for subsequent years in real terms are given along each axis respectively, with each circle of circumference representing ten billion dollars of real GNP in 1958 prices. Each row of the 14-year spreadsheet is represented by a “cross” within the spiral, beginning with Row 1 at the diagonal of the square, and moving to Row 8 at the horizontal and vertical axes of the square. The ratios of the spread sheet are simply the relative distances from the center of different points along the spiral as they relate to other points along the cross within the spiral.

DIAGRAM 15. THE "GNP SPIRAL"



As can be seen from the following enlargement of the 14-year spreadsheet, we then:

- (1) figured the average for each row of the spreadsheet for a total of 14 averages (Column F),
- (2) figured the Median (1.617735) and Average (1.619446) of Column F, and
- (3) figured a final Median Average for the entire spreadsheet of 1.618590.

In all spreadsheets this set of calculations is termed a “circle analysis.” This nomenclature refers to the arrangement of Row Averages as points along the circumference of a circle, each one counted equally and but once toward a final Median Average of the spreadsheet.

DIAGRAM 16.

14 YEAR RATIOS BASED ON ANNUAL REAL GNP;
MULTIPLE 5.962552

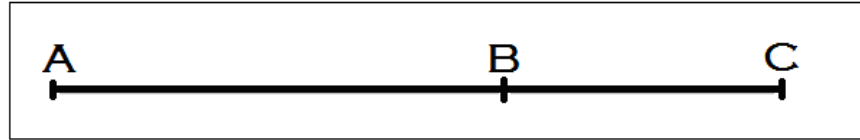
		1		2		3		4		5		6	
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1882	42.4000	1886	61.3000	1910	120.1000	1924	165.5000	1938	192.9000	1952	395.1000
	14	Est. *	23.1000	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000
	Ratio		1.8354978		1.4457547		1.959217		1.3780183		1.1655589		2.0482115
2	Year	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000	1953	412.8000
	14	1869	23.1000	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000
	Ratio		1.8354978		1.5825472		1.8360656		1.4561688		1.1672241		1.9713467
3	Year	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000	1954	407.0000
	14	1870	23.1000	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000
	Ratio		1.8354978		1.6179245		1.8979592		1.4592934		1.1957895		1.7913732
4	Year	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000	1955	438.0000
	14	1871	23.1000	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000
	Ratio		1.8354978		1.7641509		1.7566845		1.4452055		1.3886256		1.6609784
5	Year	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000	1956	446.1000
	14	1872	23.1000	1886	42.4000	1900	76.9000	1914	125.6000	1928	190.9000	1942	297.8000
	Ratio		1.8354978		1.8136792		1.63329		1.5199045		1.559979		1.4979852
6	Year	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000	1957	452.5000
	14	1873	23.1000	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000
	Ratio		1.8354978		2.0212264		1.4527421		1.6353414		1.6556974		1.3423317
7	Year	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000	1958	447.3000
	14	1874	23.1000	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000
	Ratio		1.8354978		2.0400943		1.5537572		1.3653274		1.9689373		1.2380293
8	Year	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000	1959	475.9000
	14	1875	23.1000	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000
	Ratio		2.1255411		1.8492872		1.4889868		1.2522189		2.0980508		1.3398086
9	Year	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000	1960	487.7000
	14	1876	23.1000	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000
	Ratio		2.2813853		1.7020873		1.6923077		0.9499341		2.1678225		1.5601408
10	Year	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000	1961	497.2000
	14	1877	23.1000	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000
	Ratio		2.3852814		1.7477314		1.5202492		0.9665301		2.190106		1.6043885
11	Year	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000	1962	529.5000
	14	1878	42.4000	1892	60.4000	1906	107.5000	1920	140.0000	1934	154.3000	1948	323.7000
	Ratio		1.4245283		1.7798013		1.3023256		1.1021429		2.0978613		1.6357739
12	Year	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000	1963	551.0000
	14	1879	42.4000	1893	57.5000	1907	109.2000	1921	127.8000	1935	169.5000	1949	324.1000
	Ratio		1.3561321		1.8991304		1.1703297		1.3262911		1.9120944		1.7000926
13	Year	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000	1964	581.1000
	14	1880	42.4000	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	355.3000
	Ratio		1.3183962		1.7924866		1.4770459		1.3040541		1.8409326		1.6355193
14	Year	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000	1965	617.8000
	14	1881	42.4000	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000
	Ratio		1.4764151		1.8658147		1.4203767		1.2248342		1.886811		1.6113719
A	Maximum Ratio of Column		2.385281		2.040094		1.959217		1.635341		2.190106		2.048212
B	Minimum Ratio of Column		1.318396		1.445755		1.170330		0.949934		1.165559		1.238029
C	Spread		1.066885		0.594340		0.788887		0.685407		1.024547		0.810182
D	Mid-Range Ratio of Column		1.851839		1.742925		1.564773		1.292638		1.677832		1.643120
E	Median Ratio of Column		1.835498		1.779801		1.520249		1.326291		1.840933		1.635519
F	Average Ratio of Column		1.801155		1.780123		1.582953		1.313233		1.735392		1.616954

Est. * The data for 1868, 23.10, has been taken from the estimate given in the Historical Abstract for the years 1869 - 1877. This enables Column 1, 1882 - 1895, to be added into the graph with the minimum of difficulty in figuring averages for both rows and columns. This amount is repeated throughout the period, 1869 - 1877, and appears to represent a reasonable estimate for the Real GNP of 1868

DIAGRAM 16.
14 YEAR RATIOS BASED ON ANNUAL REAL GNP;
MULTIPLE 5.962552

7		8		9		10		A	B	C	D	E	F	
YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid- Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	
1966	658.1000	1980	996.8309	1994	1514.3943	2008	2198.6295							
1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943							
	1.66565426		1.51471038		1.51920882			2.048212	1.165559	0.882653	1.606885	1.516960	1.614648	
1967	675.2000	1981	1010.8394	1995	1546.7308	2009	2208.7984							
1953	412.8000	1967	675.2000	1981	1010.8394	1995	1546.7308							
	1.63565891		1.49709627		1.53014495			1.971347	1.167224	0.804123	1.569285	1.556346	1.612417	
1968	706.6000	1982	995.1411	1996	1615.0033									
1954	407.0000	1968	706.6000	1982	995.1411									
	1.73611794		1.4083514		1.62288875			1.897959	1.195789	0.702170	1.546874	1.620407	1.618355	
1969	725.6000	1983	1072.5727	1997	1681.8760									
1955	438.0000	1969	725.6000	1983	1072.5727									
	1.656621		1.47818729		1.56807646			1.835498	1.388626	0.446872	1.612062	1.612349	1.617114	
1970	722.5000	1984	1129.4464	1998	1764.5370									
1956	446.1000	1970	722.5000	1984	1129.4464									
	1.61959202		1.56324761		1.56230256			1.835498	1.497985	0.337513	1.666742	1.562775	1.622831	
1971	751.2051	1985	1174.0716	1999	1854.0672									
1957	452.5000	1971	751.2051	1985	1174.0716									
	1.66012177		1.5629175		1.57917728			2.021226	1.342332	0.678895	1.681779	1.607259	1.638339	
1972	803.4814	1986	1203.2684	2000	1911.3209									
1958	447.3000	1972	803.4814	1986	1203.2684									
	1.79629197		1.49756846		1.58844103			2.040094	1.238029	0.802065	1.639062	1.571099	1.653772	
1973	839.4182	1987	1256.1826	2001	1925.1794									
1959	475.9000	1973	839.4182	1987	1256.1826									
	1.76385417		1.49649198		1.53256334			2.125541	1.252219	0.873322	1.688880	1.514528	1.660756	
1974	821.7401	1988	1303.1774	2002	1957.1959									
1960	487.7000	1974	821.7401	1988	1303.1774									
	1.68492946		1.58587539		1.50186452			2.281385	0.949934	1.331451	1.615660	1.635402	1.680705	
1975	843.0778	1989	1340.0434	2003	2036.0677									
1961	497.2000	1975	843.0778	1989	1340.0434									
	1.69565125		1.58946588		1.5194043			2.385281	0.966530	1.418751	1.675906	1.596927	1.690979	
1976	879.3138	1990	1351.3622	2004	2093.6810									
1962	529.5000	1976	879.3138	1990	1351.3622									
	1.66064929		1.53683725		1.5493115			2.097861	1.102143	0.995718	1.600002	1.592543	1.565470	
1977	922.6690	1991	1360.3512	2005	2151.0247									
1963	551.0000	1977	922.6690	1991	1360.3512									
	1.67453539		1.47436535		1.58122748			1.912094	1.170330	0.741765	1.541212	1.627881	1.566022	
1978	985.8821	1992	1418.0149	2006	2201.9891									
1964	581.1000	1978	985.8821	1992	1418.0149									
	1.69657907		1.43832097		1.55286739			1.840933	1.304054	0.536879	1.572493	1.594193	1.561800	
1979	1001.7304	1993	1454.1409	2007	2272.2615									
1965	617.8000	1979	1001.7304	1993	1454.1409									
	1.62144772		1.451629		1.56261439			1.886811	1.224834	0.661977	1.555823	1.586993	1.569035	
	1.796292		1.589466		1.622889									
	1.619592		1.408351		1.501865			Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid- Range + Average/ 2	Median + Average/2
	0.176700		0.181114		0.121024			1.690979	1.561800	1.626389	1.617735	1.619446	1.622918	1.618590
	1.707942		1.498909		1.562377									
	1.665654		1.497096		1.552867			Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Mid- Range + Average/ 2	Median + Average/2
	1.683407		1.506790		1.555007			1.801155	1.313233	1.557194	1.616954	1.619446	1.588320	1.618200

This number 1.618590, the final Median Average of rows²⁵, is 0.034% greater than the constant phi, 1.6180339... This constant, sometimes referred to as “the Golden Mean,” “the Golden Ratio” or “the Golden Section,” was defined circa 300 b.c. by Euclid of Alexandria, as follows:

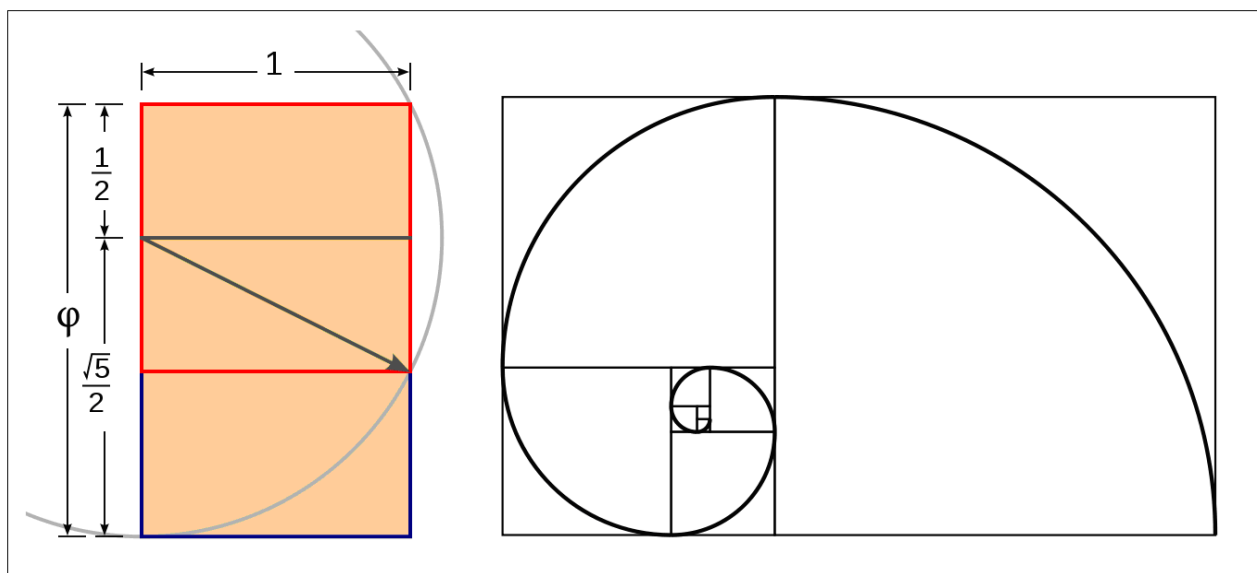


A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the lesser.^{26, 27}

²⁵ As mentioned in the text, a “circle analysis” counts each average of rows (column F) a single time toward a final Median Average for the entire spreadsheet. A “square analysis” counts the first row twice, and arrives at a slightly different number, one which is 0.0053% in proximity to the Golden Mean. A further discussion of the rationales underlying “circle analysis” and “square analysis” is placed in the Second Post-script to this article.

²⁶ Euclid of Alexandria, Elements, Book VI, Definition 3, circa 300 b.c.. A broad array of texts may be suggested describing the well-known associations between the Golden Mean and patterns discovered in Nature. See e.g. Livio, 2002; Skinner, 2006; Hemenway, 2005.

²⁷ Geometrically, the proportion of 1: ϕ may be created by the following construction. A spiral may be obtained from this construction as follows. This spiral and its relationship to the economy of the United States has been one of the central points of this paper.



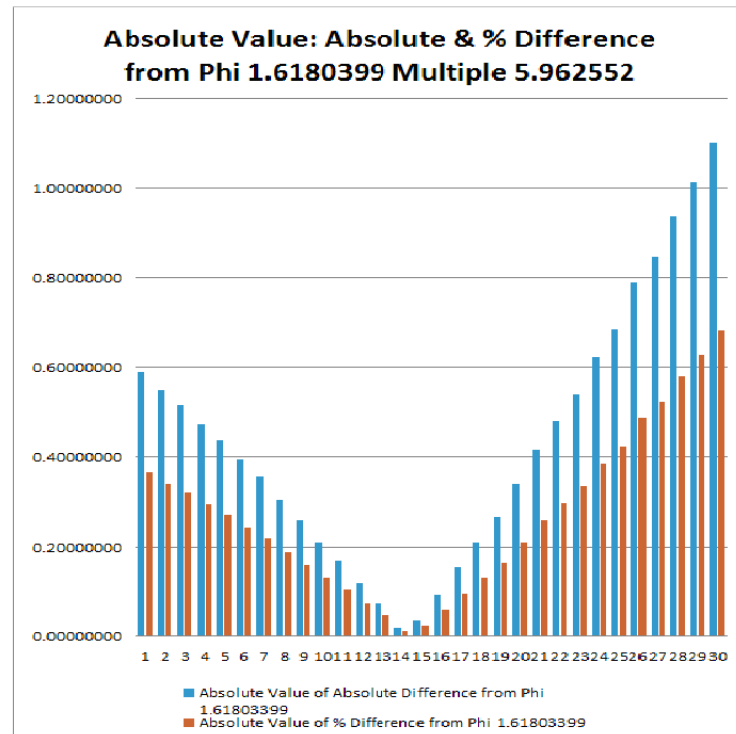
If line segment AB is set to 1, and if the line segment AC is in a Golden Mean relationship to AB, then line segment AC will equal 1.6180339... This finding can be checked by creating the following graph wherein we:

- a) indicate the spread between years which generates the ratio (presented below in the “# of years” first column),
- b) set forth the Median Average for all ratios generated for any given spread of years (second column below),
- c) figure the “absolute difference” and the “percentage difference” of these different Median Averages from phi (3rd and 4th columns below), and finally
- d) state these differences as absolute values (5th and 6th columns below).

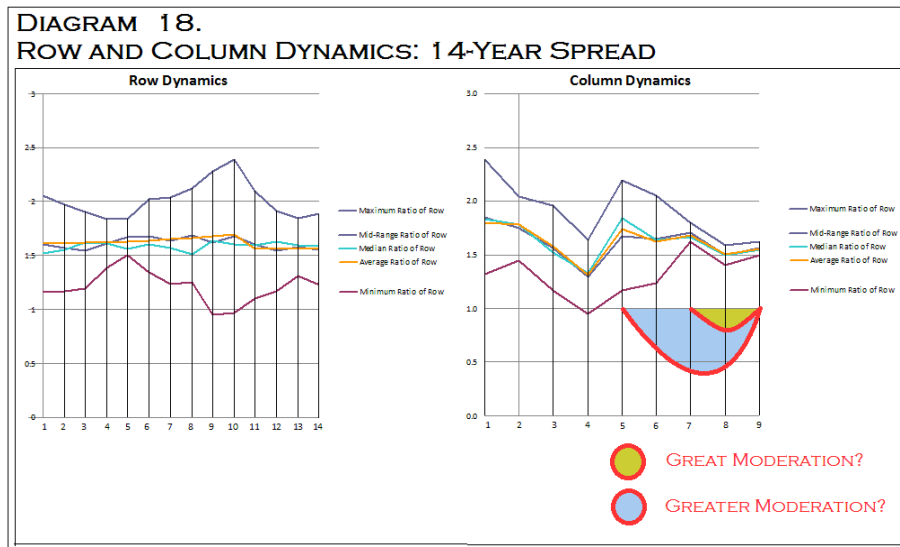
This data is summarized in the bar graph below this data. This graph demonstrates that Median Average generated by a 14-year spread between years are closest to 1.6180339..., = phi, or the Golden Mean.

DIAGRAM 17.
COMPARATIVE DIFFERENCES:
MEDIAN AVERAGES VS. 1.61803399

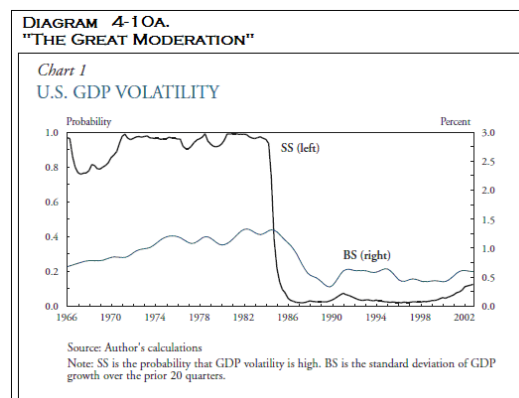
# of Years	Median Average	Absolute Difference from Phi 1.61803399	% Difference from Phi 1.61803399	Absolute Value of Absolute Difference from Phi 1.61803399	Absolute Value of % Difference from Phi 1.61803399
1	1.03086043	0.58717356	36.2893216%	0.58717356	36.2893216%
2	1.06996068	0.54807331	33.8727936%	0.54807331	33.8727936%
3	1.10353672	0.51449727	31.7976802%	0.51449727	31.7976802%
4	1.14504076	0.47299323	29.2325895%	0.47299323	29.2325895%
5	1.18247232	0.43556167	26.9191915%	0.43556167	26.9191915%
6	1.22633118	0.39170281	24.2085649%	0.39170281	24.2085649%
7	1.26388505	0.35414894	21.8876084%	0.35414894	21.8876084%
8	1.31520833	0.30282566	18.7156551%	0.30282566	18.7156551%
9	1.36070905	0.25732494	15.9035558%	0.25732494	15.9035558%
10	1.40916235	0.20887164	12.9089775%	0.20887164	12.9089775%
11	1.44965664	0.16837735	10.4062924%	0.16837735	10.4062924%
12	1.50019982	0.11783417	7.2825524%	0.11783417	7.2825524%
13	1.54501537	0.07301862	4.5127988%	0.07301862	4.5127988%
14	1.60189961	0.01613438	0.9971593%	0.01613438	0.9971593%
15	1.65125029	-0.03321630	-2.0528801%	0.03321630	2.0528801%
16	1.70936280	-0.09132881	-5.6444307%	0.09132881	5.6444307%
17	1.77052591	-0.15249192	-9.4245191%	0.15249192	9.4245191%
18	1.82742627	-0.20939228	-12.9411549%	0.20939228	12.9411549%
19	1.88097935	-0.26294536	-16.2509171%	0.26294536	16.2509171%
20	1.95675154	-0.33871755	-20.9338960%	0.33871755	20.9338960%
21	2.03196341	-0.41392942	-25.5822452%	0.41392942	25.5822452%
22	2.09620235	-0.47816836	-29.5524302%	0.47816836	29.5524302%
23	2.15690921	-0.53887522	-33.3043204%	0.53887522	33.3043204%
24	2.23755840	-0.61952441	-38.2887142%	0.61952441	38.2887142%
25	2.30123214	-0.68319815	-42.2239677%	0.68319815	42.2239677%
26	2.40625778	-0.78822379	-48.7149093%	0.78822379	48.7149093%
27	2.46439399	-0.84636000	-52.3079247%	0.84636000	52.3079247%
28	2.55145856	-0.93342457	-57.6888107%	0.93342457	57.6888107%
29	2.62813943	-1.01010544	-62.4279492%	1.01010544	62.4279492%
30	2.71795717	-1.09992318	-67.9789908%	1.09992318	67.9789908%



As noted at the outset of this paper, the final Median Average for the 14-year spread of 1.618590 was generated as a result of the following Row Dynamics, a pattern which had the least “Used General Dissonance,” the least “Acute Dissonance” and the second-to-least “Claimed Dissonance” of all spreads considered. As can be clearly seen below, and unlike the other spreads considered, when a high average of the row is reached it is immediately balanced by a low as determined from the approximate midpoint of the Golden Mean. In addition, as time has passed the American economy has steadily narrowed its focus to precisely this same single point.²⁸



²⁸ The last two columns of the Column Dynamic graphic represent a time period stretching from the end of Column 7 (1979) through the end of Column 9 (2007). During this period of time the economic volatility of previous years markedly narrowed. This finding is reflected in the graph below charting the volatility of the U. S. Gross Domestic Product and its abrupt lessening in 1984. (Summers, 2005)



Although hailed at the time as “The Great Moderation” and a possible sign of progress in economic understanding (e.g. Bernanke, 2004), post-Global Financial Crisis this view has come under attack. (e.g. Chomsky, 2011) The same graphic demonstrates that a marked narrowing of volatility began two columns prior to 1979, i.e. beginning with the end of Column 5 (1951), named here “The Greater Moderation” by way of comparison. (See “Second Post-script. Correlations and Speculations.” for additional material on this point.)

To figure the annual increase implied by the GNP Spiral, we may use the formula for simple interest compounded annually...

$$FV = PV (1+r)^t$$

... ; state a present value (PV) of \$1,000,000; a time period (t) of 14 years; and the future value (FV) as given below in proportion to the varying numbers derived in the GNP Spiral. These assumptions give us the following interest rates (r).

	<u>Future Value</u>		<u>Interest rate</u>
x= Circle Analysis:	\$1,618,590	interest rate is:	3.4995226
x= Golden Mean:	\$1,618,033	interest rate is:	3.4969781

These “interest rates” are the annual “rates of growth” necessary to obtain the various proportions of the GNP Spiral over time, ²⁹, ³⁰

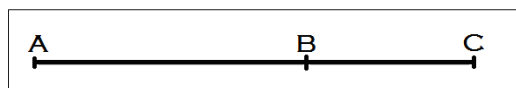
²⁹ At least one reference – albeit atavistic – may be cited in support of a similarity between the large number of designs found in Nature which incorporate the Golden Mean (the galactic spiral, the Chambered Nautilus, seed pods of various plants, aspects of DNA, etc.) and the almost biologic dynamism of the GNP Spiral presented herein. (See e.g. Kahn, 1961:425) “(I)t ... seems likely that Stalin’s caution (regarding antagonism toward the United States) did not stem from fear of the atomic bomb as a decisive weapon. What alarmed him about the United States was Detroit – not (the Strategic Air Command)! He appears to have felt very strongly that no sensible government tangles with a nation with a GNP of \$300 billion a year. Luckily we had both assets – the bomb and the GNP – so that any difference between U.S. and Soviet calculations was not crucial.”

³⁰ A surprisingly eclectic reading list may be constructed on possible parallels to the 56-year cycle suggested herein. These include: (1) the circular arrangement of 56 “Aubrey holes” at Stonehenge, (Cleal, et al. 1995); (2) price fluctuations predicted in 1875 by an Ohio farmer (Benner 1875); (3) business cycles of 56-years (Funk 1933); (4) astrologic cycles generally connected to the orbit of Saturn (Williams 1947, 1959, 1982); (5) an “energy use cycle” of 56-years (Stewart 1989); (6) the “Joseph Cycle” (Sim 2008) and (7) a compendium of geologic, weather, financial and other information (McMinn 2006, 2007, 2011). The Jewish festival *Birkat Hakhammah* “Blessing of the Sun” takes place every 28 years, most recently April 8, 2009. See also Tompkins (1976:282) “Hunab Ku, sole source of movement and measure, symbolized the universe for the Maya in the form of a circle with an inscribed square. The circle was the symbol of the infinite, the spiritual; the square of the material. Hunab Ku was thus a universal dynamism or that which motivates and stimulates life in its total manifestation as spirit and matter, the all in one.”

Conclusion

Referring once again to the definition of the Golden Mean, we have:

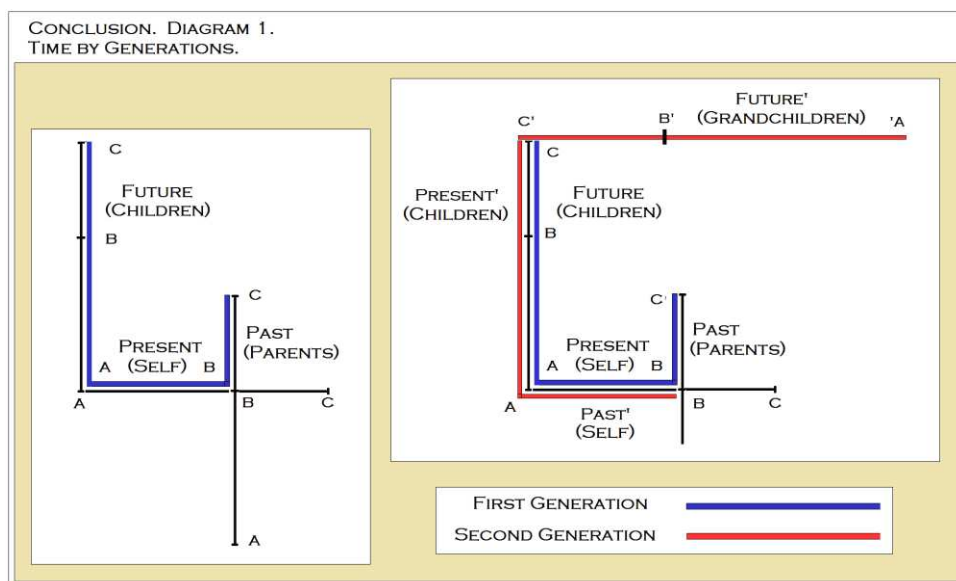
A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the lesser.



As described in this article, and in connection with the economic progress of the United States, *the Golden Mean appears to tie the past (line segment BC) to the present (line segment AB) to the future (line segment AC) in a self-consistent and harmonic fashion.* It is a mathematic statement of the historic identity of the United States itself, as moving from date to date in a coherent, repeating manner as connected to a 14-year spread between years and as nested as a quarter-cycle within a 56-year circuit of social time.

The 14-year interval of time which lays the foundation for the 14-year spread between numerator and denominator in ratios of GNP, like the musical interval of an octave, provides a framework within which this evolution of GNP may take place. Like the octave, it lays the essential mathematic relationship of the entire spectrum of harmonies of growth. This coincides with the 50-60 year period given by Kondratiev as the basis for his model.

There is at least a poetic similarity between the division of a line segment into past-present-future and the familial context underlying society itself wherein one's parents (past) give birth to one's self (present) as continued through one's children (future). Inasmuch as each stage of this familial expansion of self begins with the onset of reproductive capacities at age 14, the GNP Spiral / classic Kondratiev Wave may form as a parallel to an underlying biologic pattern.

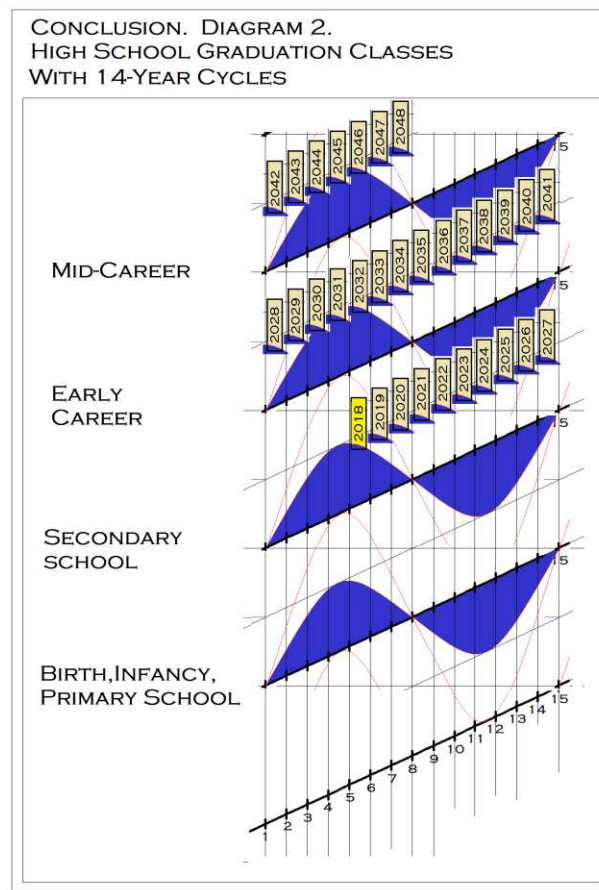


It appears to be very likely that this underlying geometry of “generational time” lays the foundation for the strict cyclical element of the Kondratiev Wave, one which is biologically driven but upon which an enormous host of other economic, social and political relationships float interconnectedly.

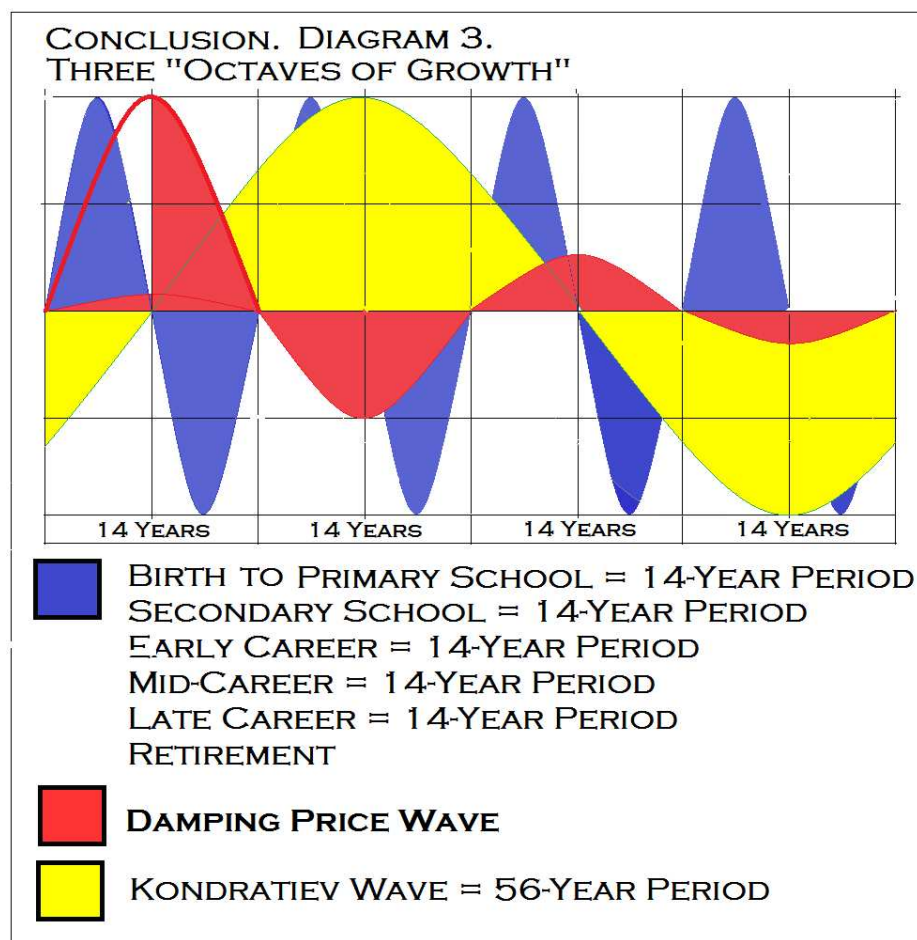
One might bear in mind the sheer force of life which continually bears on this dynamic. If we imagine that this “life force” of the economy may be viewed physically at the graduation of a high-school class, we can see that the force of these repetitive 14-year periods is not limited to a single family unit but rather constitutes a continuing host of waves, each breaking into the future as a new, highly charged and hopeful high school graduation class.

Returning to the hypothetical child born on January 1, 2000, we can watch the cumulative force of this development. Below we see a straight-line development over time as represented by each high school class graduation date, beginning with the graduation date of said child at 2018 (in highlighted yellow below). Every graduation class possesses a 14-year wavelength sustaining it. And each class is like the others in that the persons graduating begin the ascent through the careers which they choose.

As a single life goes through the sequential 14-year periods of Primary School, Secondary School, Early Career, Mid-Career and Retirement which are themselves complemented by similar high school class graduations, we have the following.



As presented below, it would appear that the fundamental “octave” of life is the motion leading from birth to reproductive capacity (in blue), as encompassed by the damping price wave described in Diagrams 11, 12, 13, and 14 (in red), and as further encompassed within the largest 56-year octave of the entire Kondratiev cycle as described in Diagrams 14 and 15 (in yellow).



The intermediate “octave” of price change (in red) transforms the biologic human octave (in blue) into the larger 56-year octave of the Kondratiev Wave (in yellow). (For the proposed placement of these waves, as well as their use in prediction, see the third essay, “Of ‘The Pyramid Economy’ and ‘The Political Economy Wave’: towards the study of consciousness as a predictive science.”)

It is to the consideration of this intermediate octave which we now turn.

Part Two: Post-scripts

First Post-script. Correlations and Speculations.

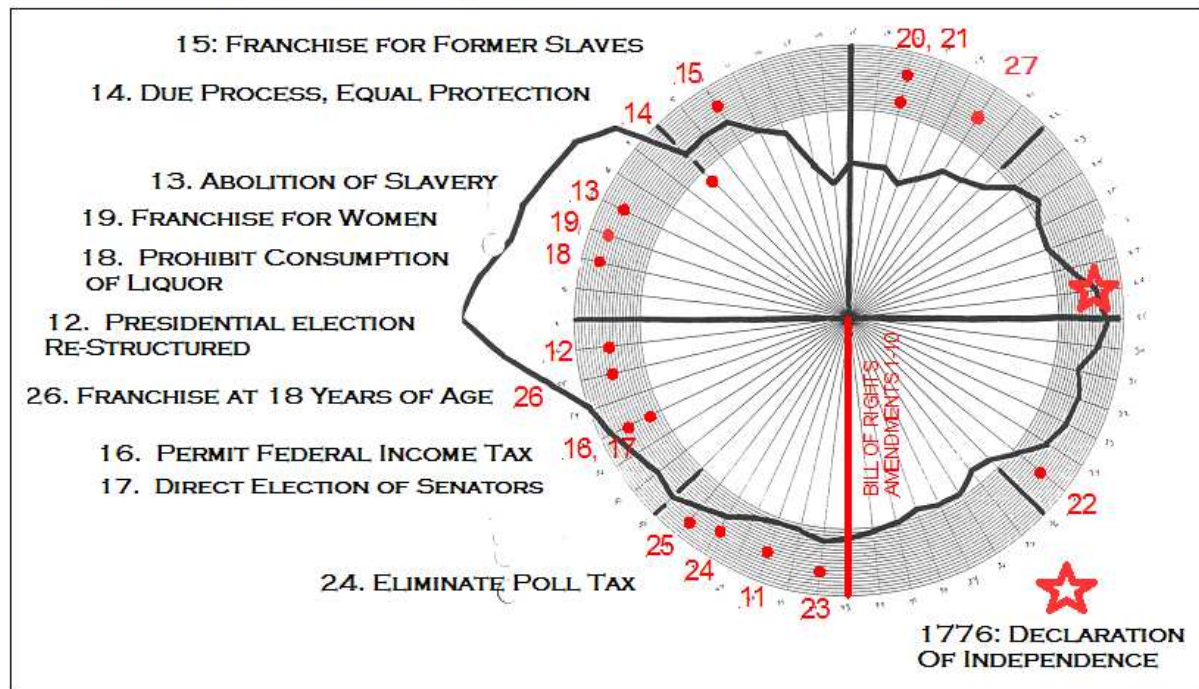
Part One.

A major conclusion reached by Kondratiev was that democratic capitalism was capable of avoiding the decline and disintegration predicted by Marx through its ability to correct the worst abuses of capitalism over time. In this vein, the significance of this 56-year cycle may be extended beyond the realm of economics if we correlate the dates of political events with their respective axes in this circuit.

For example if we place on the various axes of the 56-year circuit the dates of the Amendments to the United States Constitution we have the following distribution of significant changes to the legal foundation of the United States. It is immediately apparent that a far greater number of amendments have been adopted toward the left hand side of the circuit than have been adopted during the right hand side.

DIAGRAM 19.

CONSTITUTIONAL AMENDMENTS



Let us first discount the Bill of Rights as falling on the exact dividing line between the left and right sides of this circuit (enacted December 15, 1791). If we consider only the remaining amendments we may note that in addition to a numeric difference, a qualitative difference also exists between the right-hand and left-hand sides of the circuit. Falling within a ten-year span before and after "Year 1" (9 o'clock) are amendments:

- (1) to give former slaves the franchise (Am. 15, axis 10=1870),
- (2) to require "due process of law" and "equal protection" (Am 14, axis 8=1868),
- (3) to abolish slavery (Am. 13, axis 5=1865),
- (4) to permit women the franchise (Am. 19, axis 4=1920),
- (5) to prohibit the consumption of liquor (Am. 18, axis 3=1919),
- (6) to re-structure the election of Presidents and Vice-Presidents (Am. 12, axis 56= 1804),
- (7) to permit 18 year old citizens the franchise (Am. 26, axis 54=1971),
- (8) to permit the imposition of income taxes (Am. 16, axis 53=1913),
- (9) to require the direct election of senators (Am. 17, axis 53= 1913), and
- (10) to eliminate poll taxes as a requirement to voting (Am. 24, axis 48=1964).

Only two constitutional amendments fall within a ten year span of "Year 29," i.e. 3 o'clock. Amendment 22 restricts a president from serving more than 2 terms in office (axis 31=1951) and enshrines in law a tradition begun by George Washington 154 years earlier when in 1797 he refused to run for a third term in office. Amendment 27 prohibits laws affecting Congressional salary from taking effect until the beginning of the next session of Congress. This amendment was proposed September 25, 1789 and enacted 203 years later in May 1992.

We might also consider the two remaining Amendments on the right hand side of the cycle. Both enacted in 1933, Amendment 20 determined the dates of term commencements for Congress and the President and Amendment 21 repealed the federal prohibition on consumption of alcohol. Amendment 20 was a purely administrative amendment and Amendment 21 returned the country to a well-established social norm.

It is of course possible to take any data set and superimpose upon it a spiral of any sort. The list of Amendments to the Federal Constitution is useful in this analysis because:

- (1) each Amendment carries with it a specific date of adoption, thereby making placement in the cycle non-controversial,
- (2) each Amendment engages the entire United States by virtue of the centrality of the Federal Constitution and the difficulties posed in their adoption,
- (3) each Amendment declares in the clearest possible terms what is intended, albeit this interpretation remains subject to further interpretation by the courts, and

(4) each Amendment remains an influence upon continued American development. In many cases these Amendments are intended to direct the process of the economic future of the American people away from evils previously experienced (slavery, disenfranchisement of African-Americans, women and persons of draft age, resistance to federal taxation of income, addiction to alcohol, unjust use of governmental powers, etc.)

It should be borne in mind that, while the use of other data sets may contest the significance of this cycle, at this point we attempt simply to understand this model, explore the origin of the Golden Mean within the American economy and consider the sort of “balancing” which permits it.

The numerous amendments on the left-hand side of the circuit above should be contrasted with one of the most fundamental documents of American economic history occurring on the right-hand side of the circuit, the Declaration of Independence of 1776. This document makes clear that the colonists did not perceive themselves as setting forth upon some new and novel declaration of rights. Rather they viewed themselves as collectively determined to continue to enjoy rights which they already possessed.

Regarding George III the colonists declared in their first five grievances:

He has refused his assent to laws, the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.

The remainder of the Declaration of Independence describes in ever expanding detail the list of wrongs done by the king to his colonists. Each of these royal acts or omissions justified – at least in the minds of the signatory colonists – an immediate separation of the colonies from the crown in protection of long-held rights, customs and privileges.

The correlation between Amendments to the Federal Constitution and the 56-year circuit envisioned by this model provides support for the proposition that the circuit itself is an important part of the underlying social fabric of the United States and its political economy. The Amendments are not scattered uniformly around the spiral but rather are grouped almost entirely on the left-hand side. These Amendments generally alter American political life in quite dramatic ways. Amendments to the right of the cycle are very few and generally intended to honor and fix firmly past traditions and social mores.

The discovery of this “bi-polarity” of American political life suggests the possibility that that the four 14-year segments of time which have been used as the foundation of this circuit may themselves have importance. If this is granted we may now expand this model into an understanding of the underlying nature of the political economy of the United States over time.

Part Two

We may now speculate as to the nature of the right-left division underlying the GNP Spiral. This will conclude the final step of our analysis of American Economic History.

For the purposes of this paper regarding American economic history, let us define a “*Belief-system*” as the constellation of ideas surrounding any principle of governance: a monarchy, the bourgeoisie, slavery, the relationship of labor to capital, etc. Second, let us define the term “*Revolution*” as a period of time when significant portions of a time-honored belief-systems are destroyed and when new and largely untried belief systems are inaugurated. Third, let us define in contradistinction to “*Revolution*” the term “*Consolidation*” as an opposing historical period in which honor or reverence are given to relatively recent belief-systems in a manner calculated to preserve and prolong them. It would appear that the left half of the circuit is “*revolutionary*” in character, while the right half is “*consolidating*” in character in the context of historic American belief systems.

In light of the numerous constitutional amendments adopted on the left-hand side of the circuit, and the virtual lack thereof on the right-hand side, let us label each of the segments of American History as follows:

LINES IN BLUE REPRESENT 14 YEAR PERIODS OF TIME
NUMBERS IN BLACK REPRESENT SEPARATE AND
DISTINCT RAYS ALONG THE 56-YEAR CIRCUIT

YEARS IN RED INDICATE DATES LYING ALONG THE SAME AXIS

EACH RADIUS OF CIRCUMFERENCE REPRESENTS A POSITIVE INCREASE OF
1/2 PERCENT IN THE CUMULATIVE INFLATION RATE FOR THAT AXIS

1805, 1861, 1917, 1973, 2029

EVOLVING CONSOLIDATION

CONSOLIDATION

REVOLUTION

1777, 1833, 1889, 1945, 2001

EVOLVING REVOLUTION

APRIL 1948
SEPTEMBER 2004
FEBRUARY 1893
MAY 1837
SEPTEMBER 1949
CLOSE OF 1781

SEPTEMBER 2008

ORANGE SHADING REPRESENTS
28-YEAR CONSOLIDATION PERIOD

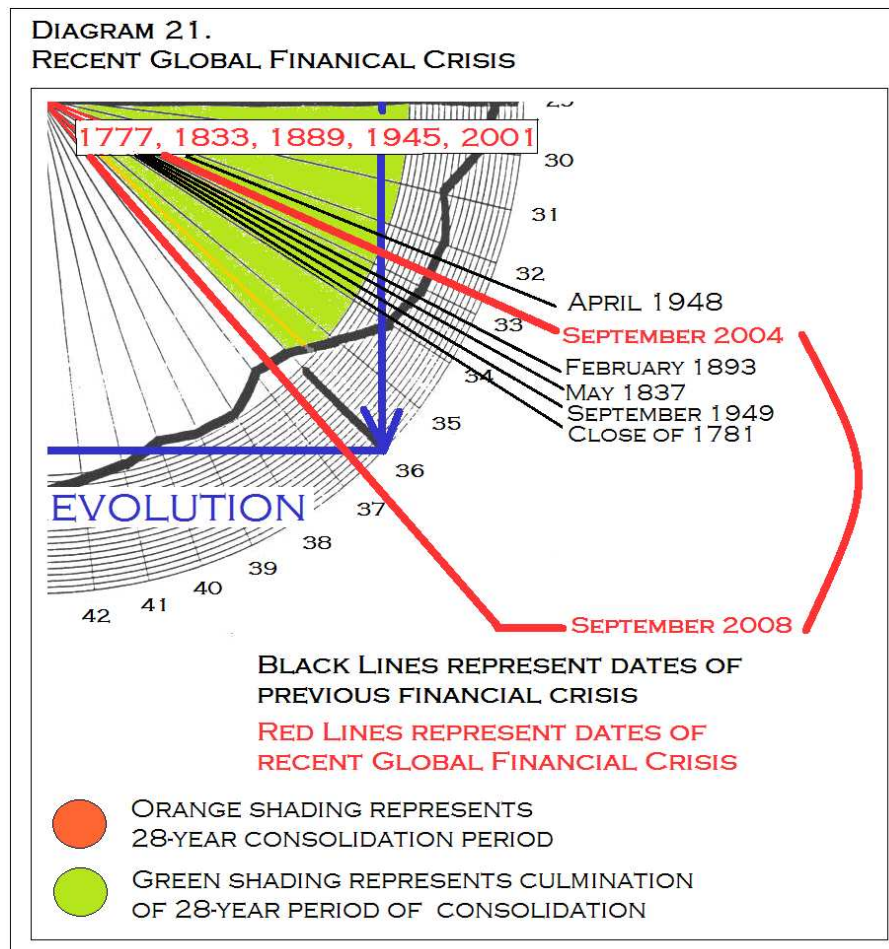
GREEN SHADING REPRESENTS CULMINATION
OF 28-YEAR PERIOD OF CONSOLIDATION

BLACK LINES REPRESENT DATES OF
PREVIOUS FINANCIAL CRISIS

RED LINES REPRESENT DATES OF
RECENT GLOBAL FINANCIAL CRISIS

1. The collapse of the colonial economy, circa 1781,
2. The Panic of 1837,
3. The Panic of 1893 and
4. The Marshall Plan of 1948 and the events of 1949.

Two unusual characteristics of the recent global meltdown should be pointed out. These are (1) the difficulty of “dating” the recent crisis, and (2) the delay of the expected time of crisis. Let us consider these important points briefly.



Each of the previous dates of “meltdown” clearly corresponded with events between axes 33 and 34. A description of these crises may be given simply by citing textbooks of American History.

Colonial meltdown of 1781

“In 1764 Parliament had outlawed paper money in the colonies altogether. Independence ended this restriction, and both the Continental Congress and the states printed large amounts of money during the Revolution, with inflationary results. To cite some examples, the Continental dollar became utterly worthless by 1781, and Virginia eventually called in its paper money at 1,000 to 1.”³¹

Panic of 1837

“In 1836 the second United States Bank automatically came to the end of its checkered career and the country under the inspiration of the new democracy entered an epoch of “wild cat” finance. The very next year (May, 1837), a terrible business depression fell like a blight upon the land, bringing as usual more suffering to farmers and mechanics than to the “rich and wellborn”; but this calamity was likewise attributed by the masses to the machinations of the money power rather than to the conduct of their hero, President Jackson. Nothing would induce them to retrace their steps. For three decades a union of the South and West prevented a restoration of the centralized banking system. Not until the planting statesmen withdrew from Congress and the storm of the Civil War swept minor gusts before it were the ravages wrought by Jackson repaired by the directors of affairs in Washington.”³²

Panic of 1893

“The (Cleveland) Administration was not three months old when a series of bank failure and industrial collapses inaugurated the panic of (February) 1893. The treasury’s gold reserve was depleted by an excess of imports and by liquidation of American securities in London after a panic there. Gold was subject to a steady drain by the monthly purchase of useless silver required by the Silver Purchase Act of 1890, and by the redemption of greenbacks which by law were promptly reissued and formed an “endless chain for conveying gold to Europe.”³³

³¹ John A. Garraty, *The American Nation, A History of the United States*, Harper-American Heritage Textbook, p. 144.

³² Charles A. Beard, Mary R. Beard, *The Rise of American Civilization*, New Edition, Macmillan Company, New York., p. 570-571.

³³ Garraty, p. 795.

Reviewing the same axes for the years 1948-1949, we have, in addition to the creation of the Marshall Plan to rebuild post-war Europe (April 1948), the following:

1949

In 1949 a business recession occurred and prices declined slightly. (p. 819) ... Further alarmed by the news, released in September 1949, that the Russians had produced an atomic bomb, Congress appropriated \$1.5 billion to arm NATO and in 1951 General Eisenhower was recalled to active duty and placed in command of all NATO forces. (p. 785) ... This (civil war in China) resulted in the total defeat of the nationalists; by the end of 1949 Mao ruled all China and Chiang's shattered armies had fled to sanctuary on the island of Formosa, now called Taiwan. This loss of over half a billion souls to communism caused an outburst of indignation in the United States and deeply divided the American people. Critics claimed that Truman had not backed the nationalists strongly enough and that he had stupidly underestimated both Mao's power and his dedication to the cause of world revolution. (p. 786)³⁴

The recent Global Financial Crisis began when, in September 2004, the FBI reported that it had uncovered widespread fraud in the home mortgage market (axis 32). The date of this FBI report precedes the axes of the above mentioned crises, i.e. 1781, 1837, 1893 and 1948-1949, by a matter of months. However, and unlike previous crises, action to correct these frauds was not undertaken and the final implosion was delayed for four years, i.e. to September 2008, two months before the election of Barack Obama. Public reaction, not unlike previous moments along axis 33, has been extremely suspicious about the timing and origin of this world-wide panic.³⁵

³⁴ Garraty, p. 786.

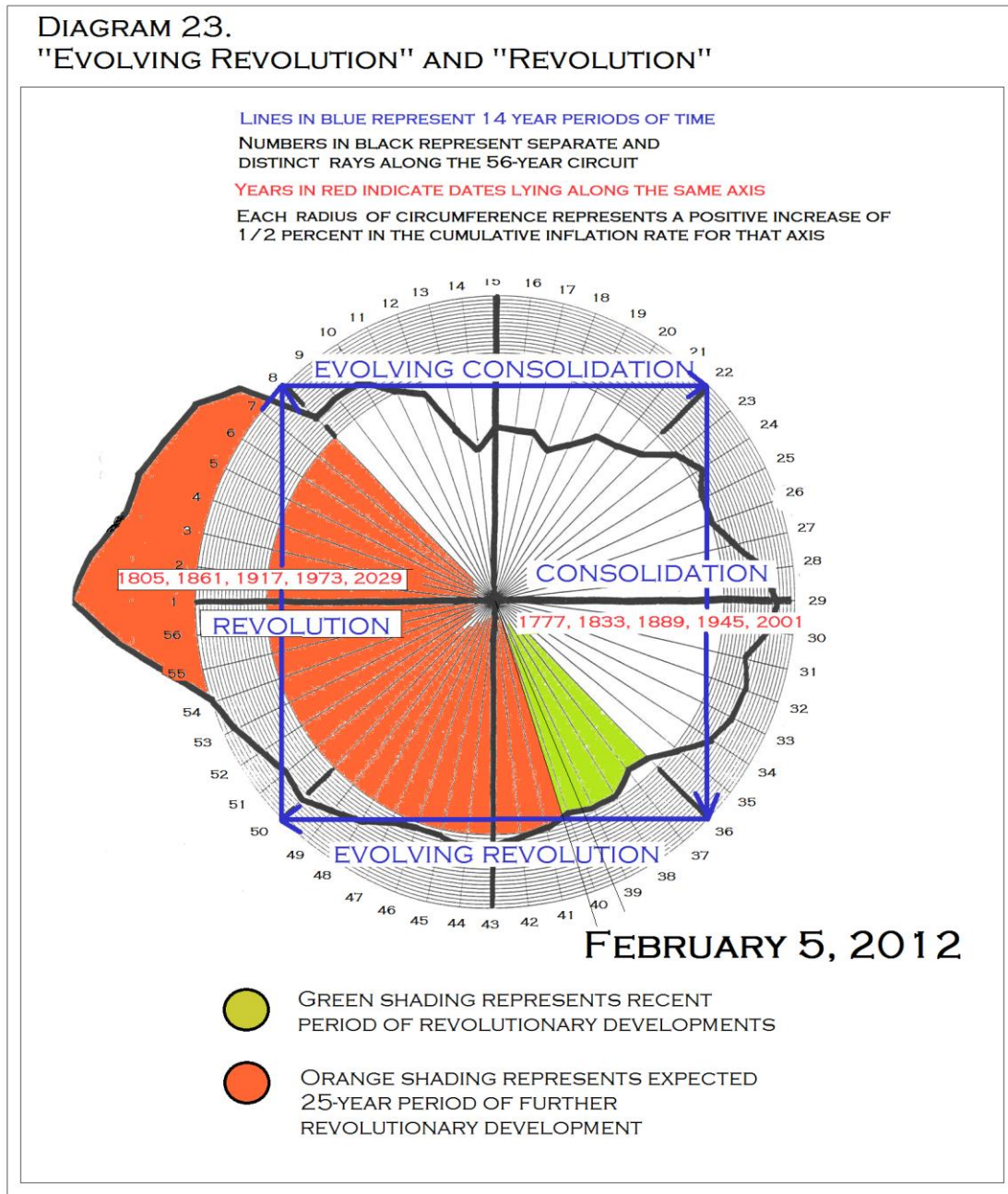
³⁵ See e.g. House Bill 3995, presented by Representative Kaptur, November 3, 2009:

“(4) Fraud also played a decisive role in the Savings and Loan crisis (of the late 1980s and early 1990s). The FBI and Justice Department made prosecuting those elite frauds among its highest priorities. This took a massive commitment of FBI resources, but it produced the most successful prosecution of an epidemic of elite fraud in history--over 1,000 ‘priority’ felony convictions of senior insiders, according to Professor William K. Black in his book ‘The Best Way to Rob a Bank is to Own One’.

(5) However, the FBI, because of its crippling personnel limitations, has been unable to assign sufficient FBI agents to investigate the current global financial crisis. The FBI identified the mortgage fraud ‘epidemic’ in congressional testimony in September 2004. It had so few white-collar crime specialists available, however, that it was able to assign only 120 special agents to mortgage fraud cases--less than one-eighth the agents it found essential to respond adequately to the huge, but far smaller, Savings and Loan crisis.

(6) Given the magnitude of the financial crisis of 2008 and the resulting losses and billions of taxpayer dollars spent to keep the financial system from collapsing, the FBI should have no less than 1,000 agents to address corporate, securities, and mortgage fraud located across the country, and, in addition, more forensic experts and Federal prosecutors to uncover the crimes committed and bring the perpetrators to justice.”

To conclude our speculation as to the nature of this circuit brings us to a discussion of the current events of today. We are, today, at the dividing line between green and orange in the graph below.



The green portion of the above represents the beginning of an evolving revolutionary trend starting in 2008.

This green section correlates to an impressive extent with the current difficulties faced by the United States in the Middle East. Note that as of the date of the publication of this article, the

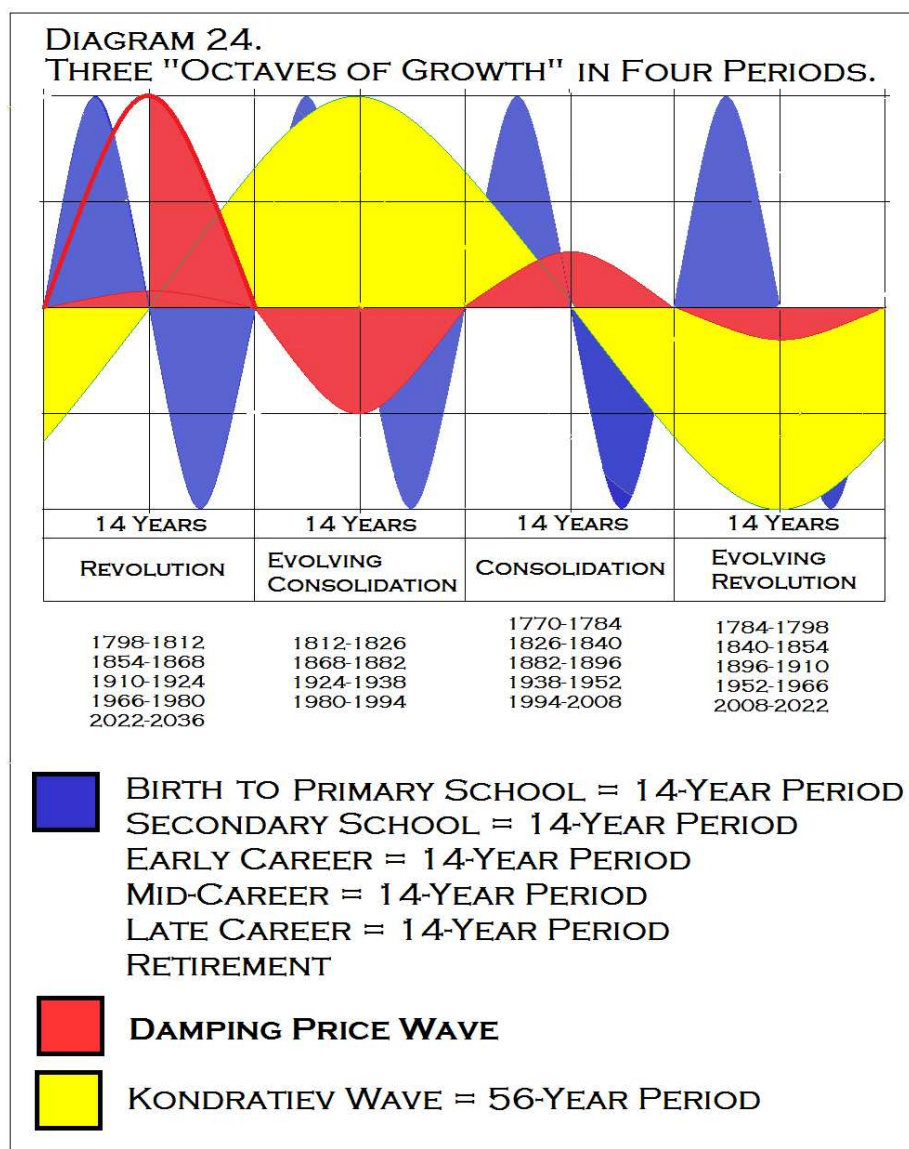
United States has attempted to deal with a number of revolutionary changes throughout the Arab world.

These have included but are not limited to: Tunisia, Egypt, Libya, Bahrain, Yemen, Syria, Morocco and Algeria. These events have become known popularly as “The Arab Spring.” Chronologically, these were preceded by the 2009 Revolution in Iran. They have been joined since that time by protests, revolts and crackdowns in Tibet, China, England and Greece as well as a painful sovereign debt crisis in Europe with additional austerity measures generally anticipated. The fact that these events are taking place at the very beginning of the “Evolving Revolution” segment of American economic history may presage much greater events to come.

A strong correlation between the onset of inflation and the axes of this period has been described by this model. The graph above demonstrates the historic inflationary rise which typically accompanies this period of American economic history.

The amount of orange given in the above development towards revolution represents inflation, the strength of which emerges most dramatically along the left-pointing axis at nine o’clock. These years represent very difficult times in the history of the United States – the coming of the war with Britain in 1812 during which the White House, the Capitol, the Library of Congress and the Treasury were burned to the ground (1814); the American Civil War beginning in 1861 ending in the assassination of President Lincoln in 1865; the First World War beginning for the United States in 1917; and the OPEC Embargo of 1973. This axis brings revolutionary times of great uncertainty, a forced re-reading of America’s place in world history.

As presented below, it would appear that the fundamental “octave” of life is the motion leading from birth to reproductive capacity (in blue), as contained within the broader “octave” of 28-year periods of Evolving Revolution to Revolution and Evolving Consolidation to Consolidation (in red), all of which are encompassed within the largest 56-year octave of the entire Kondratiev cycle (in yellow).



It would further appear that the basic reproductive expectations of life are channeled into the Kondratiev Wave via the willingness of human beings to alter their environment over specific periods of time.

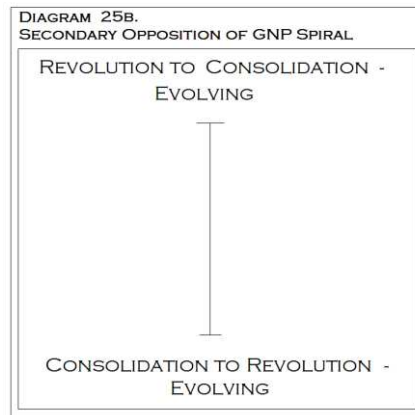
We turn next to a simplification of this model which may permit these separate wavelengths to be coordinated.

Second Post-script. Simplification, Expansion.

Our presentation of the social balance of the economic history of the United States has been based upon a pattern of two essential parts. First we have proposed a distinct and complete separation of periods of Consolidation and Revolution, indicated by what will be named a “Primary Opposition.” The purpose of stating this opposition formally is to convey the idea of an absolute or unequivocal difference between two separate and distinct things.



Second, we have contrasted this first division of a 56-year cycle with two additional periods of time wherein an evolutionary or incremental development occurs joining these first two intractable opposites. The addition of this second type of opposition is named a “Secondary Opposition.”

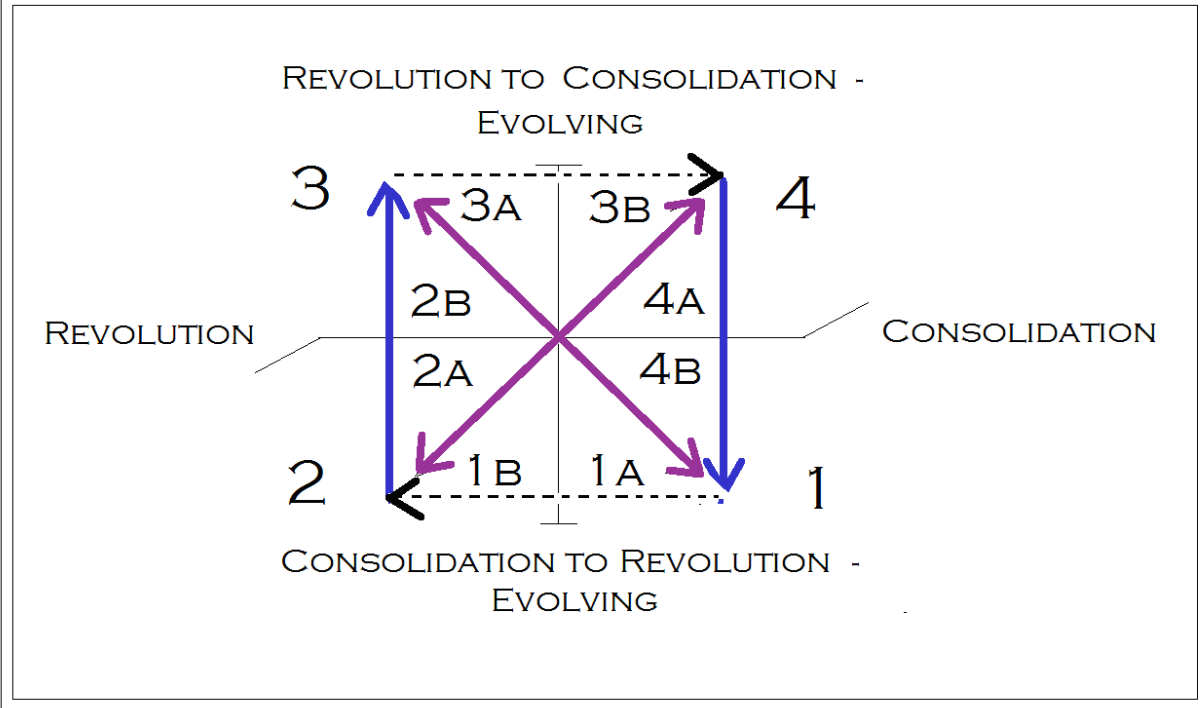


Together these two oppositions create a square of tension wherein four central points are brought out. These are:

- (1) the point at which Consolidation ends and Evolving Revolution begins,
- (2) the point at which Evolving Revolution ends and Revolution begins,
- (3) the point wherein Revolution ends and Evolving Consolidation begins and
- (4) the point at which Evolving Consolidation ends and Consolidation begins.

The notion that a geometric square is at play in the economic history of the United States arises from the force of these oppositions.

DIAGRAM 26A.
MAP OF GNP SPIRAL - DEFINED CATEGORIES



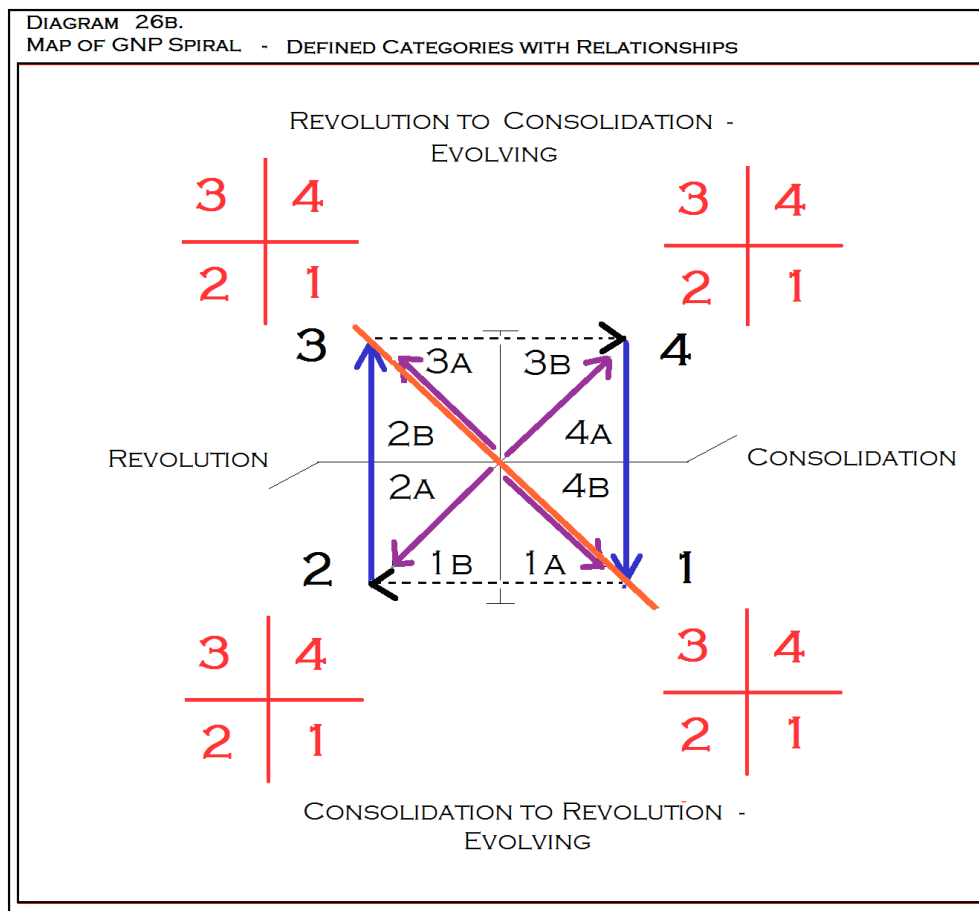
In order to map the square implied by the GNP Spiral, the placement of blue lines below indicates diametrically opposing ideas (Revolution, Consolidation) as separated by an impossible and intractable gulf of opposition and which extend themselves over a period of time.

The placement of black dotted lines below represents that gulf, as traversed by incremental adjustments over time (Evolving Revolution, Evolving Consolidation).

The orange line repeats the separation of the model into equal halves as noted in the foregoing article at length.

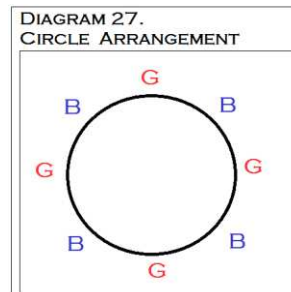
Finally, these oppositions give rise to the four corners of a square of relationships (numbers 1, 2, 3, and 4 in black), which in turn have relationships with the other corners of the square (numbers in red which repeat the 1, 2, 3, 4 pattern).

The result is a simple “map” of what might be termed the “logic” or the “social psychology” of the United States as it creates a balanced and productive political economy over time. This “square” of relationships balances the productive capacity of the United States as generated by a 14-year octave of generational development supporting the Golden Mean and its place as a fundamental figure within the economy.

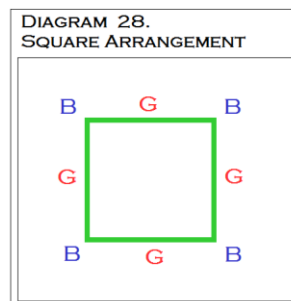


As a result of these relationships, we must consider how the geometry of a square may impact on the analysis of the data we have presented in the main paper.

Let us imagine that an elementary school teacher has a class of four girls and four boys. It would be easy to picture her taking her class outside to the playground, placing them side by side, boy-girl-boy-girl, and arranging them in a circle. They might stand as follows in the geometric figure.

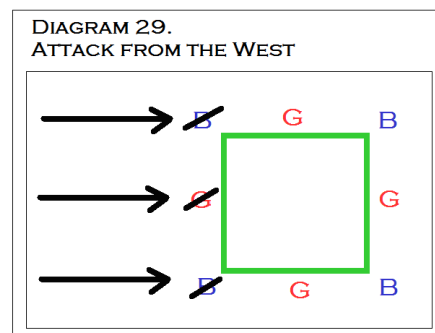


We could also imagine the teacher arranging them in a square. The geometric order might be as follows:



Now let us imagine that the same group of boys and girls are sent to war as men and women. In combat the groups are arranged in the same “square” of relationships with 100 yards between soldiers.

We may imagine for the purposes of demonstration that the enemy attacks from the west and kill all soldiers closest to the wave of the attack whilst the others escape. After battle, the enemy must necessarily count 2 male soldiers killed and one female soldier killed. Let us presume that the death count is the only knowledge the enemy has of our military. Consequently any conclusions they come to about our forces are based only upon their knowledge of persons killed.

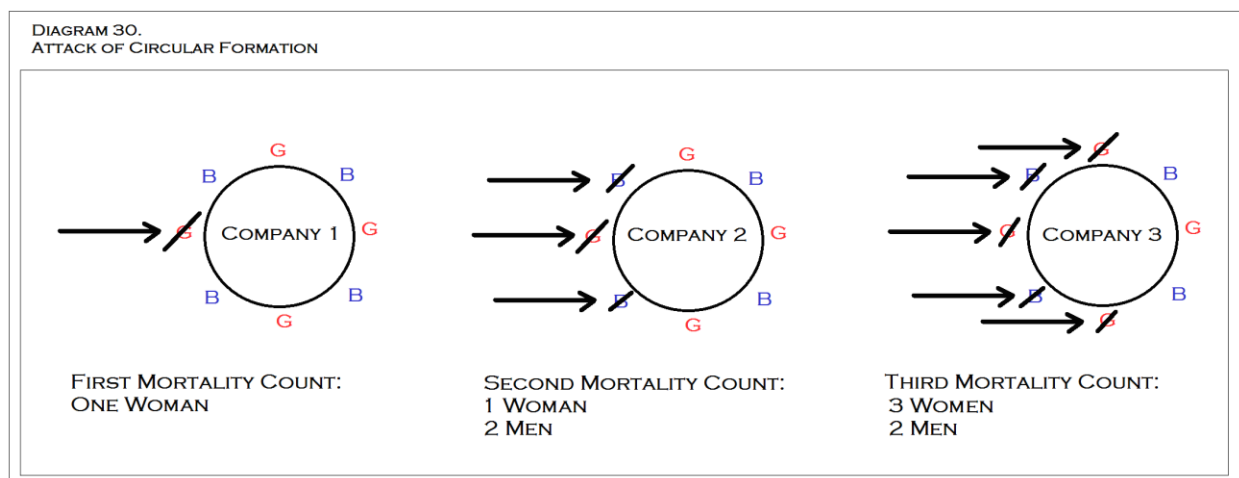


We may further imagine that the enemy repeatedly attacks other companies from the north, east, south and west, with the same dynamics in the persons killed. In each case the mortality count is 2 male soldiers killed and one female soldier killed. Based simply upon an analysis of soldiers killed in battle, the enemy could easily come to a number of incorrect conclusions, i.e.:

- (1) there are twice as many men in the company as women, or
- (2) women are twice as good as evading death as are men, or
- (3) men are one half as courageous as women.

In short, a number of false conclusions could be reached if the geometry of the arrangement of the company remains unknown and the only knowledge available comes from the body count after attacks.

On the other hand if the companies are arranged in circles, and if the enemy attacks as before, the enemy would now be much more likely to count even numbers of men and women killed, over all.



The enemy might also note that whenever they capture an entire unit, they always find equal numbers of men to women.

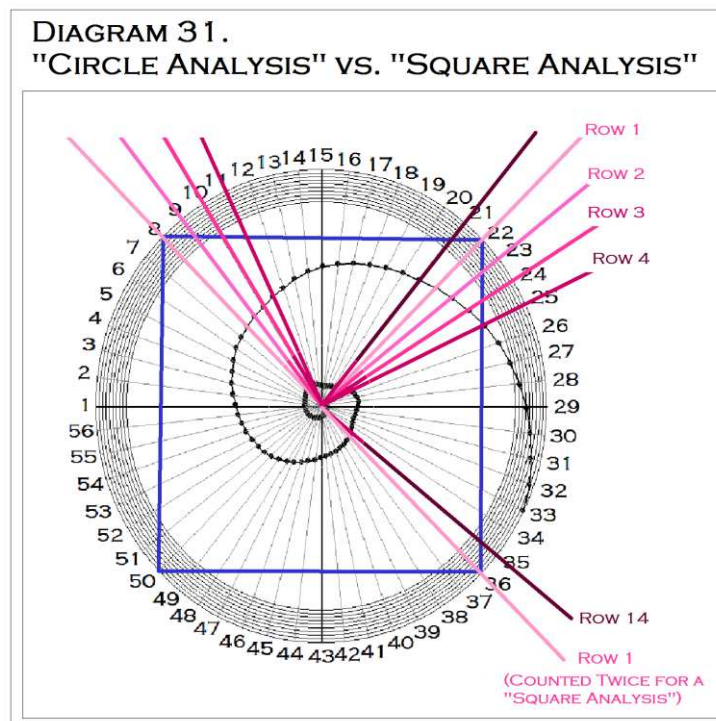
The fundamental lesson of this example is that when one takes averages of things which occur in geometric formations, one must understand the geometry of the formation to take a correct average.

It might also be pointed out that as the numbers of soldiers increases per company the significance of this insight fades. As demonstrated below, as the numbers increase in the company, the ratio of men to women killed in battle approaches a 1:1 ratio without regard to the square vs. circle formation. Referring to a square formation, the significance of the difference between a “square” and a “circle” geometric configuration is as follows:

Total soldiers	Soldiers per side	Men per side	Total fatality count per side men to women	Significance of difference
8	3	2	2:1	2
16	5	3	3:2	1.5
24	7	4	4:3	1.3333...
32	9	5	5:4	1.25
40	11	6	6:5	1.2
48	13	7	7:6	1.1666...
56	15	8	8:7	1.1428...

The association between geometry and ratio affects our analysis because, in essence, the Kondratiev wave proposes that we are in some sort of spiral version of history. According to the mathematic strategies of this paper, this spiral occurs as based upon four sets of 14-year periods of real GNP, for a total of 56 years in the circuit.

We have listed the ratios of un-averaged real GNP at 14-year spreads in an Excel spread sheet. The first date, the ratio of 1882 / 1868, is placed in Column One Row One and presents the diagonals of the square figured as underlying the entire spiral itself, as follows:



If we assume that all final row ratios within a spread sheet are of equal importance, we must count each ratio equally in a final average of fourteen rows. This may be referred to as a “circle analysis” because – like the points of the circumference of a circle – all are equidistant from the center and none possess any particular or obvious significance over the others. Under this analysis, we have figured a final average for all rows under the 14-year spread of 1.618590, or 0.034% greater than phi.

On the other hand if the development of American GNP is a *square* of relationships the corners of the square of ratios must be figured twice. The double-counting of this corner point is in a situation similar to that of the soldier standing at the corner of the square whose faces forces coming from two directions rather than one.

However as we consider this fifteenth year as an additional date in the line from corner to corner of all ratios, we must notice that this fifteenth ratio is simply the first row (which gives the diagonal of the square of ratios) counted twice. All of the diagonals of the square are contained in that single, first row in the Excel spreadsheet.

If the diagonal ratios of the 14-year spread sheet are included twice in the calculation of the final Median Average of the figures, we have the following comparisons to the Golden Mean.

DIAGRAM 32.
PROXIMITIES TO THE GOLDEN MEAN

Splicing Multiple 5.962552		Proximity to 1.61803399	
Rows:		Absolute	Percentage
Median Average (Circle)	1.618590	+0.000556	+0.034%
Median Average (Square)	1.618120	+0.000086	+0.0053%
Columns			
Median Average	1.618200	+0.000167	+0.0098%

As noted previously, to figure the annual increase implied by the GNP Spiral, we may use the formula for simple interest compounded annually...

$$FV = PV (1+r)^t$$

... ; state a present value (PV) of \$1,000,000; a time period (t) of 14 years; and the future value (FV) as given below in proportion to the varying numbers derived in the GNP Spiral. These assumptions give us the following interest rates (r).

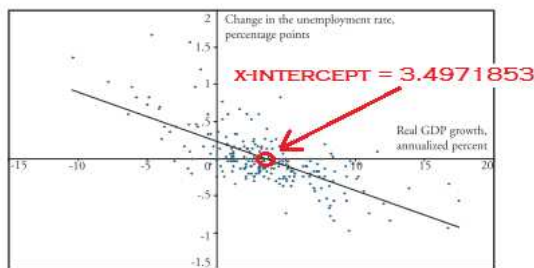
	<u>Future Value</u>		<u>Interest rate</u>
x= Circle Analysis:	\$1,618,590	interest rate is:	3.4995226
x= Square:	\$1,618,120	interest rate is:	3.4973756
x= Golden Mean:	\$1,618,033	interest rate is:	3.4969781

The above “rates of growth” may be contrasted with one of the central empirical regularities of mainstream economics, i.e. Okun’s Law. This rule proposes a roughly 3:1 ratio between increases in real GNP and decreases in the rate of unemployment in the economy of the United States. A trend line may be devised for quarterly data between the second quarter of 1948 and the second quarter of 2007 which gives the slope of this relationship as:

$$y = .23094 + -0.066036x$$

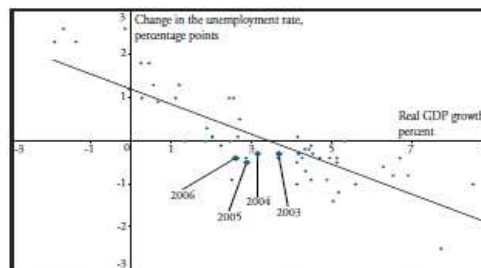
A “steady state” rate of economic growth may be figured for the x-intercept, i.e. that rate of growth which occurs when there is no change in the rate of employment. ($y = 0$). Using the above equation and trend line, this x-intercept is 3.4971853. (Knotek, 2007, with additional correspondence by the author)³⁶

Chart 1
THE DIFFERENCE VERSION OF OKUN’S LAW,
QUARTERLY DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from the second quarter of 1948 through the second quarter of 2007.

Chart 2
THE DIFFERENCE VERSION OF OKUN’S LAW,
ANNUAL DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from 1949 through 2006.

As these figures relate to the annual rate of growth necessary to sustain all values investigated above we have:

Analysis:	Future Value	Promixity to Phi	Rate:	Comparison to Okun’s x-intercept at 3.4971853
Circle:	\$1,618,590	1.00034424	3.4995226	1.000668337
Columns:	\$1,618,200	1.00010321	3.4977411	1.000158927
Square:	\$1,618,120	1.00005376	3.4973756	1.000054415
Okun’s Law x-axis:	\$1,618,078	1.00002781	3.4971853	1
Golden Mean:	\$1,618,033	1	3.4969781	0.999940752

When this “steady state” rate of growth under Okun’s Law is placed among the “rates of growth” calculated by the GNP Spiral, the x-intercept generates a future value in proximity to the Golden Mean of 2.7/100,000 parts, closer than all other values.

³⁶ “Data Set Five” contains the figures supporting these charts and is found as an Appendix to this paper.

The question arises as to whether Okun's Law can be used as evidence of the presence of the Golden Mean in this context. One may argue that because we measure GNP data herein, and because Okun's Law measures the same data, that it should not be surprising that the steady state rate of growth given by the x-intercept of Okun's Law for quarterly data (which deliberately excludes changes in the rate of unemployment) would be the same as the "Golden Mean" rate of growth.

To test this argument we took the Median Average of each spreadsheet and multiplied it by \$1,000,000 to obtain an appropriate "Future Value" for the interest rate equation above. (Figures given are "circle analyses" in as much as only even numbered spreads possess "square analysis" possibilities, and the 14-year spread is the even-numbered spread most proximate to the Golden Mean.)

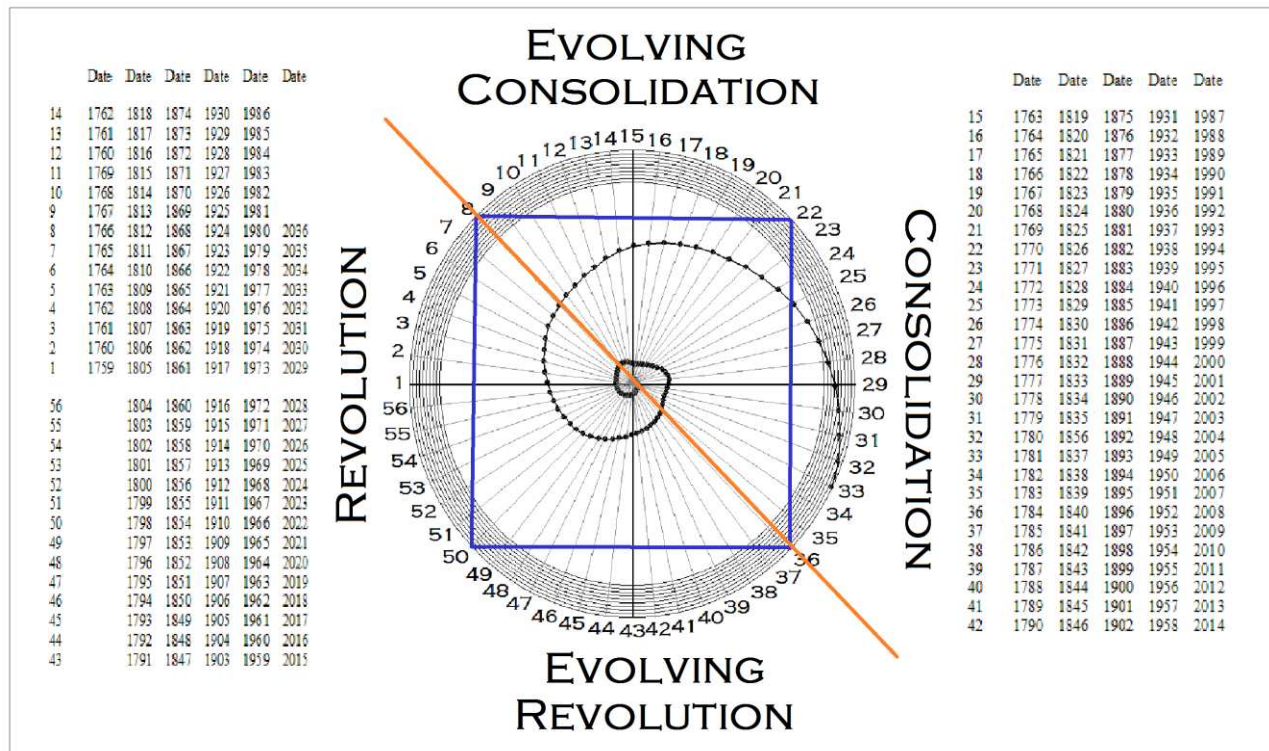
We also took the steady state rate of growth given by the quarterly data for Okun's Law as a rate for the same equation ($r = 3.4971853$) and used the spread of years for each spreadsheet for the time period ($t = \text{number of years in spreadsheet}$) of the same equation.

If the argument is valid there should be no difference between these two results. As can be seen below, proximities between these two numbers are closest at the "square analysis" of the 14-year spread (0.00259%, see Postscript Two), and become *progressively* more distant as one considers increases or decreases in the number of years in the interval between years – "the spread" – from this point.

Spread		Median Average	Future Value (Median Avg. X \$1,000,000)	Future Value ($r=3.4971853$, $t = \text{years in spread}$)	Row/Okun	Percentage Difference
7-year		1.292308	\$1,292,308	\$1,272,037	1.0159	+1.59%
8 year		1.334588	\$1,334,588	\$1,316,522	1.0137	+1.37%
9 year		1.385800	\$1,385,800	\$1,362,563	1.0170	+1.70%
10 year		1.431250	\$1,431,250	\$1,410,215	1.0149	+1.49%
11 year		1.470320	\$1,470,320	\$1,459,533	1.007390	+0.73%
12 year		1.528996	\$1,528,996	\$1,510,575	1.012194	+1.21%
13 year		1.569588	\$1,569,588	\$1,563,403	1.003956	+0.39%
14 year						
	Circle	1.618590	\$1,618,590	\$1,618,078	1.000316	+0.031%
	Column	1.618200	\$1,618,200	\$1,618,078	1.0000753	+0.00753%
	Square	1.618120	\$1,618,120	\$1,618,078	1.0000259	+0.00259%
	Phi	1.618033	\$1,618,033	\$1,618,078	- 0.0000279	- 0.00279%
15 year		1.674863	\$1,674,863	\$1,674,665	1.0001182	+0.011%
16 year		1.735887	\$1,735,887	\$1,733,231	1.0015323	+0.153%
17 year		1.796057	\$1,796,057	\$1,793,846	1.0012325	+0.123%
18 year		1.846446	\$1,846,446	\$1,856,580	- 0.00546	- 0.546%

Third Post-script. Analysis and Prediction.

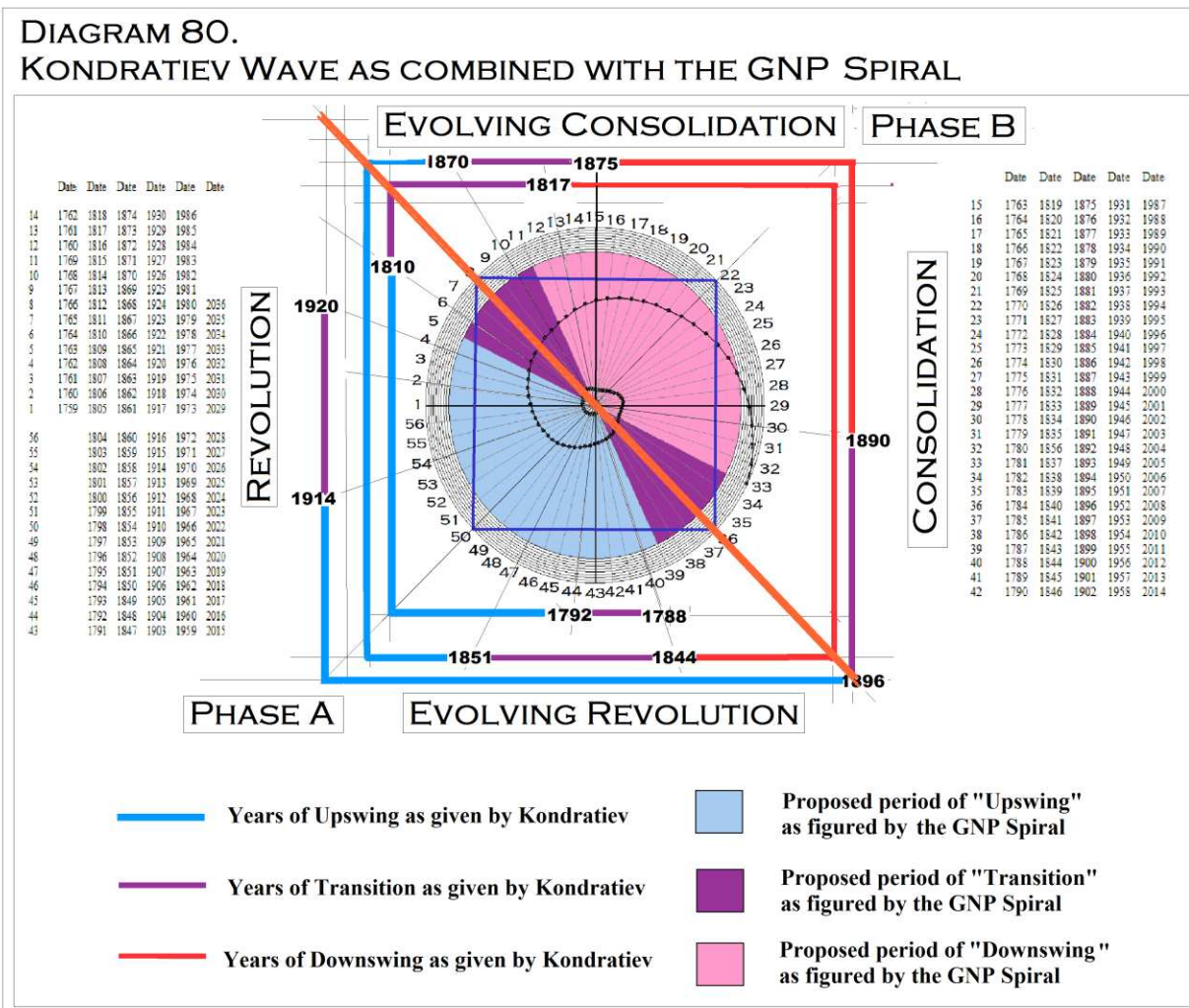
Renewed interest in the Kondratiev Wave, or Long Wave, has followed the recent global financial crisis. It is possible that the scholarship which has been generated by the Long Wave theory over the past century may be important to consider in evaluating this model and its presentation of American economic history.



Moreover the discovery of the Golden Mean at the intersection of price and productivity in the United States in a strict 56-year cycle permits us to evaluate from a more neutral and objective point of view a great deal of research on Kondratiev Waves, at least as it pertains to the American economy.

The plan of the classic Kondratiev wave can easily be superimposed upon the GNP Spiral as follows. A 22-year Phase A “upswing” period is given below by the area marked in blue, a 22-year Phase B “downswing” period is given below by the area marked in red, and two 6-year “transition periods” between these two phases are given by the area marked in purple.

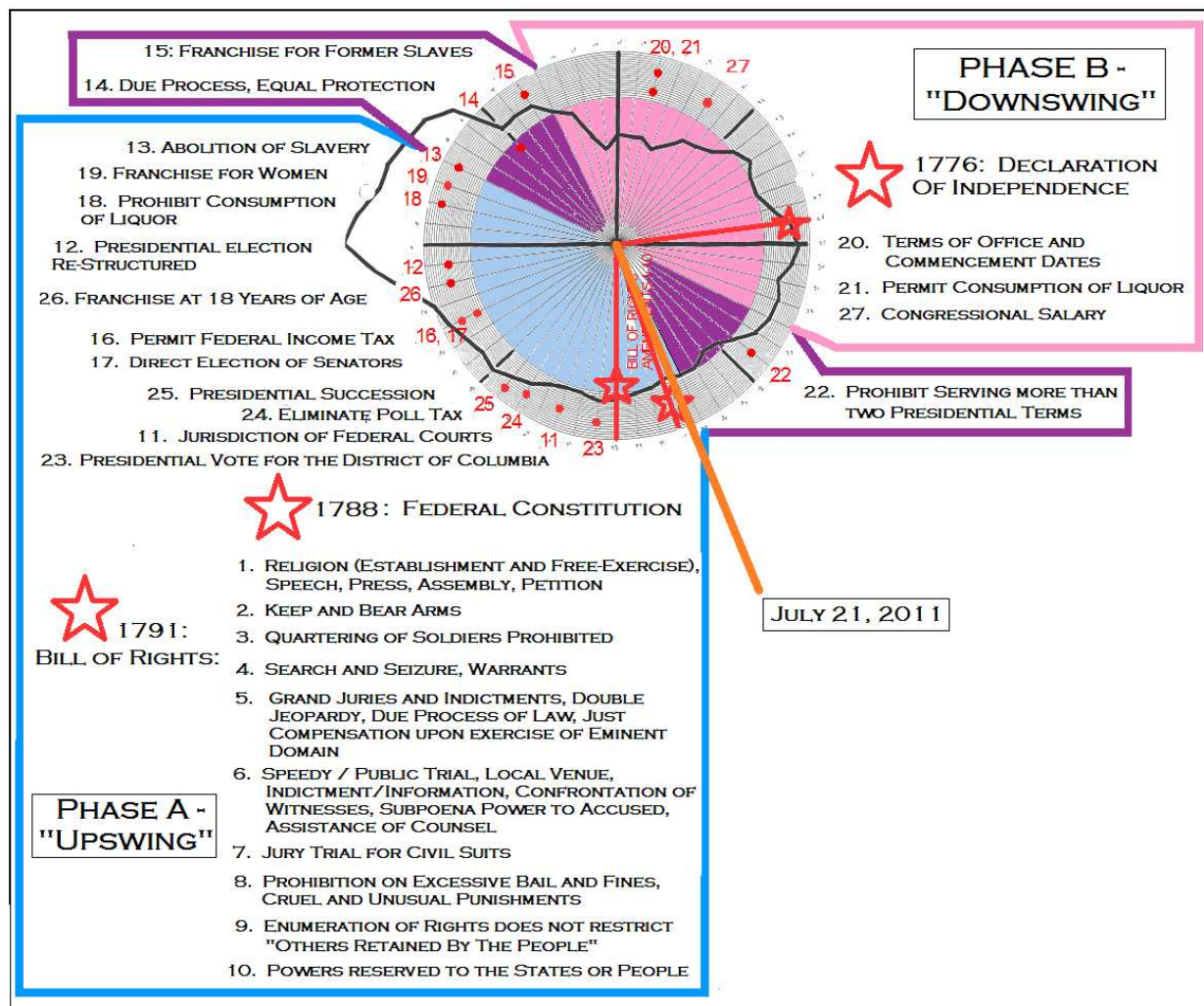
An orange line separates Phase A from Phase B, as an identical orange line in the GNP Spiral separates periods of “Evolving Revolution” and “Revolution” from “Evolving Consolidation” and “Consolidation.” Surrounding this model is a square-shaped timeline wherein the dates actually given by Kondratiev for these different periods are presented in the same color scheme for “upswing,” “downswing” and “transition.” (Korotayev and Tsirel, 2010)



The coloration of the square-shaped timeline surrounding the spiral provides the dates actually given by Kondratiev for periods of Phase A “upswing,” Phase B “downswing” and “transition” in blue, red and purple respectively.

In short the square timeline represents the Kondratiev wave as it relates to the GNP Spiral and the circular shading represents the GNP Spiral as it relates to Kondratiev wave.

When this GNP Spiral – Classic Kondratiev scheme is resolved into a pattern of inflation and Amendments to the United States Constitution, the Federal Constitution of 1788, the Bill of Rights (first ten Amendments) of 1791, and 11 additional Constitutional Amendments fall within the upswing of the phase, a total of 21 Amendments. Only 3 Amendments are found in the downswing phase, a ratio of 7:1. As noted previously, the quality of the Amendment is impacted as well. Those falling in the blue shaded area are far more fundamental to American constitutional law than those in the red shaded area. Moreover the transition periods form an interesting unit. Amendment 22, prohibiting a single individual from serving more than two presidential terms, was aimed (by Republicans) at the four elections won by (Democrat) President Roosevelt. The 13th, 14th and 15th Civil War Amendments were clearly intended to consolidate Abolitionist, Western and Northern gains against the Southern slave holding class. A la Kondratiev, “Phase A” Amendments were often the victories of hard-fought battles wherein the people of the United States did, indeed, save themselves from demise.



We can make the following predictions based upon the overall dynamics of this scheme. These are:

1. A 56-year circuit of time characterizes the growth of the United States as composed by four 14-year periods or eight seven year sub-periods. These sub-periods may be named:

- 1a. Early Evolving Revolution
- 1b. Late Evolving Revolution
- 2a. Early Revolution
- 2b. Late Revolution
- 3a. Early Evolving Consolidation
- 3b. Late Evolving Consolidation
- 4a. Early Consolidation
- 4b. Late Consolidation

2. The presence of the Golden Mean over this 56 year period permits us to estimate that the steady state rate of growth of production – that rate of production during which no change occurs in the rate of unemployment – lies within a narrow range of values between 3.4969% to 3.4995% per year, over the long term. Annualized quarterly data for Okun's Law agree with this estimate, while annual data for Okun's Law chart the steady state rate of production at 3.455%. This annual trendline and x-intercept is inconsistent with the propositions of this paper. The annualized quarterly trendline may be preferred however inasmuch as there are four times as many data points from which to figure the x-intercept for annualized quarterly data as there exist for annual data. Nevertheless the discrepancy must be acknowledged and may be interesting in its own right.

3. As society develops and changes over time, this steady state rate of growth is maintained in the face of differing rates of political activity, unemployment, production and inflation. High rates of out-of-control inflation are typical of period 2b, Late Revolution. The next period of Late Revolution and its associated out-of-control inflation may be anticipated to occur between the years 2029-2036.

4. As a consequence of the uncontrolled and high rates of inflation during periods of Late Revolution, it may be anticipated that the square described will require a balancing on the opposite side of the square. This brings about a complete meltdown of the economy toward the end of a phase of great conservatism in period 4b, Late Consolidation. This recent period of Late Consolidation and the resulting Global Financial Crisis which occurred in the closing months of 2008 may be expected to re-occur between the years 2057-2064.

5. One outcome of a period of Late Consolidation is that political activity of an increasingly revolutionary type may be expected to follow. These periods occur during the 1b and 2a stages of this model, Late Evolving Revolution and Early Revolution. In American history these periods are often ones of great internal war, social stress and Amendments to the Federal Constitution. Although the early rumbles of these expected developments may be heard today in the Arab Spring and elsewhere, these coming and more dramatically revolutionary periods will commence in 2015-2022 and strengthen considerably throughout the period 2022-2029. These developments will take on additional strength in period 2b, Late Revolution. The prolonged and sustained strain on the value system of the citizens of the United States during these periods of revolutionary change typically results in an inability to price either their own services or that of others with highly inflationary results.

6. The creativity of the legal novelties of Revolutionary periods may be expected to be balanced by the same square of tension in a period of legal suppression and oppression. These will commence at the opposite side of the square, to wit periods 3b and 4a, Late Evolving Consolidation and Early Consolidation respectively. These will occur in 2036-2043 and 2043-2050 respectively.

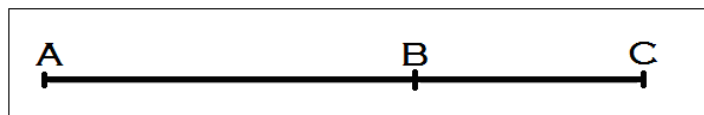
Most immediately, we are on the brink of passing from the Early Evolving Revolution to Late Evolving Revolution. This should take place in 2015.

In so far as the entire planet has demonstrated its interconnectedness with the most recent Global Meltdown, the future change taking place in 2015 may be anticipated to radically alter the very image of global life together, and with perhaps even more force.

Afterword.

Referring once again to the definition of the Golden Mean, we have:

A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the lesser.



We have proposed that “*the Golden Mean appears to tie the past (line segment BC) to the present (line segment AB) to the future (line segment AC) in a self-consistent and harmonic fashion.*” It is a mathematic statement of the historic identity of the United States itself, as moving from date to date in a coherent, repeating manner as connected to a 14-year spread between years and as nested as a quarter-cycle within a 56-year circuit of social time.”

Ultimately the GNP Spiral may suggest not simply an economic model, but a biologic one as well. Just as honeybees create hexagonal cells within a honeycomb without a conscious awareness of the geometric connections which these constructions have to mathematics, so too might American citizens create and/or associate themselves with the politics, economics, inflation rates and production necessary to ensure the harmonic continuity of their lives from one year to the next, as measured from the onset of their own reproductive identity at the age of 14.

The presentation of social sciences in this way is not an entirely new or novel concept.

E. O. Wilson (1994:328), founder of the study of sociobiology and an early researcher in the connections between the animal and human levels of biology, commented on his efforts in his autobiography as follows:

Perhaps I should have stopped at chimpanzees when I wrote the book (“*Sociology: The New Synthesis*”). Many biologists wish I had.

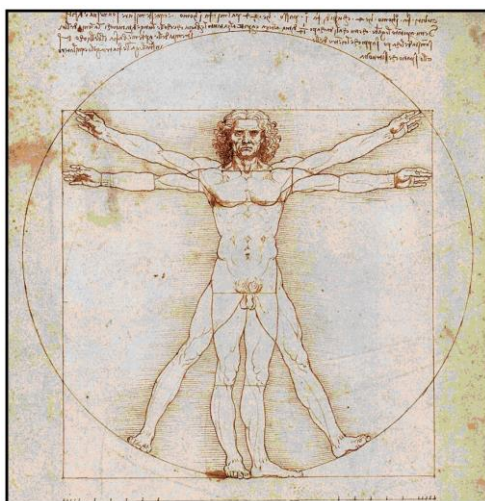
Still I did not hesitate to include *Homo sapiens* (in the study of socio-biology), because not to have done so would have been to omit a major part of biology. By reverse extension, I believed that biology must someday serve as part of the foundation of the social sciences. I saw nothing wrong with the nineteenth-century conception of the chain of disciplines, in which chemistry is obedient to but not totally subsumed by physics, biology is linked in the same way to chemistry and physics, and there is a final, similar connection between the social sciences and biology. *Homo sapiens* is after all a biological species. History did not begin 10,000 years ago in the villages of Anatolia and Jordan. It spans the 2 million years of the life of the genus *Homo*. Deep history - by which I mean biological history - made us what we are, no less than culture.

Wilson has extended these ideas into the realm of human consciousness in his book *Consilience: The Unity of Knowledge*. He states categorically (1998:8):

The greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities. The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world, but artifacts of scholarship.

If this perspective holds true, then it is at least possible that further research into the relationship between the Kondratiev Wave and the Golden Mean – a mathematic proportion of well-known biologic and botanic significance – may ultimately connect the study of economics and politics to much broader vistas of scientific interest. A recent popular article brings forward the interesting historic contrast between the circle and square analysis presented herein and the importance of the distinction between these two geometric forms in the mind of Leonardo DaVinci.

Ancient thinkers had long invested the circle and the square with symbolic powers. The circle represented the cosmic and the divine; the square, the earthly and the secular. Anyone proposing that a man could be made to fit inside both shapes was making a metaphysical proposition: The human body wasn't just designed according to the principles that governed the world; it *was* the world, in miniature. This was the theory of the microcosm, and Leonardo hitched himself to it early in his career. "By the ancients," he wrote around 1492, "man was termed a lesser world, and certainly the use of this name is well bestowed, because ... his body is an analogue for the world."³⁷



Scott Albers and Andrew Albers
March 30, 2012,
revised March 21, 2014

³⁷ Toby Lester, "The Other Man," *Smithsonian Magazine*, Washington, D.C., February 2012, p. 9. Photograph of drawing by Leonardo DaVinci "Vitruvian Man," in the public domain.

APPENDIX

This revision began as an exploration of one aspect of the paper previously written, i.e. what accounted for the strikingly negative values for the 11-year spread? Unlike all other spreads, this spread appeared to be a combination of negative waves compounding. The matter was all the more mysterious because in the “Alternative Approach” there was a striking correlation between the 11 year spread and a sudden “jump” of dissonance in the sheet.

The prior work was given to Jennifer Bain, an expert in the creation of Excel spreadsheets, and she quickly located a number of discrepancies in our spreadsheets. We discovered that the deeply negative values for the 11 year spread were the result of an incorrect spreadsheet. The question was whether the flaws in the spreadsheets would have an important impact upon the results of the original paper.

In this appendix, therefore, we outline clearly how we have proceeded in the event that the reader wishes to check our results independently.

First, and as noted in both previous versions of this paper, we have added a GNP amount for the year 1868 of 23.1. This number is not given for the year 1868 in the Historical Abstract; the Historical Abstract begins with the year 1869. The GNP for 1869 is 23.1, as found in Tab 3, and this amount is given by the Historical Abstract for the years 1869 through 1877, the next ten years.

By extending the Historical Abstract one year back in time, i.e. to 1868, we permit each of the spreadsheets a common date which seems appropriate given the significance of the 14-year spread and its best placement in the scheme.

Second, and generally speaking, if the spreadsheet runs out of data sufficient to make the last column of the spreadsheet complete, we ignore the last uncompleted column. This is a policy of considering only “Actually Complete Columns” for the data at hand.

This presents a problem in the 16 year spread and 18 year spread. In both of these spreads we are one year short of a completed final column. Because of the length of the spread, ignoring an incomplete final column puts us at the risk of ignoring 15 or 17 years of data, respectively. We wanted to compare apples to apples, prior paper to present paper, and so did not seek to amend the data set for real GNP itself. Rather, we have evaluated the result of excluding *and* including an incomplete – but *almost* complete – column.

When a spread sheet for a spread of years has a Tab which is marked “a” (i.e. Tab 13a and Tab 15a), this means that we have ignored entirely any column which is not “Actually Complete.” Even if the column has 17 out of 18 rows complete, if it has an “a” in the Tab it means that we ignored the entire last column and figured only from the basis of the “Actually Complete” columns, a policy which is applied to all other Spreadsheets. By following this policy blindly we give consistency to the approach. Nevertheless this policy results in ignoring

the final 17 data points of the 18 year spread. This is done in order to see what affect this policy will have, and at what cost.

When a spreadsheet for a spread of years has a Tab which is marked “b” (i.e. 13b and 15b) this means that there is only one year in the final column which is not complete. Because this creates an “*almost* complete column” we copy the previous year’s data into the final blank year, thereby permitting the previous year to fill in the blank of the next year. We have thereby “amended” the data so that the wealth of information in the final column is not lost. This is referred to as an “Amended Complete” column. We wanted to see what affect this policy might have on the results.

The only difference which arises as a significant point occurs in the 18 year spread as described in Tab 15a. Tab 15a figures dissonance by excluding the last incomplete column, thereby ignoring 17 years of data.

This is to be compared to Tab 15b, where the last available year in the GNP data set is duplicated into the final blank cell, and the entire column is then used to calculate dissonance.

To make the process clear:

Tab 13a (16 year spread) and Tab 15a (18 year spread) feed into Tab 19a where dissonance is figured. Tab 20a creates the chart for this version of dissonance, i.e. “Actually Complete” columns.

Tab 13b (16 year spread) and Tab 15b (19 year spread) feed into Tab 19b where dissonance is figured. Tab 20b creates the chart of this version of dissonance, i.e. “Amended Complete” columns.

Our approach, and the paper presented herein, uses the “Amended Compete” column version, i.e. we use Tabs 13b 15b, 19b and 20b in the creation of our graphs and analysis.

Comparing Tab 19b to the other answers given by the data, we have the following amounts of Claimed Dissonance. Errors in the previous paper are indicated in red. The only point of difference between Tab 19a and Tab 19b is indicated in blue.

	Tab 19b	Tab 19a	Previous Paper
7 year spread	2.38	2.38	2.33
8 year spread	1.95	1.95	2.39
9 year spread	2.36	2.36	2.41
10 year spread	3.084	3.084	2.95
11 year spread	5.165	5.165	5.165
12 year spread	5.428	5.428	5.77
13 year spread	5.55	5.55	5.55
14 year spread	2.32	2.32	2.39
15 year spread	5.77	5.77	5.77
16 year spread	5.54	5.54	5.54
17 year spread	5.40	5.40	5.40
18 year spread	4.58	5.85	4.58

TAB 0 : Table of Contents

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TAB 1: Prices – Data Set

Year	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Year	Consumer Price Index, Statistical Abstract 1997	Multiple	Consumer Price Index Historical Statistics of U.S.	Extended Series 1800-1993	7-Yr Average	Change	Change/Average
1801			50.00				
1802			43.00				
1803			45.00				
1804			45.00		45.57		
1805			45.00		45.29	-0.29	-0.006
1806			47.00		45.86	0.57	0.012
1807			44.00		46.14	0.29	0.006
1808			48.00		46.86	0.71	0.015
1809			47.00		47.71	0.86	0.018
1810			47.00		49.29	1.57	0.032
1811			50.00		52.00	2.71	0.052
1812			51.00		53.00	1.00	0.019
1813			58.00		53.57	0.57	0.011
1814			63.00		53.71	0.14	0.003
1815			55.00		53.14	-0.57	-0.011
1816			51.00		52.43	-0.71	-0.014
1817			48.00		50.14	-2.29	-0.046
1818			46.00		46.86	-3.29	-0.070
1819			46.00		44.71	-2.14	-0.048
1820			42.00		42.57	-2.14	-0.050
1821			40.00		40.43	-2.14	-0.053
1822			40.00		38.71	-1.71	-0.044
1823			36.00		37.00	-1.71	-0.046
1824			33.00		35.86	-1.14	-0.032
1825			34.00		34.86	-1.00	-0.029
1826			34.00		33.71	-1.14	-0.034
1827			34.00		33.14	-0.57	-0.017
1828			33.00		33.00	-0.14	-0.004
1829			32.00		32.43	-0.57	-0.018
1830			32.00		31.71	-0.71	-0.023
1831			32.00		31.14	-0.57	-0.018
1832			30.00		30.86	-0.29	-0.009
1833			29.00		31.00	0.14	0.005
1834			30.00		31.29	0.29	0.009
1835			31.00		31.29	0.00	0.000
1836			33.00		31.57	0.29	0.009
1837			34.00		31.71	0.14	0.005
1838			32.00		31.86	0.14	0.004
1839			32.00		31.57	-0.29	-0.009
1840			30.00		30.86	-0.71	-0.023
1841			31.00		31.00	-0.86	-0.029
1842			29.00		29.43	-0.57	-0.019
1843			28.00		28.71	-0.71	-0.025
1844			28.00		28.43	-0.29	-0.010
1845			28.00		27.71	-0.71	-0.026
1846			27.00		27.14	-0.57	-0.021
1847			28.00		26.71	-0.43	-0.016
1848			26.00		26.29	-0.43	-0.016
1849			25.00		25.86	-0.43	-0.017
1850			25.00		25.57	-0.29	-0.011
1851			25.00		25.43	-0.14	-0.006
1852			25.00		25.71	0.29	0.011
1853			25.00		26.00	0.29	0.011
1854			27.00		26.43	0.43	0.016
1855			28.00		26.57	0.14	0.005
1856			27.00		26.86	0.29	0.011
1857			28.00		27.14	0.29	0.011
1858			26.00		27.14	0.00	0.000
1859			27.00		27.43	0.29	0.010
1860			27.00		28.86	1.43	0.050
1861			27.00		31.57	2.71	0.086
1862			30.00		34.43	2.86	0.083
1863			37.00		36.86	-2.43	-0.066
1864			47.00		39.00	-2.14	-0.055
1865			46.00		40.86	1.86	0.043
1866			44.00		42.29	1.43	0.034
1867			42.00		42.43	0.14	0.003
1868			40.00		40.86	-1.57	-0.038
1869			40.00		39.43	-1.43	-0.036
1870			38.00		38.29	-1.14	-0.030
1871			36.00		37.14	-1.14	-0.031
1872			36.00		36.14	-1.00	-0.028
1873			36.00		35.00	-1.14	-0.033
1874			34.00		34.14	-0.86	-0.025
1875			33.00		33.14	-1.00	-0.030
1876			32.00		32.00	-1.14	-0.034
1877			32.00		31.00	-1.00	-0.032
1878			29.00		30.29	-0.71	-0.024
1879			28.00		29.71	-0.57	-0.019
1880			29.00		29.14	-0.57	-0.020
1881			29.00		28.43	-0.71	-0.025
1882			29.00		28.14	-0.29	-0.010
1883			28.00		28.00	-0.14	-0.005
1884			27.00		27.71	-0.29	-0.010
1885			27.00		27.43	-0.29	-0.010
1886			27.00		27.14	-0.29	-0.011
1887			27.00		27.00	-0.14	-0.005
1888			27.00		27.00	0.00	0.000
1889			27.00		27.00	0.00	0.000
1890			27.00		27.00	0.00	0.000
1891			27.00		26.86	-0.14	-0.005
1892			27.00		26.57	-0.29	-0.011
1893			27.00		26.29	-0.29	-0.011
1894			26.00		26.00	-0.29	-0.011
1895			25.00		25.71	-0.29	-0.011
1896			25.00		25.43	-0.29	-0.011
1897			25.00		25.14	-0.29	-0.011
1898			25.00		25.00	-0.14	-0.006
1899			25.00		25.14	0.14	0.006

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Year	Consumer Price Index, Statistical Abstract 1997	Multiple	Consumer Price Index Historical Statistics of U.S.	Extended Series 1800-1993	7-Yr Average	Change	Change/Average
1894			26.00	26.00	26.00	-0.29	-0.011
1895			25.00	25.00	25.71	-0.29	-0.011
1896			25.00	25.00	25.43	-0.29	-0.011
1897			25.00	25.00	25.14	-0.29	-0.011
1898			25.00	25.00	25.00	-0.14	-0.006
1899			25.00	25.00	25.14	0.14	0.006
1900			25.00	25.00	25.43	0.29	0.011
1901			25.00	25.00	25.71	0.29	0.011
1902			26.00	26.00	26.00	0.29	0.011
1903			27.00	27.00	26.29	0.29	0.011
1904			27.00	27.00	26.71	0.43	0.016
1905			27.00	27.00	27.00	0.29	0.011
1906			27.00	27.00	27.14	0.14	0.005
1907			28.00	28.00	27.29	0.14	0.005
1908			27.00	27.00	27.43	0.14	0.005
1909			27.00	27.00	27.71	0.29	0.010
1910			28.00	28.00	28.10	0.39	0.014
1911			28.00	28.00	28.40	0.30	0.011
1912			29.00	29.00	28.89	0.49	0.017
1913			29.70	29.70	29.70	0.81	0.027
1914			30.10	30.10	31.19	1.49	0.048
1915			30.40	30.40	33.63	2.44	0.072
1916			32.70	32.70	36.89	3.26	0.088
1917			38.40	38.40	41.21	4.33	0.105
1918			45.10	45.10	44.57	3.36	0.075
1919			51.80	51.80	47.40	2.83	0.060
1920			60.00	60.00	50.03	2.63	0.053
1921			53.60	53.60	51.86	1.83	0.035
1922			50.20	50.20	52.91	1.06	0.026
1923			51.10	51.10	53.09	0.17	0.003
1924			51.20	51.20	51.94	-1.14	-0.022
1925			52.50	52.50	51.61	-0.33	-0.006
1926			53.00	53.00	51.77	0.16	0.003
1927			52.00	52.00	51.61	-0.16	-0.003
1928			51.30	51.30	50.81	-0.80	-0.016
1929			51.30	51.30	49.16	-1.66	-0.034
1930			50.00	50.00	47.13	-2.03	-0.043
1931			45.60	45.60	45.43	-1.70	-0.037
1932			40.90	40.90	43.97	-1.46	-0.033
1933			38.80	38.80	42.57	-1.40	-0.033
1934			40.10	40.10	41.57	-1.00	-0.024
1935			41.10	41.10	41.11	-0.46	-0.011
1936			41.50	41.50	41.21	0.10	0.002
1937			43.00	43.00	41.67	0.46	0.011
1938			42.40	42.40	42.24	0.57	0.014
1939			41.60	41.60	43.34	1.10	0.025
1940			42.00	42.00	44.81	1.47	0.033
1941			44.10	44.10	46.20	1.39	0.030
1942			48.80	48.80	47.84	1.64	0.034
1943			51.80	51.80	50.26	2.41	0.048
1944			52.70	52.70	53.81	3.56	0.066
1945			53.90	53.90	57.81	4.00	0.069
1946			58.50	58.50	61.04	3.23	0.053
1947			66.90	66.90	63.94	2.90	0.045
1948			72.10	72.10	67.53	3.59	0.053
1949			71.40	71.40	71.19	3.66	0.051
1950			72.10	72.10	74.27	3.09	0.042
1951			77.80	77.80	76.21	1.94	0.025
1952			79.50	79.50	77.37	1.16	0.015
1953			80.10	80.10	78.80	1.43	0.018
1954			80.50	80.50	80.54	1.74	0.022
1955			80.20	80.20	81.80	1.26	0.015
1956			81.40	81.40	82.91	1.11	0.013
1957			84.30	84.30	84.14	1.23	0.015
1958			86.60	86.60	85.44	1.30	0.015
1959			87.30	87.30	86.93	1.49	0.017
1960	29.60	2.99	88.70	88.70	88.40	1.47	0.017
1961	29.90	2.99	89.60	89.60	89.63	1.23	0.014
1962	30.20	3.00	90.60	90.60	90.76	1.13	0.012
1963	30.60	2.99	91.70	91.70	92.17	1.41	0.015
1964	31.00	2.99	92.90	92.90	93.79	1.61	0.017
1965	31.50	3.00	94.50	94.50	95.87	2.09	0.022
1966	32.40	3.00	97.20	97.20	98.61	2.74	0.028
1967	33.40	2.99	100.00	100.00	102.13	3.51	0.034
1968	34.80	2.99	104.20	104.20	106.21	4.09	0.038
1969	36.70	2.99	109.80	109.80	110.63	4.41	0.040
1970	38.80	2.99	116.30	116.30	115.77	5.14	0.044
1971	40.50	3.00	121.50	121.50	122.61	6.84	0.056
1972	41.80	3.00	125.40	125.40	130.79	8.17	0.062
1973	44.40	3.00	133.20	133.20	139.49	8.70	0.062
1974	49.30	3.00	147.90	147.90	148.84	9.36	0.063
1975	53.80	3.00	161.40	161.40	159.43	10.59	0.066
1976	56.90	3.00	170.70	170.70	172.63	13.20	0.078
1977	60.60	3.00	181.80	181.80	188.91	16.29	0.086
1978	65.20	3.00	195.60	195.60	206.74	17.83	0.086
1979	72.60	3.00	217.80	217.80	225.04	18.30	0.087
1980	82.40	3.00	247.20	247.20	243.34	18.30	0.079
1981	90.90	3.00	272.70	272.70	261.90	18.56	0.071
1982	96.50	3.00	289.50	289.50	280.07	18.17	0.065
1983	99.50	3.00	298.80	298.80	295.93	15.86	0.054
1984	103.90	3.00	311.70	311.70	309.30	13.37	0.043
1985	107.60	3.00	322.80	322.80	321.04	11.74	0.037
1986	109.60	3.00	328.80	328.80	332.83	11.79	0.035
1987	113.60	3.00	340.80	340.80	346.16	13.33	0.039
1988	118.30	3.00	354.90	354.90	360.00	13.84	0.038
1989	124.00	3.00	372.00	372.00	374.01	14.01	0.037
1990	130.70	3.00	392.10	392.10	388.97	14.96	0.038
1991	136.20	3.00	408.60	408.60			
1992	140.30	3.00	420.90	420.90			
1993	144.50	3.00	433.90	433.90			

TAB 2: Prices – 56 Year Cycle

		Col. 1		Col. 2		Col. 3		Col. 4		Col. 5	Col. 6.
	Axis	Year		Year		Year		Year		Average %	Cumulative %
Revolution	1	1805	-0.63%	1861	8.60%	1917	10.50%	1973	6.24%	6.1765%	24.71%
	2	1806	1.25%	1862	8.30%	1918	7.53%	1974	6.29%	5.8409%	23.36%
	3	1807	0.62%	1863	6.59%	1919	5.97%	1975	6.64%	4.9539%	19.82%
	4	1808	1.52%	1864	5.49%	1920	5.25%	1976	7.65%	4.9799%	19.92%
	5	1809	1.80%	1865	4.55%	1921	3.53%	1977	8.62%	4.6222%	18.49%
	6	1810	3.19%	1866	3.38%	1922	2.00%	1978	8.62%	4.2970%	17.19%
	7	1811	5.22%	1867	0.34%	1923	0.32%	1979	8.13%	3.5028%	14.01%
Evolving	8	1812	1.89%	1868	-3.85%	1924	-2.20%	1980	7.52%	0.8402%	3.36%
Consolidation	9	1813	1.07%	1869	-3.62%	1925	-0.64%	1981	7.09%	0.9731%	3.89%
	10	1814	0.27%	1870	-2.99%	1926	0.30%	1982	6.49%	1.0181%	4.07%
	11	1815	-1.08%	1871	-3.08%	1927	-0.30%	1983	5.36%	0.2254%	0.90%
	12	1816	-1.36%	1872	-2.77%	1928	-1.57%	1984	4.32%	-0.3451%	-1.38%
	13	1817	-4.56%	1873	-3.27%	1929	-3.37%	1985	3.66%	-1.8843%	-7.54%
	14	1818	-7.01%	1874	-2.51%	1930	-4.30%	1986	3.54%	-2.5715%	-10.29%
	15	1819	-4.79%	1875	-3.02%	1931	-3.74%	1987	3.85%	-1.9253%	-7.70%
	16	1820	-5.03%	1876	-3.57%	1932	-3.31%	1988	3.85%	-2.0184%	-8.07%
	17	1821	-5.30%	1877	-3.23%	1933	-3.29%	1989	3.75%	-2.0169%	-8.07%
	18	1822	-4.43%	1878	-2.36%	1934	-2.41%	1990		-3.0640%	-9.19%
	19	1823	-4.63%	1879	-1.92%	1935	-1.11%	1991		-2.5561%	-7.67%
	20	1824	-3.19%	1880	-1.96%	1936	0.24%	1992		-1.6351%	-4.91%
	21	1825	-2.87%	1881	-2.51%	1937	1.10%	1993		-1.4281%	-4.28%
Consolidation	22	1826	-3.39%	1882	-1.02%	1938	1.35%	1994		-1.0174%	-3.05%
	23	1827	-1.72%	1883	-0.51%	1939	2.54%	1995		0.1012%	0.30%
	24	1828	-0.43%	1884	-1.03%	1940	3.28%	1996		0.6065%	1.82%
	25	1829	-1.76%	1885	-1.04%	1941	3.00%	1997		0.0652%	0.20%
	26	1830	-2.25%	1886	-1.05%	1942	3.43%	1998		0.0430%	0.13%
	27	1831	-1.83%	1887	-0.53%	1943	4.80%	1999		0.8133%	2.44%
	28	1832	-0.93%	1888	0.00%	1944	6.61%	2000		1.8947%	5.68%
	29	1833	0.46%	1889	0.00%	1945	6.92%	2001		2.4598%	7.38%
	30	1834	0.91%	1890	0.00%	1946	5.29%	2002		2.0674%	6.20%
	31	1835	0.00%	1891	-0.53%	1947	4.54%	2003		1.3345%	4.00%
	32	1836	0.90%	1892	-1.08%	1948	5.31%	2004		1.7132%	5.14%
	33	1837	0.45%	1893	-1.09%	1949	5.14%	2005		1.5003%	4.50%
	34	1838	0.45%	1894	-1.10%	1950	4.15%	2006		1.1681%	3.50%
	35	1839	-0.90%	1895	-1.11%	1951	2.55%	2007		0.1777%	0.53%
Evolving	36	1840	-2.31%	1896	-1.12%	1952	1.50%	2008		-0.6476%	-1.94%
Revolution	37	1841	-2.86%	1897	-1.14%	1953	1.81%	2009		-0.7269%	-2.18%
	38	1842	-1.94%	1898	-0.57%	1954	2.16%	2010		-0.1164%	-0.35%
	39	1843	-2.49%	1899	0.57%	1955	1.54%	2011		-0.1275%	-0.38%
	40	1844	-1.01%	1900	1.12%	1956	1.34%	2012		0.4875%	1.46%
	41	1845	-2.58%	1901	1.11%	1957	1.46%	2013		-0.0020%	-0.01%
	42	1846	-2.11%	1902	1.10%	1958	1.52%	2014		0.1717%	0.52%
	43	1847	-1.60%	1903	1.09%	1959	1.71%	2015		0.3973%	1.19%
	44	1848	-1.63%	1904	1.60%	1960	1.66%	2016		0.5461%	1.64%
	45	1849	-1.66%	1905	1.06%	1961	1.37%	2017		0.2572%	0.77%
	46	1850	-1.12%	1906	0.53%	1962	1.24%	2018		0.2175%	0.65%
	47	1851	-0.56%	1907	0.52%	1963	1.53%	2019		0.4987%	1.50%
	48	1852	1.11%	1908	0.52%	1964	1.72%	2020		1.1177%	3.35%
	49	1853	1.10%	1909	1.03%	1965	2.18%	2021		1.4351%	4.31%
Revolution	50	1854	1.62%	1910	1.37%	1966	2.78%	2022		1.9252%	5.78%
	51	1855	0.54%	1911	1.06%	1967	3.44%	2023		1.6783%	5.04%
	52	1856	1.06%	1912	1.68%	1968	3.85%	2024		2.1973%	6.59%
	53	1857	1.05%	1913	2.74%	1969	3.99%	2025		2.5948%	7.78%
	54	1858	0.00%	1914	4.76%	1970	4.44%	2026		3.0688%	9.21%
	55	1859	1.04%	1915	7.26%	1971	5.58%	2027		4.6289%	13.89%
	56	1860	4.95%	1916	8.83%	1972	6.25%	2028		6.6763%	20.03%

TAB 3: GNP[illegible]

TAB 4: 7 Year Spread

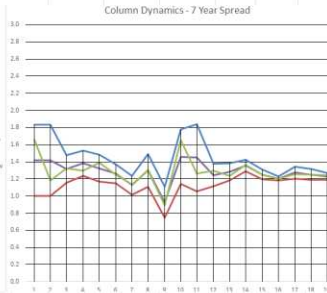
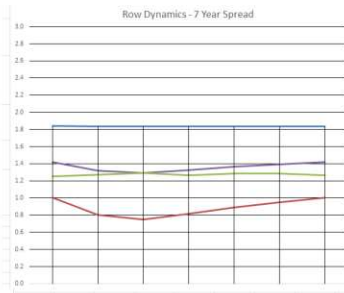
7 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		1	2	3	4	5	6	7	8	9	10	11	12
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1875	23.1000	1882	42.4000	1889	49.1000	1896	61.3000	1903	90.8000	1910	120.1000
14	Ratio	1.000000		1.835497813		1.504039884		1.288472200		1.483178666		1.320877225	
2	Year	1876	23.1000	1883	42.4000	1890	52.7000	1897	67.1000	1904	89.7000	1911	123.2000
14	Ratio	1.000000		1.835497813		1.307934918		1.098931973		1.370487115		1.310342881	
3	Year	1877	23.1000	1884	42.4000	1891	55.1000	1898	68.6000	1905	96.3000	1912	130.2000
14	Ratio	1.000000		1.835497813		1.209126392		1.045090716		1.401790857		1.353024922	
4	Year	1878	23.1000	1885	42.4000	1892	60.4000	1899	74.8000	1906	107.5000	1913	131.4000
14	Ratio	1.000000		1.835497813		1.423523362		1.108410394		1.222323581		1.065496111	
5	Year	1879	23.1000	1886	42.4000	1893	57.5000	1900	70.9000	1907	109.2000	1914	125.6000
14	Ratio	1.000000		1.835497813		1.356313075		1.137991394		1.400000000		1.057915504	
6	Year	1880	23.1000	1887	42.4000	1894	55.9000	1901	85.7000	1908	109.2000	1915	124.5000
14	Ratio	1.000000		1.835497813		1.356313075		1.137991394		1.400000000		1.057915504	
7	Year	1881	23.1000	1888	42.4000	1895	62.6000	1902	86.5000	1909	114.8000	1916	116.8000
14	Ratio	1.000000		1.835497813		1.478425994		1.181789111		1.352399617		1.109848411	
A	Minimum Ratio of Column		1.835497813		1.835497813		1.478425994		1.533994811		1.481239866		1.375467111
B	Maximum Ratio of Column		1.835497813		1.835497813		1.478425994		1.533994811		1.481239866		1.375467111
C	Spread		0.000000000		0.000000000		0.000000000		0.000000000		0.000000000		0.000000000
D	Mid-Range Ratio of Column		1.835497813		1.835497813		1.517236981		1.388712704		1.325117310		1.261821111
E	Median Ratio of Column		1.835497813		1.835497813		1.517236981		1.388712704		1.325117310		1.261821111
F	Average Ratio of Column		1.835497813		1.835497813		1.517236981		1.388712704		1.325117310		1.261821111
G	Median Average		1.835497813		1.835497813		1.517236981		1.388712704		1.325117310		1.261821111

		13	14	15	16	17	18	19	20		A	B	C	D	E	F	G
											Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid- Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average
1	Year	1919	475.9000	1966	658.1000	1973	839.4187	1980	996.8339	1987	1256.1828	1994	1514.3943	2001	1925.1796	2008	2198.6293
	Ratio	1.204951818	1.182903154	1.275317702	1.187239950	1.187239950	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818
2	Year	1920	487.7000	1967	675.2000	1974	821.7403	1981	1010.8394	1988	1303.1774	1995	1546.7308	2002	1957.1959	2009	2208.7984
	Ratio	1.3103	1.4122	1.4602	1.4871	1.5067	1.5213	1.5361	1.5513	1.5661	1.5813	1.5961	1.6113	1.6261	1.6413	1.6561	1.6713
3	Year	1921	487.2000	1968	706.6000	1975	845.0778	1982	995.1411	1989	1340.5634	1996	1615.0033	2003	2036.0677	2010	2270.9017
	Ratio	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444	1.184444444
4	Year	1922	525.5000	1969	725.6000	1976	879.3138	1983	1072.5727	1990	1351.3622	1997	1681.8768	2004	2053.6410	2011	2351.0247
	Ratio	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216	1.216216216
5	Year	1923	551.0000	1970	722.5000	1977	822.6690	1984	1129.4464	1991	1360.3512	1998	1694.5136	2005	2151.0247	2012	2407.0000
	Ratio	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111	1.208910111
6	Year	1924	581.0000	1971	751.2000	1978	985.8821	1985	1174.0716	1992	1418.0149	1999	1854.0672	2006	2201.9893	2013	2500.0000
	Ratio	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818	1.204951818
7	Year	1925	617.8000	1972	803.4814	1979	1001.7304	1986	1203.2684	1993	1454.1409	2000	1911.3209	2007	2272.2613	2014	2500.0000
	Ratio	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495	1.581179495
A	Maximum Ratio of Column		1.581179495	1.421138484	1.310300000	1.204951818	1.184444444	1.164444444	1.144444444	1.124444444	1.104444444	1.084444444	1.064444444	1.044444444	1.024444444	1.004444444	0.984444444
B	Minimum Ratio of Column		1.581179495	1.287294274	1.191177273	1.103000000	1.024444444	0.944444444	0.864444444	0.784444444	0.704444444	0.624444444	0.544444444	0.464444444	0.384444444	0.304444444	0.224444444
C	Spread		0.293978146	0.138609909	0.119151515	0.080977778	0.060000000	0.040000000	0.020000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
D	Mid-Range Ratio of Column		1.20189672	1.34843694	1.52777944	1.70543718	1.77951569	1.20540513	1.27951569	1.20540513	1.27951569	1.20540513	1.27951569	1.20540513	1.27951569	1.20540513	1.27951569
E	Median Ratio of Column		1.22832622	1.37034989	1.54677510	1.70118981	1.77950975	1.24457639	1.24458002	1.24458002	1.24458002	1.24458002	1.24458002	1.24458002	1.24458002	1.24458002	1.24458002
F	Average Ratio of Column		1.26250518	1.35190783	1.54767639	1.70484185	1.77330096	1.25160527	1.25160527	1.25160527	1.25160527	1.25160527	1.25160527	1.25160527	1.25160527	1.25160527	1.25160527
G	Median Average		1.23436376	1.36112809	1.54720674	1.70302023	1.76880133	1.24891738	1.24891738	1.24891738	1.24891738	1.24891738	1.24891738	1.24891738	1.24891738	1.24891738	1.24891738

Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average / 2	Median + Average / 2
1.288935	1.278805	1.287835	1.286312	1.284979	1.284849	1.284849

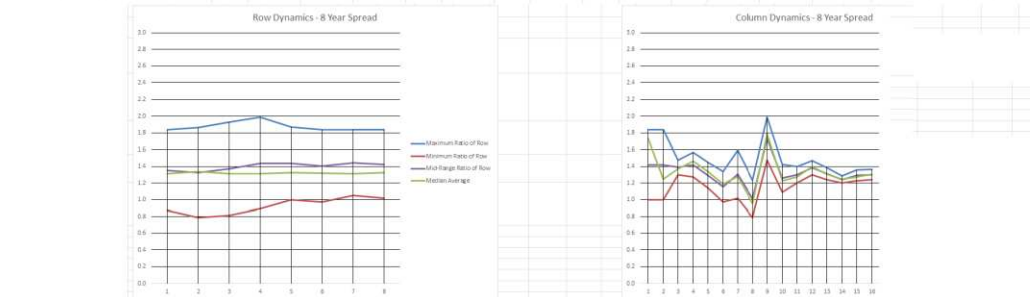
Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Mid-Range + Average / 2	Median + Average / 2
1.508263	0.908888	1.253674	1.271700	1.284979	1.268016	1.271644



TAB 5: 8 Year Spread

8 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																							
	1		2		3		4		5		6		7		8		9		10		11		
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP			
1	Year	1876	21.1000	1884	42.4000	1892	66.4000	1900	76.9000	1908	100.2000	1916	134.4000	1924	165.5000	1932	144.2000	1940	227.2000	1948	321.7000	1956	446.1000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
2	Year	1877	21.1000	1885	42.4000	1893	57.5000	1901	85.7000	1909	116.8000	1917	135.2000	1925	179.4000	1933	141.3000	1941	263.7000	1949	324.1000	1957	452.5000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
3	Year	1878	42.4000	1886	42.4000	1894	55.9000	1902	86.5000	1910	120.1000	1918	151.8000	1926	190.0000	1934	154.3000	1942	297.8000	1950	355.3000	1958	447.0000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
4	Year	1879	42.4000	1887	42.4000	1895	62.6000	1903	90.8000	1911	123.2000	1919	146.4000	1927	189.9000	1935	169.5000	1943	317.1000	1951	383.4000	1959	475.9000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
5	Year	1880	42.4000	1888	42.4000	1896	61.3000	1904	89.7000	1912	130.2000	1920	140.0000	1928	195.5000	1936	155.0000	1944	303.0000	1952	395.1000	1960	487.7000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
6	Year	1881	42.4000	1889	48.1000	1897	67.1000	1905	96.3000	1913	131.4000	1921	127.8000	1929	203.6000	1937	203.2000	1945	355.2000	1953	412.8000	1961	497.2000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
7	Year	1882	42.4000	1890	52.7000	1898	68.0000	1906	107.5000	1914	125.6000	1922	148.0000	1930	181.5000	1938	192.0000	1946	312.4000	1954	407.0000	1962	529.5000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
8	Year	1883	42.4000	1891	53.1000	1899	74.8000	1907	109.2000	1915	124.5000	1923	165.5000	1931	189.3000	1939	209.4000	1947	309.9000	1955	418.0000	1963	551.0000
	Ratio	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
A	Maximum Ratio of Columns	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
B	Minimum Ratio of Columns	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
C	Spread	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	
D	Mid-Range Ratio of Columns	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
E	Median Ratio of Columns	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
F	Average Ratio of Columns	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	
G	Median Average	1.73105609	1.24851250	1.17743748	1.46012200	1.03847077	1.18929267	1.23625250	0.95111725	1.70920358	1.22779784	1.27725058	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	1.00000000	
Average	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	1.83497913	

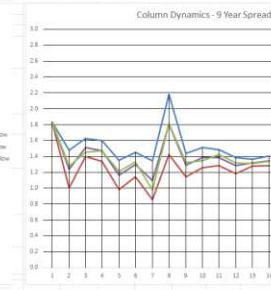
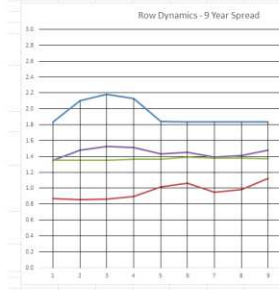
	13		14		15		16		17		A		B		C		D		E		F		G	
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1964	581.1000	1972	801.4814	1980	996.3500	1988	1081.1774	1996	1815.0513	2004	2091.4802											
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730											
2	Year	1965	617.8100	1973	861.8118	1981	1070.3700	1989	1340.5414	1997	1861.2616	2005	2015.5247											
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730											
3	Year	1966	658.1000	1974	821.7602	1982	995.3411	1990	1251.1822	1998	1764.5730	2006	2261.9897											
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730											
4	Year	1967	677.2000	1975	864.0778	1983	1072.5752	1991	1360.9512	1999	1854.0922	2007	2272.2615											
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730											
5	Year	1968	706.8000	1976	879.1118	1984	1125.4466	1992	1434.0141	2000	1911.1209	2008	2398.6297											
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730											
6	Year	1969	725.6000	1977	922.6698	1985	1114.6716	1993	1454.1429	2001	1925.1794	2009	2388.7984											
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730											
7	Year	1970	722.5000	1978	898.8821	1986	1201.2844	1994	1534.3943	2002	1957.1559													
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730														
8	Year	1971	751.2000	1979	801.7504	1987	1256.1826	1995	1546.7508	2003	2036.6707													
	Ratio	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730	1.30527730														
A	Maximum Ratio of Columns	1.47172707	1.38209413	1.29441885	1.37597694	1.36799618	1.36799618	1.36799618	1.36799618	1.36799618														
B	Minimum Ratio of Columns	1.30527730	1.24441939	1.29241488	1.23215495	1.23215495	1.23215495	1.23215495	1.23215495	1.23215495														
C	Spread	0.16644975	0.13866555	0.08824295	0.13584093	0.13584093	0.13584093	0.13584093	0.13584093	0.13584093														
D	Mid-Range Ratio of Columns	1.38849160	1.31321665	1.24431083	1.29462747	1.30110891																		
E	Median Ratio of Columns	1.38040640	1.30256258	1.24373158	1.26343760	1.31253768																		
F	Average Ratio of Columns	1.39945215	1.30805791	1.24494125	1.28845855	1.30454855																		
G	Median																							



TAB 6: 9 Year Spread

9 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																					
	1	2	3	4	5	6	7	8	9	10											
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	
1	Year	1878	42,4000	1887	42,4000	1896	61,3000	1905	96,3000	1914	125,6000	1923	185,9000	1932	144,2000	1941	263,7000	1950	355,3000	1959	479,9000
1	Ratio	1.810487910			1.406754711		1.578963648		1.904597524		1.530898151		0.889186311		1.638719312		1.547846443		1.194814460		
2	Year	1879	42,4000	1888	42,4000	1897	67,1000	1906	107,3000	1915	124,5000	1924	185,9000	1933	141,5000	1942	297,8000	1951	383,4000	1960	487,7000
2	Ratio	1.810487910			1.582547111		1.680896443		1.155139353		1.126172725		0.634848495		1.104593935		1.048474120		1.277098431		
3	Year	1880	42,4000	1889	49,1000	1898	68,6000	1907	109,2000	1916	134,4000	1925	179,4000	1934	154,3000	1943	337,1000	1952	395,1000	1961	497,2000
3	Ratio	1.810487910		1.155010889	1.197148611		1.593480073		1.259790313		1.334823443		0.800891616		1.044790311		1.172203711		1.284835593		
4	Year	1881	42,4000	1890	52,7000	1899	74,9000	1908	109,2000	1917	135,2000	1926	190,0000	1935	189,5000	1944	381,8000	1953	412,8000	1962	529,5000
4	Ratio	1.810487910		1.242924910	1.437934611		1.339377031		1.349381897		1.405329448		0.893392611		2.133394942		1.405490003		1.387394848		
5	Year	1882	42,4000	1891	55,1000	1900	76,9000	1909	118,8000	1918	151,8000	1927	189,5000	1936	193,0000	1945	355,2000	1954	407,0000	1963	551,0000
5	Ratio	1.810487910		1.299519101	1.395044311		1.318890511		1.299527248		1.250892111		1.103318111		1.405490003		1.398931111		1.538931111		
6	Year	1883	42,4000	1892	60,4000	1901	85,7000	1910	120,3000	1919	146,4000	1928	190,9000	1937	203,2000	1946	312,8000	1955	418,0000	1964	581,1000
6	Ratio	1.810487910		1.424312101	1.491786111		1.474861111		1.219848111		1.370948111		1.309612101		1.564812101		1.538931111		1.603121011		
7	Year	1884	42,4000	1893	57,5000	1902	86,5000	1911	123,2000	1920	140,0000	1929	203,6000	1938	312,8000	1947	309,9000	1956	446,1000	1965	617,8000
7	Ratio	1.810487910		1.370412101	1.564812101		1.474861111		1.134848111		1.348481111		1.405490003		1.604812101		1.405490003		1.604812101		
8	Year	1885	42,4000	1894	55,9000	1903	90,8000	1912	130,2000	1921	127,8000	1930	183,5000	1939	209,4000	1948	323,7000	1957	452,5000	1966	658,1000
8	Ratio	1.810487910		1.310487910	1.559487910		1.474861111		1.103318111		1.103318111		1.103318111		1.103318111		1.103318111		1.103318111		
9	Year	1886	42,4000	1895	62,6000	1904	89,9000	1913	131,4000	1922	148,0000	1931	209,9000	1940	227,2000	1949	324,1000	1958	447,8000	1967	675,2000
9	Ratio	1.810487910		1.474861111	1.474861111		1.474861111		1.474861111		1.474861111		1.474861111		1.474861111		1.474861111		1.474861111		
A	Maximum Ratio of Columns	1.810487910		1.474861111	1.624192101		1.603894111		1.348481111		1.454821011		1.348481111		2.044790311		1.454821011		1.509921011		
B	Minimum Ratio of Columns	1.810487910		1.000000000	1.385644311		1.285722111		0.907566011		1.348481111		0.954848495		1.436486711		1.542486711		1.284835593		
C	Spread	0.000000000		0.474861111	0.228486711		0.262124348		0.367734317		0.310987910		0.489312101		0.784208443		0.286053911		0.215828443		
D	Mid-Range Ratio of Columns	1.810487910		1.230275747	1.589996711		1.478821011		1.165444108		1.299333111		1.198496711		1.804027911		1.281037101		1.381918521		
E	Median Ratio of Columns	1.810487910		1.299528101	1.432907101		1.464821011		1.218984101		1.529172201		0.947449711		1.638719312		1.167394421		1.394413441		
F	Average Ratio of Columns	1.810487910		1.212882000	1.468397711		1.481088111		1.209598311		0.912039871		0.988833111		1.008801141		1.181448871		1.314494101		
G	Median Average	1.810487910		1.276205411	1.450486711		1.478964211		1.209780311		1.300761711		0.975040711		1.614757611		1.334451441		1.346861811		

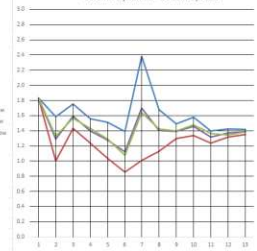
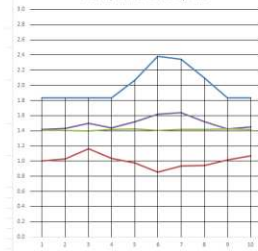
	11	12	13	14	15	A	B	C	D	E	F	G
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1968	798,8000	1977	922,6000	1986	1203,2000	1995	1548,7000	2004	2093,6818	
1	Ratio	1.684793910		1.160100000	1.160100000		1.160100000		1.160100000		1.160100000	
2	Year	1969	729,0000	1978	985,8612	1987	1256,1436	1996	1615,0633	2005	2153,0247	
2	Ratio	1.487798910		1.359171101	1.359171101		1.359171101		1.359171101		1.359171101	
3	Year	1970	722,5000	1979	1001,7064	1988	1383,1774	1997	1681,8780	2006	2291,9811	
3	Ratio	1.453137511		1.386478910	1.386478910		1.386478910		1.386478910		1.386478910	
4	Year	1971	751,2000	1980	996,8109	1989	1340,0434	1998	1764,5370	2007	2272,2613	
4	Ratio	1.410790311		1.339171101	1.339171101		1.339171101		1.339171101		1.339171101	
5	Year	1972	803,4814	1981	1010,8194	1990	1351,3612	1999	1854,0672	2008	2198,6235	
5	Ratio	1.450229511		1.258711101	1.258711101		1.258711101		1.258711101		1.258711101	
6	Year	1973	819,4182	1982	995,1411	1991	1380,3512	2000	1911,3209	2009	2308,7984	
6	Ratio	1.448313111		1.248313111	1.248313111		1.248313111		1.248313111		1.248313111	
7	Year	1974	821,3403	1983	1072,5727	1992	1418,0148	2001	1925,7947	2010	2276,9987	
7	Ratio	1.450229511		1.310487910	1.310487910		1.310487910		1.310487910		1.310487910	
8	Year	1975	843,0778	1984	1129,4464	1993	1454,1409	2002	1957,1959	2011	2454,1409	
8	Ratio	1.450229511		1.310487910	1.310487910		1.310487910		1.310487910		1.310487910	
9	Year	1976	879,3138	1985	1174,0730	1994	1514,3943	2003	2038,0673	2012	2548,0673	
9	Ratio	1.501821348		1.310487910	1.310487910		1.310487910		1.310487910		1.310487910	
A	Maximum Ratio of Columns	1.487798910		1.386478910	1.386478910		1.407801101		1.407801101		1.407801101	
B	Minimum Ratio of Columns	1.281037101		1.160100000	1.274071101		1.386478910		1.386478910		1.386478910	
C	Spread	0.206701811		0.226378910	0.226378910		0.226378910		0.226378910		0.226378910	
D	Mid-Range Ratio of Columns	1.386478910		1.281037101	1.328922101		1.342207790		1.342207790		1.342207790	
E	Median Ratio of Columns	1.448313111		1.328922101	1.364117070		1.364117070		1.364117070		1.364117070	
F	Average Ratio of Columns	1.406793910		1.311296710	1.318886710		1.317286070		1.317286070		1.317286070	
G	Median Average	1.450486710		1.310487910	1.308402811		1.308402811		1.308402811		1.308402811	



TAB 7: 10 Year Spread

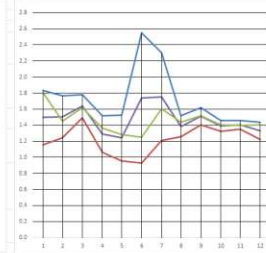
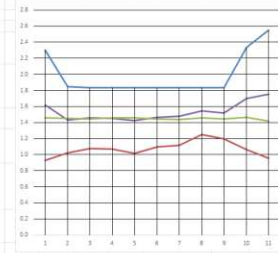
10 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																					
	YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1876	43,4000	1888	45,4000	1988	68,0000	1928	108,2000	1918	115,8000	1928	196,9000	1918	192,9000	1948	321,7000	1938	487,3000	1948	786,8000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
2	Year	1876	43,7000	1888	45,7000	1988	68,3000	1928	108,5000	1918	116,1000	1928	197,1000	1918	193,1000	1948	322,9000	1938	487,9000	1948	787,8000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
3	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
4	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
5	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
6	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
7	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
8	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
9	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
10	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
11	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
12	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
13	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
14	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
15	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
16	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
17	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
18	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
19	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
20	Year	1889	43,0000	1879	42,0000	1989	67,0000	1929	107,0000	1919	114,8000	1929	195,8000	1919	191,8000	1939	319,0000	1929	486,3000	1939	785,0000
	Ratio	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
A	Median Ratio of Column	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
B	Minimum Ratio of Column	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
C	Maximum Ratio of Column	1.184891999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	1.043999999	
D	Spread Ratio of Column	1.184891999	1.0439999																		

		31	32	33	34	A	B	C	D	E	F	G
						Maximum Ratio of Rows	Minimum Ratio of Rows	Spread	Mid Range Ratio of Rows	Median Ratio of Rows	Average Ratio of Rows	Median Average
1	Year	1978	905.8851	1988	1.9071778	1998	1.7945378	2008	2.028			
14	Year	1988	706.4858	1978	1.9053811	1988	1.9231774	1998	1.7945378			
Ratio		1.9292434	1.9143398	1.9240276	1.850498	1.909005	0.930488	1.417183	1.893348	1.840543	1.880543	
2	Year	1979	1065.7594	2008	1.9404434	1998	1.8540672	2008	2288.7984			
14	Year	1989	723.8882	1979	1.9011748	1989	1.9404544	1998	1884.0612			
Ratio		1.8895044	1.92772894	1.9378742	1.850498	1.909005	0.930488	1.417183	1.893348	1.840543	1.880543	
3	Year	1980	996.8309	2008	1.9313822	2008	1951.3288	2010	2275.9987			
14	Year	1977	922.9682	1980	1.906488	1998	1.9313822	2008	1951.3288			
Ratio		1.8798764	1.9255584	0.9149513	1.88817684	1.835084	0.868881	1.500071	1.578782	1.845268	1.978262	
4	Year	1981	1051.8394	2008	1.9683512	2011	1920.1794					
14	Year	1975	75.89181	1981	1.9014898	1981	1.9683512					
Ratio		1.8485273	1.9207638	0.9220763	1.835084	1.8737338	0.788188	1.588433	1.451328	1.432668	1.5984	
5	Year	1985	995.9613	1992	1.9133432	1992	1.9133432					
14	Year	1977	853.4848	1982	955.4433	1992	1.9481045					
Ratio		1.8289358	1.9403834	0.9855488	0.868533	0.916612	1.098861	1.519785	1.454822	1.438883	1.477781	
6	Year	1983	1032.5722	1993	1.9441498	2001	1.9441498					
14	Year	1977	838.8162	1983	1.9272572	1993	1.9441498					
Ratio		1.8779238	1.9279238	0.9855488	0.868533	0.916612	1.098861	1.519785	1.454822	1.438883	1.477781	
7	Year	1984	1129.4488	1984	1.9141943	2004	1951.4818					
14	Year	1974	828.7461	1984	1.9294464	1994	1.9341943					
Ratio		1.8249988	1.9289838	0.9341943	0.841523	0.932132	1.047028	1.588785	1.581825	1.846732	1.914978	
8	Year	1985	1129.4488	1984	1.9141943	2004	1951.4818					
14	Year	1974	828.7461	1984	1.9294464	1994	1.9341943					
Ratio		1.8249988	1.9289838	0.9341943	0.841523	0.932132	1.047028	1.588785	1.581825	1.846732	1.914978	
9	Year	1986	1295.2864	1996	1.9531803	2006	1.9213901					
14	Year	1976	879.3138	1986	1.9232688	1996	1.9531803					
Ratio		1.82698137	1.92198758	0.9269839	0.8509534	0.909039	1.047028	1.588785	1.581825	1.846732	1.914978	
10	Year	1987	1296.1509	1997	1.9818178	2007	1.97721023					
14	Year	1977	922.6696	1987	1.9261826	1997	1.9818178					
Ratio		1.8643498	1.9389758	0.9320759	1.850498	1.92881	0.762481	1.421781	1.498484	1.438883	1.457784	
Maximum Ratio of Columns		1.9982193	1.9489181	0.9320759								
B	Minimum Ratio of Columns	1.93893878	1.93760758	0.93037093								
C	Spread	0.93871123	0.93781037	0.94617625		1.488671	1.431384	1.402396	1.426361	1.428868	1.438784	1.455226
D	Mid Range Ratio of Columns	1.91881024	1.92717366	0.98117793								
E	Median Ratio of Columns	1.97343743	1.94158493	1.93057097								
F	Average Ratio of Columns	1.91141091	1.94001793	1.93371071		1.818384	1.927384	1.974868	1.480072	1.428868	1.450613	1.933832
G	Median Average	1.96149493	1.94400153	1.93523048								



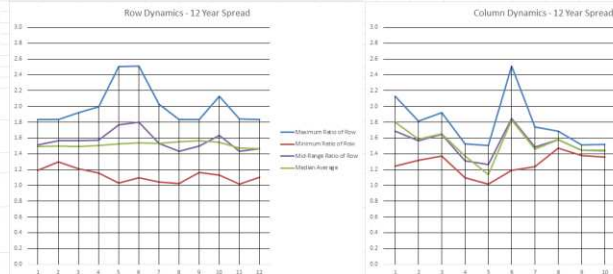
TAB 8 : 11 Year Spread

11 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																														
	1	2	3	4	5	6	7	8	9	10	11	12		A	B	C	D	E	F	G										
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average			
1	Year	1879	42,400	1890	52,700	1901	85,700	1912	130,200	1923	165,900	1934	154,300	1945	355,200	1956	446,100	1967	675,200	1978	985,882	1989	1340,043	2000	1911,320					
14	Ratio	1.00000	1.24255	1.42018	1.51533	1.77158	1.93005	1.76200	1.25311	1.31556	1.38015	1.29725	1.42011	2.30209	0.930078	1.17751	1.61494	1.49321	1.47877	1.46099										
2	Year	1880	41,400	1901	55,100	1902	86,500	1913	131,400	1924	165,500	1935	169,500	1946	312,400	1957	452,500	1968	706,400	1979	1001,700	1990	1351,862	2001	1925,174					
14	Ratio	1.00000	1.29549	1.35087	1.53987	1.53979	1.72933	1.72933	1.53418	1.64436	1.64752	1.68536	1.68536	1.84436	0.924191	0.820079	1.43428	1.43879	1.46203	1.44918										
3	Year	1881	42,400	1892	60,400	1903	90,800	1914	125,400	1925	179,400	1936	193,000	1947	309,900	1958	447,300	1969	723,600	1980	998,839	1991	1380,512	2002	1957,169					
14	Ratio	1.00000	1.42458	1.50711	1.80338	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458	1.42458										
4	Year	1882	42,400	1893	57,500	1904	89,700	1915	124,500	1926	190,000	1937	203,200	1948	324,700	1959	475,900	1970	722,500	1981	1010,834	1992	1418,014	2003	2038,087					
14	Ratio	1.00000	1.35458	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000	1.50000										
5	Year	1883	42,400	1894	55,900	1905	96,300	1916	134,400	1927	199,900	1938	192,900	1949	352,900	1960	487,700	1971	751,200	1982	995,141	1993	1454,149	2004	2093,680					
14	Ratio	1.00000	1.31556	1.42011	1.51533	1.77158	1.93005	1.76200	1.25311	1.31556	1.38015	1.29725	1.42011	2.30209	0.930078	1.17751	1.61494	1.49321	1.47877	1.46099										
6	Year	1884	42,400	1895	62,400	1906	107,500	1917	135,500	1928	209,900	1939	209,900	1950	355,300	1961	497,200	1972	751,200	1983	1010,834	1994	1418,014	2005	2151,047					
14	Ratio	1.00000	1.47611	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533										
7	Year	1885	42,400	1896	61,300	1907	109,200	1918	151,800	1929	201,800	1940	227,200	1951	383,400	1962	529,500	1973	819,412	1984	1129,464	1995	1546,738							
14	Ratio	1.00000	1.44058	1.48011	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533	1.51533										
8	Year	1886	42,400	1897	67,100	1908	100,200	1919	148,400	1930	181,500	1941	263,700	1952	393,100	1963	551,000	1974	821,740	1985	1178,074	1996	1615,013	2007	2272,265					
14	Ratio	1.00000	1.58254	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278	1.49278										
9	Year	1887	42,400	1898	66,800	1909	116,800	1920	140,000	1931	195,300	1942	297,800	1953	412,800	1964	581,100	1975	861,072	1986	1203,364	1997	1681,874	2008	2358,235					
14	Ratio	1.00000	1.57549	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702	1.61702										
10	Year	1888	42,400	1899	74,800	1910	120,100	1921	127,800	1932	144,200	1943	157,100	1954	267,800	1965	417,800	1976	679,114	1987	1010,834	1998	1418,014	2009	2508,794					
14	Ratio	1.00000	1.76151	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611	1.69611										
11	Year	1889	48,100	1900	76,900	1911	123,200	1922	148,000	1933	141,500	1944	161,300	1955	267,800	1966	417,800	1977	679,114	1988	1010,834	1999	1418,014	2010	2270,390					
14	Ratio	1.15581	1.80811	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000	1.60000										
A	Maximum Ratio of Columns	1.83448	1.96158	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448	1.78448										
B	Minimum Ratio of Columns	1.13818	1.24242	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129	1.49129										
C	Spread	0.677996	0.719161	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194	0.289194										
D	Mid-Range Ratio of Columns	1.496783	1.503577	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443	1.637443										
E	Median Ratio of Columns	1.634978	1.445747	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497	1.605497										
F	Average Ratio of Columns	1.779888	1.461319	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656	1.625656										
G	Median Average	1.804781	1.454457	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738	1.615738										



TAB 9 : 12 Year Spread

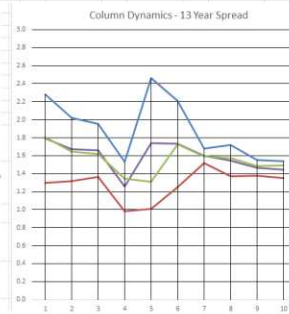
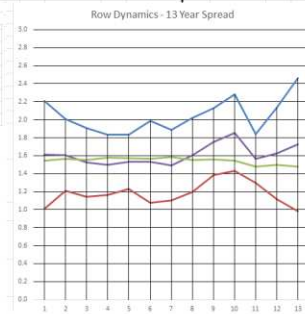
12 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	1	2	3	4	5	6	7	8	9	10	11	A	B	C	D	E	F	G																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Year	GNP	Year	GNP	Year	GNP	Year	GNP	Year	GNP	Year	GNP	Year	GNP	Year	GNP	Year	GNP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
1	Year	1880	42,400	1892	68,400	1904	85,700	1916	134,400	1928	190,900	1940	227,200	1952	305,200	1964	341,100	1976	876,3138	1988	1303,1774	2002	1557,1935																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															</



TAB 10 : 13 Year Spread

13 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		1	2	3	4	5	6	7	8	9	10		A	B	C	D	E	F	G					
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average
1	Year	1881	42.4000	1894	55.9000	1907	109.2000	1920	140.0000	1933	141.5000	1946	312.0000	1959	475.9000	1972	803.4814	1985	1174.0716	1998	1764.5370			
	Ratio	1.83497031	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	1.31879622	
2	Year	1882	42.4000	1895	42.4000	1908	100.2000	1921	127.8000	1934	154.3000	1947	309.9000	1960	487.7000	1973	839.4182	1986	1203.2684	1999	1854.0872			
	Ratio	1.83497031	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	1.47841504	
3	Year	1883	42.4000	1896	61.3000	1909	116.8000	1922	148.0000	1935	169.5000	1948	323.7000	1961	497.2000	1974	821.7401	1987	1256.1826	2000	1911.3209			
	Ratio	1.83497031	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	1.44579471	
4	Year	1884	42.4000	1897	67.1000	1910	120.3000	1923	165.9000	1936	193.0000	1949	324.1000	1962	529.5000	1975	848.0778	1988	1303.1774	2001	1925.1794			
	Ratio	1.83497031	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	1.38247171	
5	Year	1885	42.4000	1898	68.6000	1911	123.2000	1924	165.5000	1937	203.2000	1950	355.3000	1963	551.0000	1976	879.3138	1989	1340.0434	2002	1957.1959			
	Ratio	1.83497031	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	1.61794934	
6	Year	1886	42.4000	1899	74.8000	1912	130.2000	1925	179.4000	1938	212.9000	1951	381.4000	1964	581.1000	1977	922.6698	1990	1351.3622	2003	2036.0677			
	Ratio	1.83497031	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	1.76435041	
7	Year	1887	42.4000	1900	76.9000	1913	131.4000	1926	190.0000	1939	209.4000	1952	395.1000	1965	617.8000	1978	985.8821	1991	1360.3512	2004	2093.6810			
	Ratio	1.83497031	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	1.81877944	
8	Year	1888	42.4000	1901	85.7000	1914	125.6000	1927	189.5000	1940	227.2000	1953	412.8000	1966	658.1000	1979	1001.7304	1992	1418.0149	2005	2151.0247			
	Ratio	1.83497031	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	2.02122613	
9	Year	1889	49.1000	1902	86.3000	1915	124.5000	1928	190.9000	1941	263.7000	1954	407.0000	1967	675.2000	1980	996.8309	1993	1454.1409	2006	2201.9891			
	Ratio	1.83497031	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	2.12504112	
10	Year	1890	52.7000	1903	90.8000	1916	134.4000	1929	203.6000	1942	297.8000	1955	438.0000	1968	706.6000	1981	1010.8394	1994	1514.3943	2007	2272.2015			
	Ratio	1.83497031	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	2.28120704	
11	Year	1891	55.1000	1904	89.7000	1917	135.2000	1930	183.5000	1943	277.1000	1956	446.1000	1969	725.6000	1982	995.1411	1995	1546.7308	2008	2196.6295			
	Ratio	1.83497031	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	2.42432610	
12	Year	1892	60.4000	1905	96.3000	1918	151.8000	1931	219.3000	1944	361.3000	1957	552.5000	1970	822.5000	1983	1072.5727	1996	1615.0031	2009	2208.7984			
	Ratio	1.83497031	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	2.59437081	
13	Year	1893	57.5000	1906	107.5000	1919	146.4000	1932	214.2000	1945	355.2000	1958	547.3000	1971	822.5000	1984	1129.4444	1997	1681.8700	2010	2270.9907			
	Ratio	1.83497031	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	
A	Maximum Ratio of Columns	1.83497031	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	
B	Minimum Ratio of Columns	1.83497031	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	2.70521375	
C	Spread	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	0.961029679	
D	Mid-Range Ratio of Columns	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	1.79047672	
E	Median Ratio of Columns	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	
F	Average Ratio of Columns	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	1.782372134	
G	Median Average	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	1.83497031	

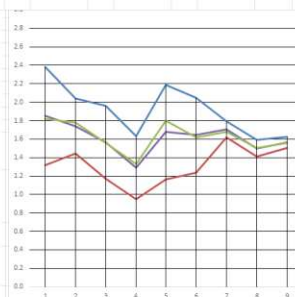
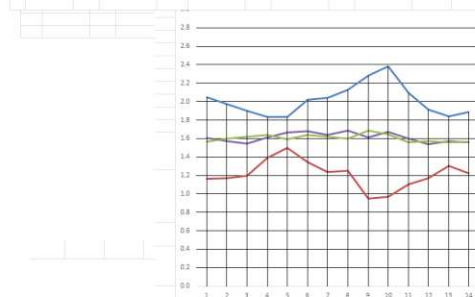


TAB 11 : 14 Year Spread

14 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																				
	1	2	3	4	5	6	7	8	9	10	A	B	C	D	E	F	G			
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP		
1	Year	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000	1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943	
14	Est. *	23.1000	1882	42.4000	1896	61.3000	1910	120.1000	1924	165.5000	1938	192.9000	1952	395.1000	1966	658.1000	1980	996.8309	1994	1514.3943
	Ratio		1.83587933	1.48572472	1.99521699	1.37801111	1.16555812	2.08211509	1.66945426	1.31471039	1.51520835	1.40152103	2.048332	1.165559	0.882653	1.406885	1.515209	1.814648	1.568923	
2	Year	1883	42.4000	1897	67.1000	1911	123.2000	1925	179.4000	1939	209.4000	1953	412.8000	1967	675.2000	1981	1010.8394	1995	1546.7948	
14	Ratio		1.83587933	1.58254771	1.89655574	1.45616851	1.16722505	1.87134670	1.61545891	1.45759620	1.42886412	1.971547	1.167224	0.804123	1.569385	1.582547	1.612417	1.597483		
3	Year	1884	42.4000	1898	68.6000	1912	130.2000	1926	190.0000	1940	227.2000	1954	407.0000	1968	706.8000	1982	999.1411	1996	1546.7948	
14	Ratio		1.83587933	1.61792433	1.89709184	1.45929339	1.19578943	1.79137323	1.71611793	1.60835140	1.62288754	1.4061933	1.897909	1.195789	0.702130	1.546675	1.622889	1.818352	1.620623	
4	Year	1885	42.4000	1899	74.8000	1913	131.4000	1927	189.9000	1941	263.7000	1955	438.0000	1969	725.6000	1983	1072.5727	1997	1681.8760	
14	Ratio		1.83587933	1.76413094	1.79690482	1.44520574	1.38692162	1.86097833	1.64664210	1.47818723	1.54687946	1.835495	1.796905	0.446872	1.612395	1.496872	1.612395	1.617134	1.636890	
5	Year	1886	42.4000	1900	76.9000	1914	125.4000	1928	190.9000	1942	297.8000	1956	446.1000	1970	722.5000	1984	1129.4464	1998	1764.5170	
14	Ratio		1.83587933	1.81146754	1.63328869	1.51996445	1.53097984	1.49780222	1.61939260	1.56304761	1.56302053	1.835495	1.497805	0.537031	1.466742	1.563048	1.622889	1.591039		
6	Year	1887	42.4000	1901	85.7000	1915	124.5000	1929	203.6000	1943	337.1000	1957	452.5000	1971	751.2051	1985	1174.0716	1999	1854.0672	
14	Ratio		1.83587933	2.02122043	1.48274013	1.63534130	1.65569744	1.34821105	1.66012178	1.56291750	1.57917738	2.021220	1.348213	0.678895	1.681775	1.635341	1.638139	1.658840		
7	Year	1888	42.4000	1902	86.5000	1916	134.4000	1930	183.5000	1944	361.3000	1958	447.3000	1972	801.4814	1986	1203.2684	2000	1911.3209	
14	Ratio		1.83587933	2.04809434	1.55179222	1.85532738	1.86893713	1.23802933	1.79629297	1.49759645	1.58844103	2.048094	1.238029	0.802065	1.639062	1.588441	1.631772	1.621130		
8	Year	1889	49.1000	1903	90.8000	1917	135.2000	1931	169.3000	1945	355.2000	1959	475.9000	1973	839.4182	1987	1256.1826			
14	Ratio		2.12554112	1.84028718	1.48898678	1.25221893	2.09805079	1.33980855	1.76385417	1.48649197	1.53256313	2.125541	1.332219	0.873122	1.688885	1.532563	1.607750	1.596660		
9	Year	1890	52.7000	1904	89.7000	1918	151.8000	1932	144.2000	1946	312.6000	1960	487.7000	1974	821.7401	1988	1303.1774	2002	1957.1959	
14	Ratio		2.38139328	1.70287728	1.69320796	0.94092423	2.16782246	1.58014075	1.68497346	1.55847538	1.50188442	2.381393	0.940924	1.331435	1.615560	1.684925	1.880705	1.882811		
10	Year	1891	55.1000	1905	96.3000	1919	146.4000	1933	141.5000	1947	309.9000	1961	497.2000	1975	843.0778	1989	1340.0434	2003	2036.0677	
14	Ratio		2.58528118	1.74777119	1.52024822	0.96683005	2.19070800	1.60438851	1.69546124	1.58946588	1.51940429	2.585281	0.966830	1.418751	1.677950	1.604389	1.890979	1.647603		
11	Year	1892	60.4000	1906	107.5000	1920	146.0000	1934	154.3000	1948	323.7000	1962	529.5000	1976	879.1138	1990	1351.3622	2004	2093.6810	
14	Ratio		1.42632030	1.72980132	1.62323258	1.10214220	2.09786130	1.45577388	1.66648925	1.53683274	1.54931130	2.097861	1.102142	0.995738	1.600005	1.549311	1.565478	1.557393		
12	Year	1893	57.5000	1907	109.2000	1921	127.8000	1935	189.5000	1949	324.1000	1963	551.0000	1977	922.6690	1991	1360.3512	2005	2151.0347	
14	Ratio		1.95613207	1.89913043	1.17652267	1.32826310	1.91298439	1.78092924	1.67402932	1.47429584	1.38122748	1.956132	1.176523	1.170330	0.741765	1.541312	1.581572	1.586623	1.573623	
13	Year	1894	55.9000	1908	100.2000	1922	148.0000	1936	193.0000	1950	368.1000	1964	568.1000	1978	905.8821	1992	1418.0149	2006	2201.9891	
14	Ratio		1.51339622	1.70348604	1.47704505	1.30405405	1.84091284	1.63551527	1.68657907	1.43810997	1.53286738	1.513396	1.304054	0.536872	1.572493	1.532867	1.561800	1.557333		
14	Year	1895	62.6000	1909	116.8000	1923	165.9000	1937	203.2000	1951	383.4000	1965	617.8000	1979	1001.7304	1993	1454.1409	2007	2272.2015	
14	Ratio		1.47943105	1.80581489	1.42037671	1.22483425	1.88861120	1.61137193	1.65134477	1.45501960	1.56301439	1.888611	1.224834	0.661937	1.535621	1.563014	1.568035	1.568223		
A	Maximum Ratio of Columns		2.38528118	2.06094345	1.99521699	1.63534130	2.19070800	2.08211509	1.79629297	1.58946588	1.62288754									
B	Minimum Ratio of Columns		1.31839622	1.48572472	1.17012967	0.94994413	1.16555812	1.23802933	1.61959202	1.40835140	1.50186452									
C	Spread		1.06698515	0.59437962	0.78889733	0.68540726	1.02454705	0.83521827	0.17669995	0.18134482	0.12102423									
D	Mid-Range Ratio of Columns		1.85183880	1.74292453	1.58477723	1.29263774	1.67783246	1.64312042	1.70794199	1.48808864	1.56237663									
E	Median Ratio of Columns		1.83587933	1.78614395	1.53700322	1.34580923	1.86387183	1.62344560	1.67094822	1.49733236	1.55758497									
F	Average Ratio of Columns		1.80154570	1.76122589	1.58295365	1.31323318	1.73589210	1.62695368	1.68340744	1.50679033	1.55500602									
G	Median Average		1.81833821	1.76113327	1.55967791	1.32953120	1.79963200	1.62019644	1.67675113	1.50296137	1.55629588									

Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average / 2	Median + Average / 2
1.899979	1.503800	1.626389	1.617775	1.619446	1.622915	1.618930

Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Mid-Range + Average / 2	Median + Average / 2
1.801555	1.313231	1.557194	1.610954	1.619446	1.588100	1.616100

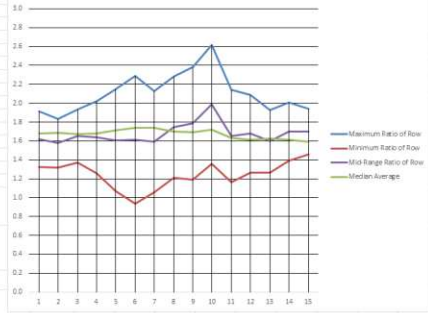


TAB 12: 15 Year Spread

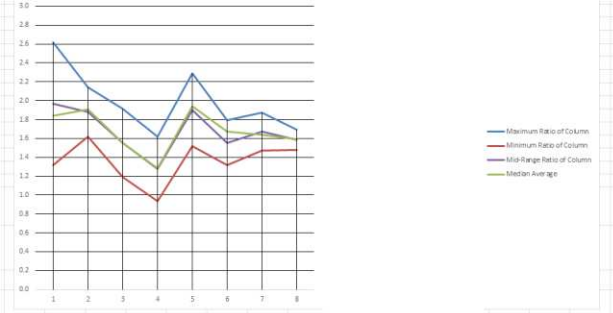
15 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		1	2	3	4	5	6	7	8	9		A	B	C	D	E	F	G					
	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average
1	Year	1883	42,4000	1888	68,6000	1913	111,4000	1928	190,9000	1943	337,1000	1958	447,3000	1973	839,4182	1988	1303,1774	2003	2036,0677				
	Ratio	1.85497813	1.61793428	1.91541895	1.45281346	1.76584991	1.76584991	1.52695961	1.87663171	1.55247684	1.56238721	1.915451	1.326956	0.588548	1.621179	1.891885	1.867944	1.679913					
2	Year	1884	42,4000	1889	74,8000	1914	125,8000	1929	203,8000	1944	361,3000	1959	475,9000	1974	821,7401	1989	1340,0434	2004	2091,6818				
	Ratio	1.85497813	1.76415094	1.67914448	1.62101910	1.72855792	1.31731932	1.72670702	1.60873871	1.56239797	1.835498	1.317188	0.518110	1.576343	1.702926	1.562398	1.605778						
3	Year	1885	42,4000	1900	76,9000	1915	124,5000	1930	183,5000	1945	355,2000	1960	487,7000	1975	843,0778	1990	1351,3622	2005	2131,0247				
	Ratio	1.85497813	1.81167924	1.61699296	1.54939078	1.47399582	1.93294622	1.37262377	1.72681134	1.60209453	1.59174051	1.935605	1.378025	0.562688	1.654365	1.673881	1.672794	1.673114					
4	Year	1886	42,4000	1901	85,7000	1916	134,4000	1931	169,3000	1946	312,6000	1961	497,2000	1976	879,3138	1991	1366,3312	2006	2201,9891				
	Ratio	1.85497813	2.02122643	1.94826177	1.239672615	1.84662462	1.59051105	1.78851374	1.54709992	1.61809163	2.021226	1.239673	0.761554	1.640405	1.679531	1.679653	1.679591						
5	Year	1887	42,4000	1902	86,5000	1917	135,2000	1932	144,2000	1947	309,5000	1962	529,5000	1977	922,6690	1992	1418,0149	2007	2272,2615				
	Ratio	1.85497813	2.04094134	1.54939078	1.08656841	2.14905614	2.14905614	1.78681663	1.74252887	1.53969177	1.60343438	2.149056	1.086569	1.082530	1.607832	1.725577	1.705284	1.725428					
6	Year	1888	42,4000	1903	90,8000	1918	151,8000	1933	141,5000	1948	323,7000	1963	551,0000	1978	985,8821	1993	1454,1409	2008	2198,6295				
	Ratio	1.85497813	2.14150944	1.671806167	0.912147561	2.287632599	2.287632599	1.702191899	1.78929771	1.51197811	1.474964294	1.511978	1.474964	1.054585	1.608994	1.745727	1.729136	1.737951					
7	Year	1889	49,1000	1904	89,7000	1919	146,4000	1934	154,3000	1949	324,1000	1964	581,1000	1979	1001,7304	1994	1514,3943	2009	2208,7984				
	Ratio	2.125041129	1.42605919	1.42605919	1.432167913	1.053951749	2.100434467	2.100434467	1.707495114	1.723655001	1.511778319	1.454931668	2.125041	1.053963	0.751579	1.588751	1.708440	1.720943					
8	Year	1890	52,7000	1905	96,3000	1920	140,0000	1935	169,5000	1950	355,3000	1965	617,8000	1980	996,8309	1995	1546,7308	2010	2270,9907				
	Ratio	2.281185281	1.827724479	1.433790219	1.210714286	2.096183192	2.096183192	1.738812271	1.613517158	1.551948132	1.46825208	2.281185	1.210714	0.707071	1.746500	1.679145	1.721270	1.698917					
9	Year	1891	55,1000	1906	107,5000	1921	127,8000	1936	193,0000	1951	383,4000	1966	658,1000	1981	1010,8394	1996	1615,0033						
	Ratio	2.383281381	1.929281181	1.599992185	1.188837208	1.510172144	1.988638417	1.71048405	1.533596051	1.397883149	1.533596051	1.397883	1.533596	1.397883	1.533596	1.397883	1.533596	1.397883					
10	Year	1892	60,4000	1907	109,2000	1922	148,0000	1937	203,2000	1952	395,1000	1967	675,2000	1982	995,1411	1997	1681,8760						
	Ratio	2.618713613	1.80794702	1.355111353	1.572972971	1.944389764	1.944389764	1.78934447	1.473846411	1.690087960	2.618713	1.355111	1.259487	1.583051	1.699511	1.748026	1.722769						
11	Year	1893	57,5000	1908	100,2000	1923	165,9000	1938	192,9000	1953	412,8000	1968	706,6000	1983	1072,5777	1998	1764,5175						
	Ratio	1.396113075	1.74260896	1.655488623	1.182748464	2.13996889	2.13996889	1.717172480	1.517914745	1.645144427	2.139968	1.182748	0.977220	1.651358	1.650417	1.638494	1.634503						
12	Year	1894	55,9000	1909	116,8000	1924	165,5000	1939	209,4000	1954	407,0000	1969	725,6000	1984	1129,4464	1999	1834,0672						
	Ratio	1.318196228	2.09445424	1.416952551	1.265256798	1.94184851	1.94184851	1.783090981	1.645689903	1.641571453	2.094454	1.265257	0.841819	1.677751	1.599078	1.628039	1.612950						
13	Year	1895	62,8000	1910	120,1000	1925	179,4000	1940	227,2000	1955	438,0000	1970	722,5000	1985	1174,0718	2000	1911,3209						
	Ratio	1.479415094	1.918530311	1.493755204	1.286442701	1.927810961	1.927810961	1.649543179	1.625012592	1.627942367	1.927811	1.286443	0.661373	1.597130	1.626477	1.621182	1.624810						
14	Year	1896	61,3000	1911	123,2000	1926	190,0000	1941	263,7000	1956	446,1000	1971	751,2051	1986	1203,2884	2001	1925,1794						
	Ratio	1.442574271	2.070749726	1.542307726	1.307894775	1.691289153	1.691289153	1.612641261	1.599768411	1.599768411	2.070749	1.307895	0.621883	1.609841	1.608077	1.620276	1.610626						
15	Year	1897	67,1000	1912	130,2000	1927	189,5000	1942	297,8000	1957	452,5000	1972	803,4814	1987	1254,1824	2002	1957,1359						
	Ratio	1.58254711	1.963817481	1.458525346	1.568193786	1.519476158	1.519476158	1.776494903	1.584348617	1.558056476	1.963817	1.458525	0.481881	1.699454	1.565895	1.620782	1.593296						
A	Maximum Ratio of Column	2.614718613	2.14150944	1.91541895	1.62101910	2.287632599	2.287632599	1.792965134	1.87663171	1.68087968													
B	Minimum Ratio of Column	1.318396228	1.617924528	1.188837209	0.912147561	1.519476158	1.31731932	1.473846411	1.478964298	1.478964298													
C	Spread	1.296322488	0.52356496	0.726644889	0.688871546	0.768156251	0.768156251	0.475777202	0.402797162	0.215232673													
D	Mid-Range Ratio of Column	1.960557421	1.679716981	1.552144052	1.276583335	1.903543434	1.903543434	1.530570533	1.67529994	1.582526133													
E	Median Ratio of Column	1.830487823	1.918530311	1.56005788	1.266443701	1.94368525	1.94368525	1.708617482	1.625012594	1.597865343													
F	Average Ratio of Column	1.899449314	1.960833228	1.54754887	1.309695171	1.940626394	1.940626394	1.638621113	1.656285295	1.584906999													
G	Median Average	1.837722875	1.909681789	1.530527228	1.286704436	1.942137579	1.942137579	1.679301398	1.640649943	1.591188024													

Row Dynamics - 15 Year Spread



Column Dynamics - 15 Year Spread



TAB 13a: 16 Year Spread using a final “Actually Complete” Column

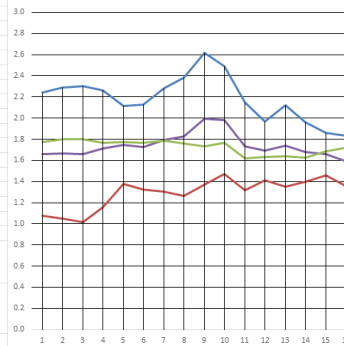
16 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552

		1	2	3	4	5	6	7	8		A	B	C	D	E	F	G								
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average			
1	Year	1884	42.4000	1900	76.9000	1916	134.4000	1932	144.2000	1948	323.7000	1964	581.1000	1980	996.8309	1996	1615.0033								
	Ratio		1.8354978		1.8136792		1.7477243		1.072916667		2.24479889		1.79518072		1.71542058		1.62013768	2.244799	1.072917	1.171882	1.658858	1.795181	1.746466	1.770820	
2	Year	1885	42.4000	1901	85.7000	1917	135.2000	1933	141.5000	1949	324.1000	1965	617.8000	1981	1010.8394	1997	1681.8700								
	Ratio		1.8354978		2.0212264		1.5775963		1.040597633		2.29045936		1.90620179		1.63619197		1.66384096	2.290459	1.046598	1.243862	1.668528	1.835498	1.759110	1.797300	
3	Year	1886	42.4000	1902	86.5000	1918	151.8000	1934	154.3000	1950	355.3000	1966	658.1000	1982	995.1411	1998	1764.5370								
	Ratio		1.8354978		2.0400545		1.7549133		1.016469038		2.30265716		1.85223755		1.52124268		1.77315257	2.302657	1.016469	1.286188	1.639563	1.835498	1.759145	1.797321	
4	Year	1887	42.4000	1903	90.8000	1919	146.4000	1935	169.5000	1951	383.4000	1967	675.2000	1983	1072.5727	1999	1854.0672								
	Ratio		1.8354978		2.1415094		1.6123348		1.15778883		2.2613469		1.76105093		1.58852592		1.72861681	2.261347	1.157788	1.104160	1.709867	1.761083	1.765527	1.763306	
5	Year	1888	42.4000	1904	89.7000	1920	140.0000	1936	193.0000	1952	395.1000	1968	706.6000	1984	1129.4464	2000	1911.3209								
	Ratio		1.8354978		2.115566		1.5607581		1.378571429		2.04715026		1.788408		1.598424		1.69226348	2.115566	1.378571	0.736995	1.747069	1.788408	1.760623	1.774517	
6	Year	1889	49.1000	1905	96.3000	1921	127.8000	1937	203.2000	1953	412.8000	1969	725.6000	1985	1174.0716	2001	1925.1794								
	Ratio		2.125541		1.9613035		1.3271028		1.589984351		2.03149606		1.75775194		1.61807001		1.63974616	2.125541	1.327103	0.798438	1.726322	1.757752	1.777036	1.765394	
7	Year	1890	52.7000	1906	107.5000	1922	148.0000	1938	192.9000	1954	407.0000	1970	722.5000	1986	1203.2684	2002	1957.1959								
	Ratio		2.281385		2.0398482		1.3767442		1.30378378		2.1099015		1.77518428		1.60542335		1.62656636	2.281385	1.303778	0.978007	1.792382	1.775184	1.793124	1.784154	
8	Year	1891	55.1000	1907	109.2000	1923	165.9000	1939	209.4000	1955	438.0000	1971	751.2051	1987	1256.1826	2003	2036.0877								
	Ratio		2.3852014		1.9818513		1.5192388		1.262206145		2.09169054		1.71500014		1.67222321		1.62083737	2.385201	1.262206	1.123075	1.823744	1.715080	1.809398	1.795908	
9	Year	1892	60.4000	1908	100.2000	1924	165.5000	1940	227.2000	1956	446.1000	1972	803.4814	1988	1303.1774	2004	2093.6810								
	Ratio		2.6147186		1.6589404		1.6516966		1.372809668		1.96346831		1.80112396		1.62191359		1.60659708	2.614719	1.372810	1.241909	1.993764	1.658940	1.812096	1.735518	
10	Year	1893	57.5000	1909	116.8000	1925	179.4000	1941	263.7000	1957	452.5000	1973	839.4182	1989	1340.0434	2005	2151.0247								
	Ratio		2.4891775		2.0131043		1.5359389		1.460899666		1.71596511		1.8506785		1.59639546		1.60519032	2.489177	1.469900	1.019278	1.970539	1.715965	1.813396	1.764680	
11	Year	1894	55.9000	1910	120.1000	1926	190.0000	1942	297.8000	1958	447.3000	1974	821.7401	1990	1351.3622	2006	2201.9891								
	Ratio		1.318396		2.148479		1.5820715		1.567868421		1.50201478		1.83711178		1.64451251		1.62945886	2.148479	1.318396	0.830083	1.713438	1.582071	1.657128	1.619572	
12	Year	1895	62.6000	1911	123.2000	1927	189.9000	1943	337.1000	1959	475.9000	1975	843.0778	1991	1360.3512	2007	2272.2615								
	Ratio		1.4764151		1.9808511		1.5413981		1.775144813		1.41124726		1.77554402		1.61355358		1.67034917	1.476415	1.411747	0.556304	1.688989	1.613554	1.651122	1.632338	
13	Year	1896	61.3000	1912	130.2000	1928	190.9000	1944	361.3000	1960	487.7000	1976	879.3138	1992	1418.0149	2008	2198.6299								
	Ratio		1.4457547		2.1239804		1.4662058		1.892613934		1.34984777		1.80298093		1.61263806		1.55049816	2.123980	1.349848	0.741133	1.736914	1.612638	1.670575	1.641600	
14	Year	1897	67.1000	1913	131.4000	1929	203.6000	1945	355.2000	1961	497.2000	1977	922.6690	1993	1454.1409	2009	2208.7984								
	Ratio		1.5825472		1.9582712		1.5494673		1.74459725		1.39977477		1.85573009		1.57601578		1.51897137	1.582547	1.399775	0.538496	1.679023	1.582547	1.666623	1.624588	
15	Year	1898	68.6000	1914	125.6000	1930	183.5000	1946	312.6000	1962	529.5000	1978	985.8821	1994	1514.3943	2010	2270.9907								
	Ratio		1.6179245		1.8309638		1.4609873		1.703542234		1.69385757		1.86191143		1.53680825		1.49560325	1.617924	1.460987	0.400924	1.661445	1.693858	1.672172	1.683015	
16	Year	1899	74.8000	1915	124.5000	1931	169.3000	1947	309.8000	1963	551.0000	1979	1001.7804	1995	1546.7986										
	Ratio		1.7641109		1.6644385		1.3598394		1.830478441		1.7779529		1.8180225		1.54405896			1.830478	1.359839	0.470639	1.595155	1.764151	1.679853	1.722003	
A	Maximum Ratio of Column		2.614719		2.148479		1.754913		1.892614		2.302657		1.906202		1.715421										
B	Minimum Ratio of Column		1.318396		1.658940		1.327103		1.016469		1.349848		1.715080		1.512143										
C	Spread		1.296322		0.489539		0.427810		0.876145		0.952805		0.691122		0.203276										
D	Mid-Range Ratio of Column		1.966557		1.903710		1.541008		1.454541		1.826252		1.810641		1.613782										
E	Median Ratio of Column		1.835498		2.001339		1.545432		1.424236		1.997482		1.802052		1.613096										
F	Average Ratio of Column		1.892424		1.968715		1.538998		1.449023		1.887173		1.809664		1.609474										
G	Median Average		1.863961		1.985127		1.542215		1.436629		1.942328		1.805858		1.611285										

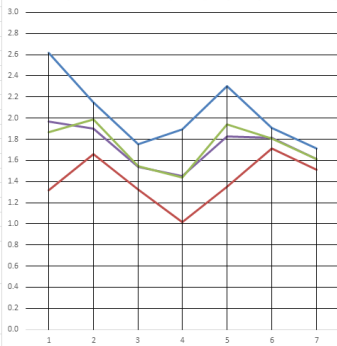
Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Range + Average / 2	Median + Average / 2
1.813396	1.651122	1.732259	1.759127	1.736496	1.734377	1.747812

Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Range + Average / 2	Median + Average / 2
1.968715	1.449023	1.708869	1.809664	1.736496	1.722683	1.771080

Row Dynamics - 16 Year Spread (Only complete columns)



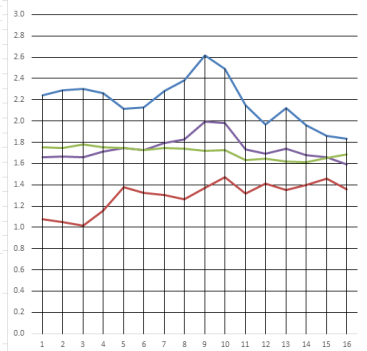
Column Dynamics - 16 Year Spread (Only complete columns)



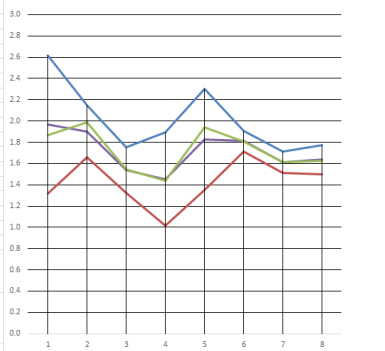
TAB 13b: 16 Year Spread using a final “Amended Complete” Column

16 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																											
		1	2	3	4	5	6	7	8			A	B	C	D	E	F	G									
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP		Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average				
1	Year	1884	42.4000	1900	76.9000	1916	134.4000	1932	144.2000	1948	323.7000	1964	581.1000	1980	996.8309	1996	1615.0033										
	Ratio	1.8354978		1.8136792	1.7472743		1.072916667		2.2447989		1.79518072		1.71542058		1.62011760		2.244799	1.072917	1.171882	1.658858	1.771453	1.730669	1.751061				
2	Year	1885	42.4000	1901	85.7000	1917	135.2000	1933	141.5000	1949	324.1000	1965	617.8000	1981	1010.8394	1997	1681.8760										
	Ratio	1.8354978		2.0212264	1.5772963		1.046597633		2.29045336		1.90620179		1.63619197		1.66384099		2.290459	1.046598	1.243862	1.668526	1.749669	1.747202	1.748435				
3	Year	1886	42.4000	1902	86.5000	1918	151.8000	1934	154.3000	1950	355.3000	1966	658.1000	1982	995.1411	1998	1764.5370										
	Ratio	1.8354978		2.0400943	1.7549133		1.016469038		2.30265716		1.85223759		1.51214268		1.77315257		2.302657	1.016469	1.286188	1.659563	1.804325	1.760896	1.782610				
4	Year	1887	42.4000	1903	90.8000	1919	146.4000	1935	169.5000	1951	383.4000	1967	675.2000	1983	1072.5727	1999	1854.0672										
	Ratio	1.8354978		2.1415094	1.6123445		1.15778885		2.2619469		1.76108503		1.58852592		1.77861681		2.261947	1.157787	1.104160	1.709867	1.744851	1.760913	1.752882				
5	Year	1888	42.4000	1904	89.7000	1920	140.0000	1936	193.0000	1952	395.1000	1968	706.6000	1984	1129.4464	2000	1911.3209										
	Ratio	1.8354978		2.115566	1.5607581		1.0715026		2.04715026		1.788400		1.586424		1.69226340		2.115566	1.378571	0.736995	1.747009	1.740316	1.752080	1.746208				
6	Year	1889	49.1000	1905	96.3000	1921	127.8000	1937	203.2000	1953	412.8000	1969	725.6000	1985	1174.0716	2001	1925.1794										
	Ratio	2.1255411		1.9611035	1.3271023		1.589984331		2.03149699		1.75775134		1.61807201		1.63974619		2.125541	1.327103	0.790438	1.726322	1.698749	1.756376	1.727563				
7	Year	1890	52.7000	1906	107.5000	1922	148.0000	1938	192.9000	1954	407.0000	1970	722.5000	1986	1209.2684	2002	1957.1959										
	Ratio	2.2813853		2.0399482	1.3767442		1.303378378		2.1099105		1.75318428		1.66542338		1.62656636		2.281385	1.303378	0.978007	1.792382	1.720304	1.772304	1.746504				
8	Year	1891	55.1000	1907	109.2000	1923	165.9000	1939	209.4000	1955	438.0000	1971	751.2051	1987	1256.1826	2003	2036.0677										
	Ratio	2.3852814		1.9818512	1.5192308		1.262206148		2.09169054		1.75168014		1.67223231		1.62083737		2.385281	1.262206	1.123075	1.823744	1.693652	1.781050	1.737351				
9	Year	1892	60.4000	1908	100.2000	1924	165.5000	1940	227.2000	1956	446.1000	1972	803.4814	1988	1303.1774	2004	2093.6810										
	Ratio	2.6147186		1.6589404	1.6169665		1.37289668		1.96346831		1.80112394		1.62191359		1.60659708		2.614719	1.372818	1.241909	1.993764	1.655319	1.786409	1.720864				
10	Year	1893	57.5000	1909	116.8000	1925	179.4000	1941	263.7000	1957	452.5000	1973	839.4182	1989	1340.0434	2005	2151.0247										
	Ratio	2.4891775		2.0311041	1.539568		1.46989966		1.71596311		1.85496701		1.59839548		1.60519031		2.489177	1.469900	1.019276	1.979539	1.660576	1.787576	1.723934				
11	Year	1894	55.9000	1910	120.1000	1926	190.0000	1942	297.8000	1958	447.3000	1974	821.7401	1990	1351.3622	2006	2201.9891										
	Ratio	1.3183962		2.1484794	1.582013		1.56738421		1.50201478		1.83711178		1.64451291		1.62945885		2.148479	1.318396	0.830083	1.733438	1.605737	1.633670	1.629703				
12	Year	1895	62.6000	1911	123.2000	1927	189.9000	1943	337.1000	1959	475.9000	1975	843.0778	1991	1360.3512	2007	2272.2615										
	Ratio	1.4764151		1.9680511	1.5413961		1.775144813		1.41174726		1.77154402		1.61355358		1.67034917		1.968051	1.411747	0.556304	1.689899	1.641951	1.653525	1.647738				
13	Year	1896	61.3000	1912	130.2000	1928	190.9000	1944	361.3000	1960	487.7000	1976	879.3138	1992	1418.0149	2008	2198.6295										
	Ratio	1.4457547		2.123804	1.4662059		1.892613934		1.34984777		1.80280931		1.6263606		1.55049610		2.123980	1.349848	0.774133	1.736914	1.581588	1.655565	1.618567				
14	Year	1897	67.1000	1913	131.4000	1929	203.6000	1945	355.2000	1961	497.2000	1977	922.6690	1993	1454.1409	2009	2208.7984										
	Ratio	1.5623472		1.9582712	1.7449671		1.39979477		1.89579477		1.85579609		1.57601078		1.51897313		1.562347	1.958271	0.558496	1.679023	1.579281	1.648172	1.613727				
15	Year	1898	68.6000	1914	125.6000	1930	183.5000	1946	312.6000	1962	525.5000	1978	985.8821	1994	1514.3943	2010	2270.9907										
	Ratio	1.6179245		1.8309038	1.4609873		1.703542234		1.69385797		1.86191143		1.53608093		1.49960329		1.861911	1.460987	0.400924	1.661449	1.655893	1.650601	1.653346				
16	Year	1899	74.8000	1915	124.5000	1931	169.3000	1947	309.9000	1963	551.0000	1979	1001.7304	1995	1546.7308	2010	2270.9907										
	Ratio	1.7641509		1.6644385	1.3598394		1.830478441		1.7799929		1.8180225		1.54405896		1.49960329		1.830478	1.359839	0.470630	1.595159	1.714295	1.657323	1.685809				
A	Maximum Ratio of Column		2.614719		2.148479		1.754913		1.892614		2.302657		1.906202		1.715421		1.773153										
B	Minimum Ratio of Column		1.318396		1.658940		1.327103		1.016469		1.349848		1.715080		1.512143		1.499603	Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Range + Average/2	Median + Average/2			
C	Spread		1.296322		0.489539		0.427810		0.876145		0.952809		0.191122		0.203278		0.273549	1.787370	1.648172	1.717773	1.749641	1.722133	1.719952	1.735887			
D	Mid-Range Ratio of Column		1.966557		1.903710		1.541008		1.454541		1.826252		1.810641		1.613782		1.636378										
E	Median Ratio of Column		1.835498		2.001539		1.545432		1.424236		1.997482		1.802052		1.613096		1.622702	Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Range + Average/2	Median + Average/2			
F	Average Ratio of Column		1.893424		1.968715		1.538990		1.449023		1.887173		1.899664		1.609474		1.621590	1.968715	1.449023	1.708865	1.715627	1.722133	1.715501	1.718889			
G	Median Average		1.863961		1.985127		1.542215		1.436629		1.942328		1.805858		1.611285		1.622646										

Row Dynamics - 16 Year Spread (Includes incomplete last column)

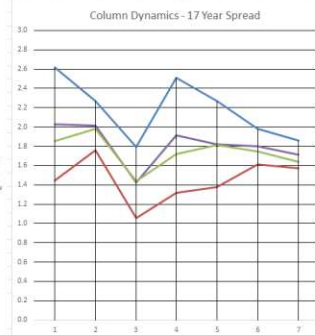
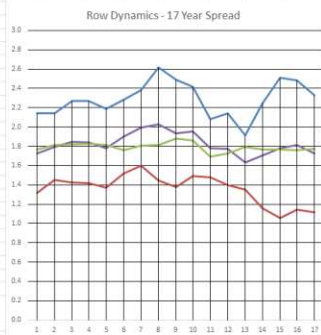


Column Dynamics - 16 Year Spread (Includes incomplete last column)



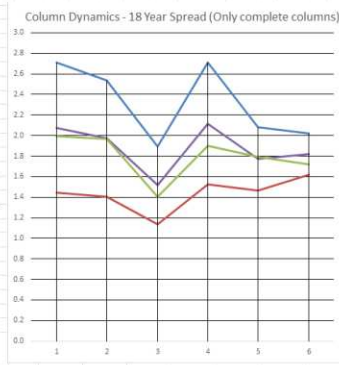
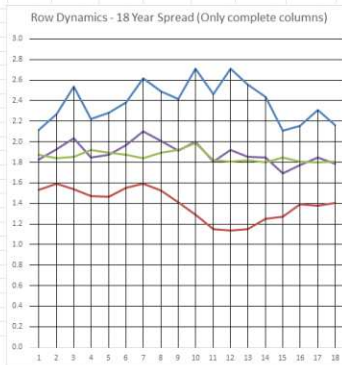
TAB 14: 17 Year Spread

17 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP
1	Year	1885	42.4000	1902	86.5000	1919	146.4000	1936	193.0000	1953	412.8000	1970	722.5000	1987	1256.1826	2004	2093.6810		
	14	1868	23.1000	1885	42.4000	1902	86.5000	1919	146.4000	1936	193.0000	1953	412.8000	1970	722.5000	1987	1256.1826		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
2	Year	1886	42.4000	1903	90.5000	1920	140.5000	1937	203.0000	1954	407.0000	1971	751.2051	1988	1303.1774	2005	2151.0247		
	14	1869	23.1000	1886	42.4000	1903	90.5000	1920	140.5000	1937	203.0000	1954	407.0000	1971	751.2051	1988	1303.1774		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
3	Year	1887	42.4000	1904	89.7000	1921	127.8000	1938	192.9000	1955	438.0000	1972	803.4814	1989	1340.0434	2006	2201.9891		
	14	1870	23.1000	1887	42.4000	1904	89.7000	1921	127.8000	1938	192.9000	1955	438.0000	1972	803.4814	1989	1340.0434		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
4	Year	1888	42.4000	1905	96.3000	1922	148.5000	1939	209.4000	1956	446.1000	1973	839.4182	1990	1351.9022	2007	2272.2615		
	14	1871	23.1000	1888	42.4000	1905	96.3000	1922	148.5000	1939	209.4000	1956	446.1000	1973	839.4182	1990	1351.9022		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
5	Year	1889	49.1000	1906	107.5000	1923	165.9000	1940	227.2000	1957	452.5000	1974	821.7401	1991	1360.3512	2008	2198.6295		
	14	1872	23.1000	1889	49.1000	1906	107.5000	1923	165.9000	1940	227.2000	1957	452.5000	1974	821.7401	1991	1360.3512		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
6	Year	1890	52.7000	1907	109.2000	1924	165.5000	1941	263.7000	1958	447.0000	1975	843.0776	1992	1418.0149	2009	2208.7964		
	14	1873	23.1000	1890	52.7000	1907	109.2000	1924	165.5000	1941	263.7000	1958	447.0000	1975	843.0776	1992	1418.0149		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
7	Year	1891	55.1000	1908	100.2000	1925	179.4000	1942	297.8000	1959	475.9000	1976	879.3138	1993	1454.1409	2010	2270.9907		
	14	1874	23.1000	1891	55.1000	1908	100.2000	1925	179.4000	1942	297.8000	1959	475.9000	1976	879.3138	1993	1454.1409		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
8	Year	1892	60.4000	1909	116.8000	1926	190.5000	1943	337.1000	1960	487.7000	1977	922.6999	1994	1514.1943	2011	2271.8615		
	14	1875	23.1000	1892	60.4000	1909	116.8000	1926	190.5000	1943	337.1000	1960	487.7000	1977	922.6999	1994	1514.1943		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
9	Year	1893	57.5000	1910	120.0000	1927	189.9000	1944	361.3000	1961	497.2000	1978	985.8821	1995	1546.7908	2012	2271.8615		
	14	1876	23.1000	1893	57.5000	1910	120.0000	1927	189.9000	1944	361.3000	1961	497.2000	1978	985.8821	1995	1546.7908		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
10	Year	1894	55.9000	1911	123.2000	1928	190.9000	1945	355.2000	1962	529.5000	1979	1001.7304	1996	1615.0033	2013	2271.8615		
	14	1877	23.1000	1894	55.9000	1911	123.2000	1928	190.9000	1945	355.2000	1962	529.5000	1979	1001.7304	1996	1615.0033		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
11	Year	1895	62.6000	1912	130.2000	1929	203.8000	1946	312.6000	1963	551.0000	1980	996.8309	1997	1681.8760	2014	2271.8615		
	14	1878	23.1000	1895	62.6000	1912	130.2000	1929	203.8000	1946	312.6000	1963	551.0000	1980	996.8309	1997	1681.8760		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
12	Year	1896	61.3000	1913	131.4000	1930	181.5000	1947	309.9000	1964	581.1000	1981	1010.8394	1998	1764.3376	2015	2271.8615		
	14	1879	23.1000	1896	61.3000	1913	131.4000	1930	181.5000	1947	309.9000	1964	581.1000	1981	1010.8394	1998	1764.3376		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
13	Year	1897	67.1000	1914	125.6000	1931	169.3000	1948	323.7000	1965	617.8000	1982	995.1411	1999	1854.0672	2016	2271.8615		
	14	1880	42.4000	1897	67.1000	1914	125.6000	1931	169.3000	1948	323.7000	1965	617.8000	1982	995.1411	1999	1854.0672		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
14	Year	1898	68.6000	1915	131.4000	1932	144.2000	1949	324.1000	1966	658.1000	1983	1072.5727	2000	1911.1209	2017	2271.8615		
	14	1881	42.4000	1898	68.6000	1915	131.4000	1932	144.2000	1949	324.1000	1966	658.1000	1983	1072.5727	2000	1911.1209		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
15	Year	1899	74.8000	1916	134.4000	1933	141.5000	1950	355.3000	1967	675.2000	1984	1129.4464	2001	1925.1794	2018	2271.8615		
	14	1882	42.4000	1899	74.8000	1916	134.4000	1933	141.5000	1950	355.3000	1967	675.2000	1984	1129.4464	2001	1925.1794		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
16	Year	1900	76.9000	1917	135.2000	1934	154.3000	1951	383.4000	1968	706.6000	1985	1174.0716	2002	1957.1359	2019	2271.8615		
	14	1883	42.4000	1900	76.9000	1917	135.2000	1934	154.3000	1951	383.4000	1968	706.6000	1985	1174.0716	2002	1957.1359		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
17	Year	1901	85.7000	1918	151.8000	1935	169.5000	1952	395.1000	1969	725.6000	1986	1203.2684	2003	2036.0677	2020	2271.8615		
	14	1884	42.4000	1901	85.7000	1918	151.8000	1935	169.5000	1969	725.6000	1986	1203.2684	2003	2036.0677	2020	2271.8615		
	Ratio	1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978		1.8154978	
A	Maximum Ratio of Column	2.614715		2.272226		1.790415		2.510954		2.770607		1.982886		1.863120					
B	Minimum Ratio of Column	1.445753		1.758127		1.052827		1.318306		1.376142		1.610782		1.568890					
C	Spread	1.168964		0.513099		0.737592		1.192648		0.994465		0.372086		0.294240					
D	Mid-Range Ratio of Column	2.030237		2.014677		1.421623		1.914630		1.823119		1.796823		1.718000					
E	Median Ratio of Column	1.835450		2.075989		1.526216		1.731519		1.887743		1.812565		1.684587					
F	Average Ratio of Column	1.870666		1.884134		1.933886		1.707609		1.737915		1.682346		1.589356					
G	Median Average	1.850081		1.900092		1.440048		1.719564		1.812588		1.747457		1.630971					
														</					



TAB 15: 18 Year Spread using a final “Actually Complete” Column

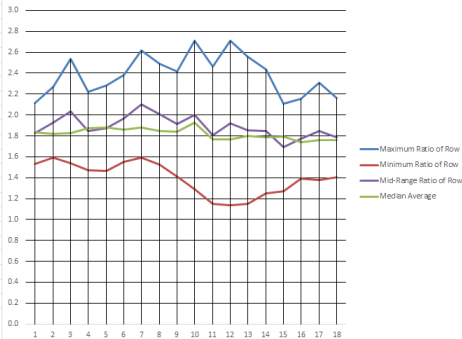
18 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																							
		1		2		3		4		5		6		7			A	B	C	D	E	F	G
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP		Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average
1	Year	1886	42.4000	1904	89.7000	1922	148.0000	1940	227.2000	1958	447.3000	1976	879.3138	1994	1514.3943								
	Ratio	1.8354978	2.113566	1.6499443	1.53135135	1.96875	1.96582563	1.7224557									2.113566	1.531351	0.580411	1.825351	1.900662	1.845120	1.872891
2	Year	1887	42.4000	1905	96.3000	1923	165.9000	1941	261.7000	1959	475.9000	1977	922.6695	1995	1546.7308								
	Ratio	1.8354978	2.2722264	1.7222416	1.7224844	1.58951179	1.80470231	1.93678794	1.67636585								2.272226	1.589512	0.681715	1.930369	1.820100	1.860411	1.840256
3	Year	1888	42.4000	1906	107.5000	1924	165.5000	1942	297.8000	1960	487.7000	1978	985.8821	1996	1615.0033								
	Ratio	1.8354978	2.5353774	1.5395344	1.79939577	1.63767629	1.67829293	1.63813026									2.535377	1.539535	0.995842	2.037456	1.817447	1.894829	1.856138
4	Year	1889	49.1000	1907	109.2000	1925	179.4000	1943	337.1000	1961	497.2000	1979	1001.7304	1997	1681.8760								
	Ratio	2.1255411	2.2240325	1.6428571	1.679041249	1.47493235	2.01474336	1.67897071									2.224033	1.474933	0.748099	1.849483	1.946892	1.895255	1.920209
5	Year	1890	52.7000	1908	100.2000	1926	190.0000	1944	361.3000	1962	529.5000	1980	996.8309	1998	1764.5370								
	Ratio	2.2813851	1.9013285	1.6262074	1.96262074	1.4555411	1.88258995	1.7704677									2.281385	1.455541	0.815844	1.873461	1.898768	1.888105	1.893436
6	Year	1891	55.1000	1909	116.8000	1927	189.9000	1945	355.2000	1963	551.0000	1981	1010.8394	1999	1854.0672								
	Ratio	2.3852814	2.1197822	1.6258862	1.87048134	1.55173874	1.83458424	1.83458424									2.385281	1.551239	0.834043	1.968260	1.852506	1.897862	1.875184
7	Year	1892	60.4000	1910	120.1000	1928	190.9000	1946	312.6000	1964	581.1000	1982	995.1411	2000	1911.3209								
	Ratio	2.6347184	1.9881104	1.5895087	1.637590548	1.85825214	1.71251205	1.92065310									2.634719	1.589509	1.025210	2.102114	1.785719	1.900364	1.842991
8	Year	1893	57.5000	1911	123.2000	1929	203.6000	1947	309.9000	1965	617.8000	1983	1072.5727	2001	1925.1794								
	Ratio	2.4891775	2.3438085	1.6529974	1.522102161	1.99354633	1.73016168	1.73016168									2.489177	1.522102	0.967075	2.095640	1.864831	1.922691	1.893761
9	Year	1894	55.9000	1912	130.2000	1930	183.5000	1948	323.7000	1966	658.1000	1984	1129.4464	2002	1957.1959								
	Ratio	2.4391934	2.3293592	1.3293592	1.4093702	1.764032688	2.0330553	1.71262307									2.439193	1.409370	1.010543	1.914642	1.885444	1.945292	1.921918
10	Year	1895	62.6000	1913	131.4000	1931	169.3000	1949	324.1000	1967	675.2000	1985	1174.0716	2003	2036.0677								
	Ratio	2.7099567	2.0990413	1.2884323	1.914333219	2.08130762	1.73885012	1.73885012									2.709957	1.288432	1.421524	1.999194	1.998810	1.972324	1.985577
11	Year	1896	61.3000	1914	125.6000	1932	144.2000	1950	355.3000	1968	706.6000	1986	1203.2684	2004	2093.6810								
	Ratio	1.4457547	2.0489396	1.1480892	2.463338754	1.98224131	1.70298509	1.70298509									2.463339	1.148089	1.315850	1.800814	1.848420	1.799727	1.827774
12	Year	1897	67.1000	1915	124.5000	1933	141.5000	1951	381.4000	1969	725.6000	1987	1256.1826	2005	2151.0247								
	Ratio	1.5825472	1.8554394	1.1365462	2.709540636	1.85254043	1.71232504	1.71232504									2.709541	1.136546	1.572994	1.923043	1.793336	1.817974	1.805655
13	Year	1898	68.6000	1916	134.4000	1934	154.3000	1952	395.1000	1970	722.5000	1988	1303.1774	2006	2201.9891								
	Ratio	1.6179245	1.9591837	1.1480953	2.569596241	1.82865097	1.80370574	1.80370574									2.569596	1.148096	1.412531	1.854311	1.816178	1.819688	1.817933
14	Year	1899	74.8000	1917	135.2000	1935	169.5000	1953	412.8000	1971	751.2000	1989	1340.0434	2007	2272.2615								
	Ratio	1.7841599	1.8078866	1.2536982	2.43539831	1.8378788	1.78385839	1.78385839									2.435398	1.253698	1.181700	1.844548	1.795672	1.810729	1.803201
15	Year	1900	76.9000	1918	151.8000	1936	193.0000	1954	407.0000	1972	803.4814	1990	1351.3622	2008	2198.6295								
	Ratio	1.8136792	1.9739922	1.2714097	2.10880829	1.97415577	1.68188163	1.62697277									2.108808	1.271410	0.837999	1.690109	1.893836	1.803988	1.848912
16	Year	1901	85.7000	1919	146.4000	1937	203.2000	1955	438.0000	1973	839.4182	1991	1360.3512	2009	2208.7984								
	Ratio	2.0212264	1.7082847	1.3879781	2.155511811	1.91647991	1.62058814	1.62058814									2.155512	1.387979	0.767534	1.771745	1.812382	1.805678	1.807030
17	Year	1902	86.5000	1920	140.0000	1938	192.9000	1956	446.1000	1974	821.7401	1992	1418.0149	2010	2270.9907								
	Ratio	2.0400981	1.6184971	1.1778371	2.313297201	1.84205438	1.72502436	1.60132888									2.313297	1.177837	0.934746	1.845227	1.783839	1.819454	1.806447
18	Year	1903	90.8000	1921	127.8000	1939	209.4000	1957	452.5000	1975	843.0778	1993	1454.1409										
	Ratio	2.1415094	1.4074848	1.6384977	2.169938088	1.86115536	1.72480037										2.169938	1.407485	0.753447	1.784212	1.793978	1.822731	1.808355
A	Maximum Ratio of Columns		2.709957	2.535377	1.896208		2.709541	2.083388	2.021493														
B	Minimum Ratio of Columns		1.445755	1.407485	1.136540	1.522102	1.465541	1.620588															
C	Spread		1.254202	1.127888	0.759661	1.187438	0.617767	0.400905															
D	Mid-Range Ratio of Columns		2.077856	1.971433	1.516377	2.115821	1.774424	1.821041															
E	Median Ratio of Columns		2.031226	2.048940	1.409370	1.914333	1.861135	1.738854															
F	Average Ratio of Columns		1.972978	1.890206	1.401728	1.880917	1.722894	1.701850															
G	Median Average		1.997102	1.970495	1.405548	1.897635	1.792925	1.720353															
																	Max. of F - Rows	Min. of F - Rows	Mid-Range of F - Rows	Median of F - Rows	Avg. of F - Rows	Mid-Range + Average/2	Median + Average/2
																	1.972324	1.799727	1.886025	1.852766	1.862022	1.874024	1.857584
																	Max. of F - Columns	Min. of F - Columns	Mid-Range of F - Columns	Median of F - Columns	Avg. of F - Columns	Mid-Range + Average/2	Median + Average/2
																	1.972978	1.401728	1.687355	1.801805	1.763017	1.724605	1.781921



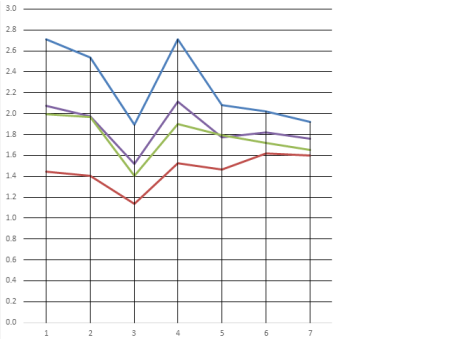
Tab 15b: 18 Year Spread with an “Amended Complete” Column

18 YEAR RATIOS BASED ON ANNUAL REAL GNP; MULTIPLE 5.962552																						
		1		2		3		4		5		6		7		A	B	C	D	E	F	G
		YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	YEAR	GNP	Maximum Ratio of Row	Minimum Ratio of Row	Spread	Mid-Range Ratio of Row	Median Ratio of Row	Average Ratio of Row	Median Average
1	Year	1886	42.4000	1904	89.7000	1922	148.0000	1940	227.2000	1958	447.3000	1976	879.3138	1994	1514.3943							
	14	1868	23.1000	1886	42.4000	1904	89.7000	1922	148.0000	1940	227.2000	1958	447.3000	1976	879.3138							
	Ratio		1.8354978		2.115566		1.6494443		1.535135135		1.96875		1.96582562		1.72224557	2.115566	1.535135	0.580431	1.825351	1.835498	1.827566	1.831532
2	Year	1887	42.4000	1905	96.3000	1923	165.9000	1941	263.7000	1959	475.9000	1977	922.6690	1995	1546.7308							
	14	1869	23.1000	1887	42.4000	1905	96.3000	1923	165.9000	1941	263.7000	1959	475.9000	1977	922.6690							
	Ratio		1.8354978		2.271264		1.7272414		1.589511754		1.80470231		1.93878754		1.67636585	2.271226	1.589512	0.681715	1.930389	1.804702	1.834119	1.819411
3	Year	1888	42.4000	1906	107.5000	1924	165.5000	1942	297.8000	1960	487.7000	1978	985.8821	1996	1615.0033							
	14	1870	23.1000	1888	42.4000	1906	107.5000	1924	165.5000	1942	297.8000	1960	487.7000	1978	985.8821							
	Ratio		1.8354978		2.5353774		1.5393449		1.79939577		1.63767629		2.02149293		1.63813028	2.535377	1.539353	0.959842	2.027456	1.799396	1.858158	1.828777
4	Year	1889	49.1000	1907	109.2000	1925	179.4000	1943	337.1000	1961	497.2000	1979	1001.7304	1997	1681.8760							
	14	1871	23.1000	1889	49.1000	1907	109.2000	1925	179.4000	1943	337.1000	1961	497.2000	1979	1001.7304							
	Ratio		2.125411		2.220328		1.6428571		1.679041249		1.47493325		2.02474336		1.67897071	2.220403	1.744933	0.749099	1.849483	1.679041	1.862874	1.870958
5	Year	1890	52.7000	1908	100.2000	1926	190.0000	1944	361.3000	1962	529.5000	1980	996.8309	1998	1764.5370							
	14	1872	23.1000	1890	52.7000	1908	100.2000	1926	190.0000	1944	361.3000	1962	529.5000	1980	996.8309							
	Ratio		2.2813851		1.9015281		1.8962076		1.901578947		1.4655411		1.88258905		1.77014677	2.281385	1.465541	0.815844	1.873461	1.896208	1.871254	1.880731
6	Year	1891	55.1000	1909	116.8000	1927	189.9000	1945	355.2000	1963	551.0000	1981	1010.8394	1999	1854.0672							
	14	1873	23.1000	1891	55.1000	1909	116.8000	1927	189.9000	1945	355.2000	1963	551.0000	1981	1010.8394							
	Ratio		2.3852814		2.1197822		1.6258562		1.870481136		1.55123474		1.83455426		1.83418573	2.385281	1.551239	0.834043	1.968280	1.834554	1.888765	1.861660
7	Year	1892	60.4000	1910	120.1000	1928	190.9000	1946	312.6000	1964	581.1000	1982	995.1411	2000	1911.3209							
	14	1874	23.1000	1892	60.4000	1910	120.1000	1928	190.9000	1946	312.6000	1964	581.1000	1982	995.1411							
	Ratio		2.6147218		1.9884109		1.5895087		1.637506544		1.85892314		1.71291203		1.92065318	2.614719	1.589509	1.025210	1.102114	1.858925	1.903176	1.981051
8	Year	1893	57.5000	1911	123.2000	1929	203.6000	1947	309.9000	1965	617.8000	1983	1072.5727	2001	1925.1794							
	14	1875	23.1000	1893	57.5000	1911	123.2000	1929	203.6000	1947	309.9000	1965	617.8000	1983	1072.5727							
	Ratio		2.4891775		2.1426087		1.6525974		1.522102161		1.99354631		1.73611638		1.7949174	2.489177	1.522102	0.960705	2.005640	1.794917	1.904438	1.849678
9	Year	1894	55.9000	1912	130.2000	1930	183.5000	1948	323.7000	1966	658.1000	1984	1129.4464	2002	1957.1959							
	14	1876	23.1000	1894	55.9000	1912	130.2000	1930	183.5000	1948	323.7000	1966	658.1000	1984	1129.4464							
	Ratio		2.4199134		2.3291592		1.4093702		1.764032698		2.0330553		1.71623207		1.73288073	2.419913	1.409370	0.100543	1.914642	1.764033	1.914948	1.839490
10	Year	1895	62.6000	1913	131.4000	1931	169.3000	1949	324.1000	1967	675.2000	1985	1174.0716	2003	2036.0677							
	14	1877	23.1000	1895	62.6000	1913	131.4000	1931	169.3000	1949	324.1000	1967	675.2000	1985	1174.0716							
	Ratio		2.7095567		2.090411		1.284321		1.914332119		2.08330762		1.73885012		1.73419181	2.709557	1.284432	1.421524	1.999194	1.914333	1.938005	1.926328
11	Year	1896	61.3000	1914	125.6000	1932	144.2000	1950	355.3000	1968	706.6000	1986	1203.2684	2004	2093.6810							
	14	1878	42.4000	1896	61.3000	1914	125.6000	1932	144.2000	1950	355.3000	1968	706.6000	1986	1203.2684							
	Ratio		1.4457547		2.0489396		1.1480893		2.463938974		1.98874191		1.70289995		1.739995	2.463935	1.148089	1.315850	1.806014	1.739995	1.791134	1.765585
12	Year	1897	67.1000	1915	124.5000	1933	141.5000	1951	383.4000	1969	725.6000	1987	1256.1826	2005	2151.0247							
	14	1879	42.4000	1897	67.1000	1915	124.5000	1933	141.5000	1951	383.4000	1969	725.6000	1987	1256.1826							
	Ratio		1.5825472		1.8554398		1.1365462		2.709540636		1.89254043		1.73123291		1.71235034	2.709541	1.136546	1.572994	1.932043	1.731233	1.802885	1.767059
13	Year	1898	68.6000	1916	134.4000	1934	154.3000	1952	395.1000	1970	722.5000	1988	1303.1774	2006	2201.9891							
	14	1880	42.4000	1898	68.6000	1916	134.4000	1934	154.3000	1952	395.1000	1970	722.5000	1988	1303.1774							
	Ratio		1.6179245		1.5951837		1.1480653		2.560596241		1.82860597		1.80370574		1.68970786	2.560596	1.148065	1.412531	1.854331	1.803706	1.801119	1.802412
14	Year	1899	74.8000	1917	135.2000	1935	169.5000	1953	412.8000	1971	751.2051	1989	1340.0434	2007	2272.2615							
	14	1881	42.4000	1899	74.8000	1917	135.2000	1935	169.5000	1953	412.8000	1971	751.2051	1989	1340.0434							
	Ratio		1.7641509		1.8078466		1.2530982		2.43539821		1.8197798		1.7835623		1.69566282	2.435396	1.253689	1.181700	1.644548	1.783858	1.794291	1.789074
15	Year	1900	76.9000	1918	151.8000	1936	193.0000	1954	407.0000	1972	803.4814	1990	1351.3622	2008	2198.6299							
	14	1882	42.4000	1900	76.9000	1918	151.8000	1936	193.0000	1954	407.0000	1972	803.4814	1990	1351.3622							
	Ratio		1.8136792		1.9739923		1.2714097		2.10880829		1.97415577		1.68188361		1.62697277	2.108808	1.271410	0.837399	1.690109	1.813679	1.778700	1.796190
16	Year	1901	85.7000	1919	146.4000	1937	203.2000	1955	438.0000	1973	839.4182	1991	1360.3512	2009	2208.7984							
	14	1883	42.4000	1901	85.7000	1919	146.4000	1937	203.2000	1955	438.0000	1973	839.4182	1991	1360.3512							
	Ratio		2.0212264		1.7082847		1.3879781		2.155511811		1.91647991		1.62058816		1.62369717	2.021226	1.387978	0.767594	1.771745	1.708285	1.776252	1.742269
17	Year	1902	86.5000	1920	140.0000	1938	192.9000	1956	446.1000	1974	821.7401	1992	1418.0149	2010	2270.9907							
	14	1884	42.4000	1902	86.5000	1920	140.0000	1938	192.9000	1956	446.1000	1974	821.7401	1992	1418.0149							
	Ratio		2.040941		1.6168971		1.3778371		2.312979201		1.84205358		1.72562456		1.60152908	2.312597	1.377857	0.934740	1.845227	1.725625	1.788322	1.756973
18	Year	1903	90.8000	1921	127.8000	1939	209.4000	1957	452.5000	1975	843.0778	1993	1454.1409	2010	2270.9907							
	14	1885	42.4000	1903	90.8000	1921	127.8000	1939	209.4000	1957	452.5000	1975	843.0778	1993	1454.1409							
	Ratio		2.1415094		1.407489		1.6384977		2.16093608		1.86315336		1.72480037		1.60152808	2.160936	1.407489	0.753447	1.794212	1.724800	1.791131	1.757966
A	Maximum Ratio of Column		2.709957		2.535377		1.896208		2.709541		2.083308		2.021493		1.920653	Max. of F-Rows	Min. of F-Rows	Mid-Range of F-Rows	Median of F-Rows	Avg. of F-Rows	Mid-Range of F-Columns	Median of F-Columns
B	Minimum Ratio of Column		1.445755		1.407489		1.136546		1.522102		1.465541		1.620588		1.601528	Min. of F-Columns	Mid-Range of F-Columns	Median of F-Columns	Avg. of F-Columns	Mid-Range of F-Rows	Median of F-Rows	Average of F-Rows
C	Spread		1.264202		1.127888		0.759661		1.187438		0.617767		0.400905		0.319125	1.938395	1.776252	1.857726	1.830843	1.840417	1.848848	1.853630
D	Mid-Range Ratio of Column		2.077856		1.971433		1.516377		2.115821													

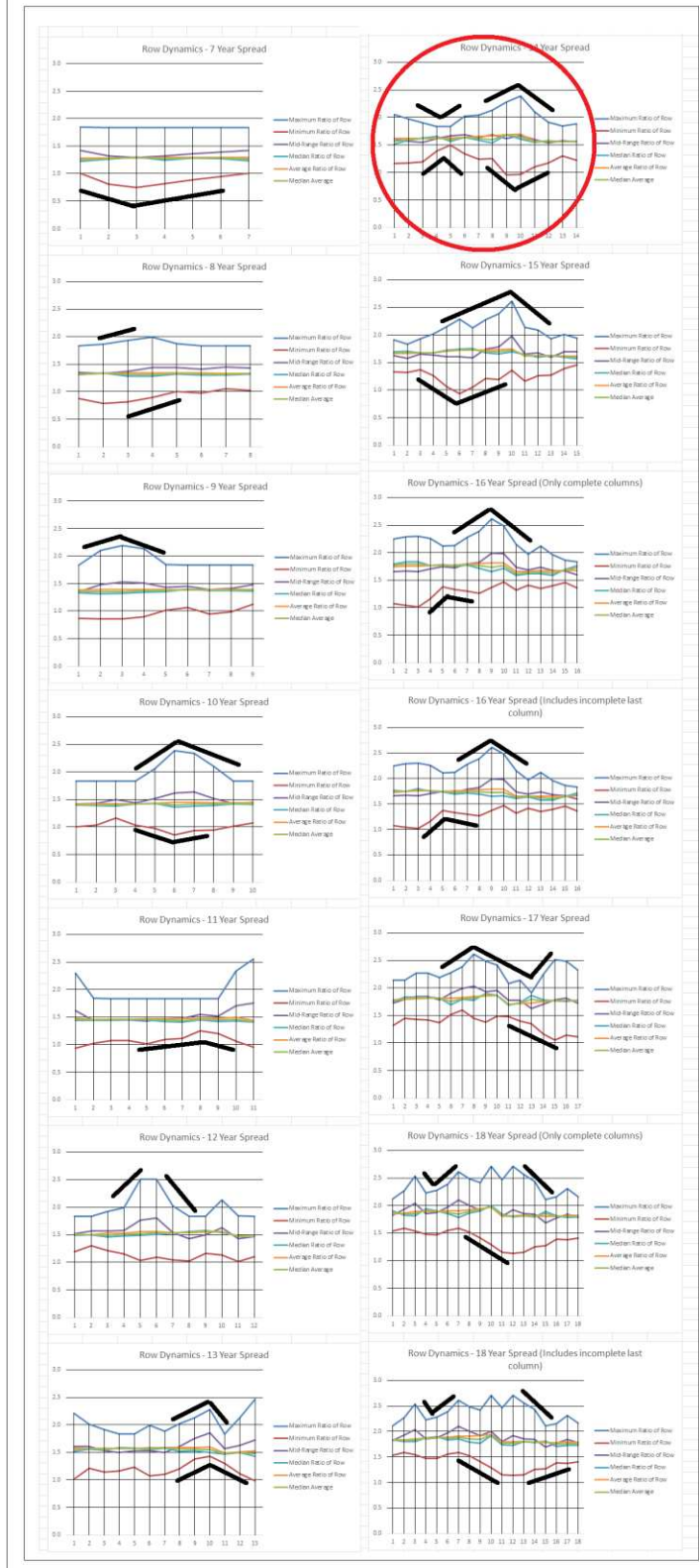
Row Dynamics - 18 Year Spread (Includes incomplete last column)



Column Dynamics - 18 Year Spread (Includes incomplete last column)



Tab 16
Differences in Row Dynamics



TAB 17
MIDRANGE MINUS MEDIAN AVERAGE

[illegible]

Mid-Range Minus Median Average (Tahs 11a & 11a)																
Y Year Spread	8 Year Spread	9 Year Spread	10 Year Spread	11 Year Spread	12 Year Spread	13 Year Spread	14 Year Spread	15 Year Spread	16 Year Spread	17 Year Spread	18 Year Spread	19 Year Spread	20 Year Spread	21 Year Spread	22 Year Spread	23 Year Spread
0.00175	0.00470	0.00056	0.01232	0.05505	0.01891	0.06441	0.03957	-0.05676	-0.11292	-0.04006	-0.07540	-0.07540	-0.07540	-0.07540	-0.07540	-0.07540
0.06789	-0.03776	0.13155	0.02085	-0.05177	0.06573	0.04032	-0.02037	-0.10643	-0.12876	-0.01795	0.09613	0.09613	0.09613	0.09613	0.09613	0.09613
-0.00279	0.00604	0.16657	0.13074	0.00976	0.07455	-0.06052	-0.07748	-0.01852	-0.17748	0.02616	0.13133	0.13133	0.13133	0.13133	0.13133	0.13133
0.00291	0.12368	0.14009	0.02013	-0.05453	0.06837	-0.07810	-0.02406	-0.09142	-0.02419	0.02355	-0.07072	-0.07072	-0.07072	-0.07072	-0.07072	-0.07072
0.07947	0.10031	0.06445	0.09045	-0.09314	0.24389	0.07643	-0.07075	-0.10795	-0.02748	0.01305	-0.09193	-0.09193	-0.09193	-0.09193	-0.09193	-0.09193
0.11029	0.00072	0.00756	0.21240	0.02169	-0.02169	-0.07243	0.04649	-0.12761	-0.09072	0.12410	0.09376	0.09376	0.09376	0.09376	0.09376	0.09376
0.00233	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232	0.01232
0.09912	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880	0.00880
0.13626	0.00992	0.13655	0.00913	0.07034	0.06163	0.19889	-0.06738	0.09118	0.02846	0.03104	-0.00726	-0.00726	-0.00726	-0.00726	-0.00726	-0.00726
			0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957	0.00957
			0.13371	-0.04441	-0.04441	0.19889	-0.06738	0.09118	0.02846	0.03104	-0.00726	-0.00726	-0.00726	-0.00726	-0.00726	-0.00726
				0.00146		0.14336	-0.01243	0.06401	0.05742	0.06828	0.01739	0.01739	0.01739	0.01739	0.01739	0.01739
				0.00146		0.09138	-0.07730	0.09138	0.16054	0.09138	0.09138	0.09138	0.09138	0.09138	0.09138	0.09138
						-0.00002	0.08827	0.08827	-0.00002	-0.00002	0.00146	0.00146	0.00146	0.00146	0.00146	0.00146
								0.10361	-0.02166	0.01391	-0.15803	-0.15803	-0.15803	-0.15803	-0.15803	-0.15803
									0.00047	0.00047	-0.00047	-0.00047	-0.00047	-0.00047	-0.00047	-0.00047
										-0.04004	0.04004	0.04004	0.04004	0.04004	0.04004	0.04004
Mid-Range Minus Median Average (Tahs 12b & 12b)	8 Year Spread	9 Year Spread	10 Year Spread	11 Year Spread	12 Year Spread	13 Year Spread	14 Year Spread	15 Year Spread	16 Year Spread	17 Year Spread	18 Year Spread	19 Year Spread	20 Year Spread	21 Year Spread	22 Year Spread	23 Year Spread
0.08175	0.00040	0.00006	0.01232	0.15505	0.01891	0.06441	0.03957	-0.05676	-0.09201	-0.04006	-0.06162	-0.06162	-0.06162	-0.06162	-0.06162	-0.06162
0.04789	0.13074	0.11545	0.02085	-0.05177	0.06573	0.04032	-0.02037	-0.10								

TAB 19A.
FIGURING CLAIMED DISSONANCE USING A FINAL "ACTUALLY COMPLETE" COLUMN
(FROM TAB 13A AND TAB 15A)

TAB 19a: CLAIMED DISSONANCE - ANALYSIS FOR UNAMENDED COMPLETED COLUMNS (Data using only complete columns (Tabs 13a and 15a))

STEP ONE: Take Data of Midrange Minus Median Average.															STEP THREE: Figure Claimed Dissonance Per Row																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
STEP TWO: Analyze Raw Data into Positive and Negative Amounts.															STEP FOUR: Figure Claimed Dissonance Per Spread																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
In columns D, E, F and G we take the information that is found in Tab 17 and break these numbers into general and acute dissonance. General dissonance is found for numbers falling between +0.05 and -0.05. Acute dissonance is found in numbers which exceed +0.05 or are less than -0.05.															In Column H we lay the foundation for figuring claimed dissonance. Claimed dissonance begins with a statement of the full range between the deepest negative and the highest positive of the spread. For individual rows we figure the sum of columns D through G. For the basis of the claimed dissonance, we add positive F and G MINUS negative D and E.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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TAB 19A.
FIGURING CLAIMED DISSONANCE USING A FINAL "ACTUALLY COMPLETE" COLUMN
(FROM TAB 13A AND TAB 15A)

TAB 19a: CLAIMED DISSONANCE - ANALYSIS FOR UNAMENDED COMPLETED COLUMNS (Data using only complete columns (Tabs 13a and 15a))

YEAR	STEP ONE: Take Data of Midrange Minus Median Average.	STEP TWO: Analyze Raw Data into Positive and Negative Amounts.						STEP THREE: Figure Claimed Dissonance Per Row	STEP FOUR: Figure Claimed Dissonance Per Spread						
	FROM TAB 17, Midrange minus Median Average, Row Data	FROM TAB 17 Midrange minus Median Average	Tab 17 - Total Negative Dissonance	Remainder	First .05	First .05	Remainder	FROM TAB 17 Midrange minus Median Average	Tab 17 - Total Positive Dissonance	In Column H we lay the foundation for figuring claimed dissonance. Claimed dissonance begins with a statement of the full range between the deepest negative and the highest positive of the spread. For individual rows we figure the sum of columns D through G. For the basis of the claimed dissonance, we add positive F and G MINUS negative D and E.	Max of Column I	Min of Column I	Claimed Dissonance: Column J minus Column K	Claimed Dissonance times number of Rows: L times 7.63, etc	Claimed Dissonance times number of Rows times Magic Fraction: M times A12, etc
1	0.03995681							0.03995681			0.092220	-0.073748	0.165968	2.323552	2.323552
2	-0.02819654	-0.02819654			-0.02819654			-0.02819654							
3	-0.07374759	-0.07374759	-0.02374759		-0.05000000			-0.07374759							
4	-0.02480587	-0.02480587			-0.02480587			-0.02480587							
5	0.07370228							0.07370228							
6	0.04493872							0.04493872							
7	0.01795549							0.01795549							
8	0.09222042							0.09222042							
9	-0.06715764	-0.06715764	-0.01715764		-0.05000000			-0.06715764							
10	0.02822213							0.02822213							
11	0.04261126							0.04261126							
12	-0.03241273	-0.03241273			-0.03241273			-0.03241273							
13	0.01515953							0.01515953							
14	-0.01000206	-0.01000206			-0.01000206			-0.01000206							
15	-0.02819654	-0.02819654	-0.04090523		-0.19541720			-0.02819654							
16	-0.02819654	-0.02819654	-0.04090523		-0.19541720			-0.02819654							
17	-0.05873574	-0.05873574	-0.00873574		-0.05000000			-0.05873574			0.262246	-0.149924	0.412171	6.182559	5.770389
18	-0.10943286	-0.10943286	-0.0943286		-0.05000000			-0.10943286							
19	-0.01895185	-0.01895185			-0.01895185			-0.01895185							
20	-0.03914153	-0.03914153			-0.03914153			-0.03914153							
21	-0.10759479	-0.10759479	-0.05759479		-0.05000000			-0.10759479							
22	-0.12766142	-0.12766142	-0.07766142		-0.05000000			-0.12766142							
23	-0.14992428	-0.14992428	-0.09992428		-0.05000000			-0.14992428							
24	0.04713261							0.04713261							
25	0.09151797							0.09151797							
26	0.06224635							0.06224635							
27	0.01790357							0.01790357							
28	0.06440094							0.06440094							
29	-0.02769966	-0.02769966			-0.02769966			-0.02769966							
30	0.08821685							0.08821685							
31	0.10616090							0.10616090							
32	-0.03914214	-0.03914214	-0.3034909		-0.33579305			-0.03914214							
33	-0.0685228	-0.0685228	-0.2837599		-0.31349684			-0.0685228							
34	-0.1196246	-0.1196246	-0.06196246		-0.05000000			-0.1196246			0.258246	-0.137758	0.386004	6.336066	5.544057
35	-0.12877551	-0.12877551	-0.07877551		-0.05000000			-0.12877551							
36	-0.13775810	-0.13775810	-0.08775810		-0.05000000			-0.13775810							
37	-0.05343896	-0.05343896	-0.00343896		-0.05000000			-0.05343896							
38	-0.02744781	-0.02744781			-0.02744781			-0.02744781							
39	-0.03907184	-0.03907184			-0.03907184			-0.03907184							
40	0.00822789							0.00822789							
41	0.06423489							0.06423489							
42	0.25824600							0.25824600							
43	0.21485825							0.21485825							
44	0.11386615							0.11386615							
45	0.05756154							0.05756154							
46	0.09530781							0.09530781							
47	0.05443468							0.05443468							
48	-0.02156591	-0.02156591			-0.02156591			-0.02156591							
49	-0.12684383	-0.12684383	-0.07684383		-0.05000000			-0.12684383							
50	-0.06486442	-0.06486442	-0.30877896		-0.33808556			-0.06486442							
51	-0.05600637	-0.05600637	-0.27018150		-0.29582487			-0.05600637							
52	-0.04040572	-0.04040572			-0.04040572			-0.04040572							
53	-0.01797520	-0.01797520			-0.01797520			-0.01797520			0.220104	-0.165654	0.385758	6.557882	5.400609
54	0.02631606							0.02631606							
55	0.01955481							0.01955481							
56	-0.03503097	-0.03503097			-0.03503097			-0.03503097							
57	0.14139481							0.14139481							
58	0.18548224							0.18548224							
59	0.22010380							0.22010380							
60	0.05354617							0.05354617							
61	0.09435377							0.09435377							
62	0.08350443							0.08350443							
63	0.04062814							0.04062814							
64	-0.16565399	-0.16565399	-0.11565399		-0.05000000			-0.16565399							
65	-0.06530570	-0.06530570	-0.01530570		-0.05000000			-0.06530570							
66	0.01393085							0.01393085							
67	0.05042682							0.05042682							
68	-0.04950445	-0.04950445			-0.04950445			-0.04950445							
69	-0.37387602	-0.37387602	-0.13095969		-0.24291633			-0.37387602							
70	-0.30789790	-0.30789790	-0.10784918		-0.20004874			-0.30789790							
71	-0.04754018	-0.04754018			-0.04754018			-0.04754018			0.259122	-0.158803	0.417925	7.522656	5.850954
72	0.09011344							0.09011344							
73	0.18131813							0.18131813							
74	-0.07072563	-0.07072563	-0.02072563		-0.05000000			-0.07072563							
75	-0.01997329	-0.01997329			-0.01997329			-0.01997329							
76	0.09307605							0.09307605							
77	0.25912237							0.25912237							
78	0.11187845							0.11187845							
79	-0.00727635	-0.00727635			-0.00727635			-0.00727635							
80	0.01361749							0.01361749							
81	-0.01675976	-0.01675976			-0.01675976			-0.01675976							
82	0.11738802							0.11738802							
83	0.03639779							0.03639779							
84	0.04134767							0.04134767							
85	-0.15880291	-0.15880291	-0.10880291		-0.05000000			-0.15880291							
86	-0.03528528	-0.03528528			-0.03528528			-0.03528528							
87	0.04358064							0.04358064							
88	0.04358064							0.04358064							
89	0.04358064							0.04358064							
90	-0.35636340	-0.35636340	-0.12952854		-0.22683486			-0.35636340							
91	-0.27717153	-0.27717153	-0.10074442		-0.17642711			-0.27717153							
92	0.77777778							0.77777778							

TAB 19B.

**FIGURING CLAIMED DISSONANCE USING A FINAL "AMENDED COMPLETE" COLUMN
(FROM TAB 13B AND 15B)**

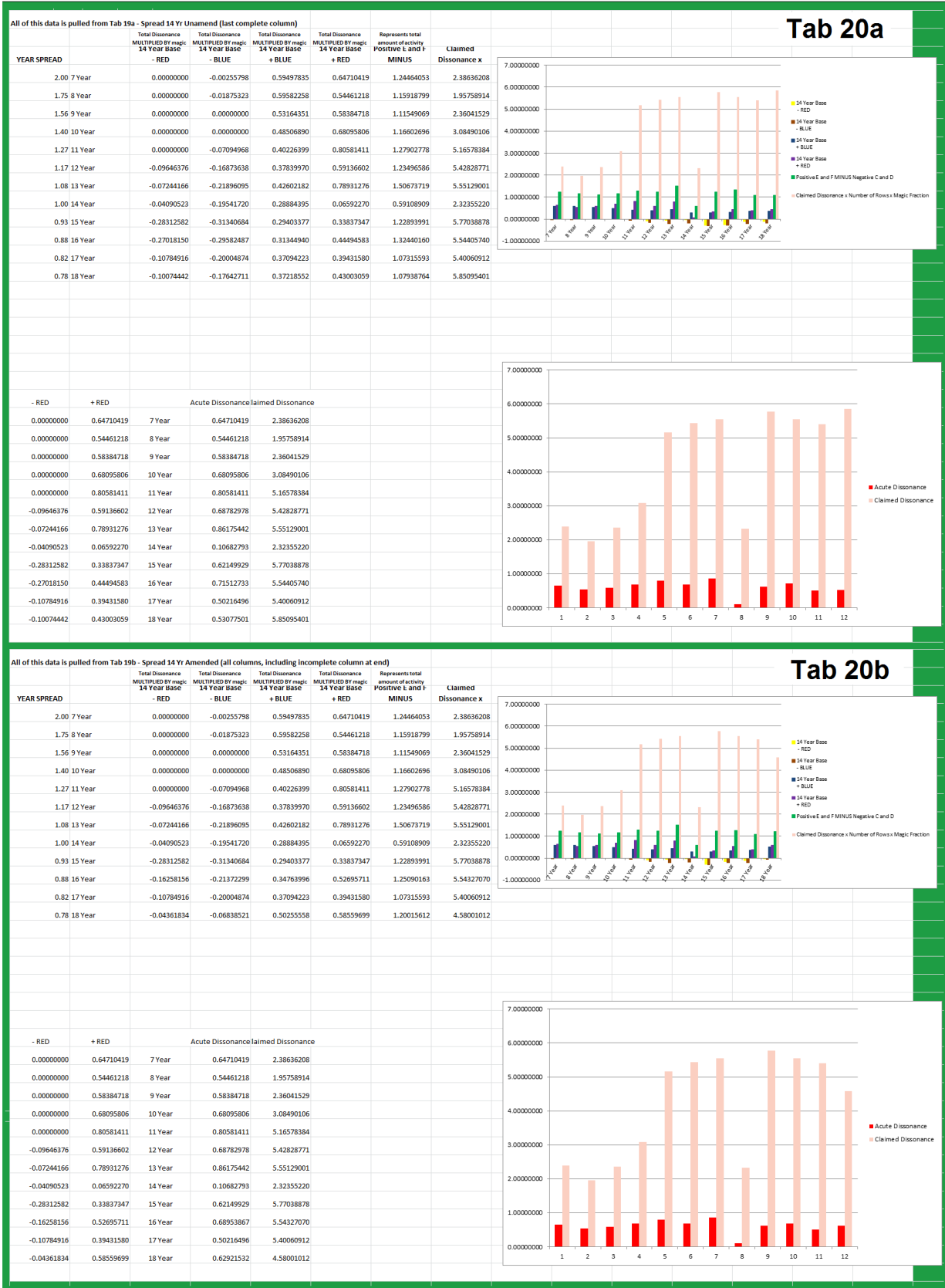
TAB 19b: CLAIMED DISSONANCE - ANALYSIS FOR *AMENDED* COMPLETED COLUMNS (Data using the last incomplete column (Tabs 13b and 15b))

STEP ONE: Take Data of Midrange Minus Median Average.		STEP TWO: Analyze Raw Data into Positive and Negative Amounts.				STEP THREE: Figure Claimed Dissonance Per Row	STEP FOUR: Figure Claimed Dissonance Per Spread				
YEAR	Raw data from Tab 17	In columns D, E, F and G we take the information that is found in Tab 17 and break these numbers into general and acute dissonance. General dissonance is found for numbers falling between +0.05 and -0.05. Acute dissonance is found in numbers which exceed +0.05 or are less than -0.05.				FROM TAB 17 Midrange minus Median Average Tab 17 - Total Positive Dissonance	In Column H we lay the foundation for figuring claimed dissonance. Claimed dissonance begins with a statement of the full range between the deepest negative and the highest positive of the spread. For individual rows we figure the sum of columns D through G. For the basis of the claimed dissonance, we add positive F and G MINUS negative D and E.				
		FROM TAB 17 Midrange minus Median Average Tab 17 - Total Negative Dissonance	Remainder	First .05	First .05		Max of Column I	Min of Column I	Claimed Dissonance: Column J minus Column K	Claimed Dissonance times number of Rows: L times 7.8, 9, etc	Claimed Dissonance times Magic Fraction: M times A12, etc
1	0.10917544					0.10917544	0.10917544	0.10917544	0.10917544	1.193181	2.386362
2	0.04748918					0.04748918					
3	-0.00127899	-0.00127899		-0.00127899		-0.00127899					
4	0.05851002					0.05851002					
5	0.07874681					0.07874681					
6	0.11102610					0.11102610					
7	0.15609372					0.15609372					
2	-0.00257798	0.00000000	-0.00257798	0.29748918	0.32355210	0.62104127	0.62232025				
1	0.04047004					0.04047004	0.24208255	1.24464053			
2	-0.01071613	-0.01071613		-0.01071613		-0.01071613	0.129112	-0.010716	0.139828	1.118622	1.957589
3	0.06006637					0.06006637					
4	0.12848765					0.12848765					
5	0.10833106					0.10833106					
6	0.08607188					0.08607188					
7	0.12911166					0.12911166					
8	0.09913834					0.09913834					
1.75	-0.01071613	0.00000000	-0.01071613	0.34047004	0.31120696	0.65167700	0.65239314				
1	0.00005568					0.00005568	0.168857	0.000056	0.168801	1.517410	2.360415
2	0.13156480					0.13156480					
3	0.16865677					0.16865677					
4	0.14630642					0.14630642					
5	0.06349521					0.06349521					
6	0.05875579					0.05875579					
7	0.01282207					0.01282207					
8	0.02899308					0.02899308					
9	0.10655133					0.10655133					
1.555555	0.00000000	0.00000000	0.00000000	0.34177083	0.37533033	0.71710116	0.71710116				
1	0.01213245					0.01213245	0.221963	0.001613	0.220350	2.203501	3.084901
2	0.02918550					0.02918550					
3	0.10376438					0.10376438					
4	0.02051332					0.02051332					
5	0.09204493					0.09204493					
6	0.21524647					0.21524647					
7	0.22196335					0.22196335					
8	0.10337948					0.10337948					
9	0.00161327					0.00161327					
10	0.03303325					0.03303325					
1.4	0.00000000	0.00000000	0.00000000	0.34647778	0.48639662	0.83287640	1.16602696	0.333871	-0.035114	0.368995	4.058930
1	0.15504486					0.15504486	0.15504486	0.15504486	0.15504486	5.165784	
2	-0.01517745	-0.01517745		-0.01517745		-0.01517745					
3	0.00974725					0.00974725					
4	-0.00545483	-0.00545483		-0.00545483		-0.00545483					
5	-0.03511390	-0.03511390		-0.03511390		-0.03511390					
6	0.02164913					0.02164913					
7	0.03466818					0.03466818					
8	0.08415538					0.08415538					
9	0.07083376					0.07083376					
10	0.23923498					0.23923498					
11	0.33387066					0.33387066					
1.272727	-0.05574618	0.00000000	-0.05574618	0.31606456	0.63311966	0.94920422	1.00495040	0.269907	-0.120828	0.387735	4.652818
1	0.01809113					0.01809113	0.01809113	0.01809113	0.01809113	5.428288	
2	0.06857317					0.06857317					
3	0.07455214					0.07455214					
4	0.06839696					0.06839696					
5	0.24589916					0.24589916					
6	0.26906822					0.26906822					
7	0.00479012					0.00479012					
8	-0.12082802	-0.12082802	-0.07082802	-0.05000000		-0.12082802					
9	-0.06185521	-0.06185521	-0.01185521	-0.05000000		-0.06185521					
10	0.08255691					0.08255691					
11	-0.04463118	-0.04463118		-0.04463118		-0.04463118					
12	0.00146135					0.00146135					
1.166667	-0.22731441	-0.06268322	-0.14463118	0.32434260	0.50688516	0.83122776	1.05854216	0.307564	-0.089957	0.396521	5.154769
1	0.06441126					0.06441126	0.06441126	0.06441126	0.06441126	5.512900	
2	0.04559169					0.04559169					
3	-0.02605198	-0.02605198		-0.02605198		-0.02605198					
4	-0.07831041	-0.07831041	-0.02831041	-0.05000000		-0.07831041					
5	-0.04002542	-0.04002542		-0.04002542		-0.04002542					
6	-0.03724348	-0.03724348		-0.03724348		-0.03724348					
7	-0.08895685	-0.08895685	-0.03895685	-0.05000000		-0.08895685					
8	0.05422993					0.05422993					
9	0.19688914					0.19688914					
10	0.30756386					0.30756386					
11	0.08906988					0.08906988					
12	0.12453648					0.12453648					
13	0.24549572					0.24549572					
1.0769231	-0.27058814	-0.06726726	-0.20332088	0.39569169	0.73293328	1.12852497	1.39911311				
	-0.29140261	-0.07244166	-0.21896095	0.42602182	0.78931276	1.21533458					

TAB 19B.
FIGURING CLAIMED DISSONANCE USING A FINAL "AMENDED COMPLETE" COLUMN
(FROM TAB 13B AND 15B)

TAB 19b: CLAIMED DISSONANCE - ANALYSIS FOR *AMENDED* COMPLETED COLUMNS (Data using the last incomplete column (Tabs 13b and 15b))

STEP ONE: Take Data of Midrange Median Average.		STEP TWO: Analyze Raw Data into Positive and Negative Amounts.					STEP THREE: Figure Claimed Dissonance Per Row		STEP FOUR: Figure Claimed Dissonance Per Spread					
YEAR	Raw data from Tab 17	FROM TAB 17 Midrange minus Median Average Tab 17 - Total Negative Dissonance	Remainder	First .05	First .05	Remainder	FROM TAB 17 Midrange minus Median Average Tab 17 - Total Positive Dissonance	In Column H we lay the foundation for figuring claimed dissonance. Claimed dissonance begins with a statement of the full range between the deepest negative and the highest positive of the spread. For individual rows we figure the sum of columns D through G. For the basis of the claimed dissonance, we add positive F and G minus negative D and E.	Max of Column I	Min of Column I	Claimed Dissonance: Column J minus Column K	Claimed Dissonance times number of Rows: L,3,9, etc.	Claimed Dissonance times number of Rows times Magic Fraction: M times A12, etc.	
1	0.03995681						0.03995681	0.03995681	0.092220	-0.073748	0.165968	2.323552	2.323552	
2	-0.02819654	-0.02819654			-0.02819654			-0.02819654						
3	-0.07374759	-0.07374759	-0.02374759		-0.05000000			-0.07374759						
4	-0.02480587	-0.02480587			-0.02480587			-0.02480587						
5	0.07370228					0.05000000	0.07370228	0.07370228						
6	0.04493872					0.04493872	0.04493872	0.04493872						
7	0.01795549					0.01795549	0.01795549	0.01795549						
8	0.09222042					0.05000000	0.04222042	0.09222042						
9	-0.06715764	-0.06715764	-0.01715764		-0.05000000			-0.06715764						
10	0.02822213					0.02822213	0.02822213	0.02822213						
11	0.04261126					0.04261126	0.04261126	0.04261126						
12	-0.03241273	-0.03241273			-0.03241273			-0.03241273						
13	0.01515953					0.01515953	0.01515953	0.01515953						
14	-0.01000206	-0.01000206			-0.01000206			-0.01000206						
15	-0.23632243	-0.23632243	-0.04090523		-0.19541720	0.28884395	0.06592270	0.35476665	0.262246	-0.149924	0.412171	6.182559	5.770389	
16	-0.23632243	-0.23632243	-0.04090523		-0.19541720	0.28884395	0.06592270	0.35476665						
17	-0.05873574	-0.05873574	-0.00873574		-0.05000000			-0.05873574						
18	-0.10943286	-0.10943286	-0.05943286		-0.05000000			-0.10943286						
19	-0.01895185	-0.01895185			-0.01895185			-0.01895185						
20	-0.03914153	-0.03914153			-0.03914153			-0.03914153						
21	-0.10759479	-0.10759479	-0.05759479		-0.05000000			-0.10759479						
22	-0.12766142	-0.12766142	-0.07766142		-0.05000000			-0.12766142						
23	-0.14992428	-0.14992428	-0.09992428		-0.05000000			-0.14992428						
24	0.04713261					0.04713261	0.04713261	0.04713261						
25	0.09151797					0.05000000	0.04151797	0.09151797						
26	0.26224635					0.05000000	0.21224635	0.26224635						
27	0.01790357					0.01790357	0.01790357	0.01790357						
28	0.06440094					0.05000000	0.01440094	0.06440094						
29	-0.02769966	-0.02769966			-0.02769966			-0.02769966						
30	0.08821685					0.05000000	0.03821685	0.08821685						
31	0.10616090					0.05000000	0.05616090	0.10616090						
32	-0.63914214	-0.63914214	-0.30334909		-0.33579305	0.31503619	0.36254301	0.67579199	1.31672133					
33	-0.59653266	-0.59653266	-0.28312582		-0.31340864	0.29403377	0.33837347	0.63240725	1.22893991					
34	-0.09220233	-0.09220233	-0.04220233		-0.05000000			-0.09220233	0.272901	-0.123047	0.395948	6.335167	5.543271	
35	-0.07990697	-0.07990697	-0.02990697		-0.05000000			-0.07990697						
36	-0.12304728	-0.12304728	-0.07304728		-0.05000000			-0.12304728						
37	-0.04301504	-0.04301504			-0.04301504			-0.04301504						
38	0.00086092					0.00086092		0.00086092						
39	-0.00123981	-0.00123981			-0.00123981			-0.00123981						
40	0.04607794					0.04607794	0.04607794	0.04607794						
41	0.08639289					0.05000000	0.03639289	0.08639289						
42	0.27290063					0.05000000	0.2290063	0.27290063						
43	0.25569477					0.05000000	0.20569477	0.25569477						
44	0.10373453					0.05000000	0.05373453	0.10373453						
45	0.04216093					0.04216093	0.04216093	0.04216093						
46	0.11834755					0.05000000	0.06834755	0.11834755						
47	0.06529634					0.05000000	0.01529634	0.06529634						
48	0.00820303					0.00820303	0.00820303	0.00820303						
49	-0.09065002	-0.09065002	-0.04065002		-0.05000000			-0.09065002						
50	-0.43006234	-0.43006234	-0.18580749		-0.24425485	0.39730282	0.60272367	0.99953952	1.42900186					
51	-0.7630455	-0.7630455	-0.16258156		-0.21327299	0.34763996	0.52695711	0.87459708	1.2500103					
52	-0.04040572	-0.04040572			-0.04040572			-0.04040572	0.220104	-0.165654	0.385758	6.557882	5.400609	
53	-0.01797520	-0.01797520			-0.01797520			-0.01797520						
54	0.02631606					0.02631606	0.02631606	0.02631606						
55	0.01955481					0.01955481	0.01955481	0.01955481						
56	-0.03503097	-0.03503097			-0.03503097			-0.03503097						
57	0.14139481					0.05000000	0.09139481	0.14139481						
58	0.18548224					0.05000000	0.13548224	0.18548224						
59	0.022010380					0.05000000	0.17010380	0.022010380						
60	0.05354617					0.05000000	0.00354617	0.05354617						
61	0.09435377					0.05000000	0.04435377	0.09435377						
62	0.08350443					0.05000000	0.03350443	0.08350443						
63	-0.04062814					0.04062814	0.04062814	0.04062814						
64	-0.16565399	-0.16565399	-0.11565399		-0.05000000			-0.16565399						
65	-0.06530570	-0.06530570	-0.01530570		-0.05000000			-0.06530570						
66	0.01393085					0.01393085	0.00042682	0.01393085						
67	0.05042682					0.05000000	0.05042682	0.05042682						
68	-0.04950445	-0.04950445	-0.04950445		-0.04950445			-0.04950445						
69	-0.37367602	-0.37367602	-0.13095969		-0.24291633	0.45042985	0.48781204	0.92924189	1.30311762					
70	-0.30787970	-0.30787970	-0.10784916		-0.20004874	0.37094223	0.39431580	0.76525803	1.07135593					
71	-0.00618151	-0.00618151			-0.00618151			-0.00618151	0.221063	-0.106081	0.327144	5.888584	4.580010	
72	0.11095842					0.05000000	0.06095842	0.11095842						
73	0.20867928					0.05000000	0.15867928	0.20867928						
74	-0.02147481	-0.02147481			-0.02147481			-0.02147481						
75	-0.01026753	-0.01026753			-0.01026753			-0.01026753						
76	0.10890031					0.05000000	0.05690031	0.10890031						
77	0.22106286					0.05000000	0.17106286	0.22106286						
78	0.15596214					0.05000000	0.10596214	0.15596214						
79	0.07515156					0.05000000	0.02515156	0.07515156						
80	0.07289536					0.05000000	0.02289536	0.07289536						
81	0.04041955					0.04041955	0.04041955	0.04041955						
82	0.15598429					0.05000000	0.10598429	0.15598429						
83	0.05191838					0.05000000	0.00191838	0.05191838						
84	0.05547378					0.05000000	0.00547378	0.05547378						
85	-0.10608072	-0.10608072	-0.05608072		-0.05000000			-0.10608072						
86	0.02947645					0.02947645	0.02947645	0.02947645						
87	0.08825403					0.05000000	0.03825403	0.08825403						
88	0.02624689					0.02624689	0.02624689	0.02624689						
89	-0.14004056	-0.0500072	-0.08792384		-0.04814289	0.75291041	1.39905330	1.54305787						
90	-0.12200350	-0.04361834	-0.06838251		-0.05255558	0.58559699	1.08815257	1.20015612						
91	0.77777778													



DATA SET SIX.

SCHOOL ENROLLMENT - STUDENT POPULATION

Enrollment of public secondary schools, by state, 2007-08									
State	Total	Regular	Junior high	7 to 12	8 to 12	Grades 9-12	10 to 12	11,12-12	Other sec.
Total	16,184,724	15,680,507	1,578,163	927,888	451,656	12,500,341	418,850	41,545	266,281
Alabama	224,711	223,040	20,696	31,465	4,638	153,011	11,021	181	3,699
Alaska	41,004	39,078	7,907	3,433	672	28,726	266	0	0
Arizona	350,928	344,460	47,571	9,488	3,536	279,380	10,038	291	624
Arkansas	177,098	175,870	29,801	35,288	2,801	64,323	29,260	1,305	14,320
California	2,155,154	2,045,990	286,060	67,486	1,280	1,790,115	0	46	10,167
Colorado	253,235	244,201	27,213	8,358	205	207,613	5,787	99	3,960
Connecticut	197,194	183,550	20,092	3,330	5,877	166,038	424	9	1,424
Delaware	40,916	34,271	4,395	116	30,589	5,381	0	0	435
Dist. of Columbia	20,962	18,465	1,218	471	0	19,137	39	0	97
Florida	780,816	763,609	14,554	19,705	27,172	715,591	929	1,709	1,156
Georgia	472,846	467,357	7,694	1,616	3,032	447,166	3,880	89	9,369
Hawaii	63,118	62,939	8,996	5,531	0	48,591	0	0	0
Idaho	94,705	89,494	19,170	5,036	11	54,213	14,112	0	2,163
Illinois	695,769	681,319	64,033	19,151	4,440	589,359	9,091	1,517	8,178
Indiana.....	365,073	363,830	43,486	43,844	673	271,861	3,217	296	1,696
Iowa	171,477	167,360	15,323	18,821	0	126,224	7,571	21	3,517
Kansas	165,490	165,368	24,758	17,523	1,237	115,495	6,462	0	15
Kentucky	207,811	203,021	14,123	9,891	3,962	175,945	2,589	171	1,130
Louisiana	189,919	185,751	19,412	25,680	48,368	89,446	4,921	0	2,092
Maine	65,668	65,618	6,000	2,237	435	56,709	101	0	186
Maryland	280,768	264,881	13,151	1,028	3,431	259,507	272	486	2,893
Massachusetts	319,336	282,426	19,064	21,082	5,328	273,541	0	93	228
Michigan	591,680	557,118	51,998	28,354	21,176	446,232	29,987	2,477	11,456
Minnesota	314,250	299,280	29,259	62,591	9,874	179,606	25,598	2,674	4,648
Mississippi	148,111	148,021	13,128	21,902	3,634	97,600	7,313	362	4,172
Missouri.....	326,470	323,794	38,486	34,044	145	231,179	11,790	622	10,204
Montana	60,355	60,254	13,853	0	0	46,502	0	0	0
Nebraska	112,050	112,034	12,148	28,492	1,749	68,898	165	31	567
Nevada	131,671	126,175	10,970	481	3,660	114,025	1,640	812	83
New Hampshire	70,844	70,844	4,431	0	0	65,765	0	0	648
New Jersey	465,666	438,730	39,712	21,929	2,386	383,611	8,770	1,462	7,796
New Mexico	114,391	111,108	14,395	2,570	950	80,999	9,582	0	5,895
New York	913,079	860,711	50,934	78,176	5,997	729,745	23,676	337	24,214
North Carolina ...	415,325	412,194	13,676	1,409	621	390,498	1,705	355	7,061
North Dakota	38,626	38,617	4,218	11,846	157	16,207	3,770	947	1,481
Ohio	637,089	633,721	62,066	61,315	55,112	441,585	6,376	681	9,954
Oklahoma	199,392	198,585	24,753	0	0	137,023	22,176	4,140	11,300
Oregon	193,303	190,205	18,368	8,481	760	165,054	619	21	0
Pennsylvania	649,436	632,017	64,052	87,655	12,163	425,120	37,389	7,065	15,992
Rhode Island	50,061	47,096	4,033	993	0	44,434	30	0	571
South Carolina ...	221,608	221,526	15,855	4,841	755	188,676	8,388	90	3,003
South Dakota	41,607	41,026	3,921	29	0	37,657	0	0	0
Tennessee	288,904	286,784	12,577	9,050	15,846	246,916	2,268	484	1,763
Texas	1,429,301	1,392,149	181,487	37,720	97,344	1,041,501	10,433	10,566	50,250
Utah	215,405	207,270	71,658	10,861	11,688	46,890	59,578	783	13,947
Vermont	33,156	33,140	2,225	8,677	0	22,254	0	0	0
Virginia	410,561	409,423	26,999	13,741	15,399	348,628	2,971	0	2,823
Washington	357,904	341,744	45,437	19,713	43,622	219,623	21,300	146	8,063
West Virginia	83,502	82,971	4,491	5,684	136	70,499	2,643	12	37
Wisconsin	305,036	301,274	20,879	15,321	533	258,193	5,941	1,165	3,004
Wyoming	31,943	30,798	7,437	1,433	262	18,049	4,762	0	0
SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data, 2007-08.									

DATA SET SEVEN. SCHOOL ENROLLMENT - SCHOOL TYPE

Table 99. Public secondary schools, by grade span, average school size, and state or jurisdiction: 2007-08

State or jurisdiction	Total, all secondary schools	Total, all regular secondary schools\1\	Schools, by grade span								Vocational schools\2\	Average number of students per school\3\	
			Grades 7 to 9	Grades 7 to 12	Grades 8 to 12	Grades 9 to 12	Grades 10 to 12	Other spans ending with grade 12	Other grade spans	All secondary schools		Regular secondary schools\1\	
1	2	3	4	5	6	7	8	9	10	11	12	13	
United States	24,426	19,264	3,047	3,278	777	15,179	748	378	1,019	1,409	706	816	
Alabama	414	314	34	96	19	226	28	3	8	73	681	709	
Alaska	84	65	16	20	3	43	2	0	0	3	494	601	
Arizona	667	470	76	36	7	527	10	3	8	166	696	729	
Arkansas	393	360	59	134	8	127	42	1	22	24	484	494	
California	2,449	1,495	342	321	42	1,679	25	13	27	76	901	1,355	
Colorado	410	344	61	60	1	274	7	1	6	5	619	710	
Connecticut	261	195	35	12	11	184	11	2	6	17	756	941	
Delaware	46	34	7	1	27	10	0	0	1	6	952	1,008	
District of Columbia ..	38	30	6	3	1	26	1	0	1	5	549	606	
Florida	668	475	20	67	30	488	9	19	35	51	1,276	1,667	
Georgia	435	392	11	14	8	350	7	2	43	3	1,137	1,201	
Hawaii	53	52	11	9	0	33	0	0	0	0	1,191	1,210	
Idaho	231	154	40	47	1	115	24	0	4	11	440	593	
Illinois	1,007	802	150	67	19	634	11	57	69	55	745	847	
Indiana	439	420	75	89	1	265	1	1	7	29	853	866	
Iowa	449	381	48	80	1	302	9	4	5	0	392	450	
Kansas	392	387	58	81	4	239	8	0	2	1	430	432	
Kentucky	465	240	30	43	24	295	12	9	52	126	586	803	
Louisiana	310	263	41	49	68	125	18	0	9	6	637	709	
Maine	153	124	15	10	2	115	9	0	2	27	525	533	
Maryland	277	208	20	6	8	213	2	6	22	24	1,065	1,270	
Massachusetts	370	315	33	36	6	293	0	1	1	39	860	894	
Michigan	1,082	745	102	96	37	664	64	39	80	55	569	749	
Minnesota	894	482	63	298	40	391	57	32	13	11	405	625	
Mississippi	321	226	29	60	8	188	26	2	8	89	652	658	
Missouri	684	587	80	204	1	350	21	11	17	63	548	557	
Montana	352	348	180	1	0	171	0	0	0	0	172	173	
Nebraska	329	325	28	181	1	116	1	1	1	0	360	361	
Nevada	134	111	23	7	8	87	2	5	2	1	998	1,158	
New Hampshire	106	106	18	0	0	85	0	0	3	0	681	681	
New Jersey	503	401	60	40	8	352	18	7	18	55	930	1,094	
New Mexico	230	200	39	30	7	137	9	0	8	2	527	572	
New York	1,059	980	89	132	10	722	24	3	79	29	862	878	
North Carolina	516	486	26	10	7	439	6	5	23	10	830	867	
North Dakota	186	179	11	105	2	56	3	1	8	6	215	216	
Ohio	1,015	928	131	142	80	605	9	17	31	75	664	684	
Oklahoma	564	560	84	0	0	417	45	3	15	0	354	355	
Oregon	302	270	30	41	12	211	7	1	0	0	620	679	
Pennsylvania	815	720	101	162	13	449	59	9	22	87	863	875	
Rhode Island	75	52	9	4	0	59	2	0	1	12	795	906	
South Carolina	275	222	24	14	5	210	14	3	5	40	974	983	
South Dakota	270	257	80	1	1	188	0	0	0	0	164	166	
Tennessee	345	308	24	27	18	248	13	10	5	22	868	924	
Texas	2,158	1,482	316	215	109	1,185	37	47	249	1	702	948	
Utah	305	219	85	45	23	68	48	12	24	8	715	934	
Vermont	72	56	8	19	0	30	0	0	15	15	582	592	
Virginia	385	343	33	6	36	272	3	0	35	31	1,183	1,197	
Washington	574	388	83	67	53	327	24	9	11	11	652	885	
West Virginia	130	116	10	19	1	93	2	3	2	31	657	715	
Wisconsin	631	561	69	60	4	434	14	36	14	8	495	543	
Wyoming	103	86	24	11	2	62	4	0	0	0	310	358	
Bureau of Indian Education	21	21	2	5	0	14	0	0	0	0	---	---	
DoD, domestic	7	7	2	0	0	5	0	0	0	0	476	476	
DoD, overseas	32	32	2	13	0	17	0	0	0	0	453	453	
Other jurisdictions													
American Samoa	6	5	0	0	0	5	1	0	0	1	---	---	
Guam	0	0	0	0	0	0	0	0	0	0	---	---	
Northern Marianas ..	6	6	1	1	0	4	0	0	0	0	727	727	
Puerto Rico	398	368	191	28	1	3	158	0	17	27	529	518	
U.S. Virgin Islands	10	8	5	0	0	5	0	0	0	1	803	896	

---Not available.

\1Excludes vocational, special education, and alternative schools.

\2Vocational schools are also included under appropriate grade span.

\3Average for schools reporting enrollment data. Enrollment data were available for 22,800 out of 24,426 public secondary schools in 2007-08.

NOTE: Includes schools with no grade lower than 7. Excludes schools not reported by grade level, such as some special education schools for the disabled. DoD = Department of Defense.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 2007-08. (This table was prepared September 2009.)

**Okun's Law as a π -to-1 Ratio:
A Harmonic / Trigonometric Theory as to Why Okun's Law Works**

By Scott A. Albers*

Abstract: *"Okun's Law" states a 3:1 proportion between percent growth in U. S. real GNP and percent decrease in the rate of unemployment. This paper argues that this ratio is actually a π :1 proportion, heretofore unrecognized because it is displayed through a form of mathematic / harmonic inverse.*

In Part One the Cartesian coordinate system is merged with the legal doctrines of actus reus (x-axis, actions) and mens rea (y-axis, thoughts). A unit circle of personal choice – including economic choice (trading vs. keeping) – may thereby be devised. This unit circle is then aggregated into a torus, half the circumference of which represents U.S. real GNP (π), the antipodal half-circumference its monetary value (π) and the radius the rate of employment necessary to its production ($R = 1$). Mainstream econometric analysis appears to support this theory of inverses with proximities of within 1.3%, 1.0%, 0.35%, 0.00105% and less than half a degree.

In Part Two this model of Okun's Law is connected closely to an analysis of the well-known Kondratiev Wave, a 56-year "Long Wave" of evolving social and economic relationships. This approach to macroeconomics is thereby aligned with a geometric, harmonic and trigonometric analysis of empirical data, rather than purely statistical methods.^{38, 39}

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³⁸ Acknowledgements. This article is a sequel, a "Part Two," following upon a previous peer-reviewed article entitled "On the mathematic prediction of economic and social crises: towards a harmonic interpretation of the Kondratiev Wave," *Entelequia: Revista Interdisciplinar*, University of Malaga, Malaga, Spain, Issue 15, April, 2013, pp. 37-124, <http://www.eumed.net/entelequia/en.art.php?a=15a02>. Special thanks go to Dr. Arno Tausch, editor of this issue "Globalization of World System Research," <http://www.eumed.net/entelequia/en.art.php?a=15>, for including this article in the monograph.

This second and subsequent paper is a reply to Dr. Edward Knotek's rhetorical question "How Useful is Okun's Law?" (*Economic Review* 2007) <http://www.kc.frb.org/publicat/econrev/PDF/4q07Knotek.pdf> made possible only because Dr. Knotek has been so generous with his time, information, insights and explanations vis-à-vis that article.

³⁹ This article contains 12,693 words, with an abstract of 200 words, paginated as a two page pdf view, odd numbered pages to the left, even numbered pages to the right. A majority of the diagrams used in this essay are taken from five working papers which develop "the Political Economy Wave" entitled "Predicting crises: Five essays on the mathematic prediction of economic and social crises," <http://mpira.ub.uni-muenchen.de/43484/>. These diagrams are left in their original format and numbering scheme for easy reference to that set of papers, i.e. "5-3" or "2-4" etc. New diagrams introduced in this essay post-Introduction in Parts One and Two are without dashes, i.e. "Diagram 1." Early drafts of this paper are posted at the Munich Personal Repository, Papers No. 44843 and No. 44594. See also http://www.scribd.com/scott_albers_1 for additional related works adapting the ideas herein to a variety of fields.

JEL Classification: A12, A13, B00, B4, B59, C1, C19, C50, E1, E10, E19, E3, P16, Z0, Z00

Key words: Okun's Law, Kondratiev wave, unemployment, GNP growth, Long wave, trigonometric analysis, unit circle, Okun's coefficient, steady-state rate of growth, π , ϕ , the Golden Mean, harmonic analysis

Introduction: Okun's Law

“Okun's Law” is an economic empirical regularity⁴⁰ which notes that – in the United States⁴¹ – for every three percentage points of increase in real GNP the rate of employment increases by one percentage point, and that decreases of both take place at the same rate. This 3 : 1 proportion is generally referred to using a double negative, i.e. an increase of three percent in real GNP will lead to a one percent *decrease* in the rate of *un*-employment. Although first stated by Arthur Okun, at the time senior economist of President Kennedy's Council of Economic Advisors, “Okun's Law” has taken on a legend of its own, as “one of the most reliable empirical regularities in macroeconomics.” (Tobin, 1983)

This 3:1 ratio was first presented in a 1962 paper by Arthur M. Okun entitled “Potential GNP: Its Measurement and Significance.” The paper opens with the question: “How much output can the economy produce under conditions of full employment?” Dr. Okun writes:

The basic technique I am reporting consists of a leap from the unemployment rate to potential output rather than a series of steps involving the several underlying factors (which might impact on potential output). Strictly speaking, the leap requires the assumption that, *whatever the influence of slack economic activity on average hours, labor force participation, and manhour productivity, the magnitudes of all these effects are related to the unemployment rate*. With this assumption, the unemployment rate can be viewed as a proxy variable for all the ways in which output is affected by idle resources. The measurement of potential output then is simplified into an estimate of how much output is depressed by unemployment in excess of four percent.

⁴⁰ The notion of an “empirical regularity” in economics is undefined in the literature. The notion of a *statistical* regularity is described by the observation that, although the throw of dice is indeterminable on a single throw, over many repeated throws various statistical regularities are observed. The notion that a π :1 ratio is to be found in the econometric data of the United States is at odds with the notion of a statistical regularity. As William Feller noted: “There is no place in our system for speculations concerning the probability that the sun will rise tomorrow. Before speaking of it we should have to agree on an (idealized) model which would presumably run along the lines ‘out of infinitely many worlds one is selected at random...’ Little imagination is required to construct such a model, but it appears both uninteresting and meaningless.”

The phrase “stylized fact” is also used, defined as: “Something that has been observed to be true, or close to true, sufficiently often and in enough different contexts that an economic theory should be consistent with it. Those who present a set of stylized facts typically do not attempt to support them with data, but simply list them so as to motivate their theoretical analysis.” Dictionary Central.com. See e.g. Heine, et al. (2005), “Stylized Facts and the Contribution of Simulation to the Economic Analysis of Budgeting.”

⁴¹ I undertake an economic analysis of the United States alone on the expectation that if a harmonic / trigonometric theory for Okun's Law can be derived for this largest and most dynamic economy a similar analysis of other countries may more readily be considered. Regional and cross-cultural evaluations of Okun's coefficient are available, see e.g. Moosa (1997); Lee (2000); Freeman (2000); Sogner and Stiassny (2002); Kennedy (2009); Oberst and Oelgemoller, (2013).

Dr. Okun then states his law.

The answer I have to offer is simple and direct. In the postwar period, on the average, each extra percentage point in the unemployment rate above four percent has been associated with about a three percent decrement in real GNP.

... My own subjectively weighted average of the relevant coefficients is 3.2, yielding the following estimate of potential:

$$P = A(1 + .032 (U-4))$$

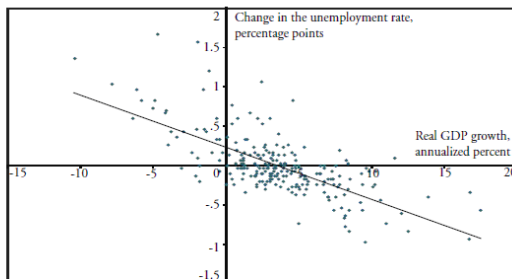
Recent Scholarship

Dr. Edward Knotek's article "How Useful Is Okun's Law?" (2007) proposes that Okun's Law is, at best, a helpful rule of thumb. As the title of the article suggests directly, Dr. Knotek describes in detail our present understanding of Okun's Law as both a mathematic equation and as a policy tool.

To make the point of his article Dr. Knotek organizes data sets which follow mainstream econometric methods as applied to well-known and easily available federal data bases covering a 60 year period of American economic history, i.e. the second quarter of 1947 through the third quarter of 2007. Charts One and Two graph the quarterly and annual data sets supporting the regularity of the relationship between changes in the size of real GNP (x-axis) and the corresponding effect this has on the rate of employment (y-axis).

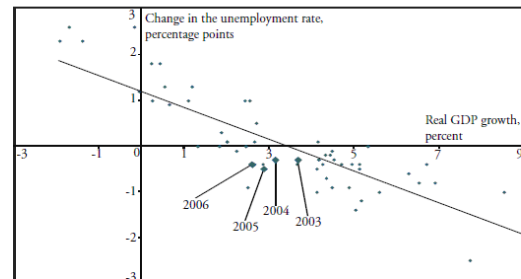
INTRODUCTORY DIAGRAM 1. CHARTS ONE AND TWO OF "HOW USEFUL IS OKUN'S LAW?"

Chart 1
THE DIFFERENCE VERSION OF OKUN'S LAW,
QUARTERLY DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from the second quarter of 1948 through the second quarter of 2007.

Chart 2
THE DIFFERENCE VERSION OF OKUN'S LAW,
ANNUAL DATA



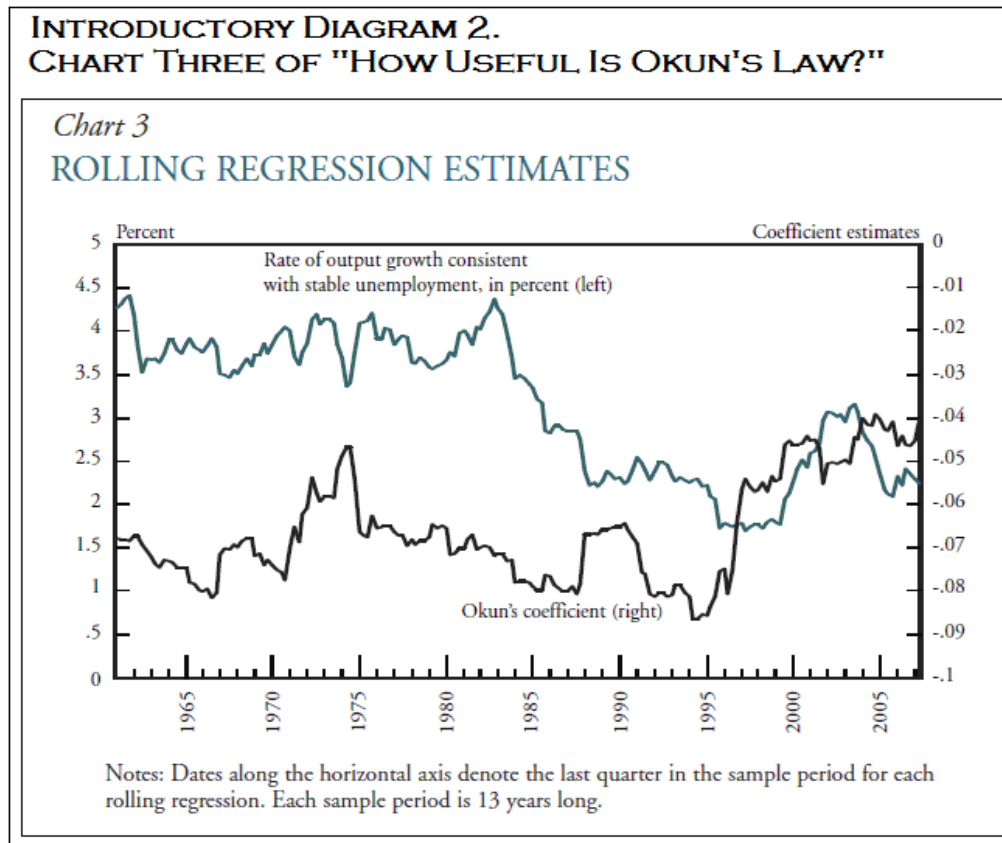
Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from 1949 through 2006.

The significance of these trend lines is developed throughout this essay.⁴²

⁴²

The trend line for annualized quarterly data in Chart One as originally provided by Dr. Knotek (June 24, 2011) is $y = .23094 - 0.066036x$, giving a steady-state rate of growth (x-intercept) of 3.4971853. This rate was virtually identical to the 3.4969781 rate calculated at the time under this program of research. These rates will be used throughout this essay but see the Appendix for alternative trend lines and measurements.

Dr. Knotek then takes issue with the straight-forward association presented above between the rate of growth and the rate of unemployment. He makes the point that the historic associations underlying these trend lines merit much closer scrutiny. We will turn to this insight, illustrated by Chart Three below, near the end of this paper.



Despite the issues brought forward by Dr. Knotek,⁴³ Okun's Law remains one of the most well-known and central findings of macro-economics.^{44 45 46} Surprisingly, there is at present no theoretic structure,⁴⁷ or even agreed upon *ansatz*,^{48 49 50 51} to explain the apparently long-

⁴³ See, in accord, e.g. Meyer and Tasci (2012), "An Unstable Okun's Law, Not the Best Rule of Thumb."

⁴⁴ On the significance of Okun's law see also Freeman, 2000: "(M)easured correctly Okun's relationship continues to be perhaps the closest thing to a law that macroeconomics has." See also Blinder, 1997: "Is There a Core of Practical Macroeconomics that We Should All Believe? With emphasis on the adjective 'practical' and the normative 'should,' my answer to the question of this session is a resounding yes. ... (Here) I will describe briefly the main practical elements that I think we should agree on, without worrying too much about their theoretical underpinnings ... Okun's Law. The other truly sturdy empirical regularity, Okun's Law, is even more atheoretical, if not indeed antitheoretical. This simple linear relationship between the percentage change in output and the absolute change in the unemployment rate presumably embodies productivity, labor-force participation and production-function considerations. On the surface, it seems to contradict the concavity of the latter. Nonetheless, it closes the loop between real output growth and changes in unemployment with stunning reliability."

⁴⁵ As to the current perception of the reliability of Okun's Law see a recent working paper published by the International Monetary Fund, Ball, et al., 2012: "Our principal conclusion is that Okun's Law is a strong and stable relationship in most countries. Deviations from Okun's Law occur, but they are usually modest in size and short-lived. Overall, the data are consistent with traditional models in which fluctuations in unemployment are caused by shifts in aggregate demand. There is one important qualification to the universality of Okun's Law. While a stable Law fits the data for most countries, the coefficient in the relationship - percent change in output on the unemployment rate - varies across countries. We estimate, for example, that the coefficient is -0.15 in Japan, -0.45 in the United States, and -0.85 in Spain. These differences reflect special features of national labor markets, such as Japan's tradition of lifetime employment and the prevalence of temporary employment contracts in Spain."

⁴⁶ The significance of Okun's Law may be considered in light of the central role "potential output" plays in many macroeconomic models. See Moosa 1997: 335-336. "Economists are interested in (Okun's law) not only because it appears to be a robust empirical regularity, but also due to its theoretical importance because the aggregate supply curve is derived by combining it with the Phillips curve. Moreover, the relationship has important implications for macroeconomic policy, particularly in determining the optimal or desirable growth rate."

This essay proposes that a steady-state rate of growth of 3.4969% per year applies to the United States, both as a matter of our analysis as well as the annualized quarterly data for Okun's Law. (Knotek 2007)

⁴⁷ See e.g. Kennedy, 2009:3. "Given the weak theoretical understanding of why the coefficient is greater than one, and has been so stable, it is somewhat surprising that a larger literature has not been produced specifically on this variable. For every one article on Okun's coefficient, there are five on the Non-Accelerating Inflation Rate of Unemployment (NAIRU), or twenty on the Phillips curve. Yet Okun's coefficient is as firmly embedded in practical macroeconomics as any other empirical relationship." A good review of the current literature is provided in this dissertation, pages 4-28.

⁴⁸ It is important to note at the outset that 'potential output' is connected quite closely to the pricing scheme, at least in concept. As pointed out in Congdon (2008): "The analysis (by Okun) proposed a concept of 'the GNP gap', which was obtained by distinguishing between potential and actual GNP. In his words, 'Potential GNP is a supply concept, a measure of productive capacity.' Nevertheless, '... it is not a measure of how much output could be generated by unlimited amounts of aggregate demand... The full employment goal must be understood as striving for maximum production without inflationary pressure.' Potential output differs from actual output because aggregate demand may not be sufficient to deliver full employment. It follows that 'If, in fact, aggregate demand is lower, part of potential GNP is not produced; there is unrealized potential or a 'gap' between actual and potential.'"

⁴⁹ As to challenges to the notion of "potential GDP" see the report of the Congressional Budget Office (2004), "A Summary of Alternative Methods for Estimating Potential GDP." "A spectrum of opinion exists among economists about the usefulness of measures of potential GDP for monetary and fiscal policy and for economic projections. Some economists do not think that the idea of potential output is useful, arguing that: (1) The concept is based on a flawed view of the causes of inflation, even in the short run. According to this argument, inflation is determined by growth in the money supply, not by where the economy is in the business cycle. (2) Potential GDP is so unstable and varies so much that it is impossible to estimate accurately, especially for recent years, and thus is not a helpful guide for policymaking or forecasting. (3) Policies to manage demand generally do more harm than good because of lags, uncertainties and political pressures. Hence, the size of the gap between actual and potential output

standing and vital 3:1 macroeconomic / mathematic relationship given by Okun's Law. On this point see Owyang and Sekhposyan (2012):

Many macroeconomic textbooks contain a rule of thumb relating real output growth to changes in the unemployment rate. This relationship, called Okun's law after Okun (1962) typically assigns a 2- to 3- percentage point decrease in real gross domestic product (GDP) growth to a 1-percentage point increase in the unemployment rate. Unlike laws in the physical sciences (e.g. Newton's laws of motion) Okun's law is an (arguably loose) empirical correlation and is, in general, neither theoretically motivated⁵² nor strictly adhered to in the data. As many of the reduced-form relationships build strictly on associations and not causation, Okun's law appears to vary depending on the sample period studied.⁵³

ought to be irrelevant to policymakers. ... In CBO's view, the value of potential GDP is not restricted to short term fiscal and monetary policy. Potential output calculated with a growth model is a useful concept for gauging the economy's productive capacity and offers the best basis for projecting GDP over the 10-year horizon required by the budget process. Carefully estimated, potential GDP can provide the user with a reasonable sense of the economy's potential for growth."

⁵⁰ On the validity of the notion of "potential GNP" see also Penson and Webb (1981), "Gross National Product at Full Employment." "Some economists have questioned the meaning and usefulness of the concept of potential GNP because it explicitly ignores demand. Plosser and Schwert, for example, argue that potential GNP has little operational significance because: 'It is not an equilibrium concept, since there is no relationship with aggregate demand. Consequently 'potential GNP' cannot be viewed as representing the level of output which would prevail in the absence of any unexpected random shocks to aggregate supply or demand.' Gordon also faults estimates of potential GNP – a term he says has been discredited and is obsolete – because they do not explicitly relate to the behavior of wages and prices. This raises a question as to whether policy makers can realistically expect to see the output levels suggested by estimates of potential GNP if they adopt policies to fully employ available resources, since these estimates explicitly ignore the economic factors influencing producers' and consumers' decisions."

⁵¹ A good example of the relationship which Okun's Law has been perceived to play vis-à-vis prices is found in Holloway (1989). "The Okun's Law equation and estimates of potential GNP derived from it have some significant implications for public policy. Currently, the most important one concerns potential inflationary pressures. The level of potential GNP addresses the noninflationary capacity constraints of the economy. As the economy tests those constraints, accelerating inflation is the likely consequence. The growth rate of potential GNP relative to the actual growth rate determines whether the economy is moving toward its productive capacity or is not growing as rapidly as the economy is capable of adding to capacity. In recent years, very rapid growth in actual GNP has greatly exceeded the rate of growth in potential GNP of 2.25 percent estimated in this note. As a consequence the unemployment rate has fallen sharply and the economy has moved ever closer to its productive capacity. Partially in response to this strength, the Federal Reserve initiated credit tightening moves several times in 1987 and 1988 out of fears of the likelihood of accelerating inflation. ..."

⁵² Okun's Law is studied from a number of perspectives including (1) the difference version, (2) the gap version, (3) the dynamic version, and (4) production-function versions. (Knotek 2007) See Condon (2008), "Two Concepts of the Output Gap," for a thorough review of the philosophic and theoretical differences surrounding the "gap" approach to Okun's Law. "(O)ne concept of the gap was first advanced by Arthur Okun in 1962 and may be termed 'Keynesian', whereas the alternative concept stems from Milton Friedman's presidential address to the American Economic Association in 1967 and may be regarded as 'monetarist'. The argument here will be that over time the monetarist concept of the gap has ousted the Keynesian and that the consequent refurbishment of economists' understanding of the 'gap' notion has made a vital contribution to the so-called 'Great Moderation'.

⁵³ I propose herein that eight 7-year periods, in a recurring circuit of 56-years, are an essential part of calculating Okun's Law, and that the slopes of these periods are responsible collectively for the maintenance of the proportions of Okun's Law over the long term. (see Part Two)

The Need for a Theory

Three approaches attempt to provide a theoretic explanation for Okun's Law, but with limited success in deciphering the stability or ratio of "Okun's coefficient" over time. Briefly, (1) Prachowny's approach takes Okun's Law from the view of production, (2) Adachi's approach considers Okun's Law as the outcome of economic growth and (3) Lang and de Perretti's approach considers Okun's Law from the point of view of historic "hysteretic" development.

(1) In his 1993 paper "Okun's Law: Theoretical Foundations and Revised Estimates" Dr. Martin Prachowny uses production functions to derive Okun's Law.

The relationship between unemployment changes and output must be derived from a production function for the economy as well as from ancillary relationship in the labor market. In natural logs, the production function is written as

$$y = \alpha(k+c) + \beta(\gamma n + \delta h) + \tau$$

where y is output, k is the capital input and c is its utilization rate, n represents the number of workers, h is the number of hours that they work; α and β are output elasticities and γ and δ are the contributions of workers and weekly hours to the total labor input; finally τ is a disembodied technology factor. Various constraints can be put on the elasticities...

As to the actual 3:1 ratio he states:

Okun's coefficient of three is derived from a complicated weighted sum of all other changes.

He concludes:

Arthur Okun's insights into the relationship between the demand for labor and the supply of output are every bit as important as the Phillips curve in understanding the Aggregate Supply curve for any macro-economy. However empirical work on Okun's Law seems not to have progressed very far beyond Okun's original estimates. This paper has attempted to remedy this unfortunate neglect, not by generating one more parameter value for Okun's original coefficient, but by focusing on the underlying production function that connects labor input as well as other facts of production to output of goods and services. In the process, it has been determined that changes in weekly hours and movements in capacity utilization, in addition to adjustments in the unemployment, are significant influences on the changes in the output gap. The next step in the analysis is to examine whether changes in hours or capacity utilization have the inflationary effects as changes in unemployment.⁵⁴

⁵⁴ See Attfield and Silverstone (1997), "Okun's Coefficient: A Comment," for a complete re-evaluation of Prachowny's approach. "(T)here is no evidence that any of the relations (suggested by Prachowny) are co-

(2) In his 2007 paper “Economic Growth and Unemployment – Theoretical Foundations of Okun’s Law” Dr. Hideyuki Adachi suggests that Okun’s Law may be derived from the Solow growth model. (Adachi, 2007). Dr. Adachi distinguishes his effort to tie Okun’s Law to Solow’s growth equations from Prachowny’s production functions as follows.

Prachowny (1993) attempts to provide theoretical foundations of Okun’s Law by deriving the relationship between unemployment changes and output from a production function for the economy and ancillary relationship in the labor market. Quite differently from his approach, this paper attempts to provide theoretical foundation to Okun’s Law by integrating it with growth theory.

He states:

So far, Okun’s Law remains to be an empirical observation rather than a result derived from theory. Moreover, this quantitative relationship varies depending on the countries and time periods under consideration. To identify what factors cause these differences, the theory that explains this empirical law is required. ... As far as I know... there is no literature that gives theoretical explanations of this law.⁵⁵ ...

He comments upon the need to deal with growth as a fundamental basis for the reliability of Okun’s Law.

Solow (2000) ... mentions the need to develop the medium-run macroeconomic theory that explains medium-run departure from the steady growth. For this purpose, he suggests the idea of using Okun’s Law in growth theory, saying “what is wanted is an integration of Okun’s Law and growth models, so that the events of the business cycle are directly linked to the evolutions of the growth path. This is not only useful for growth theory, but also for Okun’s Law, because Okun’s Law might be improved by this marriage, too.”

integrated, and therefore we can draw no conclusion from the results. ...What we can conclude from this analysis is that the value of the Okun’s coefficient for the United States is around -2.25 using Gordon’s output-unemployment data from 1967 to 1986. This finding, rather than Prachowny’s estimated value for around -0.67, supports previous research.”

⁵⁵ In light of the theoretic work by Adachi, it would appear that Freeman’s (2000) reference to a theoretical basis for Okun’s Law is premature. He states: “Since (1962) a number of papers have established theoretical foundations for Okun’s Law (Clark, 1983; Gordon, 1984; Prachowny, 1993) and tested the stability of the 3:1 trade-off (Clark, 1983; Gordon, 1984; Adams and Coe, 1989; Holloway, 1989; Prachowny, 1993; Attfield and Silverstone, 1998). In general, Okun’s Law has withstood most challenges, although current estimates of the trade-off fall into a range closer to 2:1 than 3:1 (Gordon, 1984; Attfield and Silverstone, 1998; Moosa, 1997) and vary according to the methods and specifications used. Variations notwithstanding, the stability of Okun’s Law contrasts favorably with the Phillips curve, its counterpart in the unemployment-inflation space.”

Freeman notes the uncertain basis for Okun’s Law even as Okun himself interpreted it. “Writing almost two decades later, however, and shortly before his death, Okun (1981, p. 228) himself doubted his law’s stability: ‘During the late seventies, the three-to-one ratio (on real GNP to the unemployment rate) no longer approximated reality. If employers encounter an unusually deep recession and expect the subsequent period of slack to be especially long lasting, they are likely to cut back employment more nearly in proportion to the decline in output.’ ”

Dr. Adachi derives the following equation as the basis for Okun's Law,

$$\frac{\dot{Y}}{Y} = (\alpha + \lambda) - \frac{1}{1-u} (1 + \varepsilon \sigma(n)) \dot{u}$$

where Y is output; α is labor augmenting the technological progress, assumed to be proceeding at a constant rate; λ is the constant rate of growth in the labor population; u is the rate of unemployment; ε represents the sensitivity of the real wage rate to the tightness of the labor market; $\sigma(n)$ is the elasticity of substitution between labor and capital and n is the efficiency per unit of capital. He notes:

As this equation shows, the rate of growth of output in the case of (\dot{u} "dot") = 0 is equal to $\alpha + \lambda$, which is the steady growth rate of the model. The coefficient for (\dot{u} "dot"), which is called Okun's coefficient, is equal to $(1 + \varepsilon(n))/(1-u)$. Since this value depends on u , Okun's coefficient in theory is not constant. However, this value will presumably change little within the relevant range of u .

Ultimately Dr. Adachi's finds his effort to be of limited success. He states:

It is shown that the substantial difference of Okun's coefficient between the two countries (Japan = 3.38 and the United States = 0.39) may be attributed at least partly to the difference in the elasticity of the real wage rate the unemployment rate, i.e. the real wage flexibility.⁵⁶

However these two parameters are not enough to explain fully the size of Okun's coefficient. I consider it important to introduce the utilization of labor and capital into the model to achieve more perfect marriage of Okun's Law with growth theory. I plan to discuss about this attempt in another paper.⁵⁷

⁵⁶ The conclusion reached in this paper is that growth in the United States (x-axis intercept) runs on a 56-year cycle, and that unemployment (y-axis intercept) runs on a 14-year cycle. In consequence the slope of Okun's Law varies over time, but continually dances around a steady $\pi:1$ ratio as exhibited in the data. Regarding the effort to quantify Okun's coefficient itself see Weber (1995), "Cyclical Output, Cyclical Unemployment, and Okun's Coefficient: A New Approach." See also Penson and Webb (1981), "Gross National Product at Full Employment."

⁵⁷ In connection with this approach see Aghion and Howitt (1994), "Growth and Unemployment." In this study the authors: "ask() the question of how the rate of economic growth affects unemployment in the long run. The main consideration that leads us to think that this is an interesting question has to do with the re-allocation aspect of growth. In the long run, faster economic growth must come from a faster increase in knowledge. To the extent that the advancement of knowledge is embodied in industrial innovations it is likely to raise the job-destruction rate, through automation, skill-obsolescence, and the bankruptcies associated with the process of creative destruction. In short, increased growth is likely to produce an increased rate of job-turnover, and the search theories of Lucas and Prescott (1974) and Pissarides (1990) imply that an increased rate of job-turnover will result in a higher natural rate of unemployment. This conclusion is also consistent with the empirical results of Davis and Haltiwanger (1990) which show that periods of high unemployment tend to be periods of high job-turnover at the establishment level. It suggests the possibility of a positive long-run tradeoff between growth and employment, at least over some range."

Aghion and Howitt do not discuss Okun's Law. However in as much as we herein consider Okun's Law as playing a central role in maintaining the political, social and cultural development of the United States over recurring 56-year circuits, the article may be relevant to Okun's Law itself and its final understanding.

(3) A third approach is presented by Drs. Dany Lang and Christian de Peretti in their paper entitled “A strong hysteretic model of Okun’s Law: theory and a preliminary investigation.” (2009) Their approach takes issue with the straight-forward linear relationship posed by Okun’s Law.⁵⁸

The underlying assumption that unemployment responds to growth shocks in a *linear* fashion can be regarded as open to question. Arguably, the response of unemployment to variations in growth need not be the same during booms as during recessions, and should depend on the *intensity* of economic fluctuations, and possibly on the *past history* of the economic system. (at 446)... This implies that reactions of the unemployment to growth shocks can be *asymmetric*. (emphasis in the original)

This approach does not take up the 3:1 ratio presented by Okun’s Law. Rather a mathematic approach is devised whereby the study of points in the graph may be understood.

(T)he link between growth and unemployment may be hysteretic. According to the rigorous mathematical definition of hysteresis, due to Krasnosel’skii and Pokrovskii (1989) and Mayeregozy (1991), a process that has a memory of past shocks must possess two key properties to be characterized as hysteretic: remanence and a selective, erasable memory. Remanence occurs when the application of two successive shocks of the same magnitude, but of opposite signs, does not bring the system back to its initial position. The selective, erasable memory property means that only the non-dominated extremum values of the past shocks that have hit the system remain in its memory bank. In economics this definition of hysteresis can be called ‘strong’ or genuine hysticeses. It has been applied mainly, but not only, to the study of exchange rates dynamics (Amable et al. 991; Gocke 2003;) and to unemployment (Cross et al. 1998). As argued by Amable et al (1993, 1994) and Cross (1993, 1995), the multiple other uses of the term ‘hysteresis’ are inappropriate and these inappropriate uses can be found in economics only. The definition of hysteresis used in this paper is the only one that is used in physics (from where the term originates) and biology, and which respects the mathematical properties of the concept.

Thus one may locate three theoretic approaches to Okun’s Law each of which may be the outgrowth of the structure of the law itself.

The y-axis of Okun’s Law (employment) might be seen in Prachowny’s paper which emphasizes the productive use of labor, capital, technology, etc. and the y-axis of Okun’s Law, i.e. the “rate of employment,” not simply of labor but of all productive aspects of the economy.

The x-axis of Okun’s Law (growth) might be seen in Adachi’s paper which emphasizes the Solow growth model: “increase in the size of real GNP.”

Finally Lang and de Peretti emphasize the creation of various moments in time driving the data underlying the linear relationship of Okun’s Law itself.

⁵⁸ See also Cross (1993); Cross, et al (1998); Piscitelli, et al (2000); Gocke (2002); Hallett (2002).

It is difficult to see how these equations and approaches can account for the linear stability of Okun's Law over time or the 3:1 ratio suggested by U. S. data. Simply considering the variables collected we have:

Prachowny:

y is output,
 k is the capital input and
 c is its utilization rate,
 n represents the number of workers,
 h is the number of hours that they work;
 α and β are output elasticities and
 γ and δ are the contributions of workers and weekly hours to the total labor input;
 τ is a disembodied technology factor.

Adachi:

Y is output;
 α is labor augmenting the technological progress, assumed to be proceeding at a constant rate;
 λ is the constant rate of growth in the labor population;
 u is the rate of unemployment;
 ε represents the sensitivity of the real wage rate to the tightness of the labor market,
 n is the efficiency per unit of capital, and
 $\sigma(n)$ is the elasticity of substitution between labor and capital.

In both theories many of the variables mentioned are difficult to assess and may be quite volatile over time. Intuitively it does not seem possible that the linear stability of Okun's Law would emerge easily from sets of such variables. Moreover the hysteresis approach does not attempt to define any larger, linear dynamic into which the method of hysteresis fits.

Our approach examines more closely the econometric data presented by Dr. Knotek. I propose that a valid and workable theory of Okun's Law and its 3:1 ratio may be derived, not from first principles suggested by way of a mathematic or theoretical emphasis, but by first principles which are imposed upon us by the data itself.

The implications of deriving a π :1 ratio from the existing data are quite significant, in as much as so much of mathematic inquiry begins at the unit circle of trigonometric analysis. The result is a view of the economy as a living organism, one which over time collects and puts into place the various and subsidiary ratios mentioned above as necessary to maintain an overarching unity of development over time. By considering the unity of the picture first and the ratios which pertain thereto, we hope to provide a context to which all other aspects of the economy must find themselves subject.

Okun's Leap

Okun begins with the following clearly stated and central assumption.

Strictly speaking, the leap (from employment rate to potential output) requires the assumption that, *whatever the influence of slack economic activity on average hours, labor force participation, and manhour productivity, the magnitudes of all these effects are related to the unemployment rate.*

As will be developed at greater length in this paper, Okun's leap from an individual consideration of various subsidiary "effects" to the proxy variable of a single, all-encompassing "national rate of unemployment" significantly simplifies the approach to the question posed. It is important to note however that the subsidiary "effects" leapt over ("average hours, labor force participation, and manhour productivity") continue to have a vital and independent standing as they are "related to the unemployment rate."⁵⁹

An inverse and reciprocal relationship is implied by this leap. Just as the "rate of national unemployment" will always be tied to the personal and individual "effects" disregarded in Okun's Law, so will these personal and individual "effects" always be tied to the "rate of national unemployment" by a mathematic reciprocity. Put simply, as the national rate of unemployment goes up, the number of individual people unemployed goes up. As the number of people unemployed goes up thereby igniting a myriad of personal concerns, the more that national rate of unemployment becomes a matter of national concern and direct political consequence. It is hardly too much to say that public concern regarding job creation, social mobility and economic fairness implicated in high rates of unemployment are among the chief concerns of the government of the United States.

One might imagine the inverse relationship implied between the "personal" and the "national" if we let "Government" = 1. In this case the fraction "1/individual" might represent the individual as he/she relates to the nation. Inversely, the fraction "individual/1" would represent the nation as it relates to the individual.

The risk inherent in Okun's approach is that the inverse relationship between the personal and the national might become obscured, taking on by unacknowledged acquiescence the nature of a "1/1," an impenetrable and un-investigable union. In this paper we will deal extensively with the inverse relationship between the "personal made national," and the "national made personal" as the mathematic foundation of our approach.

⁵⁹ See Adams and Coe (1989) and Gordon (1984) for a careful evaluation of the underlying factors underlying the national unemployment rate.

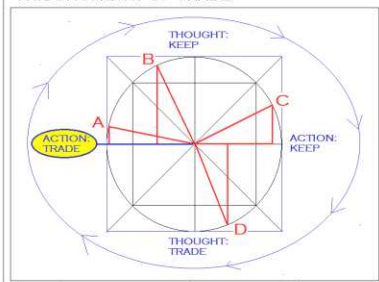
To this basic insight must be added the empirical fact that (1) the steady-state rate of growth given by the GNP Spiral (3.4969% per year, Albers & Albers, 2013) is virtually identical with the steady state rate of growth given for annualized quarterly growth given by Knotek. (3.4971% per year, Knotek, 2007, *supra*, footnote 5). In turn, (2) the GNP Spiral predicts this steady state rate of growth as a function of the bio-complexity of the United States.

A Description of Our Approach

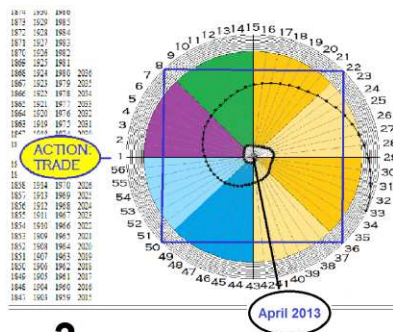
Using these two central insights we propose that Okun's Law may be the result of a formal, highly mathematic balance between the individual's right to trade over the short term as influencing and influenced by social values chosen by the people of the United States over the long term. The larger society is thereby the fractal of the smaller, although both merge continually with each other, thereby providing a "proof" of this approach.

INTRODUCTORY DIAGRAM 3. OKUN'S LAW AS FULCRUM

DIAGRAM 1-13.
TRIGONOMETRY OF TRADE.



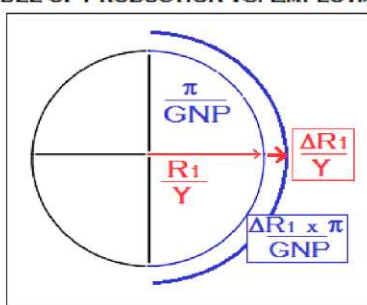
1.
Personal Choice
To Trade Property



3.
Social Choice
To Trade Values

2.
Okun's Law

DIAGRAM 2-9.
MODEL OF PRODUCTION VS. EMPLOYMENT



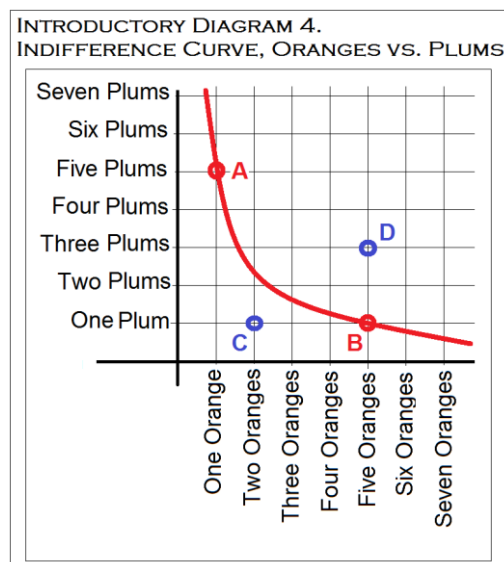
Conclusion to the Introduction: To Buy or Not To Buy

The balance between the personal and the social in the United States is provided by the individual choice of the citizen either to buy, or to refrain from buying, goods and services made available in the productive stream of commerce. This entails the notion of price and the relative demands people place upon economic production in view of their personal financial circumstances. It also connects directly to the type and location of jobs created and the employment rate which follows upon these decisions.

By way of introduction it is worth noting that in his course on the development of political morality Dr. Ian Shapiro (<http://oyc.yale.edu/political-science/plsc-118/lecture-6>) makes clear that the whole of neo-classical economics can be condensed into a study of the indifference curve. (Shapiro, 2003:38, 44-45)

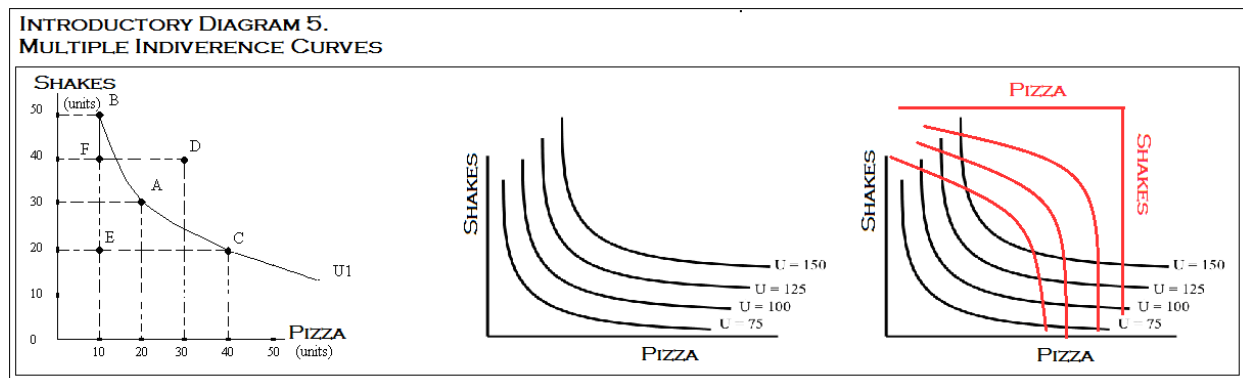
The architects of neoclassical price theory, William Jevons (1835-1882), Leon Walras (1834-1910), Alfred Marshall (1848-1924), Francis Edgeworth (1845-1926), Knut Wicksell (1851-1926) and Vilfredo Pareto (1848) were principally interested in understanding the behavior of prices in market economics. ...The core notion here is that of an indifference curve. The intuition behind it is a syntheses of three ideas already discussed: that people want to maximize utility in Pareto's stripped-down sense, that their choices generally reflect the principle of diminishing marginal utility, and that they are minimally rational in that their ordering of their desires do not violate transitivity. ... Indifference means exactly what it says: someone is indifferent between two goods if exchanging one for the other would neither increase nor decrease his or her utility.

In the graph below points A and B represent John's indifference to possessing either five plums and one orange, or five oranges and one plum. Under these circumstances someone offering such a trade can be considered by John because he is indifferent to the choice between them.



Point C represents a collection of two oranges and one plum. If this point represents the bundle which John possesses, he will save this quantity because he is not indifferent to the choices available to him. Point D represents a collection of five oranges and three plums, a collection which John does not possess and therefore cannot trade.^{60 61}

The curve drawn below left represents the “indifference” for any consumer as to a choice between pizza and shakes. (Introductory Diagram 5, below) The “indifference curves” generated from this pair of dichotomies represents the willingness to trade one set of goods for different goods.



As increasing levels of affluence are provided, a map of multiple curves becomes possible. (center, Introductory Diagram 5, above)

The indifference curves of two competing trading partners may be explored by inverting the curve of one of the partners.⁶² (right, Introductory Diagram 5, above)

⁶⁰ The presentation of the indifference curve between plums and oranges is meant simply to give an intuitive notion of the indifference curve as originally envisioned by Pareto. See Lenfant, 2012:114-116: “The concept of the indifference curve was the touchstone of the escape from cardinalism and the psychological foundations of demand and choice. ... More precisely, what is meant here is the escape from a certain kind of psychology that was widespread in the late nineteenth century and the beginning of the twentieth century, that is, psychological assumptions taken from psychophysiology and experimental psychology and whose main figures were (or had been) Helmholtz, Weber, Fechner, and Wundt. ... The “ordinalist revolution” ... is grounded in a methodological transformation of economics that put the facts of objective experience as a foundation of economics and provided a research program for the ensuing years. Mathematically ordinalism is entirely based upon the idea that one can dispense with the use of a specific utility function and that no meaning shall be attached to utility measurement, except as an ordinal principle.” (pp. 114-116)

⁶¹ An excellent critique of the mathematization of indifference curves is found at Barnett (2003): “The purpose of this article is to demonstrate that neoclassical utility functions are an invalid means of analyzing consumer behavior for three reasons: first, and most important, because such functions, and their attendant rankings, are cardinal, not ordinal in nature; second, because, with respect to the set of bundles relevant to actual human beings, such functions are not continuous and therefore, not differentiable; and, third, such functions do not correctly, consistently, and properly include dimensions/units.”

My use of indifference curves as an introductory point is simply to assert that, taken in the intuitive context wherein they are derived, they are useful in an evaluation of choices which people make on a day-to-day basis.

⁶² Barnett 2003:42, footnote six, provides the following analysis of neoclassical economics and its use of indifference curves. “An anonymous referee comments that, ‘It was the use of indifference curves by the victorious neoclassicists that permitted them to have ordinal utility and mathematical functions too. Indifference curves, invented by Edgeworth in the 1880s, made no advance among economists until it was noticed that they made it appear that one could advocate ordinal utility while doing mathematics.’ ”

“Pareto optimality” represents a qualitative evaluation of these relationships. Given an initial allocation of goods among a set of individuals, a change to a different allocation that makes at least one individual better off without making any other individual worse off is called a Pareto improvement. An allocation is defined as "Pareto efficient" or "Pareto optimal" when no further Pareto improvements can be made.⁶³

The essential point to notice about each of these curves is that they assume that the “space” lying outside the curve is synonymous with a “refusal to trade” or “saving,” and the points within the curve are synonymous with a “willingness to trade” or simply “trade.”

⁶³ Lenfant, 2012:118: “As is well known, Pareto’s and Fisher’s main idea was that knowledge of observed behavior was enough to derive the equilibrium of markets and the laws of a market economy. This idea was based upon the intuition that indifference curves were in principle obtainable from observed behavior and that indifference maps could be represented by indexing utility functions. Consequently, they expected to ignore the psychological foundations of choice and of price theory. ... I am not pointing out any contradiction per se between psychology and indifference curves. I am only stressing that indifference curves would be exploited in order to promote an ordinalist representation of utility and a behaviorist foundation for the theory of choice and demand.”

Part One: The Theory

The elaborate nature of indifference curves can be significantly simplified and expanded into other areas of social research through an investigation of the manner in which human beings associate a given thing with reality, a thing's actual existence.

For the purposes of these essays we will take as an axiomatic truth that all human life is based upon the presumed equivalence between that which we experience through the senses and that which we know to be real.⁶⁴ If “that which we experience” is given the variable “X” and “that which we know to be real” is given the variable “Y”, we may state this equivalence as:

$$X = Y.$$

If we place this equation in a Cartesian coordinate system, we have the following 45 degree angle line, beginning at $x = 0, y = 0$ and extending on toward and infinite number of associations.

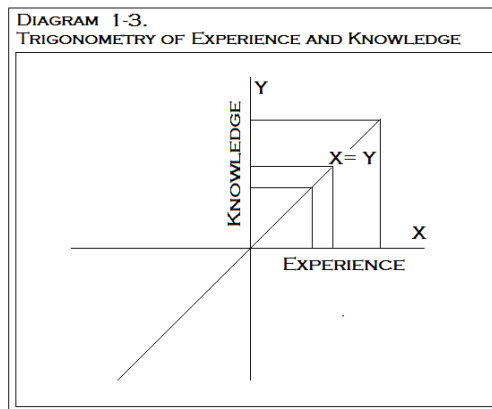
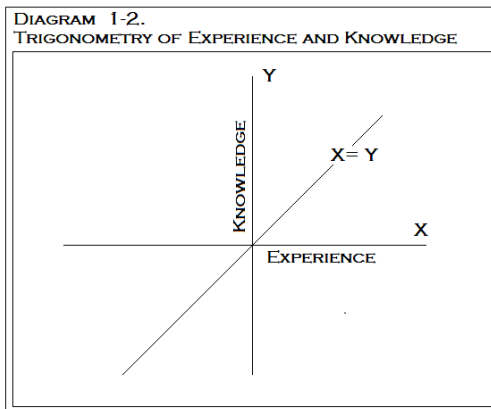


Diagram 1-2 is, in reality, the outcome of an infinite number of squares, wherein each corner point has a specific meaning. “X” represents our experience of something, “Y” represents our knowledge of the thing experienced, the point “(X, Y)” represents the interaction between our experience of the thing itself and our knowledge of the thing itself, and the origin of the graph “(0, 0)” represents the beginning association we make between experience and knowledge as fundamental assumptions of all inquiry.⁶⁵

⁶⁴ For a famous example of the meaning of this sentence, see Boswell, J. (1820). “After we came out of the church, we stood talking for some time together of Bishop Berkeley’s ingenious sophistry to prove the nonexistence of matter, and that every thing in the universe is merely ideal. I observed, that though we are satisfied his doctrine is not true, it is impossible to refute it. I never shall forget the alacrity with which (Samuel) Johnson answered, striking his foot with mighty force against a large stone, till he rebounded from it -- “I refute it *thus*.”

One might assert that the experience of reading a book and enjoying the imaginary world conveyed is not the same as “experiencing” or “knowing” anything about the world imagined.

Our point here is far more modest and direct. The “experience” referred in this essay is simply that of “reading the book” and the knowledge considered is simply that the person reading knows that he or she is reading a book. The equivalence understood between the *experience* of reading the book, and the *knowledge* that one is reading a book, is the equivalence with which we begin this analysis.

⁶⁵ See Ornstein, at 63: “In 1268, Roger Bacon, one of the founders of modern science, wrote (in his *Opus Maius*....), ‘There are two modes of knowing, through argument and experience. Argument brings conclusion and compels us to concede them, but does not cause certainty nor remove doubts in order that the mind may remain at

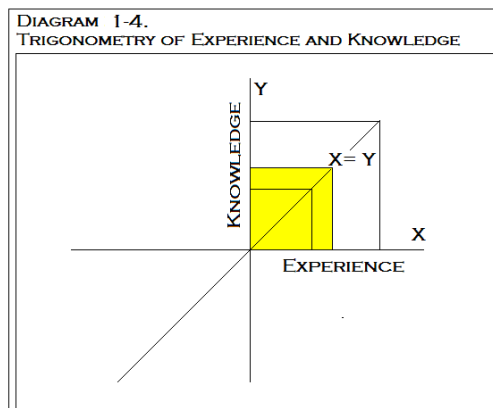
Extension to the Jury Trial of a Criminal Case

In the United States the jury trial of a case is premised on this same equation “ $X = Y$,” “experience” and “knowledge,” taken to the next higher social level of the jury. The jury’s reception and consideration of the evidence presented⁶⁶ indicates that this small group is the expansion of the smaller individual and included minds. In the jury’s deliberation the jury demonstrates itself as being the larger, expanded, copied and congruent larger “fractal” of the individual mind.

Specifically, the jury’s personal *experience* of the evidence as presented in trial represents the “X” of a trial proceeding.

The jury’s evaluation of this evidence as understood through the prism of their own life experiences is the “Y” of the trial proceeding, their collective *knowledge* of the facts presented.

The final verdict given by the jury states its evaluation of the association between the “X” of the trial (the evidence presented) with the “Y” of the trial (the jury’s evaluation of this evidence).



rest in truth, unless this is provided by experience.’ These two modes are complementary (both are “right”), and together form the basis for the complete human consciousness.”

⁶⁶ The law of evidence is an important branch of law within the United States. See Thayer 1898. “One who would state the law of evidence truly must allow himself to grow intimately acquainted with the working of the jury system and its long history.” As taken from page 267, footnote 1 he states:

“At once, when a man raises his eyes from the common-law system of evidence, and looks at foreign methods, he is struck with the fact that our system is radically peculiar. Here, a great mass of evidential matter, logically important and probative, is shut out from the view of the judicial tribunals by an imperative rule, while the same matter is not thus excluded anywhere else. English-speaking countries have what we call a “Law of Evidence;” but no other country has it; we alone have generated and evolved this large, elaborate, and difficult doctrine. We have done it, not by direct legislation, but, almost wholly, by the slowly accumulated rulings of judges, made in the trying of causes during the last two or three centuries, - rulings which at first were not preserved in print but in the practice and tradition of the trial courts; and only during the last half or two-thirds of this period have they been revised, reasoned upon, and generalized by the courts in banc.

When one has come to perceive these striking facts, he is not long in finding the reason for them. ... It is this institution of the jury which accounts for the common-law system of evidence, - an institution which English-speaking people have had and used, in one or another department of their public affairs, ever since the Conquest. Other peoples have had it only in quite recent times, unless, indeed they may belong to those who began with it centuries ago, and then allowed it to become obsolete and forgotten. England alone kept it, and, in a strange fashion, has developed it. “

This simple model may be expanded upon.

The criminal law of the United States is based upon a dichotomy between the criminal act alleged to have been committed – (the *actus reus* of the offense⁶⁷) – and the mental intent – (the *mens rea* of the offense⁶⁸) – associated with the crime. For example, the act of killing someone is a homicide if done with the intent to kill the individual. If the killing was the result of recklessly driving in a crowded street, the crime is less because the evil of the intent to harm was less. Differences in the consequence to the Defendant can be quite significant, depending upon the nature of the criminal act and mental intent found by the jury.

⁶⁷ The significance of an actual *act* in violation of the law was highlighted in the case of *Robinson v. California*, 370 U.S. 660 (1962). In this case the U.S. Supreme Court ruled that a California law making it illegal to be a drug addict was unconstitutional because the mere status of being a drug addict was not an *act* and thus not criminal. The Court held:

“It is unlikely that any State at this moment in history would attempt to make it a criminal offense for a person to be mentally ill, or a leper, or to be afflicted with a venereal disease. A State might determine that the general health and welfare require that the victims of these and other human afflictions be dealt with by compulsory treatment, involving quarantine, confinement, or sequestration. But, in the light of contemporary human knowledge, a law which made a criminal offense of such a disease would doubtless be universally thought to be an infliction of cruel and unusual punishment in violation of the Eighth and Fourteenth Amendments. ...

“We cannot but consider the statute before us as of the same category. In this Court counsel for the State recognized that narcotic addiction is an illness. Indeed, it is apparently an illness which may be contracted innocently or involuntarily. We hold that a state law which imprisons a person thus afflicted as a criminal, even though he has never touched any narcotic drug within the State or been guilty of any irregular behavior there, inflicts a cruel and unusual punishment in violation of the Fourteenth Amendment.”

⁶⁸ The Model Penal Code has provided a general scheme for *mens rea* in criminal cases since its promulgation in 1957. These levels of intent are:

Strict liability: the actor engaged in conduct and his mental state is irrelevant. Under Model Penal Code Section 2.05, this *mens rea* may only be applied where the forbidden conduct is a mere violation, i.e. a civil infraction.

Negligently: a “reasonable person” would be aware of a “substantial and unjustifiable risk” that his conduct is of a prohibited nature, will lead to a prohibited result, and/or is under prohibited attendant circumstances, and the actor was not so aware but should have been.

Recklessly: the actor consciously disregards a “substantial and unjustifiable risk” that his conduct is of a prohibited nature, will lead to a prohibited result, and/or is of a prohibited nature.

Knowingly: the actor is practically certain that his conduct will lead to the result, or is aware to a high probability that his conduct is of a prohibited nature, or is aware to a high probability that the attendant circumstances exist.

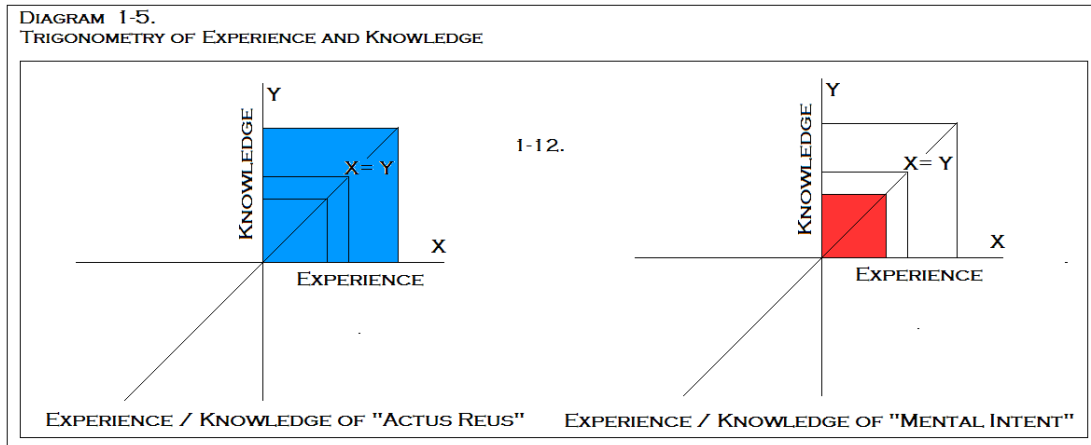
Purposefully: the actor has the “conscious object” of engaging in conduct and believes or hopes that the attendant circumstances exist.

Except for strict liability, these classes of *mens rea* are defined in Section 2.02(2) of the MPC.

The significance of these levels of mental intent and the actions to which they apply is well illustrated in the case of *State of Montana vs. Rothacher*, 901 P.2d 82, 86-87 (1995). In this case the court’s prior decisions had left open the possibility that a homicide might be charged based upon a *mens rea* going simply to the act which created the crime, rather than the intent to commit the crime itself. The Montana Supreme Court reversed itself, as follows: “It is time to clear up this misperception of the state of mind which must be proven to establish deliberate or mitigated deliberate homicide before a significant injustice results. Our prior construction is clearly contrary to the plain language in the homicide statute and may, in the future, lead to serious and unjust perversion of its purpose. For these reasons, we conclude that the District Court erred when it instructed the jury that the State merely needed to prove that Rothacher acted purposely, without regard to the result that he intended. To the extent that our prior decisions in *Sigler*, *McKimmie*, and *Byers* are inconsistent with this opinion, they are overruled. District courts should not give a similar instruction in the future.”

If we let the “actus reus” of any given offense equal a particular number – for example, 5 – then the jury’s experience with the evidence presented as to the criminal act ($X = 5$) and the jury’s understanding of that evidence ($Y = 5$) may be given as a square, in blue below.

Similarly, if we let the “mens rea” of the same offense equal a different number – for example, 3 – then the jury’s experience with the evidence presented as to mental intent ($X = 3$) and the jury’s understanding of that evidence ($Y = 3$) may be given as the red square below.⁶⁹



The idea of giving physical “size” to the jury’s experience in court with the evidence may be explained by comparing these experiences. One may readily imagine that prosecutor Jones, an obsessive-compulsive sort, might spend three days developing the actus reus of the case, replete with victim and expert testimony, etc. This is considerably different than might be the case put on by Prosecutor Smith who casually places before the evidence of the same charge a much lesser quantum of evidence, spending the bare minimum of time necessary to establish that a criminal act has occurred. As the jury experiences these differences in court, the outcome of the verdict will shift.

Likewise should Prosecutor Smith neglect to prove that a criminal mental state existed at the time of the alleged offense, it is possible that the proof of the crime as to mens rea may fail entirely. On the other hand, should the prosecutor Jones present proof of mens rea which includes confessions, eye-witness testimony, the testimony of co-conspirators, etc. the experience of the jury with this enlarged quantum of evidence will be fuller than with Smith.

The comparison of these different experiences with the evidence may be depicted by ever larger lengths along the x and y axis as to both the actus reus and mens rea of the charge. The point here is not to propose an absolute scale of proof but rather to suggest that there are very different quanta of proof going into these two essential elements of every criminal case. These

⁶⁹ The basic architecture underlying personal choice may be accessed through reference to the common law, an ongoing system of social, political and economic thought all of which is directed toward the maintenance of social order and progress. The central place of the American jury in the legal system of the United States provides a constant connection between the circumstances faced by the people and the laws governing the people. The central ideas of the common law in criminal cases – actus reus, mens rea – are profoundly important to economics because they state the fundamental social basis of common American understandings of human motivation and social judgment, much of which directly applies to very important matters of business, finance, morality and economics, as evolved over tens of thousands of jury trials. This wealth of information as to social and personal behavior is included in this model. It has proven to be both illustratively useful as well as mathematically helpful.

quanta are separate as to actus reus and mens rea but they are joined together in the jury's evaluation of the weight of the case against the Defendant.

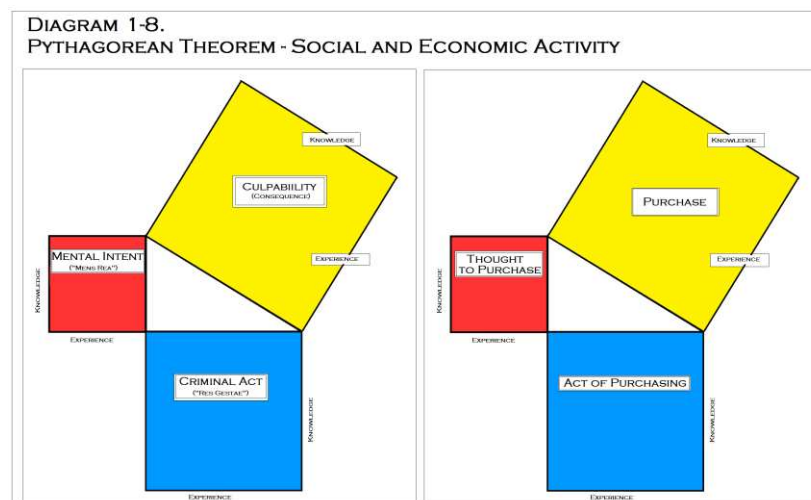
The culpability, if any, of the Defendant for a crime is given in accordance with the sum of these two elements of proof. The full experience and knowledge summarized by the case will equal the sum of these two squares. Stating the jury's experience with the evidence of a criminal act as a positive distance "A" and the jury's experience with the evidence of mental intent as a positive distance "B", then the experience / knowledge represented by Culpability (C) associated with the verdict should equal the sum of these two things, or :

$$A^2 + B^2 = C^2$$

Geometrically, this equation may be portrayed with the proportions of the Pythagorean Theorem as follows.



From the economic point of view, there is no difference between stating that "John purchased x" and "John is guilty of purchasing x." The relationship between the act and the thought which motivates the act, speaking economically, is the same as that of the court considering such an act criminally.



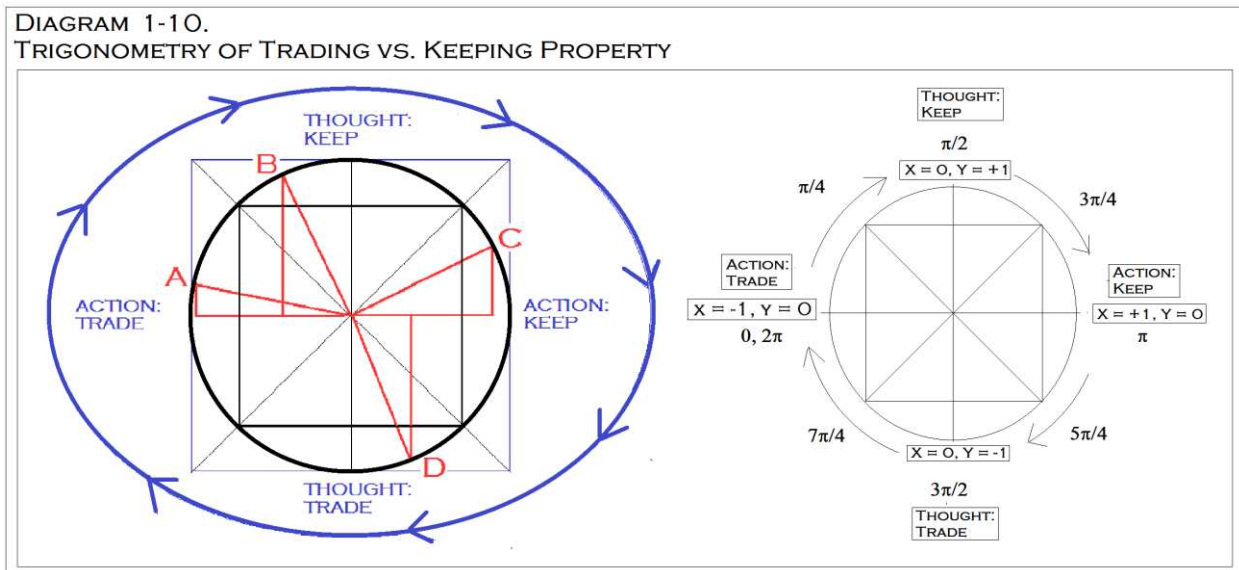
Micro-economics: The “Chooser – Available Choice” Model

Each of the points within the plane of an indifference curve – both those on the curves and those outside the curve – represents a given decision to trade or to keep various properties. If we contrast the actions of *trading* a good versus *keeping* that same good, a set of dichotomies may be constructed which may be used to structure our understanding of economic development.

The first dichotomy – action, as comparable to the “actus reus” of criminal law – represents a tension between “Keeping” a particular good vs. “Trading” the good for something else. This is indicated in the circle below by the opposition of “Keep” at 3 o’clock and “Trade” at 9 o’clock. All economic life stems from the core principle that one may *act* freely in choosing either to keep a given property or to trade it for some other piece of property and that these transactions clearly affect the status of the property so owned or traded.

This is contrasted with a secondary dichotomy – thoughts, as comparable to the “mens rea” of criminal law – which represents a tension between one’s mental “thoughts in favor of keeping” and “thoughts in favor of trading” a particular property, located at 12 o’clock and 6 o’clock respectively in the circle below. These are the mental pre-dispositions of every owner towards keeping or trading a given piece of property for something else.

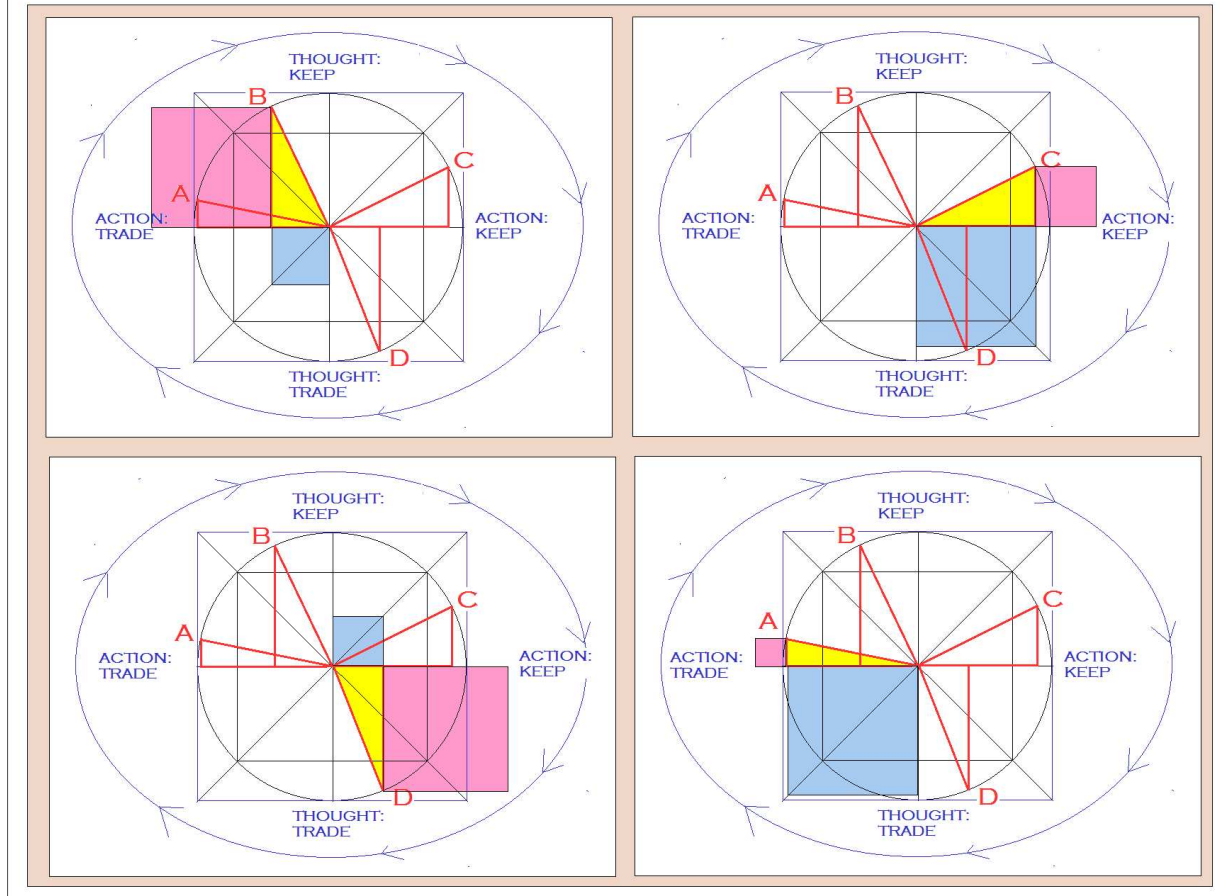
Using the Pythagorean Theorem to structure the sum total of possible permutations between the “Action” aspect of a purchase, and the “Thought” aspect of a decision to Purchase, we may structure every possible balancing of these two with the “Purchase” itself.⁷⁰



⁷⁰ The “clock-wise” direction of movement around the unit circle and the “9:00 o’clock” place of beginning the analysis as used in these essays are opposite that taken in most trigonometry textbooks. This approach does not alter the trigonometric identities considered in the slightest and provides an approach to the measurement of time which is consistent with the sense of the hands of a clock.

The Pythagorean relationships inherent in the association of Action and Thought as expressed previously create around the unit circle an infinite set of mathematic relationships wherein the actual possibility of a Purchase is set as the sum of some combination of Action and Thought.

DIAGRAM 1-1 1.
TRIGONOMETRIC RATIOS.

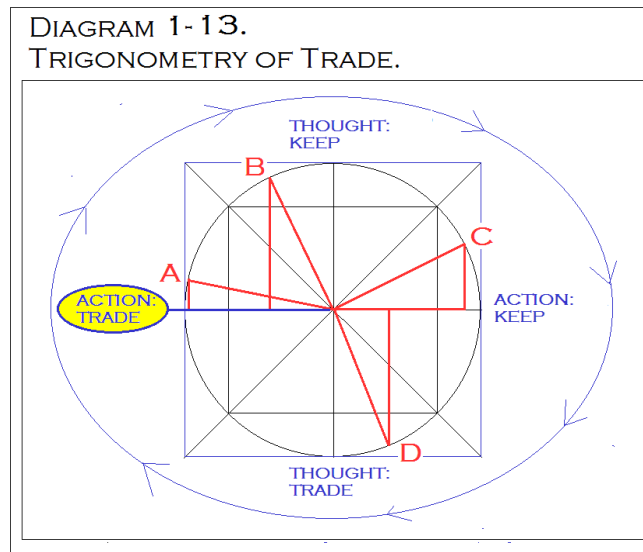


The unity of the underlying ego which selects these various points may be associated with the radius of this circle. If we give this radius the number “1” it represents the “unity” of the ego as a balancing radius between these two dichotomies of Action (“Trading” vs. Keeping”) and Thoughts (“Thoughts related to Trading the property,” “Thoughts related to Keeping the property”). An internal angle is thus constructed at the origin of the coordinate system.

The Significance of Trading

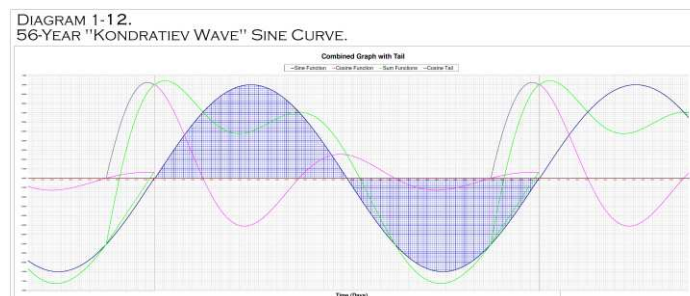
There is only one point along the Unit Circle where Action is wholly aligned with Trading, i.e. the point at 9:00. All other points along the unit circle are similar to one another in that there is some “Y” component connected to some mental aspect of trading and/ or keeping the object in question. This mental aspect must include some possibility of cancelling the action contemplated. Consequently only at 9:00 o’clock is the possibility of a “Trade” wholly equivalent with Action; at this point “Thought” is Zero and the Action “Trading” occurs.

Conversely at 3:00 o’clock the Action undertaken is to “Keep” the property in question and the status quo is actively continued.⁷¹



⁷¹

If we consider the side opposite the internal angle as divided by the hypotenuse of “1” we set up a set of fractions which may be charted against an x-axis wherein the circumference of the circle is superimposed upon the x-axis in divisions associated with 2π . Beginning at 9 o’clock and moving clockwise, we have the following mathematic associations between various points along the unit circle, to wit, the sine curve.

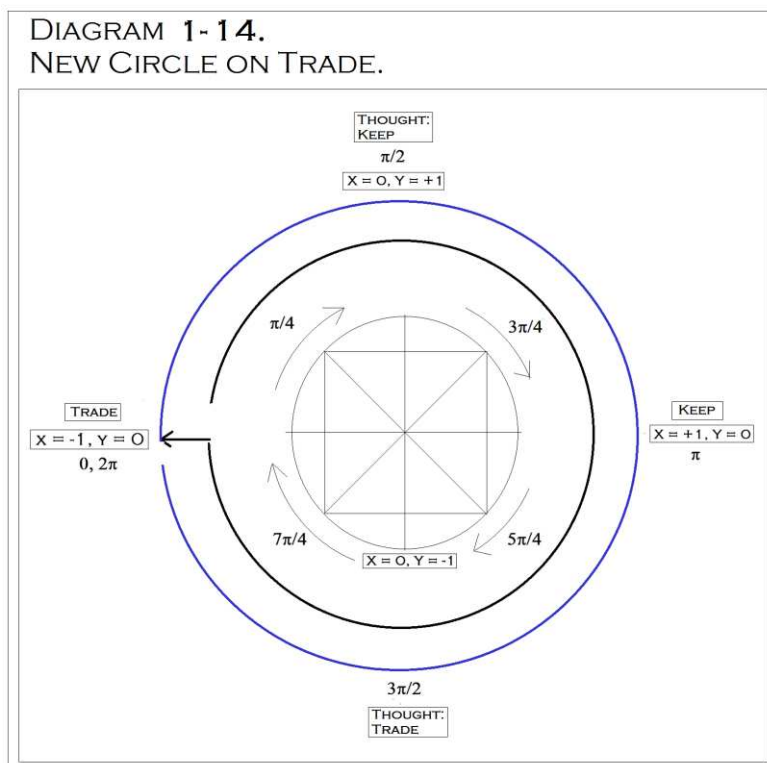


The equation for this wave is:

$$g(y) = \sin(y)$$

The unique aspect of this point at 9:00 o'clock creates an unavoidable change in the overall unit circle. The break which is presented at $(x = -1, y = 0)$ creates a new and unknown element in the unit circle itself. Once the trade is made, the situation is no longer the way it was. Something new has taken place.⁷²

In contrast, when the x-axis is directed toward “Keeping” a particular good, the point at which Thought = 0 will be that point most dedicated in favor of the status quo.⁷³



⁷² There is an analogy here to quantum mechanics in the “Schrodinger’s Cat Thought Experiment.” The second half of the third postulate of quantum mechanics states, roughly speaking, that observation changes the physical system. <http://vergil.chemistry.gatech.edu/notes/quantrev/node20.html> A physical system exists in as many state as possible until it is observed. Once the observation has been made, it changes into another state, one which can be unique or not.

Until one opens the box, the cat is both dead and alive. Opening the box (observing the state of the cat), indicates which state it is, and so changes the state of the physical system. In this essay, trading equates with the observation. By analogy, stating that with trade “something new has happened” one would indicate that the wave function describing the state of the cat has changed.

⁷³ As this relates to the use of indifference curves, at least in their original design by Pareto, see Lenfant 2012:119: “Pareto’s own construction and discussion of indifference curves are developed in the Manual. ... Pareto (1900), 2008) already argued that indifference curves could be obtained through experiments or statistical studies. As long as statisticians have not established lines of indifference, ‘for lack of more precise notion, the sciences possesses only some general data suggested by crude and everyday observations of facts.’ ... So the final methodological position of Pareto is that the theoretical possibility of an empirical construction of indifference curves is at least enough for the foundation of the theory of choice. Eventually, when he comes to a precise description of indifference curves, Pareto appeals to “every day experience” and to introspection to discuss the shape of indifference curves.”

The model will be referred to as the “chooser – available choice” model, as a way of presenting the unit circle and its radius of “1” – representing the “chooser” – and the number π – representing the “choices available” – in a simple and direct fashion. Our premise is that a radius originating at the center of the unit circle and moving toward any spot on the circle of possible choices divides the circle at a $1 : \pi$ ratio. Half of the circle constitutes “available choices” which will be associated with the point at which the radius and the circle intersect. This relationship will exclude an equivalent set of opposite choices on the opposing side of the circle.

In other words, one cannot simultaneously trade a good and keep the same good, or vice versa. The possible choices which *are* available toward any particular goal are those which are not directly undermining of whatever goal is chosen. The choices which are *not* available are those which are in some negative value, or opposite position, from this chosen goal. This same dynamic applies to any point of psychological consideration along the unit circle.

I conclude that it is possible to construct a simple and mathematically straight-forward model of micro-economic choices which is completely in accord with the available evidence of social behavior as evidenced by universal and legally required social understandings.

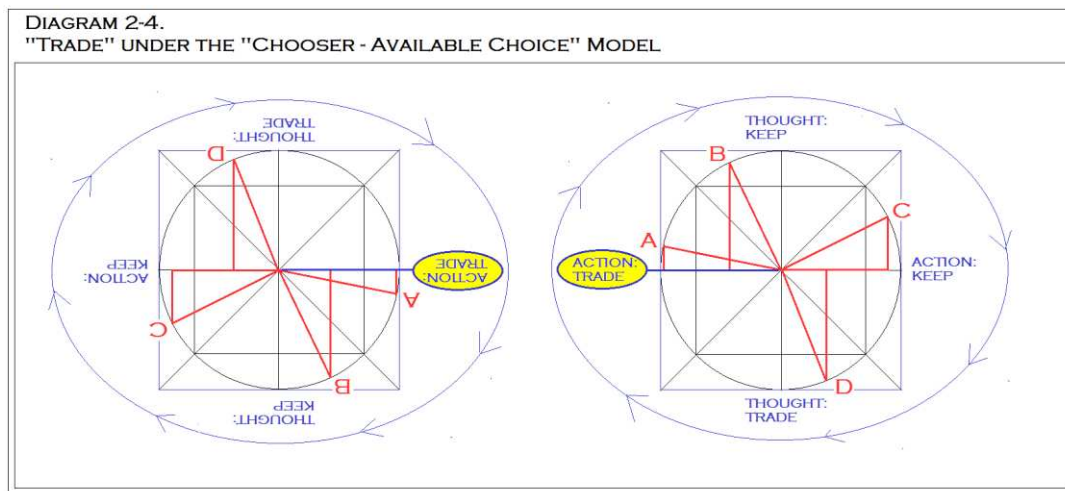
By drafting the experience and knowledge of a jury as the larger “fractal” of the individual mind, we have the ability to state a pattern of “mind” itself which is both useful and concrete in its form.

Macro-economics: The “Chooser - Available Choice” model in aggregate

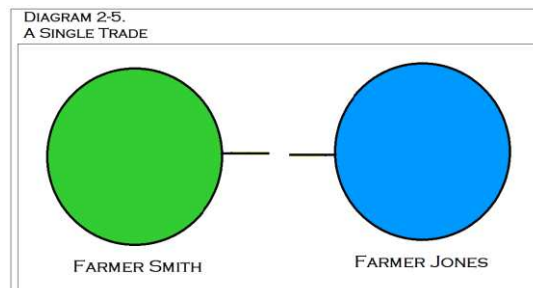
The “chooser – available choice” model is the central point of departure for this model. If we invert this model such that the willingness to “trade” of one person meets the willingness to “trade” of a trading partner, we have a connection between two people indicating a mutual willingness to exchange goods or services with one another. (See discussion of Pareto efficiency *supra* and the inverted Edgeworth “box”) The willingness and ability of persons to trade goods and their services with one another is the foundation for the entire economy.

Let us begin with a proposed willingness of Farmer Jones to part with two cows in return for three horses. This willingness is met by Farmer Smith who is willing to trade three specific horses which he owns in return for two specific cows belonging to Farmer Jones.

The fact that these two farmers have met with a match which in their minds is favorable to both is indicated by the fact that both have extended the 9:00 axis “Action : Trade” towards one another. As a result of this trade, Farmer Jones’ two cows will be handed over to Farmer Smith, and Farmer Smith’s three horses will be handed over to Farmer Jones.



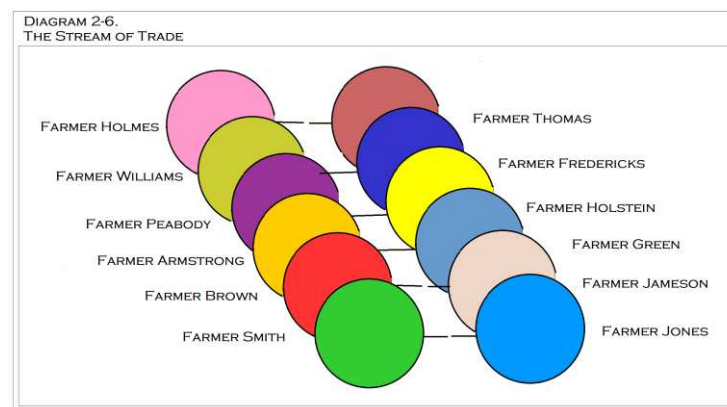
The following two circles simplify the basic ideas going into the above trade. Note that the early barter of horses for cows suggested by the circles below depicts trading at its most elementary level. Note that the trade itself must in some fashion state an improvement in the lives of the trading partners. Consequently the act of trading makes more efficient and useful the sum total of property within society because those who own the property are seeking ever more agreeable collections of that property by trading what they have for things which they desire but do not possess.



These trades represent a re-arrangement of property amongst those owning property. There is no “expansion” of the economy based upon this trade. However the usefulness of the property exchanged, in combination with the improved efficiency brought about by the trade, suggests that the natural rate of increase in any biologic organism – a farm, a household, a local market – will result from the full set of trades engaged in by all persons.

In short, the same property and the same traders exist after as well as before the trade. However the straight forward exchange of one set of property for another is conveyed by the model above.

There is no limit to the number of such trades which can be done over the course of any particular period of time. We may imagine two pipes running parallel, each suggesting the desire of one of two trading partners to enter into trade. Each trade may be listed in chronologic order and depicted as below.⁷⁴



⁷⁴ The stream of trade considered in this paper is “Gross National Product” (GNP). This figure adds to Gross Domestic Product (GDP) the income receipts from the rest of the world minus payments to the rest of the world. The United States Bureau of Economic Analysis published the following table for these figures. (as taken from BEA 13-13, Table 9, http://www.bea.gov/newsreleases/national/gdp/2013/pdf/gdp4q12_3rd.pdf) Note that the difference between these is a multiple of (in billions of dollars) $GNP = \$16,130.8 / GDP = \$15,864.1 = 1.016$, or 1.6%, roughly \$266 billion.

Table 9. Relation of Gross Domestic Product, Gross National Product, and National Income
[Billions of dollars]

Line		2010	2011	2012 ^r	Seasonally adjusted at annual rates					Line
					2011	2012				
						IV	I	II	III	
1	Gross domestic product	14,498.9	15,075.7	15,684.8	15,321.0	15,478.3	15,585.6	15,811.0	15,864.1	1
2	Plus: Income receipts from the rest of the world.....	716.5	783.7	782.3	787.1	769.6	775.1	775.8	808.5	2
3	Less: Income payments to the rest of the world	507.2	531.8	539.3	523.1	554.7	527.8	532.7	541.8	3
4	Equals: Gross national product	14,708.2	15,327.5	15,927.8	15,585.0	15,693.2	15,832.9	16,054.2	16,130.8	4
5	Less: Consumption of fixed capital	1,873.4	1,936.8	2,011.7	1,966.6	1,984.9	2,004.8	2,019.8	2,037.4	5
6	Less: Statistical discrepancy	23.3	31.9	67.2	70.3	1.1	77.7	138.5	51.7	6
7	Equals: National income	12,811.4	13,358.9	13,848.8	13,548.1	13,707.2	13,750.5	13,895.9	14,041.7	7
8	Compensation of employees.....	7,970.0	8,295.2	8,565.8	8,340.1	8,495.7	8,527.7	8,577.6	8,662.1	8
9	Wage and salary accruals	6,404.6	6,661.3	6,880.7	6,692.4	6,825.9	6,849.2	6,888.5	6,959.3	9
10	Supplements to wages and salaries.....	1,565.4	1,633.9	1,685.1	1,647.7	1,669.8	1,678.5	1,689.1	1,702.8	10
11	Proprietors' income with inventory valuation and capital consumption adjustments.....	1,103.4	1,157.3	1,202.3	1,165.3	1,184.3	1,194.9	1,205.4	1,224.7	11
12	Rental income of persons with capital consumption adjustment.....	349.2	409.7	462.6	430.3	445.3	452.8	471.0	481.5	12
13	Corporate profits with inventory valuation and capital consumption adjustments.....	1,702.4	1,827.0	1,950.6	1,953.1	1,900.1	1,921.9	1,967.6	2,013.0	13
14	Net interest and miscellaneous payments	567.9	527.4	504.3	515.9	515.6	489.5	518.2	493.8	14
15	Taxes on production and imports less subsidies.....	998.0	1,036.2	1,069.2	1,047.1	1,067.7	1,069.8	1,067.8	1,071.3	15
16	Business current transfer payments (net)	140.0	132.6	128.0	127.4	130.5	127.9	123.8	129.7	16
17	Current surplus of government enterprises	-19.5	-26.5	-34.0	-31.1	-32.0	-34.1	-35.5	-34.5	17
	Addendum:									
18	Gross domestic income.....	14,475.6	15,043.8	15,617.5	15,250.7	15,477.1	15,507.9	15,672.6	15,812.5	18

^r Revised

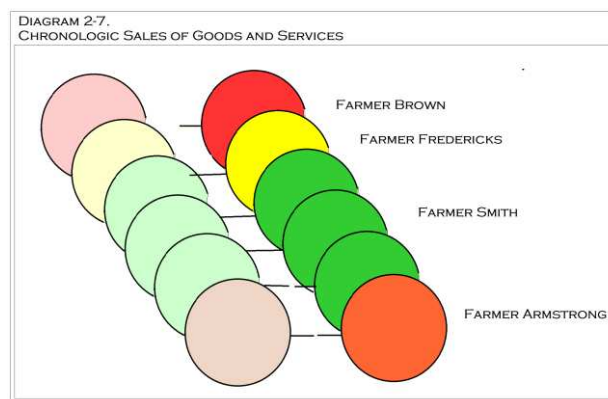
As reliable currency enters into circulation⁷⁵ persons engaged in trading have the further ability to make trades of much greater complexity than a straight-forward barter. By saving the money obtained from prior trades people are able to amass a trading ability to trade which far exceeds the more clumsy and complicated trade of physical objects, herds of cattle or flocks of geese, etc.

The ability to trade goods and services for currency permits the evaluation of the worth of the trade itself in relative terms vis-à-vis all other trades, however subjective. A trade of \$50 might represent an acre of land, a pair of mules, a suit of fine clothes or a suite of furniture. By “mirroring” the value of these various goods (or services), currency permits a much broader extent of trading and trading partners.

The pastel coloration below of the thing traded – money – is available to give a relative value to all the trades of an economy. These “trades” now become “sales,” i.e. the surrender of something in return for currency.

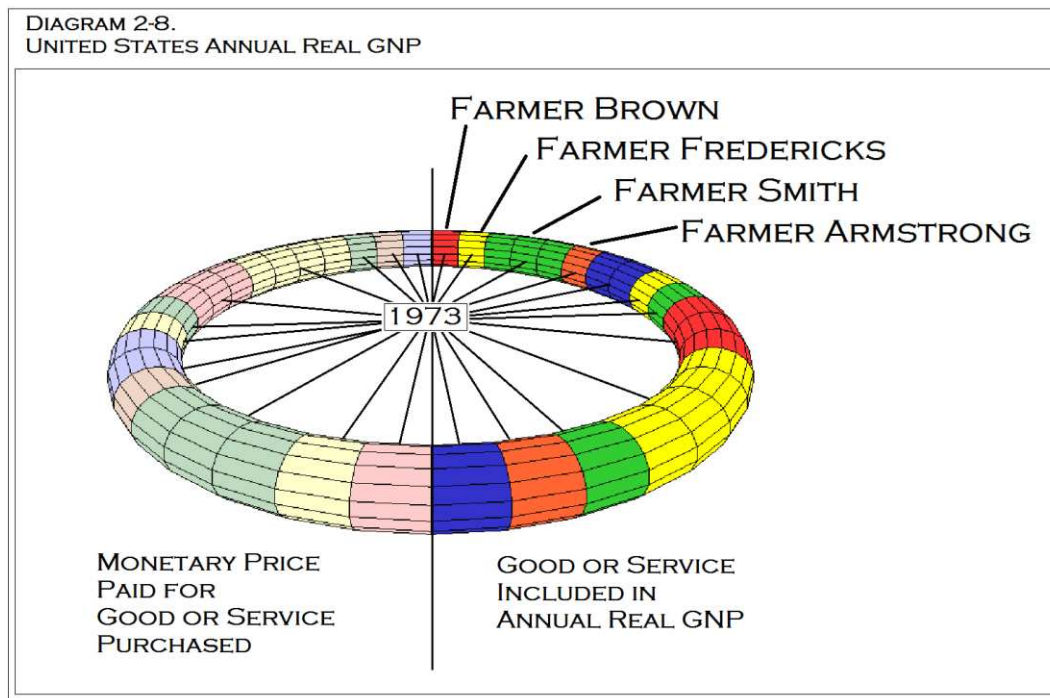
The chronology of the trade is given by the difference in color, the red trade being first, the yellow being second, the green third, the orange fourth, etc. The pastel coloration indicates that in this case Farmer Jones did not trade goods for goods but rather money for goods (or services).

The size of the trade in question, its monetary value, is indicated by the number of circles used. For example Farmer Smith’s trade of goods or services for money (three green circles) is three times as valuable in monetary terms as Farmer Brown’s trade of goods and services for money (one red circle), Farmer Frederick’s trade of goods or services for money (one yellow circle) and Farmer Armstrong’s trade of goods or services for money (one orange circle).



⁷⁵ See Penson and Webb (1981) on the importance of including capital into the determination of Okun’s law. “The procedures used by the CEA (Council of Economic Advisors) assume that only the availability of labor and its productivity determine potential GNP. As Perry notes, however, ‘it is hard to argue that capital should not be included in estimating potential output because everyone knows it belongs in the calculation.’ Okun, in fact, also recognized that capital should be incorporated into the measurement of potential GNP when he stated ‘I shall feel much more satisfied in the estimation of potential output when our data and our analysis have advanced to the point where ... the capital factor can be explicitly taken into account.’ ... All the procedures for estimating potential GNP, therefore either explicitly ignore the role of the current capital stock in the economy or implicitly assume the input shares for capital and labor are the same in each production sector of the economy. ... In measuring GNP at full employment, it is not enough to account only for the physical production process. One must also account for the changes in the relative prices of products and resources as the economy moves from current GNP to full employment GNP, and for the effects these price changes will have upon the economic decisions of producers and consumers’.”

If we set an arbitrary division of the stream of trade at a single 365-day year, we can place the monetary and the “real” aspects of these sales of goods and services as oppositions antipodal from one another. The result is a circle of such sales. The length of half the circle indicates the monetary value of each of the sales of goods or services included in the year. If the size of these transactions is copied into the length of the circuit itself, we have the following. Because the connection of any particular sale of a good or service to the year “1973” is no greater than any other trade, we draw here a circle, i.e. that geometric construct in which all points in a plane lie equidistant from a single point.⁷⁶



The development of currency and its association with trade given above suggests that the “work” necessary for Farmer Smith or Farmer Jones to possess “trade-able items” has now become the “employment” of Farmer Smith and Farmer Jones as engaged “sales” of these items in a money-based, capitalistic society. In this fashion the use of currency which has turned “trades” into “sales” is in a direct relationship to the rate of employment, i.e. that employment necessary to sustain the full scope of sales given above.

⁷⁶

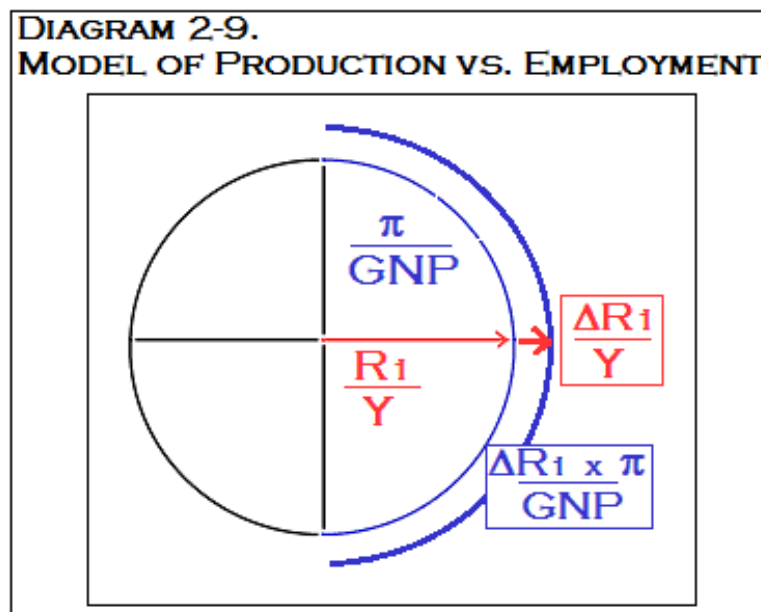
The 2010 real GNP for the United States was \$2.27 trillion dollars in 1958 dollars with a population in the same year of 308,745,538 residents, for a GNP per capita of \$7,355 per resident in 1958 prices. (See Essay Three, Data Set One, for figures as to real GNP. See 2010 Census for population figures.)

One might picture the relative size of these relationships by noting that if GNP per capita was set as the one inch radius of a pipe and the length of pipe set equal to U.S. real GNP, the pipe would run 406 miles (25,728,794 inches), roughly the distance from Chicago to Kansas City. To bend this pipe into the shape of half a circle would require a radius of 129 miles, roughly the distance from Washington D.C. to Philadelphia.

These proportions might be taken on a smaller scale. If a length of string representing 2010 real GNP was set equal to the length of a football field (3600 inches), the equivalent proportional thickness of the string would measure 0.00014 inches in a radial thickness. Spider silk measurements vary from 0.00012 to 0.00032 inches in diameter. The radius would run from the goal line to the 31.8 yard line.

In the above diagram 2-8 we have used the GNP per capita of the United States as a radius “r” of the generating circle and the rate of unemployment as the radius “R” generating the torus which swings the smaller circle in an arc around the center point “1973.”

If this relationship is stated geometrically, it would appear necessary that an increase in the rate of employment from one year to the next ($R = \text{the radius of the circle} = 1$) will correlate geometrically to a necessary increase in the size of GNP ($Y = \text{half circumference} = \pi$) at the necessary ratio of $1 : \pi$, as follows.



The above diagram is therefore the basis for an understanding of why Okun's Law works. The $\pi:1$ ratio (3.14159:1 ratio) given above between “Percent Change in real GNP” and “Percent Change in the Rate of Employment” is a trigonometric outcome of necessary and straightforward social realities of longstanding duration within the economic history of the United States.

The relative wealth of Americans controlling trade may play a role in the maintenance of this ratio.⁷⁷

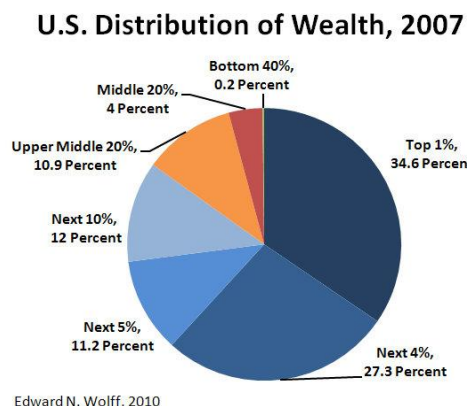
⁷⁷ Taking the analogy of a 100 yard length of spider silk stretched into a half circle on a football field, the present distribution of wealth in the United States in 20% quintiles is as follows: 1st = 84 yards, 2nd = 11 yards, 3rd = 4 yards, 4th = 7 inches, 5th = 3.6 inches. From the following chart one sees quite clearly that the top 1% of wealth owners control significantly more wealth (34.6%) than 90% of the rest of America combined (0.2% + 4% + 10.9% + 12% = 27.1%). (as taken from Wolff 2010)

Table 2. The Size Distribution of Wealth and Income, 1983–2007										
Year	Gini Coefficient	Percentage Share of Wealth or Income Held by:								
		Top 1.0%	Next 4.0%	Next 5.0%	Next 10.0%	Top 20.0%	4th 20.0%	3rd 20.0%	Bottom 40.0%	All
A. Net Worth										
1983	0.799	33.8	22.3	12.1	13.1	81.3	12.6	5.2	0.9	100.0
1989	0.832	37.4	21.6	11.6	13.0	83.5	12.3	4.8	-0.7	100.0
1992	0.823	37.2	22.8	11.8	12.0	83.8	11.5	4.4	0.4	100.0
1995	0.828	38.5	21.8	11.5	12.1	83.9	11.4	4.5	0.2	100.0
1998	0.822	38.1	21.3	11.5	12.5	83.4	11.9	4.5	0.2	100.0
2001	0.826	33.4	25.8	12.3	12.9	84.4	11.3	3.9	0.3	100.0
2004	0.829	34.3	24.6	12.3	13.4	84.7	11.3	3.8	0.2	100.0
2007	0.834	34.6	27.3	11.2	12.0	85.0	10.9	4.0	0.2	100.0
B. Non-home Wealth										
1983	0.893	42.9	25.1	12.3	11.0	91.3	7.9	1.7	-0.9	100.0
1989	0.926	46.9	23.9	11.6	11.0	93.4	7.4	1.7	-2.5	100.0
1992	0.903	45.6	25.0	11.5	10.2	92.3	7.3	1.5	-1.1	100.0
1995	0.914	47.2	24.6	11.2	10.1	93.0	6.9	1.4	-1.3	100.0
1998	0.893	47.3	21.0	11.4	11.2	90.9	8.3	1.9	-1.1	100.0
2001	0.888	39.7	27.8	12.3	11.4	91.3	7.8	1.7	-0.7	100.0
2004	0.902	42.2	26.7	12.0	11.6	92.5	7.3	1.2	-1.1	100.0
2007	0.908	42.7	29.3	10.9	10.1	93.0	6.8	1.3	-1.0	100.0
C. Income (SCF)										
1982	0.480	12.8	13.3	10.3	15.5	51.9	21.6	14.2	12.3	100.0
1988	0.521	16.6	13.3	10.4	15.2	55.6	20.6	13.2	10.7	100.0
1991	0.528	15.7	14.8	10.6	15.3	56.4	20.4	12.8	10.5	100.0
1994	0.518	14.4	14.5	10.4	15.9	55.1	20.6	13.6	10.7	100.0
1997	0.531	16.6	14.4	10.2	15.0	56.2	20.5	12.8	10.5	100.0
2000	0.562	20.0	15.2	10.0	13.5	58.6	19.0	12.3	10.1	100.0
2003	0.540	17.0	15.0	10.9	14.9	57.9	19.9	12.1	10.2	100.0
2006	0.574	21.3	15.9	9.9	14.3	61.4	17.8	11.1	9.6	100.0

Source: Own computations from the 1983, 1989, 1992, 1995, 1998, 2001, 2004, and 2007 SCF.

For the computation of percentile shares of net worth, households are ranked according to their net worth; for percentile shares of non-home wealth, households are ranked according to their non-home wealth; and for percentile shares of income, households are ranked according to their income.

Graphically the net worth of Americans may be pictured as follows. (Wolff 2010, as placed on under a Creative Commons License 3.0 at: http://en.wikipedia.org/wiki/File:Global_Distribution_of_Wealth_v3.jpg)



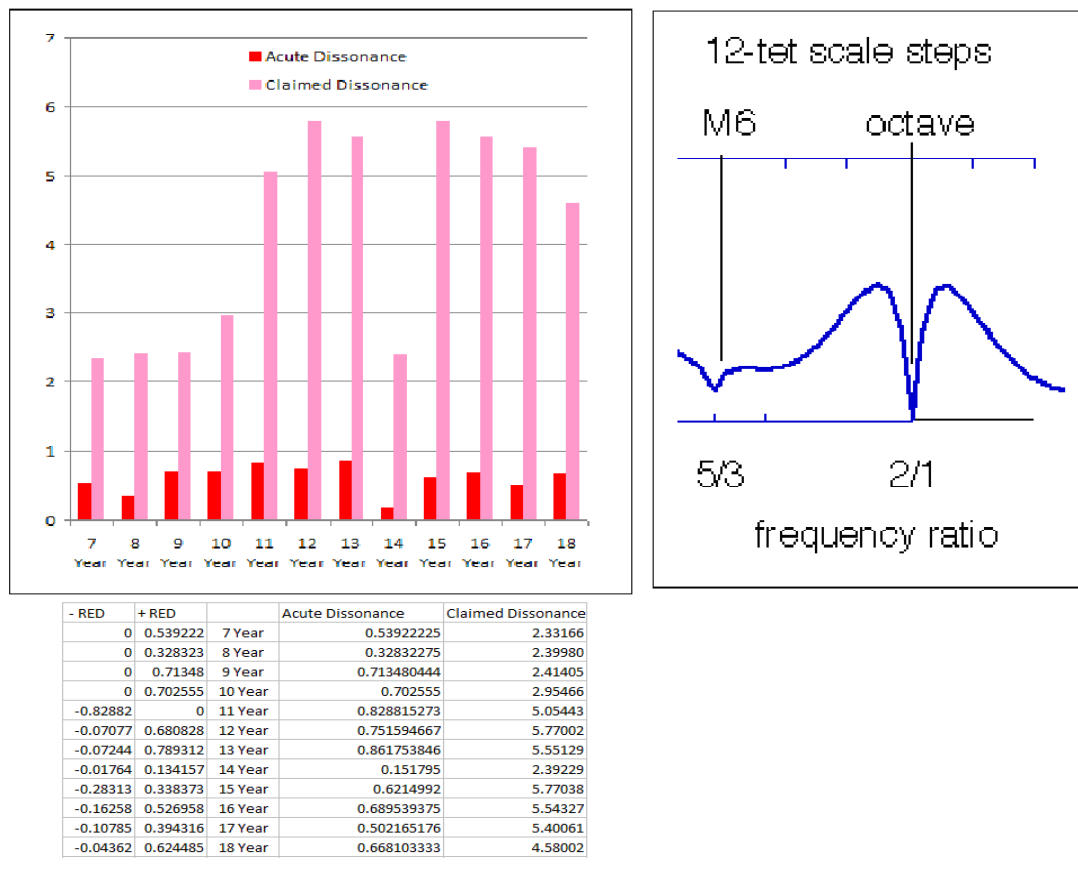
The amount of wealth controlled by the least wealthy 40% of Americans is a fraction of the difference between the GNP and the GDP of the United States (in linear measurements vis-à-vis the football field, 1.6 yards (= 57.6 inches) vs. 7.2 inches). Indeed for the lowest 20% this amount is actually negative in so far as debt outweighs assets. For popular YouTube videos on this point see: <http://www.youtube.com/watch?v=QPKKQnijnsM>, and: http://www.youtube.com/watch?v=EAOKIGJbg_c.

In essence this may mean that the financial identity of the United States – and its ability to function as an ongoing financial system – is far more dependent upon the influx of foreign capital (1.6% of GNP) than on the financial contribution of 40% of its citizens (0.2% of net worth). The long-standing difficulty of creating jobs in the United States may be exacerbated, and possibly connected directly, to considerations as to the use of GDP, rather than GNP, as the appropriate measurement of social progress.

The GNP Spiral

The macro-economic statement of annual GNP takes place in a context of years in sequence. Through the distinct similarity which ratios of U.S. real GNP using various “spreads of years” have with octaves of musical harmony, one may determine “octaves” of mathematic association within the economic data itself, falling at spreads of 14 years. (Albers & Albers, 2013) This is consonant with the onset of reproductive capabilities within the American citizenry; moreover it presents associations of both economics as well as politics.

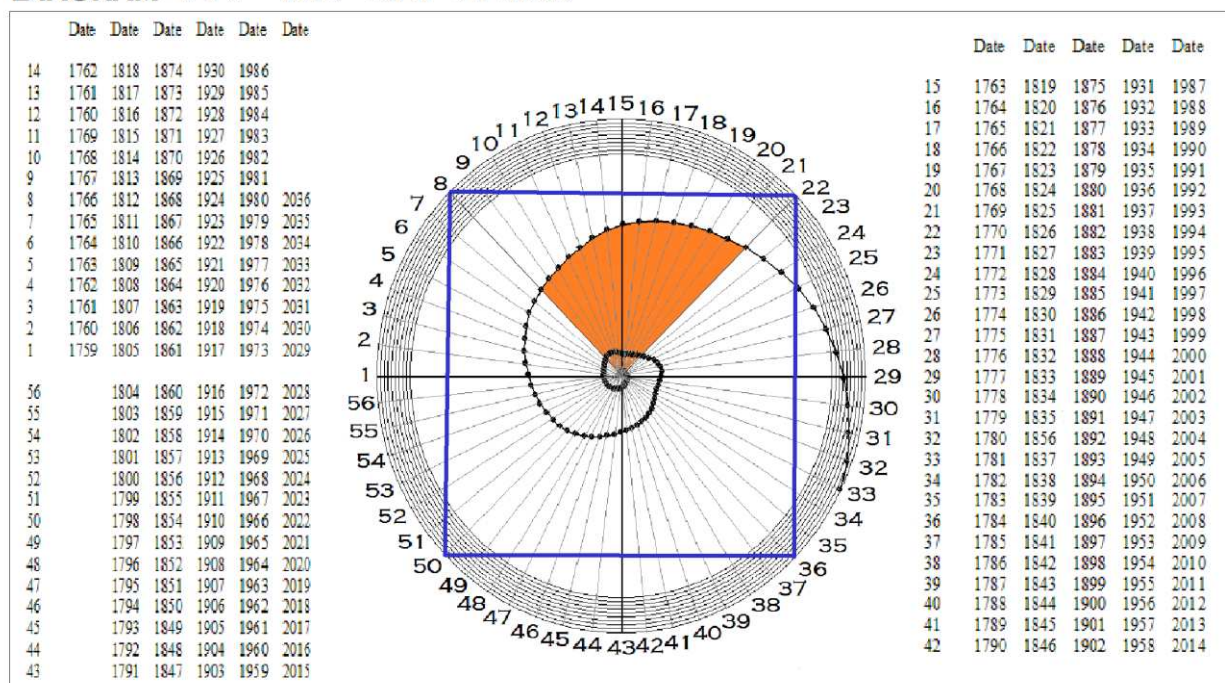
DIAGRAM 3.11.
"ACUTE DISSONANCE" AND "CLAIMED DISSONANCE" WITH MUSICAL OCTAVE



Using 14 year periods arranged in a square it may be shown that the central quantitative fixture of the economy of the United States is the proportion $1:\phi$, as demonstrated cursorily in the following diagram. (Albers & Albers, 2011, 2013) The resulting “GNP Spiral” is an exactly 56-year pattern within the political, social and economic history of the United States which correlates generally with the well-known Kondratiev Wave or “Long Wave.”

In other words, over the course of 14 years the real GNP of the United States increases on average in a $1 : 1.6180$ ratio. This proportion is the famous “Golden Mean” of botanical arrangement, natural selection, pyramid construction, Greek art, Euclidean geometry, Renaissance painting, modular architecture, etc. The biologic, mystical, natural, mathematic, etc. associations, benign and otherwise, brought forward by this unexpected yet quite quantifiable fact are yet to be explored fully.

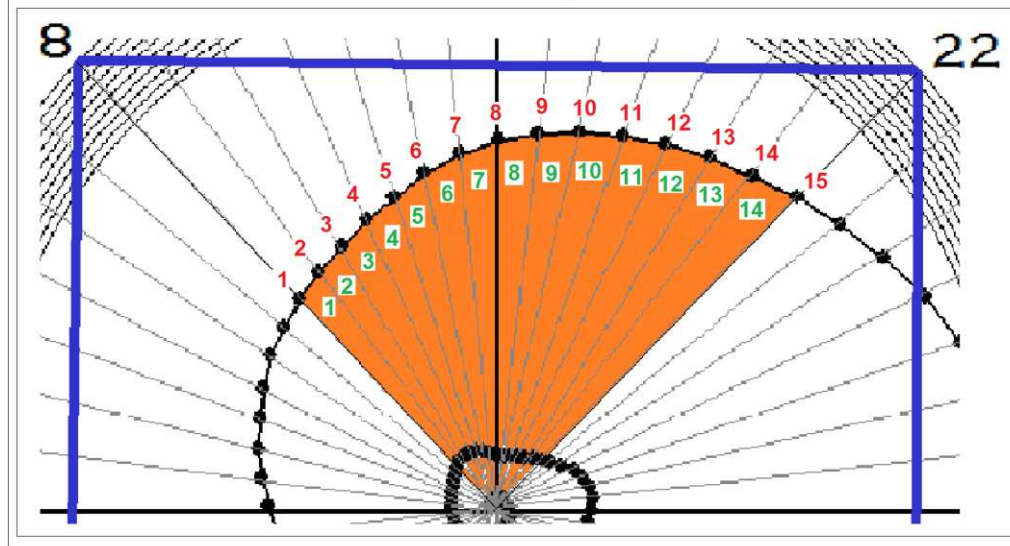
DIAGRAM 4-7. THE "GNP SPIRAL"



Using the above model – “the GNP Spiral” – repetitions of constitutional amendment in the lower left quadrant stand at a 18 liberal : 3 conservative ratio in relation to the upper right quadrant. Moreover the Golden Mean and its association with $\phi = 1.6180\dots$ is stated to within 3.4 parts of 10,000 – and under even more exacting analysis at 5.3 parts of 100,000 – with an explained steady-state rate of growth between 3.496 and 3.499 percent annually.

The above spiral, which mimics the spiral of galaxies and shellfish alike, brings forward numerous questions as to the nature of time in social systems. Here let us note that one of these aspects is that an additional inverse is implied. This inverse suggests that the running of a period of time, like the running of a race, can be looked at from two different but mathematically very complementary points of view.

DIAGRAM 4-7A. DETAIL.
ORIGIN OF THE 15/14 AND 14/15 RATIOS



In so far as the race begins with a starting line and ends with a finish line, the number of lines counted will be one more than the spaces held between the lines. In the above case highlighted in orange we count 15 lines creating 14 spaces. The fourteen spaces themselves contain a specific number days. To begin the count of days we start at the first day, indicating the starting line of the race. It is, however, the second line, not the first, which represents the end of the first year.

Consequently the period of time in orange might be measured as 14/15 (counting the time held within the boundaries). Conversely we may consider the same period as stated at its inverse, 15/14 (counting the number of boundaries holding the time period).

Okun suggests that the unemployment rate is to be taken as a proxy variable for a number of lesser and included features of employment (Okun, 1962: “average hours, labor force participation, and manhour productivity”). If these “included” factors are a form of inverse of the national rate of employment, then these “included” aspects of personal employment must be stated formally in the final calculation and understanding of Okun’s Law.

It appears from the data that the inverses 14/15 and 15/14 above represent the personal “race through time” of the American citizenry as they are engaged as members of the national work force. This work force creates U. S real GNP over time through the personal element of the employment rate which was “leapt over” by Okun’s approach. This personal aspect of employment is a necessary part of any understanding of *why* Okun’s Law works. These inverses of 14/15 and 15/14 are a fundamental part of Okun’s Law. In short,

If the GNP Spiral is governed by the “Golden Mean” as associated with the lifespan of American workers, then the π :1 relationship between employment and GNP must include as well the fractions 14/15 and 15/14 as representing these lifespans.

The Harmonic Inverse

As mentioned previously, Okun begins his analysis with the following assumption.

Strictly speaking, the leap (from employment rate to potential output) requires the assumption that, *whatever the influence of slack economic activity on average hours, labor force participation, and manhour productivity, the magnitudes of all these effects are related to the unemployment rate.*

If this leap from the personal to the national is indeed an inverse of the leap from the national to the personal, then some effort must be made to identify the nature of an inverse relationship as it applies to the relationship between employment and growth.

For the purposes of the data analysis which follows it may first be considered that the positive numbers, $0 < x$ may be divided arbitrarily into three groups, which we denominate for the purposes of this essay feminine ($0 < F < 1$), $1=1$, and masculine ($1 < M$). Any $1/x = F$ must and always will have some number $x/1 = M$ by way of a multiplicative inverse, the product of which will be 1.

$$\frac{1}{x} \times \frac{x}{1} = 1$$

The word “progenic” may be introduced, as referring to the product of the above association of feminine and masculine numbers. By “progenic” (“P” as taken from the root word “progeny” signifying “child” or “children”) we mean the number which is derived from a member of the feminine numbers and a member of the masculine numbers *as an intended result*, as contrasted with a number which appears in the data through statistical chance.

Two types of inverses may be noted. The first, a proper inverse, is given above. The second, a “Harmonic multiplicative inverse,” may be created by taking a feminine number and calculating some M as the progenic product, rather than the number “1.”

For example, should a “harmonic multiplicative inverse” be derived for the number $\frac{1}{2}$ about the progenic number π , the algorithm $2/1 \times \pi = 6.28...$, will be the masculine number necessary, as follows:

$$\begin{array}{lcl} \frac{1}{2} & \longrightarrow & \pi \\ & & \pi \times \frac{2}{1} = 2\pi \\ \frac{1}{2} \times 2\pi & = & \pi \end{array}$$

To state clearly: a *proper* multiplicative inverse has as its progenic product the number “1,” and a *Harmonic* multiplicative inverse has as its progenic product some number greater than 1, some “P,” implying thereby the existence of some masculine father as determined to be always at some multiple greater than x/1.

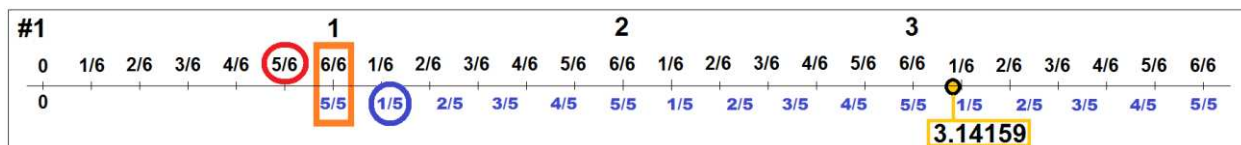
By way of example, let us consider the simple process whereby a Harmonic multiplicative inverse may be procured for the number 1/46 about the progenic number phi = 1.6180... We would use the following straight-forward calculus:

$$\begin{array}{l} \frac{1}{46} \longrightarrow \varphi \\ \varphi \times \frac{46}{1} = 46 \varphi \\ \frac{1}{46} \times 46 \varphi = \varphi \end{array}$$

In the same fashion, taking the feminine number “5/6” a proper multiplicative inverse may be created by reversing the numerator and denominator and “6/5” is found to be the proper multiplicative inverse. (see #1, below):

$$\frac{5}{6} \times \frac{6}{5} = 1$$

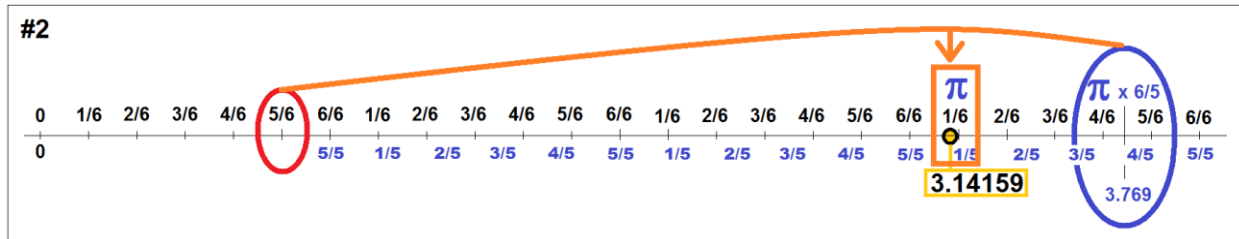
As this might be placed on a number line, we have:



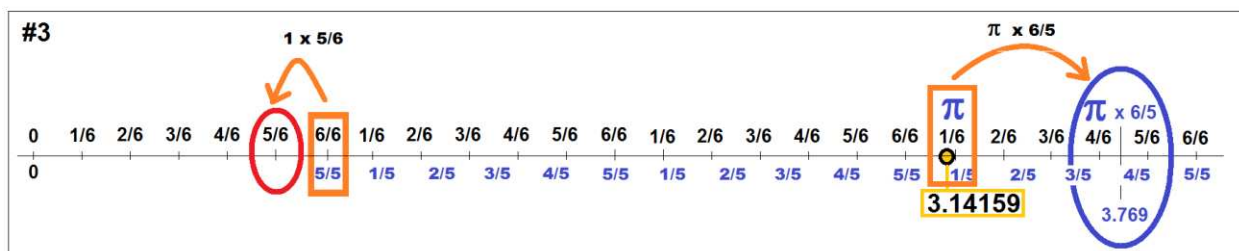
If a Harmonic multiplicative inverse about the progenic number π is intended, then multiplying $\pi \times 6/5$ yields the following (see #2, below):

$$\begin{array}{l} \frac{5}{6} \longrightarrow \pi \\ \pi \times \frac{6}{5} = \frac{6}{5} \pi \\ \frac{5}{6} \times \frac{6}{5} \pi = \pi \end{array}$$

... or stated in the context of a number line:



Viewed in reverse, the progenic number $P = \pi$ has been shown to be the progenic product of a Harmonic multiplicative inverse using $5/6$ as the feminine number as follows: feminine number = “ $5/6 \times 1$,” masculine number “ $6/5 \times P$.” (see #3, below):



The fact that this relationship might be expressed in decimals rather than fractions does not alter the situation in the least. The following example, using decimals, is equivalent for the purposes of this commentary, to wit:

$$0.8333... \times 1.2 = 1$$

With this discussion of the concept of an inverse, let us consider the data which underlies Dr. Knotek’s description of Okun’s Law and the tables used.⁷⁸

⁷⁸ For the original data sets used by Professor Knotek to create these graphs, see Appendix 1.

Data Analysis

This first table states the size of GDP as measured quarterly. These numbers form the basis for calculating GDP growth. Annual GDP growth is calculated as $100 \times ((\text{GDP in the fourth quarter of this year}) / (\text{GDP in the fourth quarter of last year}) - 1)$. Quarterly GDP figures are annualized according to the formula provided by the Bureau of Economic Analysis.

Table 1.1.6. Real Gross Domestic Product, Chained Dollars (Billions of chained (2005) dollars), Seasonally adjusted at annual rates Quarterly data from 1947 to 2007 Bureau of Economic Analysis Data published September 27, 2007 File created 9/26/2007 9:47:04 AM										Table 1.1.6. Real Gross Domestic Product, Chained Dollars (Billions of chained (2005) dollars), Seasonally adjusted at annual rates Quarterly data from 1947 to 2007 Bureau of Economic Analysis Data published September 27, 2007 File created 9/26/2007 9:47:04 AM										Table 1.1.6. Real Gross Domestic Product, Chained Dollars (Billions of chained (2005) dollars), Seasonally adjusted at annual rates Quarterly data from 1947 to 2007 Bureau of Economic Analysis Data published September 27, 2007 File created 9/26/2007 9:47:04 AM									
Year	Quarter	Green domestic product	Current Quarter divided by Previous Quarter	Quarter divided by Previous Quarter*4 (minus 1)	Copy of Previous Column (Values Only)	Make Column F a Percent (Multiply by 100)	Year	Quarter	Green domestic product	Current Quarter divided by Previous Quarter	Quarter divided by Previous Quarter*4 (minus 1)	Copy of Previous Column (Values Only)	Make Column F a Percent (Multiply by 100)	Year	Quarter	Green domestic product	Current Quarter divided by Previous Quarter	Quarter divided by Previous Quarter*4 (minus 1)	Copy of Previous Column (Values Only)	Make Column F a Percent (Multiply by 100)									
1947	1	1,578.5					1978	1	4,838.8	1.003	0.01294	0.01294	1.29379	1994	1	7,755.1	1.020	0.04132	0.04132	4.13197									
1947	2	1,568.7	0.999	-0.00658	0.00658	-0.42357	1978	2	4,881.2	1.009	0.01572	0.01572	1.57220	1994	2	7,855.7	1.012	0.04570	0.04570	4.57085									
1947	3	1,568.9	1.000	-0.00018	0.00018	-0.11317	1978	3	4,976.7	1.010	0.04002	0.04002	4.00196	1994	3	7,959.5	1.006	0.02265	0.02265	2.26506									
1948	1	1,616.1	1.026	0.06689	0.06689	4.48819	1978	4	5,137.4	1.011	0.05306	0.05306	5.30623	1994	4	7,951.6	1.012	0.04710	0.04710	4.71026									
1948	2	1,644.6	1.018	0.01723	0.01723	1.10282	1978	5	5,161.4	1.002	0.00781	0.00781	0.78888	1994	5	8,051.1	1.001	0.01116	0.01116	1.11617									
1948	3	1,654.1	1.006	0.00349	0.00349	0.21369	1978	6	5,252.3	1.001	0.00881	0.00881	0.88132	1994	6	8,112.8	1.001	0.01185	0.01185	1.18555									
1948	4	1,638.9	1.002	-0.00840	0.00840	0.50445	1978	7	5,353.9	1.000	0.00000	0.00000	0.00000	1994	7	8,209.2	1.000	0.00000	0.00000	0.00000									
1949	1	1,633.2	0.990	-0.00950	0.00950	-0.58020	1978	8	5,467.8	1.000	0.00000	0.00000	0.00000	1994	8	8,261.2	1.000	0.00000	0.00000	0.00000									
1949	2	1,628.4	0.997	-0.01170	0.01170	-1.17143	1978	9	5,582.1	1.001	0.02126	0.02126	2.12613	1994	9	8,377.7	1.001	0.01395	0.01395	1.39535									
1949	3	1,646.7	1.011	0.00677	0.00677	0.41716	1978	10	5,704.7	1.001	0.01185	0.01185	1.18555	1994	10	8,476.6	1.002	0.01470	0.01470	1.47019									
1949	4	1,629.9	0.990	-0.00819	0.00819	-0.49186	1978	11	5,827.3	1.001	0.01282	0.01282	1.28189	1994	11	8,571.1	1.001	0.01518	0.01518	1.51819									
1950	1	1,617.3	1.012	0.00835	0.00835	0.49811	1978	12	5,959.5	1.001	0.01926	0.01926	1.92613	1994	12	8,665.8	1.001	0.01628	0.01628	1.62765									
1950	2	1,617.3	1.017	0.00873	0.00873	0.51765	1979	1	6,063.4	1.000	0.00000	0.00000	0.00000	1994	1	8,773.7	1.002	0.01604	0.01604	1.60429									
1950	3	1,641.1	1.020	0.00229	0.00229	0.14219	1979	2	6,167.8	1.001	0.00984	0.00984	0.98400	1994	2	8,868.1	1.001	0.01678	0.01678	1.67813									
1950	4	1,644.4	1.002	0.00082	0.00082	0.04976	1979	3	6,264.1	1.001	0.00884	0.00884	0.88400	1994	3	8,959.5	1.001	0.01584	0.01584	1.58400									
1951	1	1,671.3	1.012	0.00835	0.00835	0.49811	1979	4	6,358.1	1.001	0.00784	0.00784	0.78400	1994	4	9,050.5	1.001	0.01484	0.01484	1.48400									
1951	2	1,663.1	1.017	0.00873	0.00873	0.51765	1979	5	6,450.5	1.001	0.00684	0.00684	0.68400	1994	5	9,141.6	1.001	0.01384	0.01384	1.38400									
1951	3	1,641.1	1.020	0.00229	0.00229	0.14219	1979	6	6,543.1	1.001	0.00584	0.00584	0.58400	1994	6	9,232.6	1.001	0.01284	0.01284	1.28400									
1951	4	1,644.4	1.002	0.00082	0.00082	0.04976	1979	7	6,635.1	1.001	0.00484	0.00484	0.48400	1994	7	9,323.6	1.001	0.01184	0.01184	1.18400									
1952	1	1,662.7	1.010	0.00402	0.00402	0.24195	1979	8	6,726.1	1.001	0.00384	0.00384	0.38400	1994	8	9,414.6	1.001	0.01084	0.01084	1.08400									
1952	2	1,662.7	1.010	0.00402	0.00402	0.24195	1979	9	6,817.1	1.001	0.00284	0.00284	0.28400	1994	9	9,505.1	1.001	0.00984	0.00984	0.98400									
1952	3	1,662.7	1.010	0.00402	0.00402	0.24195	1979	10	6,908.1	1.001	0.00184	0.00184	0.18400	1994	10	9,596.1	1.001	0.00884	0.00884	0.88400									
1952	4	1,662.7	1.010	0.00402	0.00402	0.24195	1979	11	7,000.1	1.001	0.00084	0.00084	0.08400	1994	11	9,687.1	1.001	0.00784	0.00784	0.78400									
1953	1	1,682.3	1.019	0.01751	0.01751	1.06098	1979	12	7,091.1	1.001	0.00000	0.00000	0.00000	1994	12	9,778.1	1.001	0.00684	0.00684	0.68400									
1953	2	1,682.3	1.019	0.01751	0.01751	1.06098	1980	1	7,182.1	1.001	0.00000	0.00000	0.00000	1995	1	9,869.1	1.001	0.00584	0.00584	0.58400									
1953	3	1,682.3	1.019	0.01751	0.01751	1.06098	1980	2	7,273.1	1.001	0.00000	0.00000	0.00000	1995	2	9,960.1	1.001	0.00484	0.00484	0.48400									
1953	4	1,682.3	1.019	0.01751	0.01751	1.06098	1980	3	7,364.1	1.001	0.00000	0.00000	0.00000	1995	3	10,051.1	1.001	0.00384	0.00384	0.38400									
1954	1	1,703.5	1.026	0.02609	0.02609	1.56948	1980	4	7,455.1	1.001	0.00000	0.00000	0.00000	1995	4	10,142.1	1.001	0.00284	0.00284	0.28400									
1954	2	1,703.5	1.026	0.02609	0.02609	1.56948	1980	5	7,546.1	1.001	0.00000	0.00000	0.00000	1995	5	10,233.1	1.001	0.00184	0.00184	0.18400									
1954	3	1,703.5	1.026	0.02609	0.02609	1.56948	1980	6	7,637.1	1.001	0.00000	0.00000	0.00000	1995	6	10,324.1	1.001	0.00084	0.00084	0.08400									
1954	4	1,703.5	1.026	0.02609	0.02609	1.56948	1980	7	7,728.1	1.001	0.00000	0.00000	0.00000	1995	7	10,415.1	1.001	0.00000	0.00000	0.00000									
1955	1	1,724.5	1.031	0.03119	0.03119	1.87119	1980	8	7,819.1	1.001	0.00000	0.00000	0.00000	1995	8	10,506.1	1.001	0.00000	0.00000	0.00000									
1955	2	1,724.5	1.031	0.03119	0.03119	1.87119	1980	9	7,910.1	1.001	0.00000	0.00000	0.00000	1995	9	10,597.1	1.001	0.00000	0.00000	0.00000									
1955	3	1,724.5	1.031	0.03119	0.03119	1.87119	1980	10	8,001.1	1.001	0.00000	0.00000	0.00000	1995	10	10,688.1	1.001	0.00000	0.00000	0.00000									
1955	4	1,724.5	1.031	0.03119	0.03119	1.87119	1980	11	8,092.1	1.001	0.00000	0.00000	0.00000	1995	11	10,779.1	1.001	0.00000	0.00000	0.00000									
1956	1	1,745.5	1.036	0.03619	0.03619	2.17119	1980	12	8,183.1	1.001	0.00000	0.00000	0.00000	1995	12	10,870.1	1.001	0.00000	0.00000	0.00000									
1956	2	1,745.5	1.036	0.03619	0.03619	2.17119	1981	1	8,274.1	1.001	0.00000	0.00000	0.00000	1996	1	10,961.1	1.001	0.00000	0.00000	0.00000									
1956	3	1,745.5	1.036	0.03619	0.03619	2.17119	1981	2	8,365.1	1.001	0.00000	0.00000	0.00000	1996	2	11,052.1	1.001	0.00000	0.00000	0.00000									
1956	4	1,745.5	1.036	0.03619	0.03619	2.17119	1981	3	8,456.1	1.001	0.00000	0.00000	0.00000	1996	3	11,143.1	1.001	0.00000	0.00000	0.00000									
1957	1	1,766.5	1.041	0.04119	0.04119	2.47119	1981	4	8,547.1	1.001	0.00000	0.00000	0.00000	1996	4	11,234.1	1.001	0.00000	0.00000	0.00000									
1957	2	1,766.5	1.041	0.04119	0.04119	2.47119	1981	5	8,638.1	1.001	0.00000	0.00000	0.00000	1996	5	11,325.1	1.001	0.00000	0.00000	0.00000									
1957	3	1,766.5	1.041	0.04119	0.04119	2.47119	1981	6	8,729.1	1.001	0.00000	0.00000	0.00000	1996	6	11,416.1	1.001	0.00000	0.00000	0.00000									
1957	4	1,766.5	1.041	0.04119	0.04119	2.47119	1981	7	8,820.1	1.001	0.00000	0.00000	0.00000	1996	7	11,507.1	1.001	0.00000	0.00000	0.00000									
1958	1	1,787.5	1.046	0.04619	0.04619	2.77119	1981	8	8,911.1	1.001	0.00000	0.00000	0.00000	1996	8	11,598.1	1.001	0.00000	0.00000	0.00000									
1958	2	1,787.5	1.046	0.04619	0.04619	2.77119	1981	9	9,002.1	1.001	0.00000	0.00000	0.00000	1996	9	11,689.1	1.001	0.00000	0.00000	0.00000									
1958	3	1,787.5	1.046	0.04619	0.04619	2.77119	1981	10	9,093.1	1.001	0.00000	0.00000	0.00000	1996	10	11,780.1	1.001	0.00000	0.00000	0.00000									
1958	4	1,787.5	1.046	0.04619	0.04619	2.77119	1981	11	9,184.1	1.001	0.00000	0.00000	0.00000	1996	11	11,871.1	1.001	0.00000	0.00000	0.00000									
1959	1	1,808.5	1.051	0.05119	0.05119	2.97119	1981	12	9,275.1	1.001	0.00000	0.00000	0.00000	1996	12	11,962.1	1.001	0.00000	0.00000	0.00000									
1959	2	1,808.5	1.051	0.05119	0.05119	2.97119	1982	1	9,366.1	1.001	0.00000	0.00000	0.00000	1997	1														

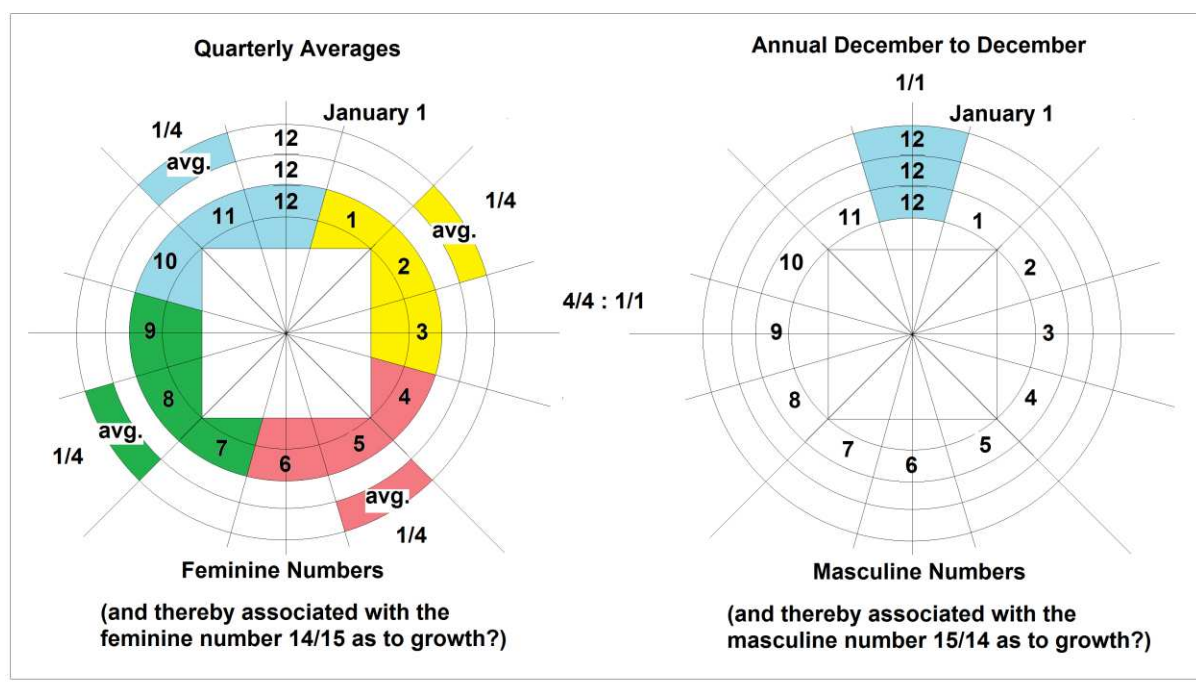
The next table below states the employment rate in months. For annual data, the change in the unemployment rate is the current December minus the previous December. For quarterly data, the change in the unemployment rate is the difference between subsequent quarterly averages.

The above chart is of specific interest as it relates to the calculation of quantities of monthly unemployment in both their “feminine” and “masculine” characteristics, or put another way, their “circumferential” and “radial” characteristics.

To make the distinction plain, let us imagine that the march of months within a year was made congruent to the 12 hours on the face of the clock. The manner in which the data for unemployment is collected and analyzed against itself partakes of the circular nature of a unit circle. In this way the average of each quarter is taken and compared with the average of each other quarter. This is portrayed in the left hand side of the following chart.

Contrast this with a single month, chosen from the twelve, and it alone being contrasted with the same month of the following year, and then the following year, and so on.

DIAGRAM 1.
FEMININE AND MASCULINE NUMBERS



On the left we have a circumferential relationship between quarterly data which itself relies upon a circular sense of time, a legitimate apportion-izing of something which itself is taken as a “1.” On the right we have a distinctly different and radial view of time, one which does not accept any obvious limitation to its ongoing list of endless Decembers.⁷⁹

Note that the estimation of a “quarterly” rate for unemployment takes as its beginning source of numeric encouragement the idea that it is $1/4^{\text{th}}$ of something else, specifically a sub-part of a 12-month, four-quarter year. If we were to have a full year specified in quarters then numerically we would be interested in a year stated as $4/4$ which, according to number theory, would equal a single year.

⁷⁹ It must be noted, however, that the GNP Spiral assumes a further circular aspect of time applying even to annual data. Consequently the 14/15 association of feminine numbers in this regard, and the 15/14 association with masculine numbers, remains connected to this approach. In short, if the annual data itself falls into a larger circumferential relationship, what relationship might this have to the quarterly data which are, at best, a sub-part of the GNP Spiral and its $1:\phi$ ratio over a span of 56 years?

Conversely the statement of an “annual” rate of unemployment seeks not an association between the data and the year itself, but rather to an *on-going set of years in sequence*. Consequently the rate of one December is compared to the rate of the next December and measured. In contrast to the quarterly data – which by definition is part of some other wholeness – we might state annual data as a repeated sense of “1,” each point repeating itself in endless time, a 1/1.

Here we enter into the intrigues and quiet thoughts of the numbers themselves. Placing both feminine and masculine numbers together we see above a hinted “radius : 2π ” relationship between annual and quarterly approaches using a single data set describing unemployment and a second single data set describing GDP growth. Three questions arise.

1. Do the feminine ($0 < F < 1$) numbers maintain a secret relationship with the quarterly employment figures, their circumferential sense of time and the fraction $14/15$ as these relate to the GNP Spiral / Kondratiev Wave, perhaps “filling up” the space between moments of time?

2. Do the masculine ($1 < M$) numbers share an equally hidden relationship with annual employment figures, their radial sense of time and the fraction $15/14$ as these relate to the GNP Spiral / Kondratiev Wave, perhaps setting up “boundaries” separating moments of time?

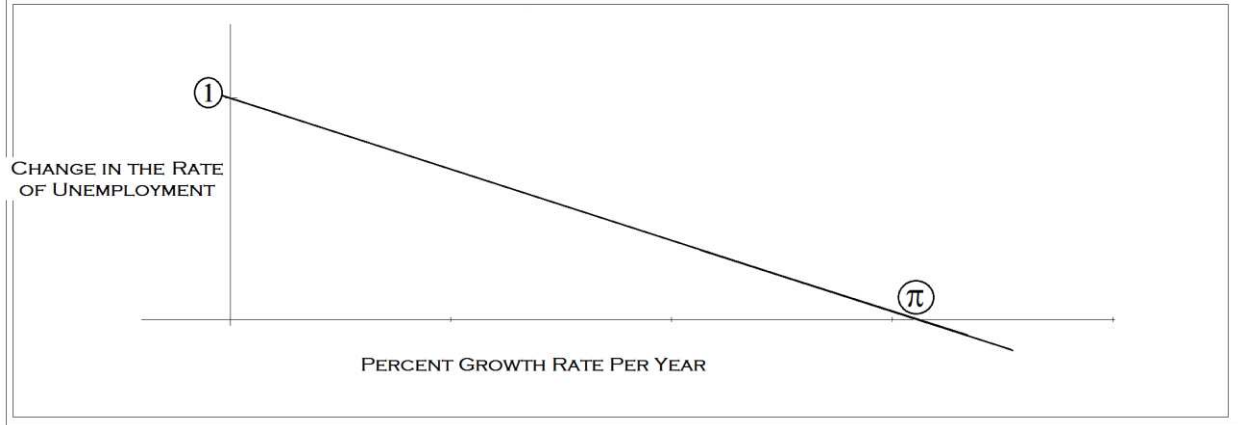
3. Under what circumstances might these secrets be revealed, secrets which although hidden, tentative and circumspect, might actually bear an inverse relationship of some sort to one another?

“The Harmonic Multiplicative Inverse Surprise”

The relationship which we are anticipating is that a $1 : \pi$ relationship will exist between a percentage change in the rate of unemployment and the percentage growth of GNP. As the rate of growth increases on the x-axis, the rate of unemployment will go down on the y-axis. Setting this relationship as a straight-forward linear relationship, we have the following.

DIAGRAM 2-13.

PI : 1 RELATIONSHIP BETWEEN GNP GROWTH AND CHANGE IN THE RATE OF EMPLOYMENT



In order to establish a $1 : \phi$ proportion over fourteen years the economy of the United States must possess a steady state rate of growth of approximately 3.4969% per year. As one calculates a $1 : \pi$ exchange between rates of unemployment and GDP growth under Okun's Law, one notices that the slope of the $1 : \pi$ relationship must remain the same, but that the y-intercept shifts slightly upwards, becoming not “1” but $3.4969 / \pi = 1.1131227$.

DIAGRAM 2-14.

PI : 1 RELATIONSHIP BETWEEN GNP GROWTH AND CHANGE IN THE RATE OF EMPLOYMENT USING GOLDEN MEAN RATE OF GROWTH OF 14-YEAR OCTAVES = 3.4969



Comparing this to the observed data calculated by Dr. Knotek, one notices that Chart One uses quarterly *growth data* which has been annualized. However quarterly *employment data* is *not* annualized.

DIAGRAM 2-2.

CHARTS ONE AND TWO OF "HOW USEFUL IS OKUN'S LAW?"

Chart 1

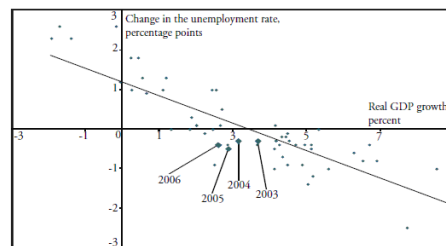
THE DIFFERENCE VERSION OF OKUN'S LAW,
QUARTERLY DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from the second quarter of 1948 through the second quarter of 2007.

Chart 2

THE DIFFERENCE VERSION OF OKUN'S LAW,
ANNUAL DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from 1949 through 2006.

We adjust the trend line for annualized quarterly data by multiplying quarterly employment data by four, thereby “annualizing” quarterly employment data. In this manner annualized quarterly data on growth is matched with “annualized” quarterly data on employment.

DIAGRAM 2-15.

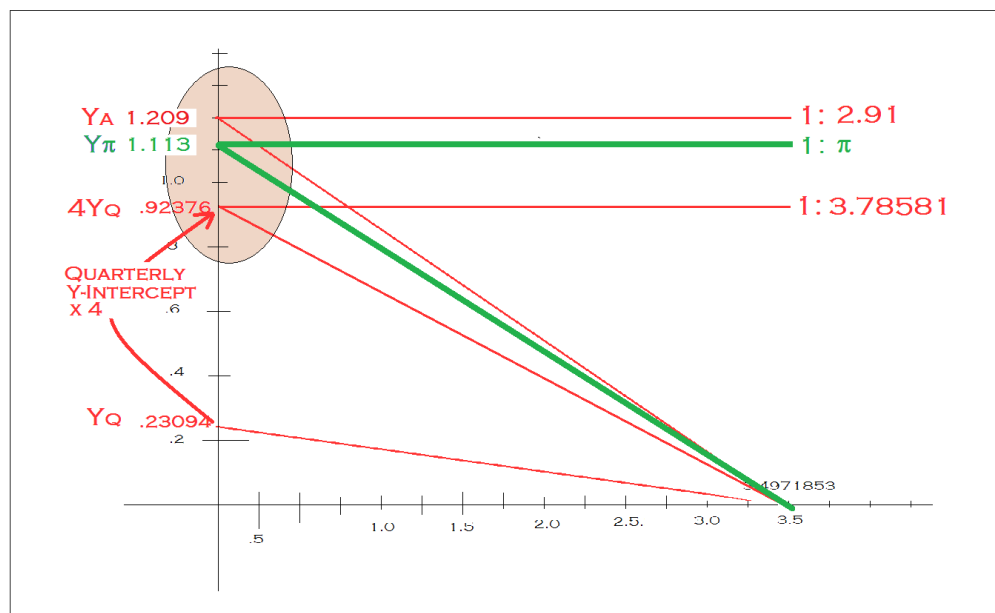
MULTIPLYING QUARTERLY UNEMPLOYMENT RATE X 4

IMPLIED RATIOS BETWEEN
Y-INTERCEPT AND

$X = 3.4551266$ (ANNUAL X-INTERCEPT)

$X = 3.4969781$ (GOLDEN MEAN X-INTERCEPT)

$X = 3.4972429$ (QUARTERLY X-INTERCEPT)



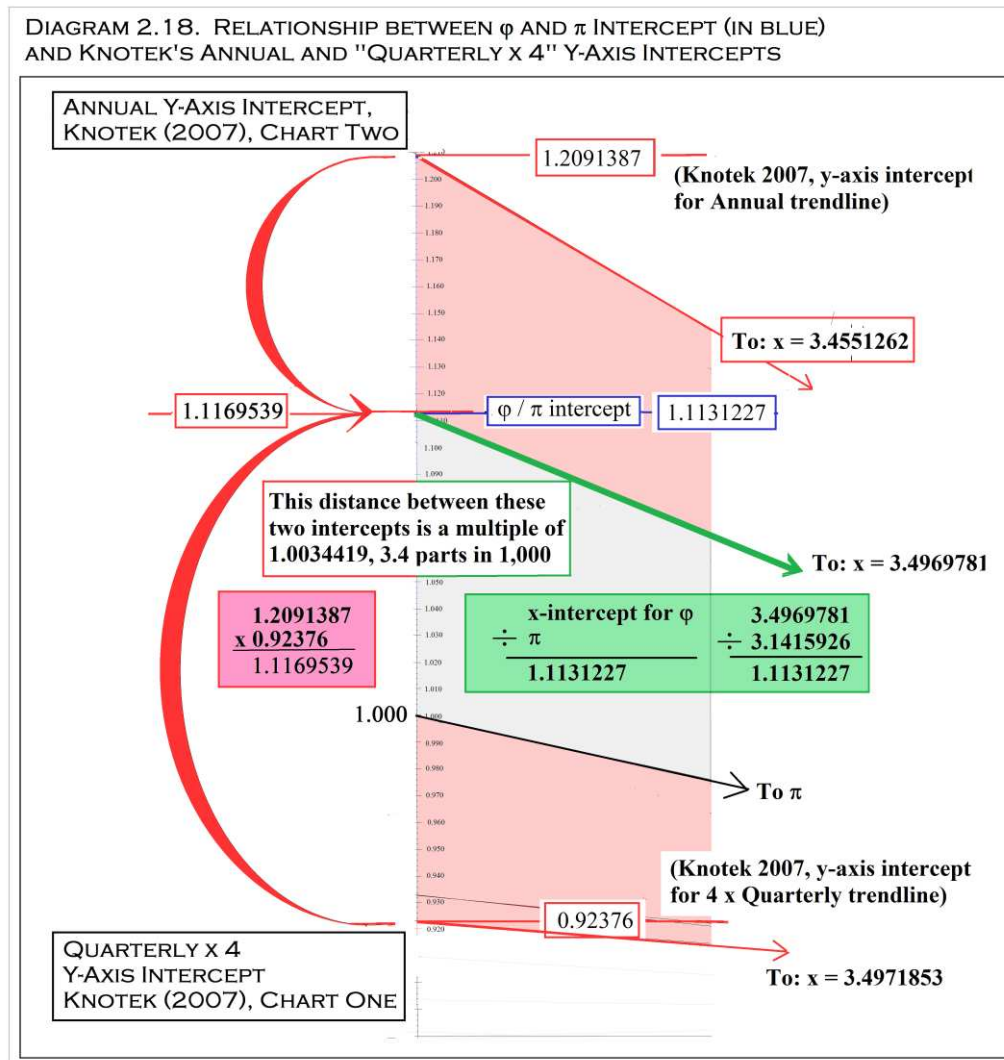
If the steady state rate given for the Golden Mean proportion (3.4969 percent per year) is divided by π , the y-axis intercept is **1.1131227**.

The “Annual” y-intercept given in Knotek 2007 is 1.2091387, and the “4 x Quarterly” y-intercept is 0.92376. We may multiply the two in order to test whether they are inverses around a common point. The multiple of these two intercepts is **1.1169539**. The result is remarkable.

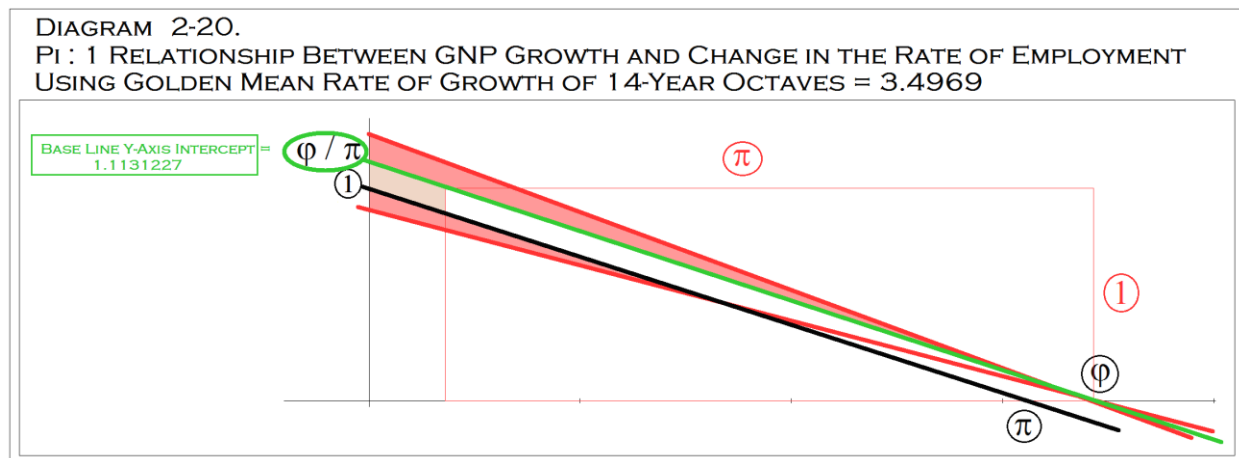
*In short when the growth rate is zero (the y-axis), the y-axis intercepts for the Knotek: “Annual” and Knotek: “4 x Quarterly” trend lines create a “Harmonic multiplicative inverse” about a progenic y-axis intercept of **1.1169539**.*

*This is very proximate to the projected trend line connecting a $1:\phi$ steady-state rate of growth with a $\pi:1$ slope for Okun’s Law creating a y-axis intercept of **1.1131227**.*

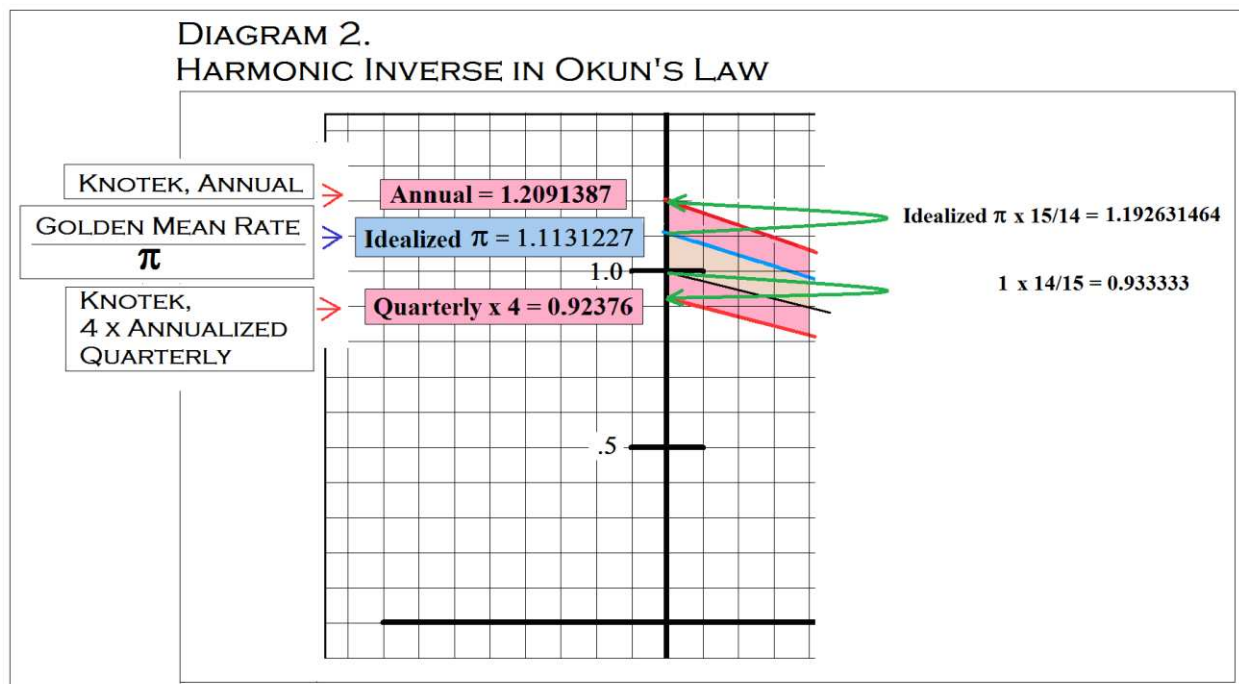
These two y-axis intercepts are equal to one another to an accuracy of 0.34%, 3.4 parts in 1,000, or 99.65%. (See chart below)



In short, the possibility of two specific sets of numbers – feminine and masculine – as configured in the theory of a harmonic multiplicative inverse appears to generate a remarkable understanding of the econometric data underlying Okun's Law.⁸⁰

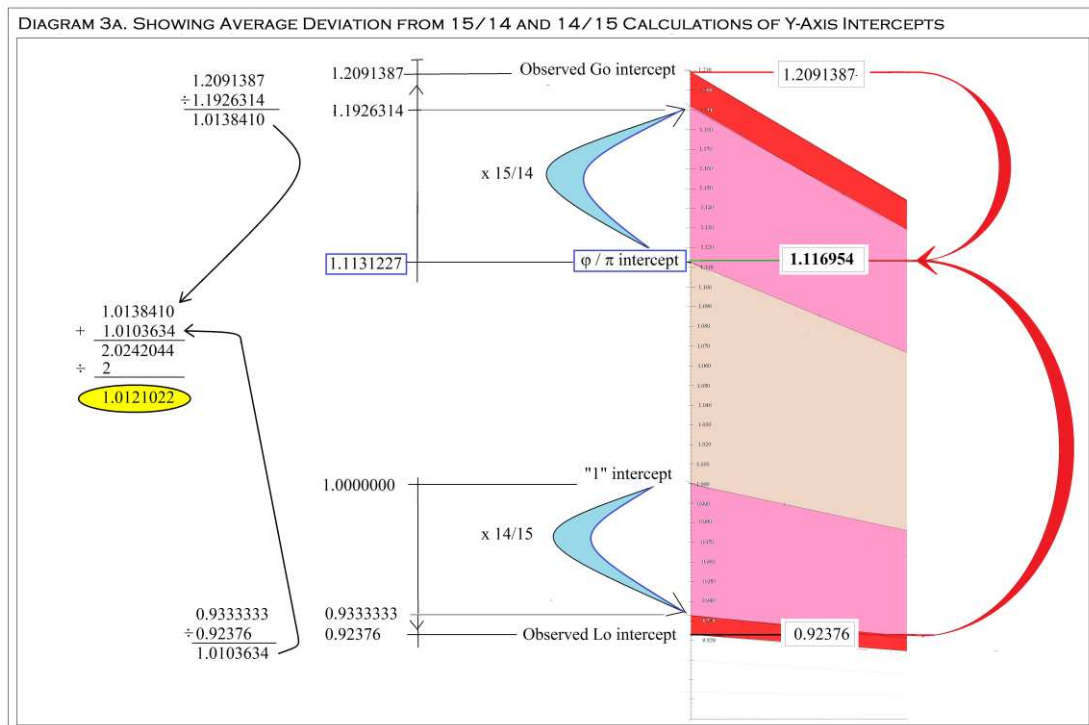


The advantages increase considerably if we connect the “1:π / 1:φ” trend line to an analysis of the Kondratiev Wave. The progenic π/ϕ intercept (“P”) may be constructed from a feminine “14/15 x 1” as combined with a masculine “15/14 x P.” (See “The Harmonic Inverse” *supra*) The resulting projections of Annual and Quarterly intercepts lie at variances from Knotek:4 x Quarterly at 1.0% and Knotek:Annual at 1.3%.

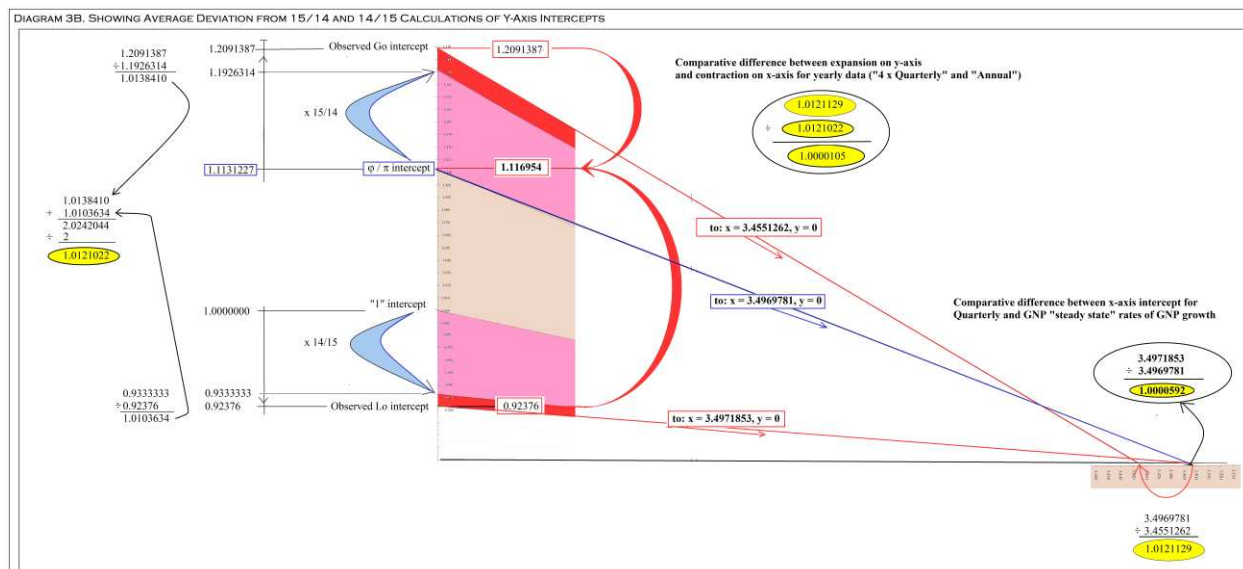


⁸⁰ A simple 3:1 ratio, with the same approach used, yields a y-intercept of 1.1656. This is contrasted with a π/ϕ intercept of 1.1131 / 1.1656 (at 95.49%) and an observed intercept of 1.1169 / 1.1656 (at 95.81%).

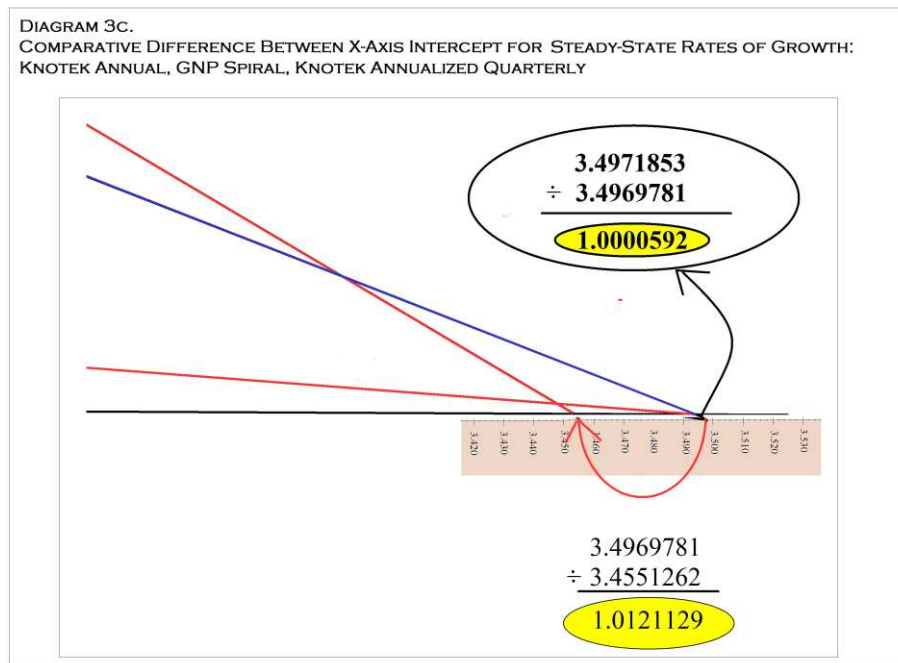
This yields an average expansion of 1.2% beyond the masculine and feminine inverses, or more specifically a multiple of **1.0121022**, in yellow below.



This y-axis deviation balances a similar deviation between growth rates along the x-axis. The steady state rate for Annual Data calculated by Dr. Knotek is 3.4551266. The steady state rate of growth calculated via the GNP Spiral (3.4969781) is greater than this number by a multiple of **1.0121129**, virtually identical to the y-axis deviation stated above.



Let us consider more carefully the three rates we have for a steady state rate of growth, each of which constitutes an x-axis intercept. These are Knotek: Annual (3.4551262), Knotek: Annualized Quarterly (3.4971853) and the GNP Spiral (3.4969781).



Dr. Knotek's data track slightly more than one complete circuit around the 56-year GNP Spiral, i.e. covering the second quarter of 1947 through the third quarter of 2007, a period of 60 years. This data misses the full range of GNP values available from the Department of Commerce (1869 through 1946), a period of 78 years. Moreover between 1869 and 1947 very large growth rates are found in GNP ratios. These larger ratios are included as a part of the calculation of the GNP Spiral.

Despite the incongruity of data sets Knotek:Annualized Quarterly (3.4971853) is virtually the same as that given for the GNP Spiral (3.4969781).

When the larger (Knotek: Annualized Quarterly = 3.4971853) is divided by the smaller (GNP Spiral = 3.4969781) a multiple of 1.0000592 is found, indicating a proximity between the two numbers of 5.9 parts in 100,000.⁸¹

⁸¹ This result, as first pointed out by Dr. Knotek in an email of June 24, 2011, was the genesis of the correspondence resulting in this paper.

Given the absence of GNP data pre-dating 1947, one might expect that the Knotek:Annual must be smaller than that of the growth rate calculated by the GNP Spiral. Indeed the x-axis intercept for Knotek:Annual (3.4551262) retreats from the expected GNP Spiral x-axis intercept (3.4969781), the second being larger by a multiple of **1.0121129**.

As noted previously, this compares to an expansion along the y-axis for unemployment averaging between feminine and masculine components of **1.0121022**.

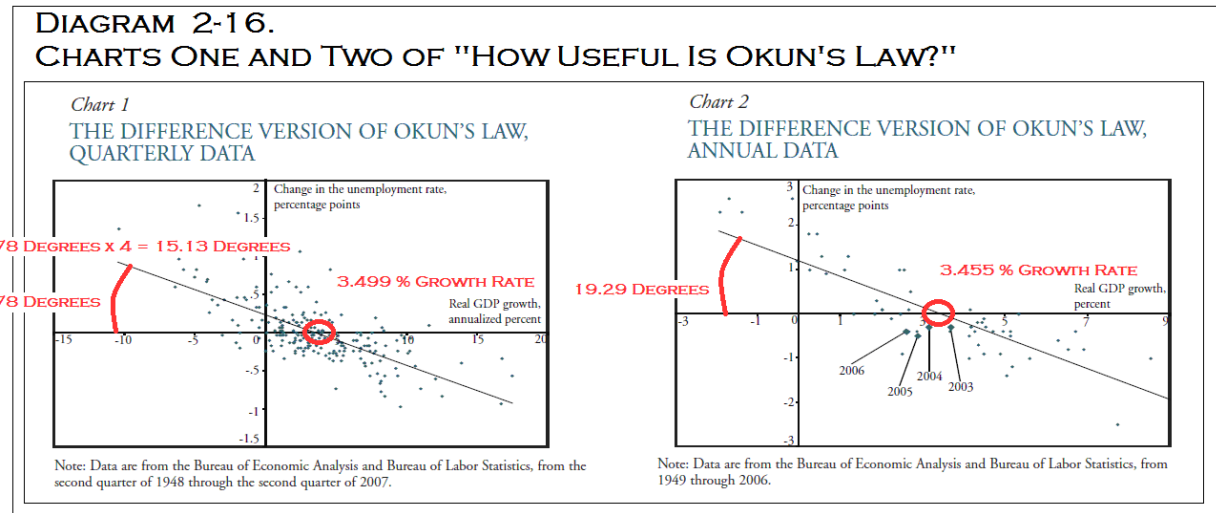
*When the deviation along the x-axis **1.0121129** is divided by the deviation along the y-axis **1.0121022** a multiple of **1.0000105** results. This indicates that a balance between growth and employment along a $1:\varphi / 1:\pi$ trendline is accurate to within 1.05 parts in 100,000. It further suggests that while unemployment states a Harmonic multiplicative inverse, growth is not figured in such a way.*

This leads to the following insight as to the operation of the harmonic multiplicative inverse and its impact upon the analysis of data surrounding Okun's Law.

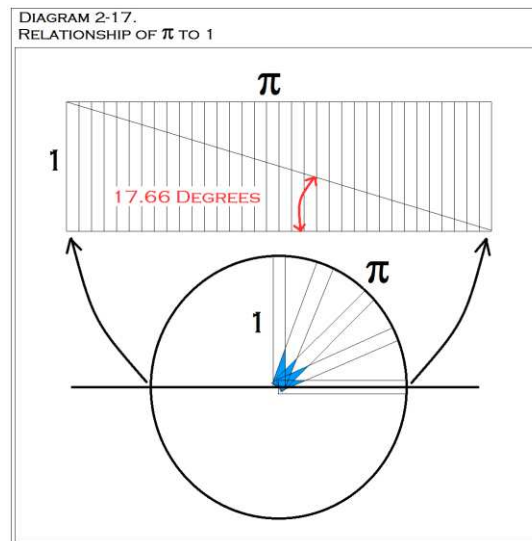
When change in the rate of unemployment is zero, the rate of growth is seen clearly; there is no inverse at all to found in the growth data.

When the growth of GDP is zero, quarterly and annual rates of unemployment at in great flux and we see quite clearly the Harmonic multiplicative inverse in the unemployment data.

A second test of the harmonic multiplicative inverse may be found in the fact that the $\pi:1$ understanding of Okun's Law generates an angle bisecting that of Charts One and Two to within half a degree. These angles are 15.13 degrees for annualized quarterly data and 19.29 degrees for annual data.



The angle created by the rectangle $\pi : 1$ bisects these two within one half of one degree, i.e. 17.66 degrees.



In other words, the slope of the angle bisecting the angles given in Charts One and Two is 17.213 degrees, less than half a degree from the slope of 17.66 degrees of a projected relationship between the constant π and 1 as projected by this approach.

Conclusion to Part One: Understanding of the Data

The same data, used in different guises, leads to two separate lines, each of which are the harmonic inverses necessary to bring together the π :1 relationship running Okun's law.

Let us consider how the mathematics of these lines might come about.

If John runs a race beginning at point "x", over space "y", and ending at point "z", the "rate" at which John has run will be:

$$\frac{z - x}{\text{time}}$$

If $x=0$ and $z=5$ miles from 0, and the race is over one hour, then John has run at the rate of (5 miles – 0)/one hour, or 5 miles per hour.

The "substance" or "effect" of running this distance is "y." In "y" we may count drops of sweat, hills and valleys, rocks, snakes dodged, etc. But whatever has happened to John between x and z (i.e. "y") is ignored by virtue of the $(z-x)/\text{time}$ equation.

If we make "x" and "z" "markers" then the rate is composed of 2 markers / 1 substance. As this accounts for Okun's law, we have rate / effect. Nevertheless the number of markers which create the rate will always be one more than the number of effects or $2/1$.

Okun disregards the notion of the two markers which create a single rate. By using the employment "rate" as a proxy variable for all subsidiary effects he inadvertently creates a "1/1" fraction between the "rate" and the lesser, included, subsidiary "effects." This poses a difficulty for econometrics because it leads to scores of evaluations for Okun's law without a consideration of what is being placed side-by-side for comparison.

We can just as easily consider the inverse of the above with the substance of the race (miles traversed, people applauding, mountains climbed, ankles broken, etc.) in a myriad of various "effects." But no matter how multitudinous the "effects" considered, the overall substance of these "effects" equates simply with the inverse of the first equation, i.e. substance / markers = effects / rate = $1/2$.

It has proved salutary to see the chart of annual data as asking a "national employment rate" question (i.e. $15/14 \times "y=\phi/\pi"$ intercept) and the quarterly data as asking a personal "effects" question ($14/15 \times "y=1"$ intercept) both of which are engaged by Okun's approach. The questions posed are "harmonic inverses" of one another in a fashion not contemplated by Okun's law but implied nevertheless by the leap of logic which Okun makes at the beginning of his approach.

To clarify the "harmonic" approach to Okun's law advanced here let us imagine a musician sitting at a piano, holding down the damper pedal thereby "opening" all the strings to vibration, and playing a single "Middle C" on the keyboard. If the musician "sounds" the string and then stops its vibration while allowing all other strings to be vibrate clearly, one will hear the overtones of "middle C" quietly "humming" their various tones without any apparent effort by the musician. These overtones are the lengths of string which are mathematically close to the vibration of C itself. These strings resonate by "sympathetic vibration" or "sympathetic harmony" to Middle C, even after the Middle C string is silenced.

In a similar fashion arranging employment and growth rates in national data brings forth a “resonance” to the idea of growth vs. employment vis-à-vis *annual* data because it links multiple yearly “toruses” together into a common, overarching pattern, a 15/14.

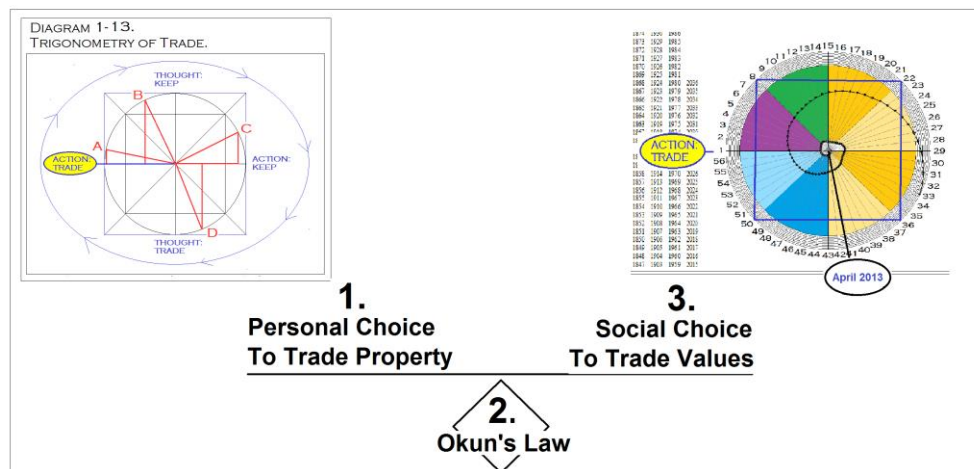
This is quite different than arranging growth and employment rates vis-à-vis *annualized quarterly data*, although technically they are supposed to be close to the same thing. This second chart sets up a sympathetic vibration amongst the data which is fundamentally different than that of the annual data because it seeks not a rate generated between end year dates but rather quarters of a single year which, in turn, are sub-portions of the single year wherein the torus was constructed.

It happens, however, that these questions are actually inverses surrounding a single topic raised by Okun’s law, i.e. the proper understanding of growth vs. employment. This inverse relationship is further highlighted by the fact that the models given for immediate personal choice and long-term national choice are fractals of one another, mirror images of one another at differing scales. This may be considered more closely if we consider once again the ”rates” vs. “effects” dichotomy set up by Okun at the beginning of his paper.

In other words, when growth is determined via the GNP Spiral to be a measurement of a rate of growth over 14 years (3.4969%) we may state this as emphasizing one of two aspects of this relation as presented by Okun,

<i>National</i>		<i>Personal</i>
i.e. rate/effects	OR	effect/rate;
i.e. 15/14 x “ $y=\phi/\pi$ ” intercept	OR	14/15 x “ $y = 1$ ” intercept.

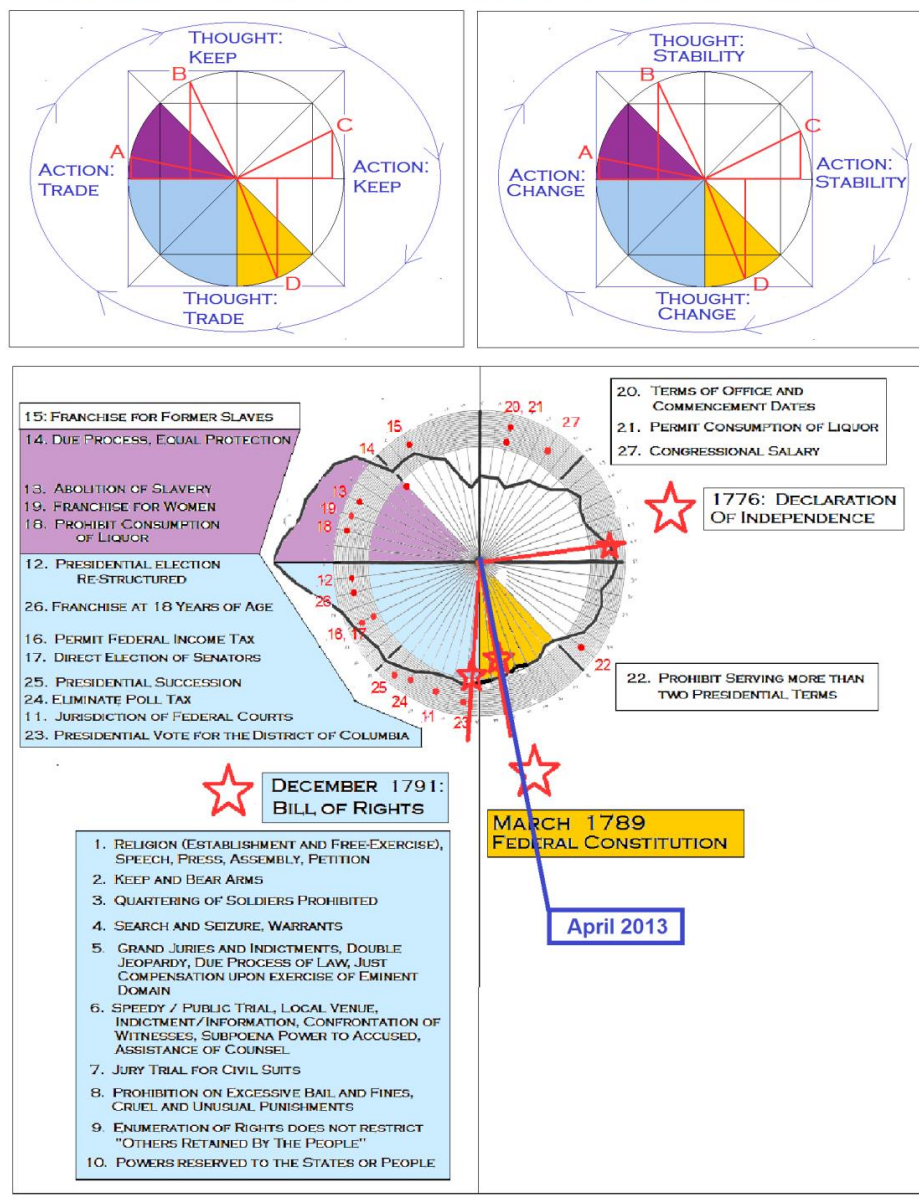
The data used to evaluate these questions are the same data, but the harmonies which are raised from the data in response to these different questions or inverse points of view is the underlying basis for the strict and virtually identical correlations derived herein. Here the strict symmetry of the models given for personal choice in trading material goods and services and social choice in trading values over time may be key in maintaining the $\pi:1$ proportion which underlies both the ratio and stability of Okun’s Law in the United States.



Part Two: The Kondratiev Wave

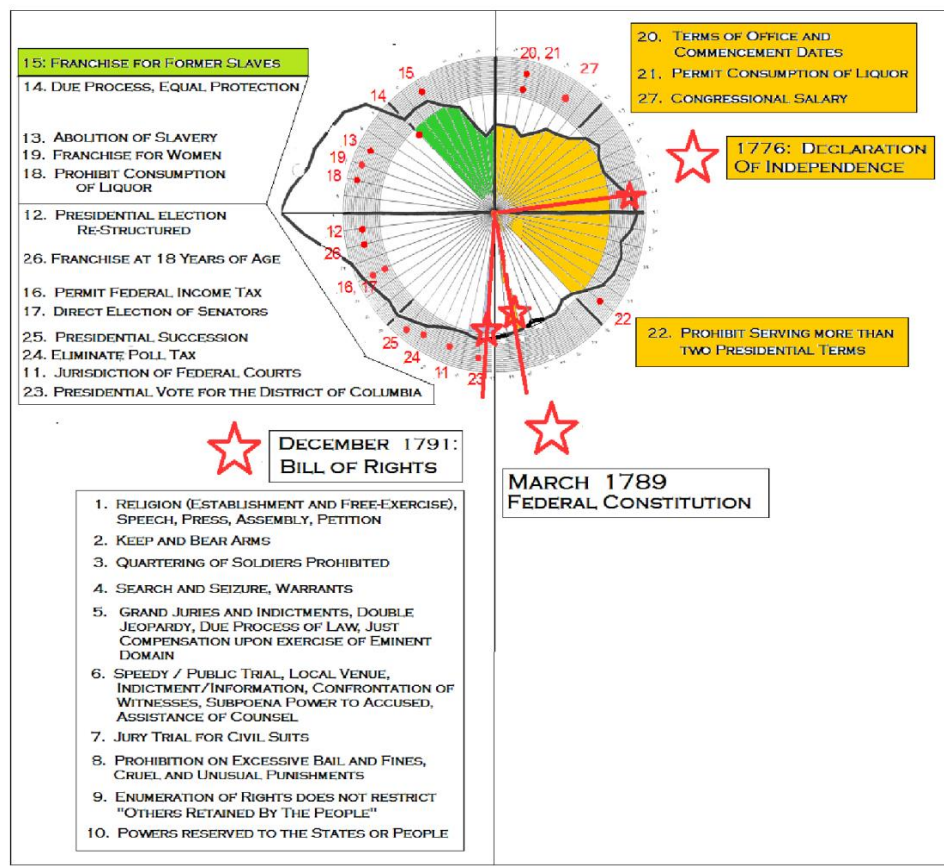
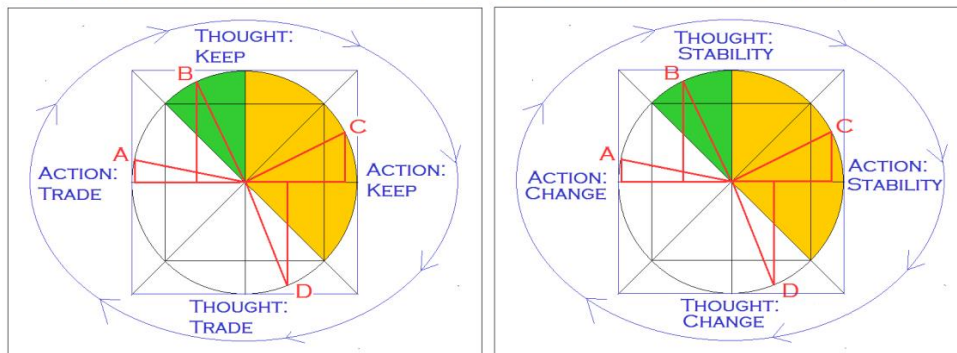
The GNP Spiral gives rise to an evaluation of the economic history of the United States. This may be stated in a circuit of 56 years, i.e. eight sections of 7 years each. (Albers & Albers 2013) The political and economic emphasis of these different periods has economic impact upon Okun's law. At the present time, we face a sea change in political attitudes. (April 2013) During comparable historic periods frustration with the political status quo has led to significant and enduring constitutional change. These changes alter the ground rules of economic engagement and permit the capitalistic enterprise to move forward. The following constitutional amendments are associated with historically comparable periods of time.

DIAGRAM 5-7.
CHANGE VS. STABILITY - SOUTHWEST CORNER



The period of time which we are leaving is one of tremendous conservatism, a period during which the rules previously laid down are made permanent to the satisfaction of a newly empowered political elite. Historically comparable periods of time are associated with the Articles of Confederation, the rise of slavery in the South and the westward expansion of the United States, the Gilded Age and power of the Robber Barons, and the international dominance of the United States post-World War II.

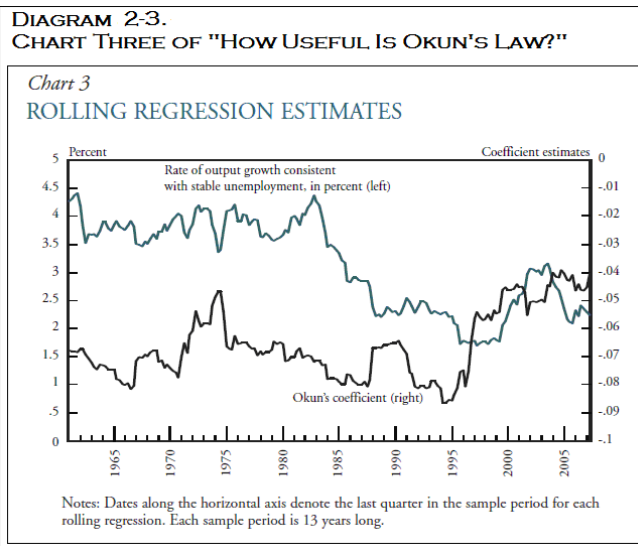
DIAGRAM 5-8. CHANGE VS. STABILITY - NORTHEAST CORNER



Consequently the straightforward presentation of a $\pi:1$ ratio within the data underlying Okun's Law also must take into account the tremendous underlying political change which this involves. These are part of Okun's Law as well. As Dr. Knotek argues, the stability of the trend lines provided in Charts One and Two mask the underlying dynamics of these relationships. He writes:

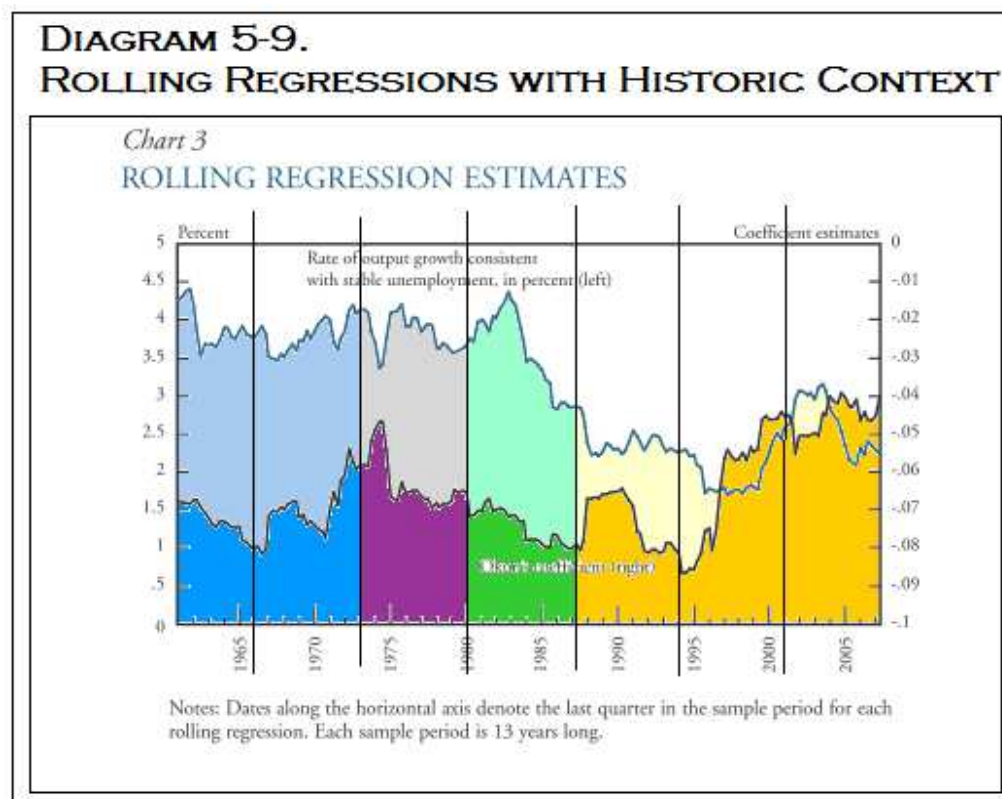
One problem with a long time series – such as from 1948 to 2007 – is that history can hide changes in relationships. This is the case for Okun's law. The previous section (Charts 1 and 2) found considerable similarities between Okun's original estimate and an updated regression using a longer time series. This section shows that, when estimated over shorter time horizons, the relationship between changes in the unemployment rate and real output growth has varied considerably.

To capture this variation, this article uses a technique called rolling regressions. A rolling regression estimates a particular relation over many different sample periods. Each regression produces a set of estimated coefficients. If the relationship is stable over time, then the estimated coefficients should be relatively similar from one regression to the next. Variations in the relation will appear as sizeable movements in the estimated coefficients.



This apparent chaos may be understood by recalling that Okun's Law, being the consequence of the inverse between national and personal aspects of the economy, is itself intimately connected to the GNP Spiral and the passage of time within it. In consequence we are able to divide the time periods shown by Knotek's Chart Three above into quite specific, distinct *and predictable* periods of definite duration, each of which possesses its own unique political economy.

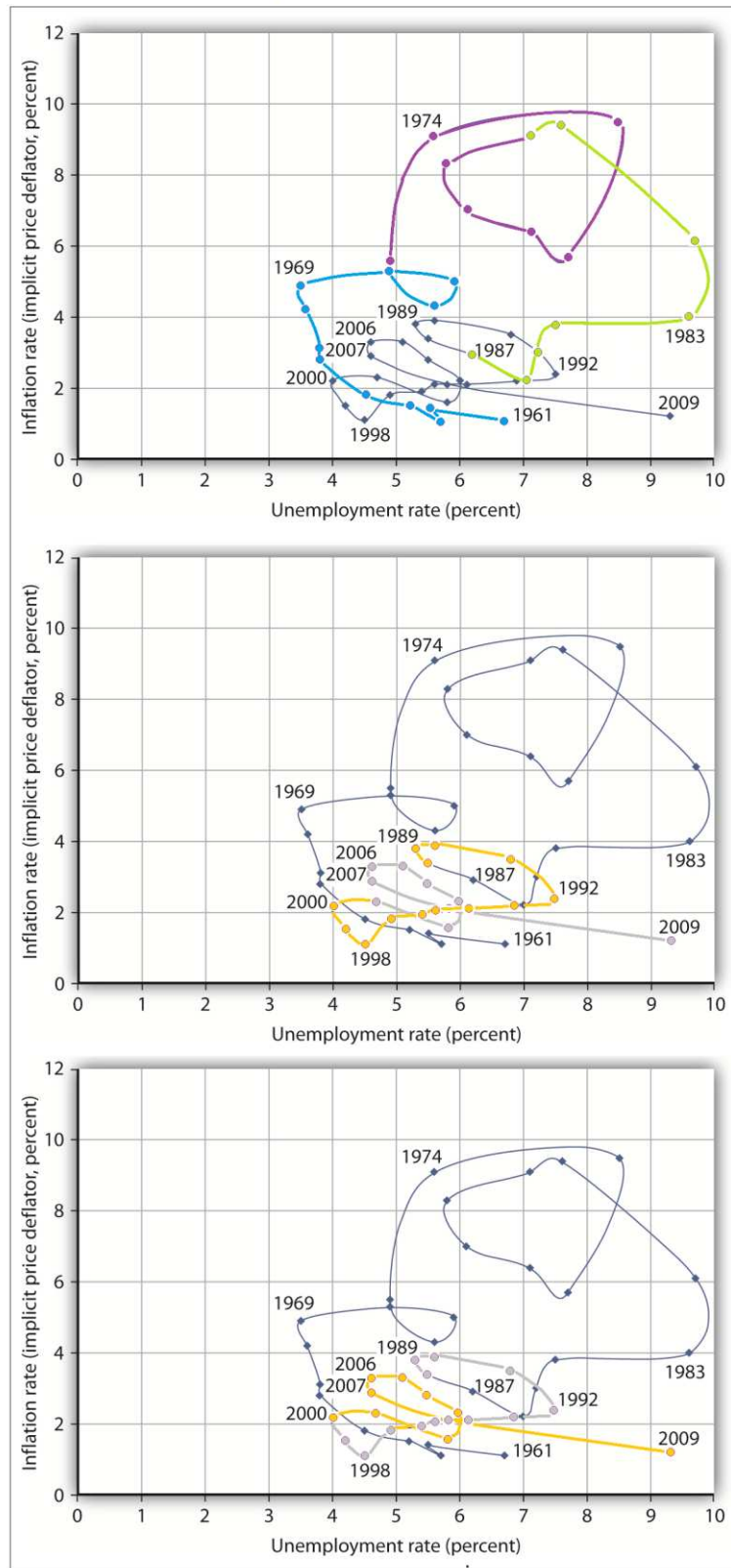
In short, using ideas proposed by Nicholai Kondratiev in 1925 we may develop a theory undergirding the seeming randomness of Knotek's Chart Three, one which brings light to the proper understanding of a short-term calculation of Okun's Law, without diminishing its long-term perspicuity.



This coloration scheme further may be used to investigate the Phillips curve, i.e. the relation between unemployment and inflation. Comparing these two graphs simultaneously demonstrates important correlations between various periods of American economic history.⁸² Quotes by Robert Gordon, with his permission, are provided next to the period described by these graphs as taken from his article “*The Demise of Okun’s Law and of Procyclical Fluctuations in Conventional and Unconventional Measures of Productivity*,” July 21, 2010.

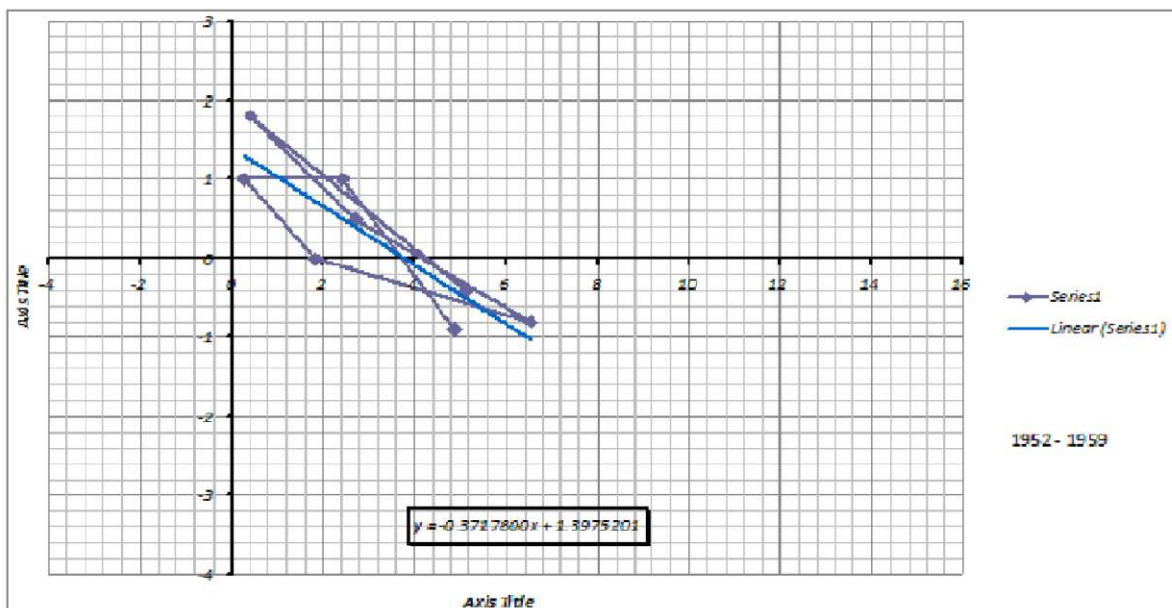
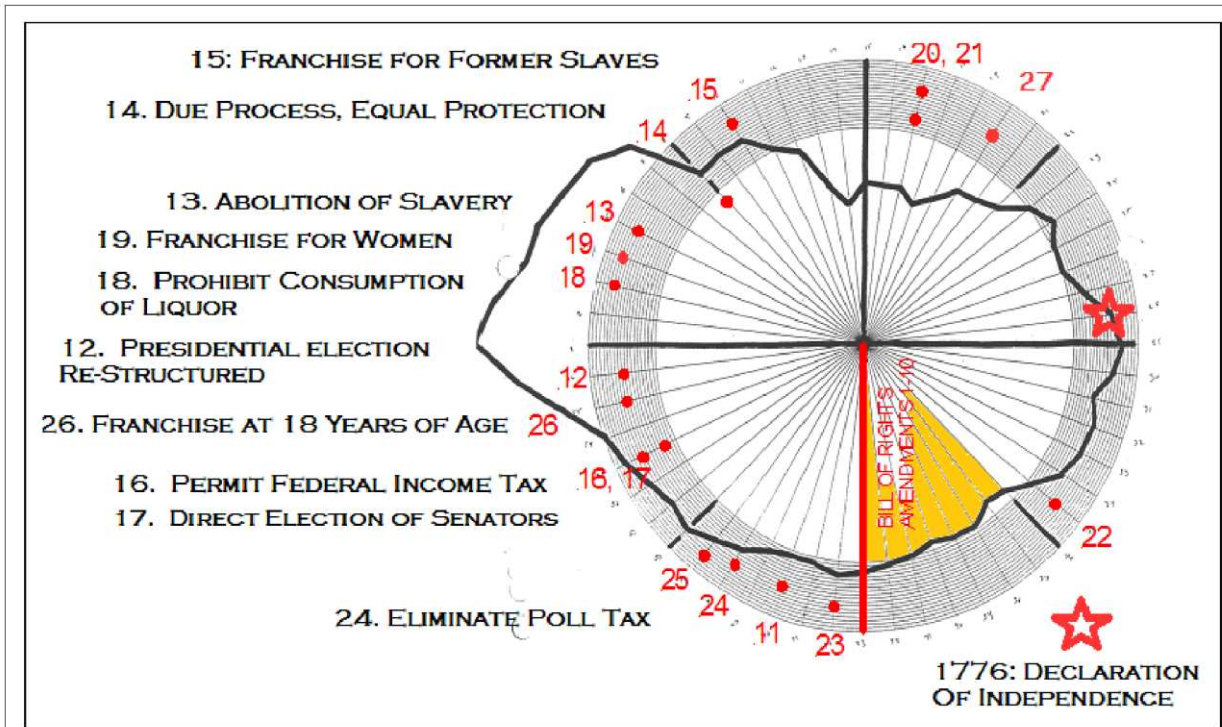
⁸² See e.g Gordon, 2012: 35: “No paper can discuss or analyze cyclical gaps in output, hours, productivity, or employment until they have done their preliminary homework of determining the underlying growth trends from which the “gaps” are a deviation. ... Once the trends have been created, the ratios of actual to trend (or “gaps” can be examined. An important finding is that volatility in the cyclical gap for labour hours has gradually increased relative to the output gap.”

DIAGRAM 4.
THE PHILLIPS CURVE ARRANGED BY 7-YEAR PERIODS



Using these separate portions of the circuit as guides, let us now re-evaluate Okun's Law as it moves around the 56-year circuit.

Early Evolving Revolution – 1952-1959
(Formerly 1784-1791, 1840-1847, 1896-1903)



Late Evolving Revolution – 1959-1966
(Formerly 1791-1798, 1847-1854, 1903-1910)

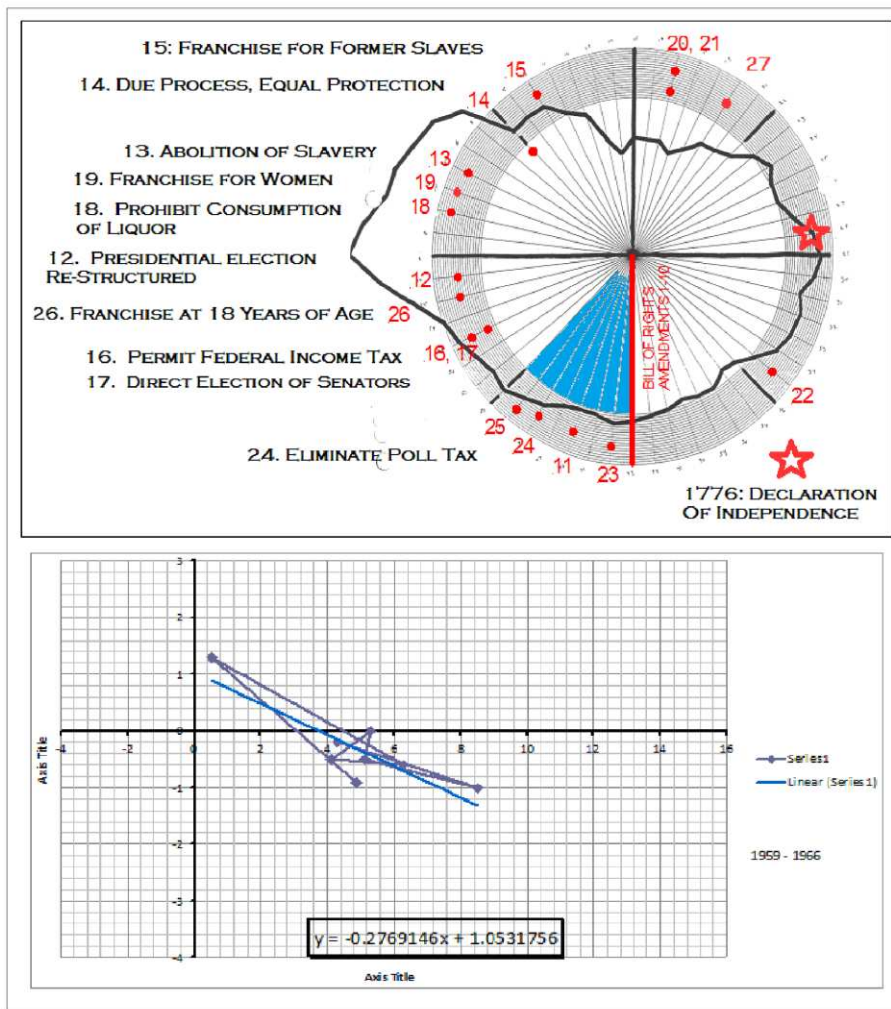
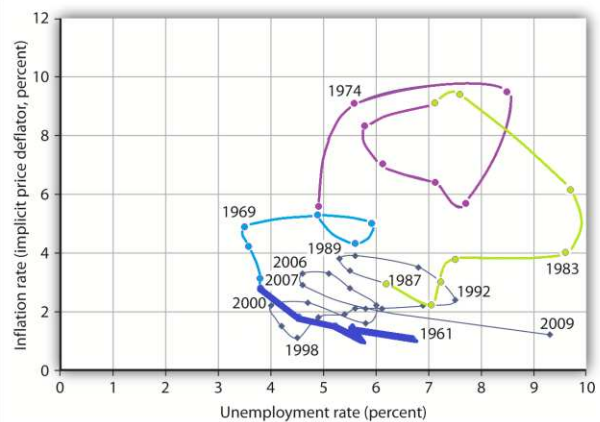
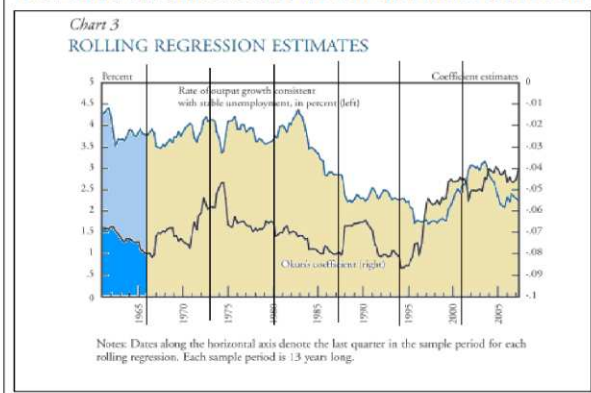


DIAGRAM 5-9.
ROLLING REGRESSIONS WITH HISTORIC CONTEXT



Early Revolution – 1966-1973
(Formerly 1798-1805, 1854-1861, 1910-1917)

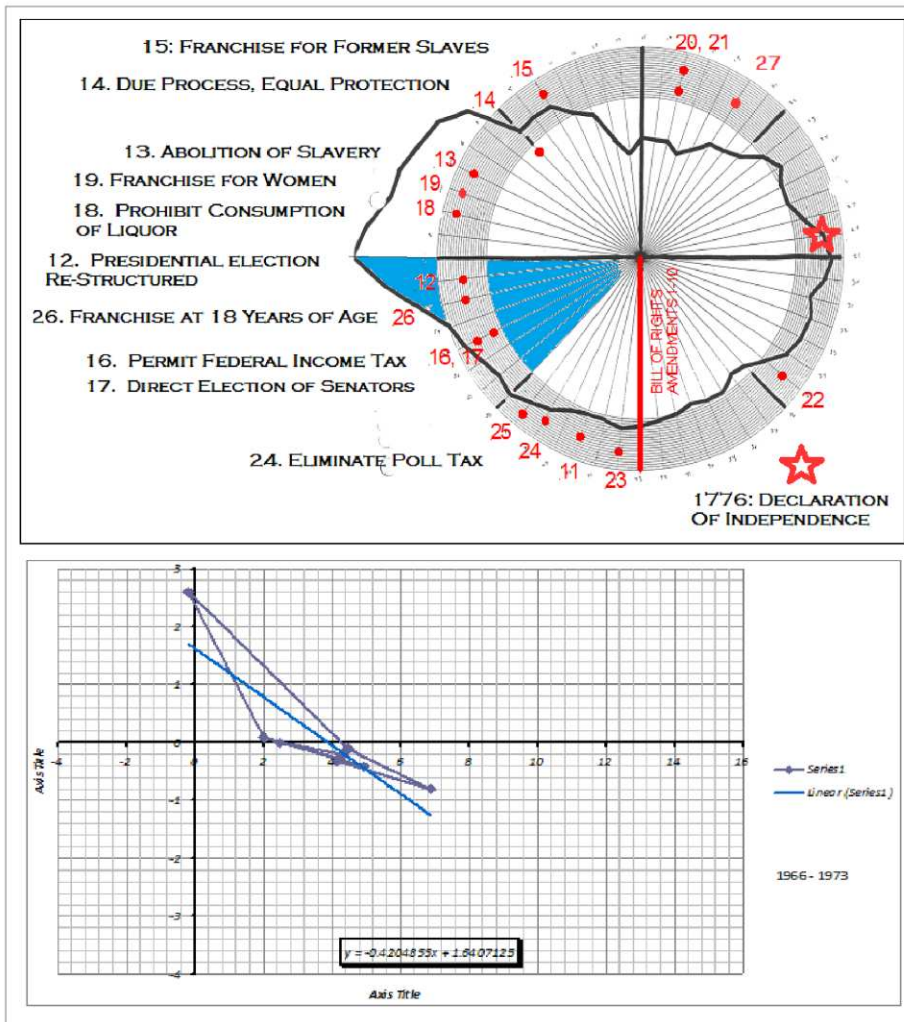
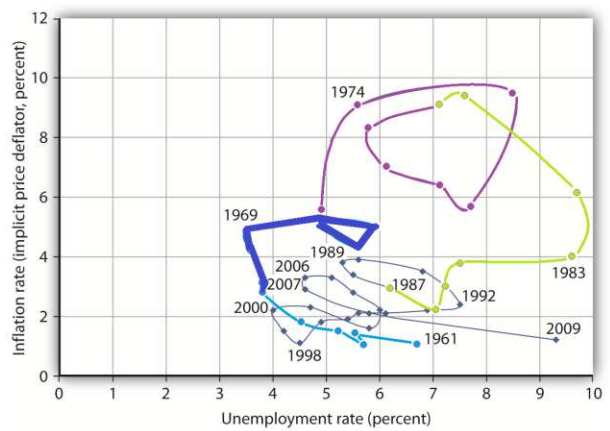
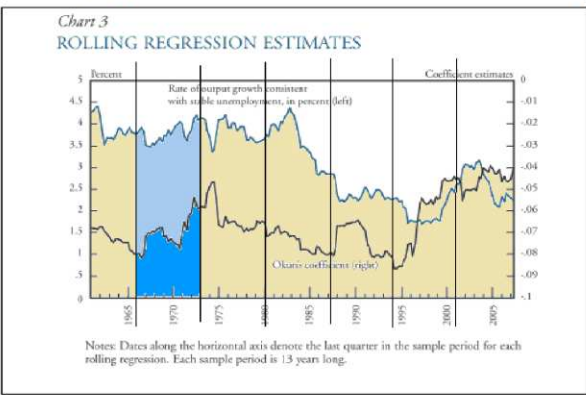
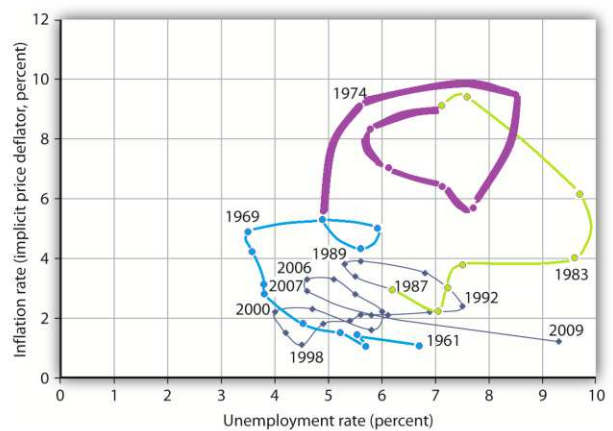
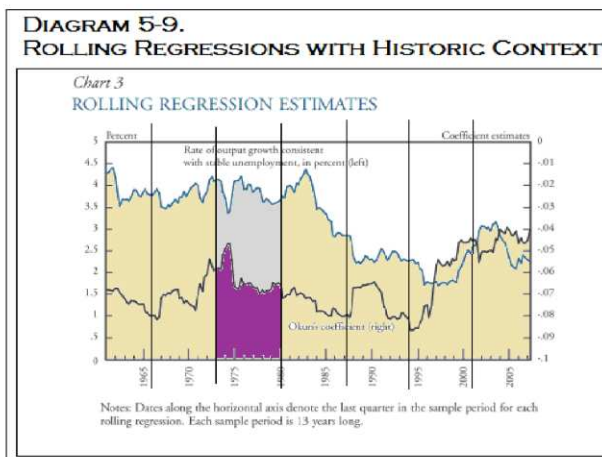
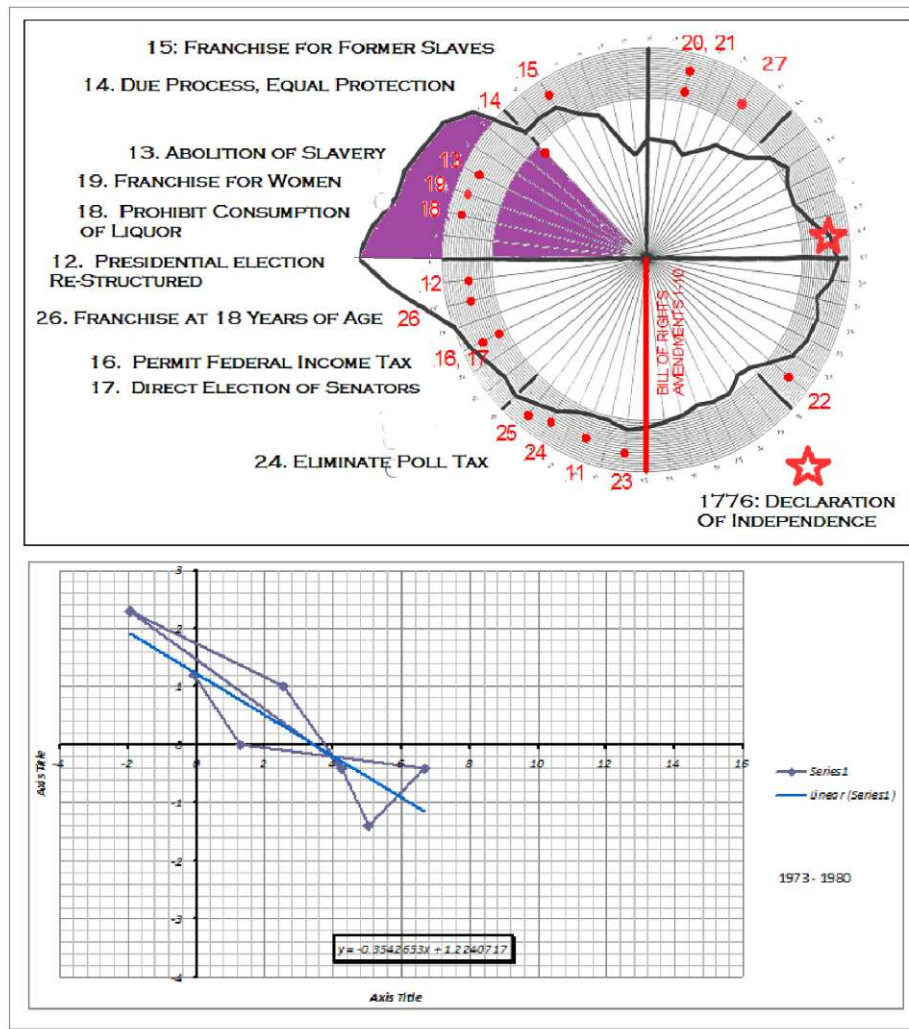


DIAGRAM 5-9.
ROLLING REGRESSIONS WITH HISTORIC CONTEXT



Late Revolution – 1973-1980
(Formerly 1805-1812, 1861-1868, 1917-1924)



Early Evolving Consolidation – 1980-1987 (Formerly 1812-1819, 1868-1875, 1924-1931)

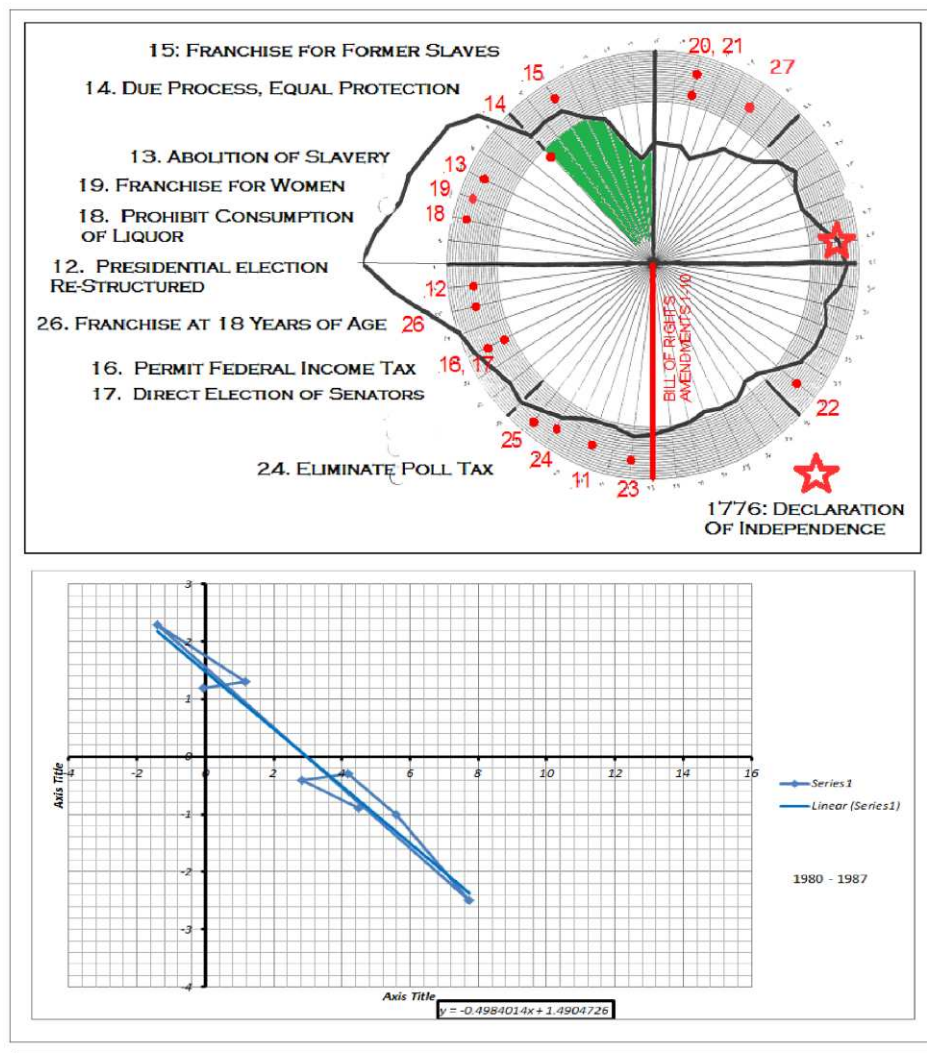
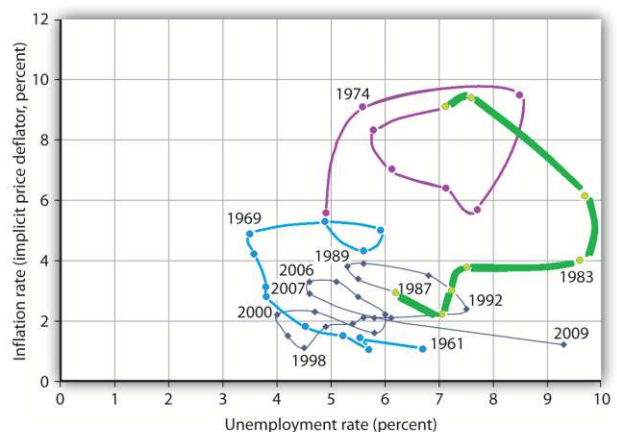
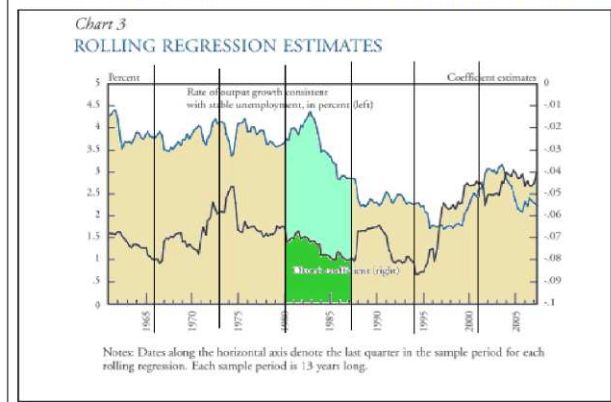


DIAGRAM 5-9.
ROLLING REGRESSIONS WITH HISTORIC CONTEXT



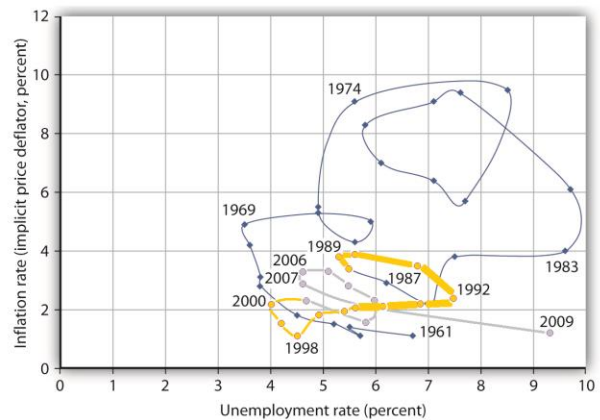
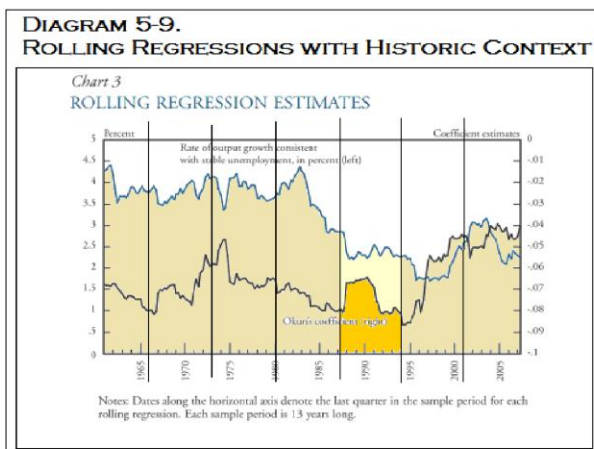
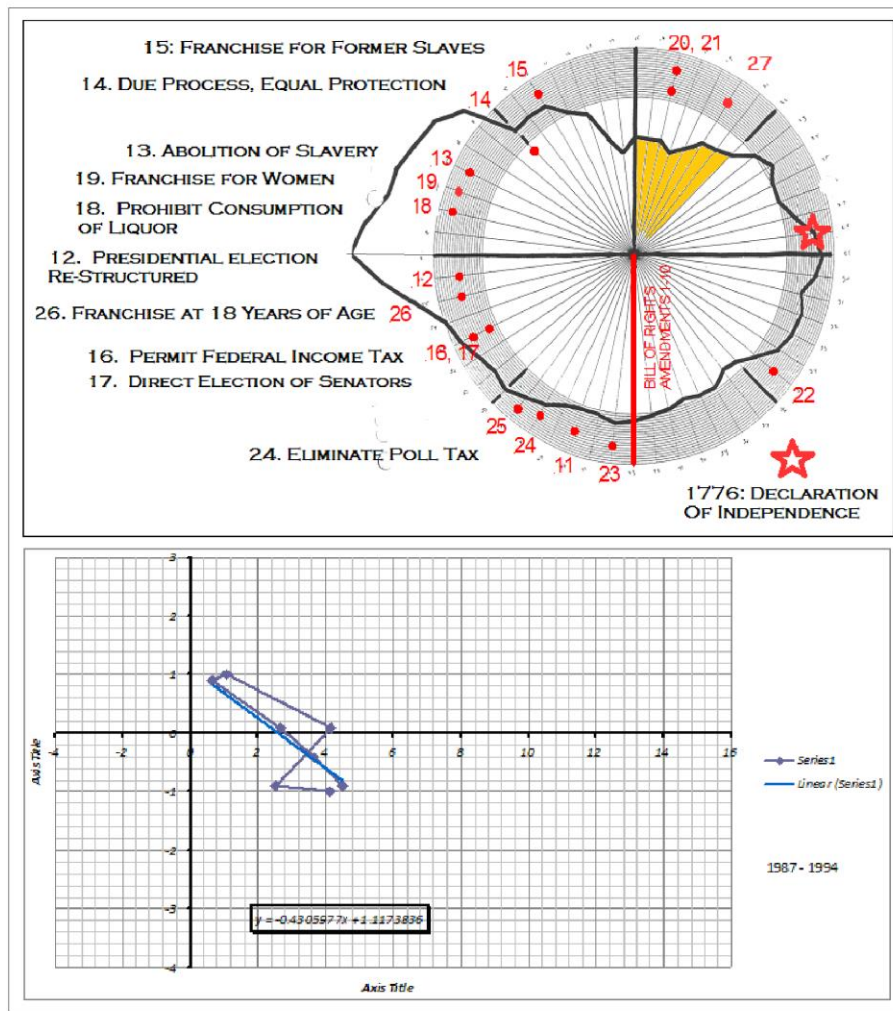
Late Evolving Consolidation – 1987-1994
(Formerly 1819-1826, 1875-1882, 1931-1938)

See e.g. Gordon 2010: 34.

“Our basic conclusion is that Okun’s Law was approximately correct for the cyclically volatile period between 1954 and 1986, but that since 1986 a marked structural shift has occurred in the responses of hours and productivity to cyclical fluctuations in real GDP.”

“This paper suggests a set of complementary hypotheses to explain these changes in behavior. The most important of these is the “disposable worker” hypothesis. Starting in the 1990s business firms began to increase their emphasis on maximizing shareholder value, in part because of a shift in executive compensation toward stock options. The overall shift in structural responses in the labor market after 1986 were caused by many of the same causes that have previously been proposed to explain the increase in American inequality. These include the role of the stock market in boosting compensation at the top, together with several forces that have increased income dispersion in the bottom 90 percent of the distribution. These include the declining minimum wage, the decline of unionization, the increase of imported goods, and the increased immigration of unskilled labor. Taken together these factors have boosted incomes at the top and have increased managerial power, while undermining the power of the increasingly disposable workers in the bottom 90 percent of the income distribution. As a result, employers can reduce labor hours with impunity and without restraint in response to a decrease in the output gap in contrast to the period before 1986 when their behavior was more constrained by the countervailing power of labor.”

Late Evolving Consolidation – 1987-1994
(Formerly 1763-1770, 1819-1826, 1875-1882, 1931-1938)

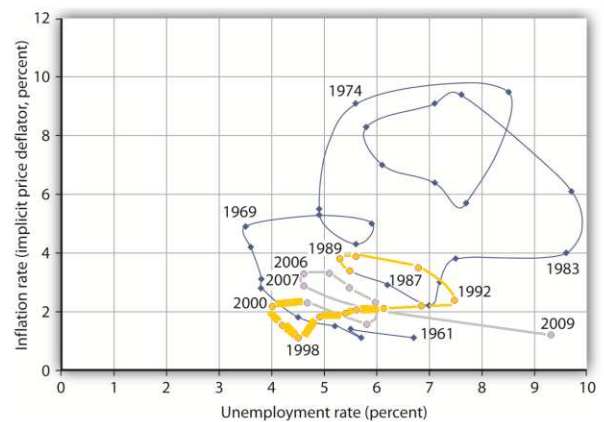
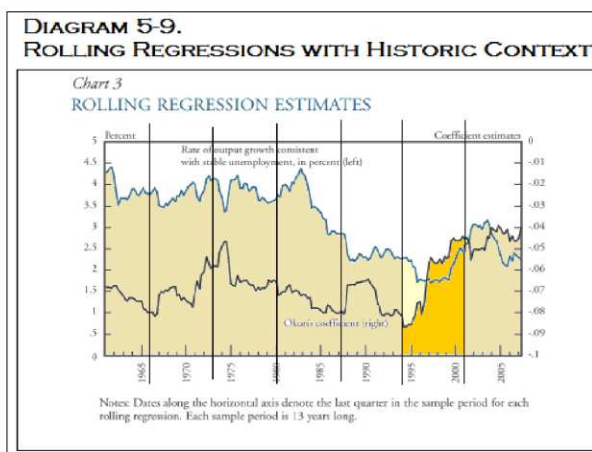
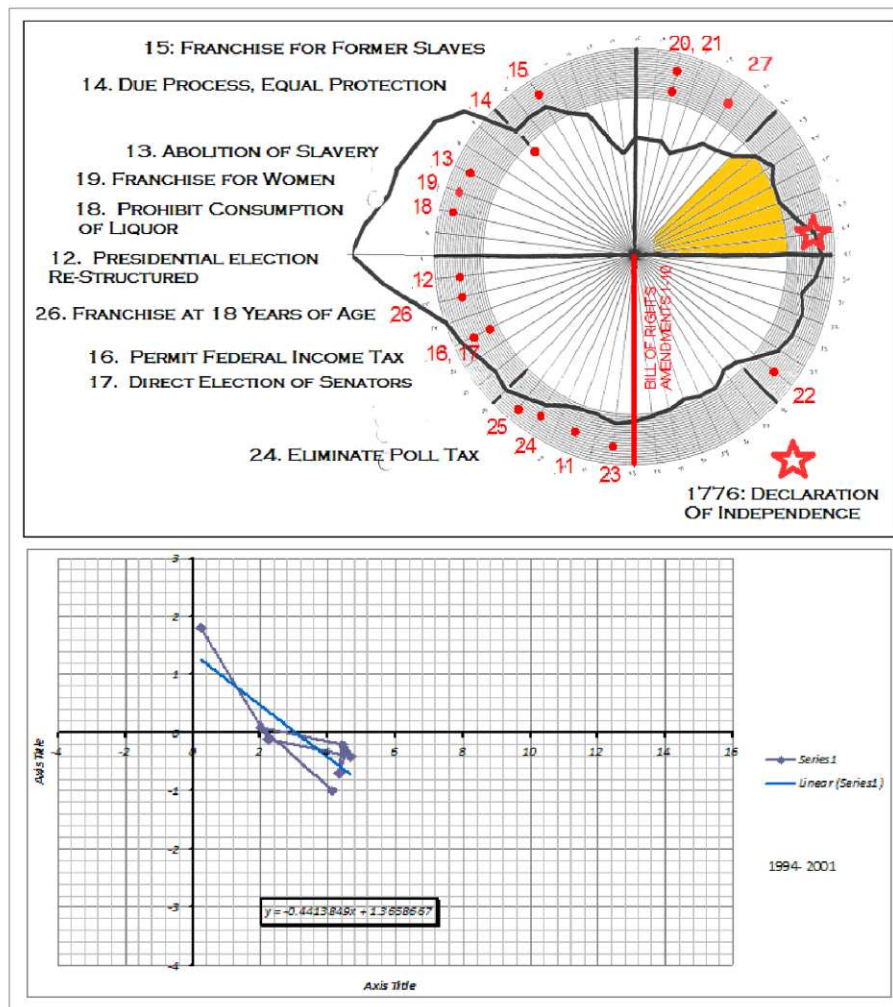


Early Consolidation – 1994-2001
(Formerly 1770-1777, 1826-1833, 1882-1899, 1938-1945)

See e.g. Gordon 2010: 34.

“The unique aspects of the recession/recover period of 2001-03 and the recession period of 2008-2009 require supplementary explanations. Our primary explanation for the large hours reductions in 2001 and the continuing reductions of 2002-03 combine two main hypotheses. As combination of increased reliance of executive pay on stock options, together with a collapse of profits and of the stock market, created a unique set of incentives to cut costs beyond anything that had been contemplated before. Complacency and overhiring was replaced by desperation and job-shedding.”

Early Consolidation – 1994-2001
(Formerly 1770-1777, 1826-1833, 1882-1899, 1938-1945)

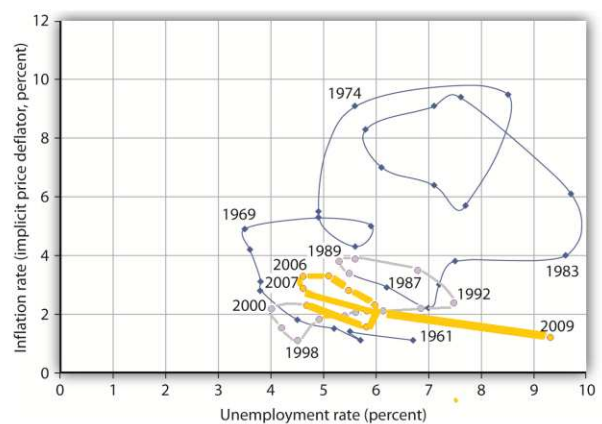
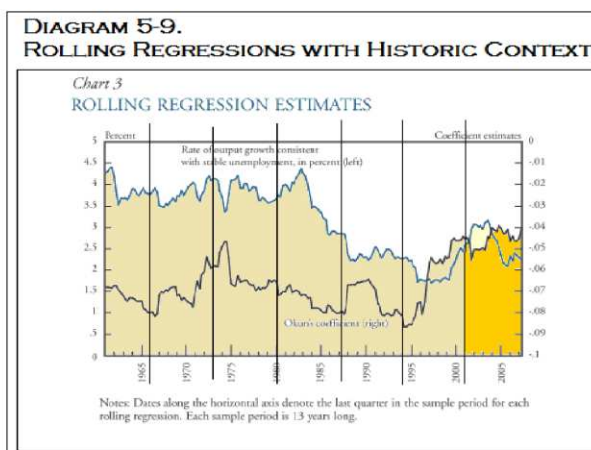
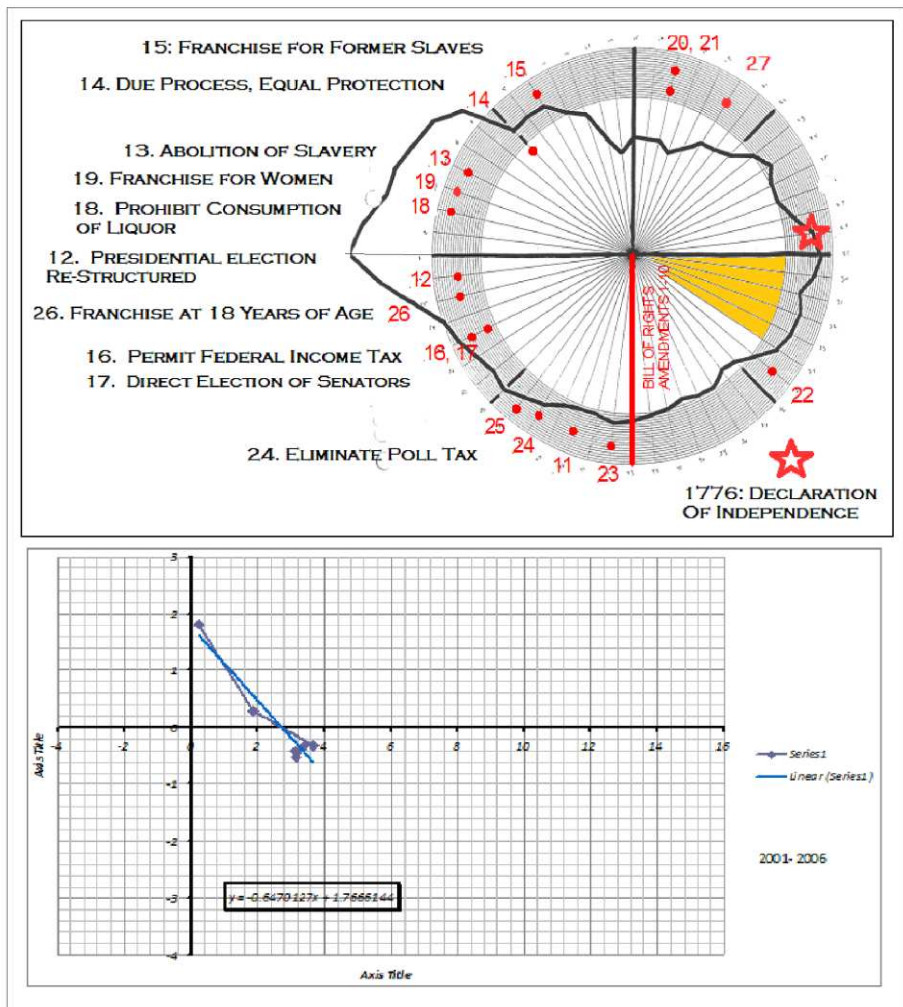


Late Consolidation – 2001-2008
(Formerly 1833-1840, 1899-1906, 1945-1952)

See e.g. Gordon 2010: 34.

“The recent 2007-2009 recession involved the same mechanism, but with the added element of a much steeper decline in the output gap and a sense of sheer panic in the fall of 2008 and winter of 2009 that capitalism was on the verge of collapsing. For every deck chair that was thrown overboard in 2001-2003, perhaps three or four were tossed in 2008-2009. This comes out in the fact that the hours gap relative to trend in 2009-2010 was larger than the output gap, in contrast to 1982 when the hours gap was about two-thirds of the output gap.”

Late Consolidation – 2001-2008
(Formerly 1833-1840, 1889-1896, 1945-1952)



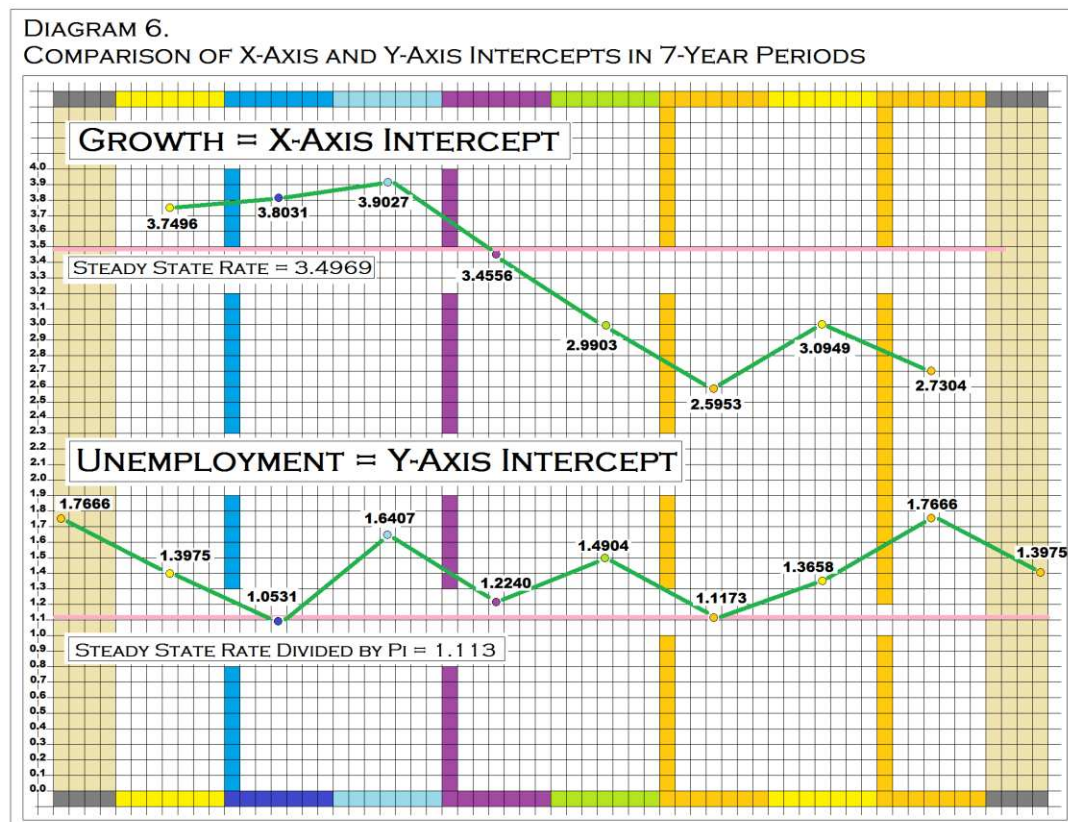
Below are the equations for each of the slopes indicated by these trendlines.

DIAGRAM 5.		
SLOPES AND INTERCEPTS IN 7-YEAR PERIODS		
EARLY EVOLVING REVOLUTION, 1952-1959	$Y = -0.3727x + 1.3975$	$X = 3.7496$
LATE EVOLVING REVOLUTION, 1959-1966	$Y = -0.2769x + 1.0531$	$X = 3.8031$
EARLY REVOLUTION, 1966-1973	$Y = -0.4204x + 1.6407$	$X = 3.9027$
LATE REVOLUTION, 1973-1980	$Y = -0.3542x + 1.2240$	$X = 3.4556$
EARLY EVOLVING CONSOLIDATION, 1980-1987	$Y = -0.4984x + 1.4904$	$X = 2.9903$
LATE EVOLVING CONSOLIDATION, 1987-1994	$Y = -0.4305x + 1.1173$	$X = 2.5953$
EARLY CONSOLIDATION, 1994-2001	$Y = -0.4413x + 1.3658$	$X = 3.0949$
LATE CONSOLIDATION, 2001-2008	$Y = -0.6470x + 1.7666$	$X = 2.7304$
GOLDEN MEAN GROWTH / Pi:1 EMPLOYMENT	$Y = -0.3183x + 1.1131$	$X = 3.4970$

Below are the x-axis and y-axis intercepts of Okun's Law as divided into eight seven-year periods.

The x-axis coordinates (growth) begin above the Golden Mean rate, but sink below it at the beginning of the evolving consolidation (in green) period. Throughout this and the subsequent consolidation period the rate of growth has been significantly less than is necessary to maintain the Golden Mean proportion over time.

Note as well that the y-axis coordinate (employment) appears to have a half-cycle of 7 years, and alternates quickly from high to low, as follows.



It may be possible that we see above two separate cycles, the growth cycle extending over a period of 56-years and an employment cycle of 14 years. Note that the Evolving Revolution and Revolution periods have gentler slopes (pale blue, all are between -0.27 and -0.42) whereas Evolving Consolidation and Consolidation have much steeper slopes (light red, all are between -0.43 and -0.64). What do these different slopes, y-intercepts (unemployment) and x-intercepts (steady state rates of growth) mean?⁸³

Growth rate, revolution

An x-intercept which is below 3.4969 will not be able to create the GNP spiral over time. This is the steady state rate given for annualized quarterly data (Chart One, $x = 3.4971$). The annual steady-state rate, however, is 3.4551. The data we are considering here comes from the annual data used in Knotek, Chart Two.

An x-intercept which is above 3.4969 (or, for annual data, 3.451) is significantly overheating the economy and placing great strain on the people in the United States. All of the x-intercepts involving evolving revolution or revolution are above this figure. (dark blue)

Slope, revolution

A negative slope of between -0.27 and -0.42 appears to represent flexibility in dealing with workers and the citizens of the United States. All of the slopes of involving evolving revolution or revolution fall into this range. (in pale blue)

Growth rate, consolidation

All x-intercepts involving consolidation are below this figure of 3.4551. None of them are capable of sustaining the growth rate of 3.4969 per year over the long term. (in dark red)

Slope, consolidation

A negative slope which falls outside the -0.42 range represents a willingness to be harsh and curtail many social and political rights, or alternatively, vigorously advance the financial prospects of a new and rising political elite. All the slopes involving evolving consolidation and consolidation are between -0.43 to -0.64. (in light red)

Unemployment, y-axis intercepts

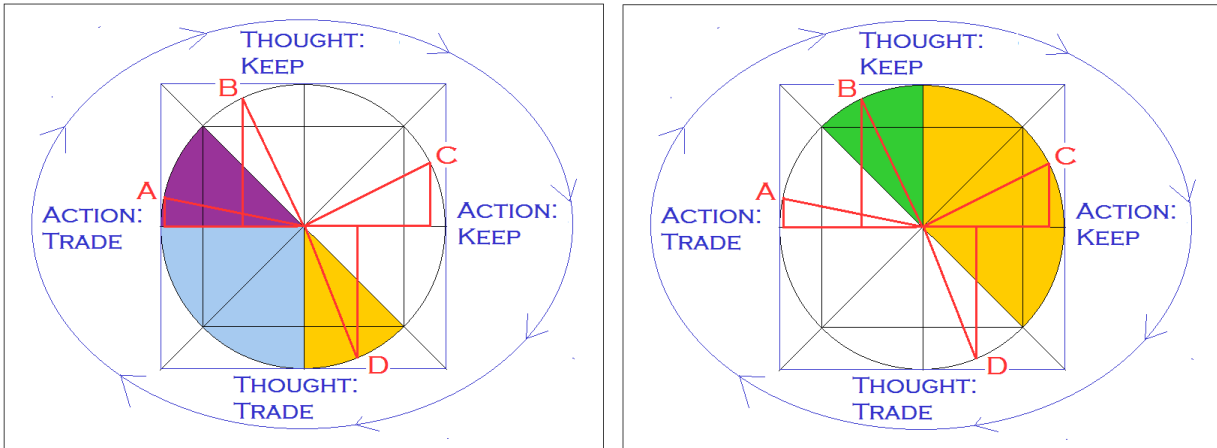
The the y-axis intercepts fluctuate considerably over time in 14-year stages during both revolution or consolidation periods. These rhythms may be combined with a different 56-year rhythm of x-axis intercepts and slopes so as to create trendline virtually identical to that given by the Golden Mean rate of growth over 14 years (3.4969 per year) as divided by π to obtain both the slope (-0.3183) and the y-axis intercept ($y=1.1131$).

⁸³ See e.g. Gordon, 2010: 35. “The two biggest recessions of the postwar period, 1981-1982 vs. 2008-2009, differ in the relative magnitude of the output and hours gap. In 1981-1982 the hours gap was only about 2/3 of the output gap, consistent with Okun’s Law. In contrast in 2008-2009 the hours gap has been about 6/5 larger than the output gap, refuting Okun’s Law.”

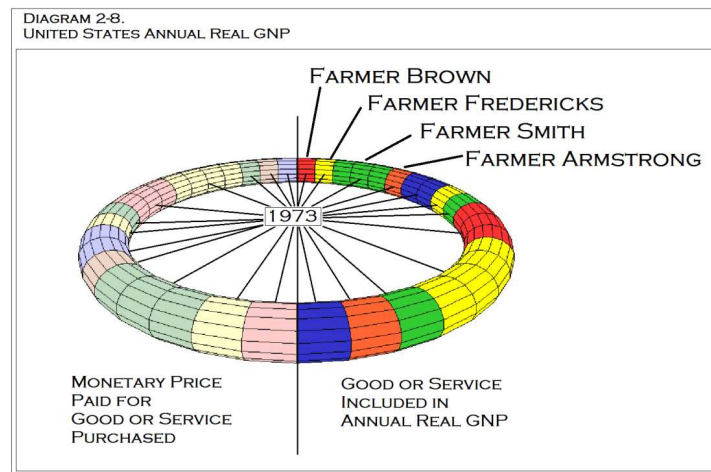
Conclusion

In conclusion, we began our description of Okun's Law with a formal structure combining action and thought in a geometric form,

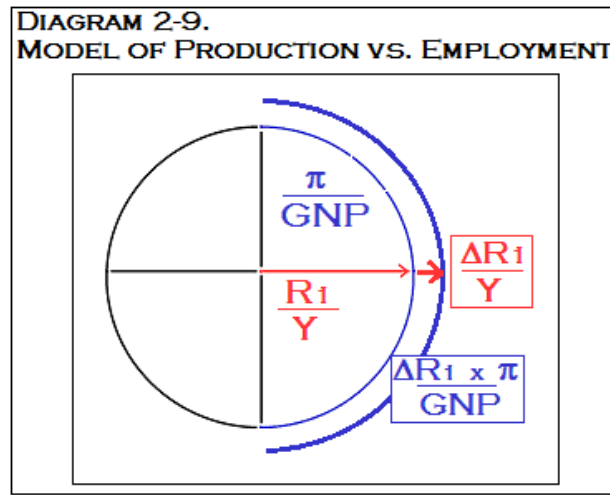
Micro-economic Unit Circle



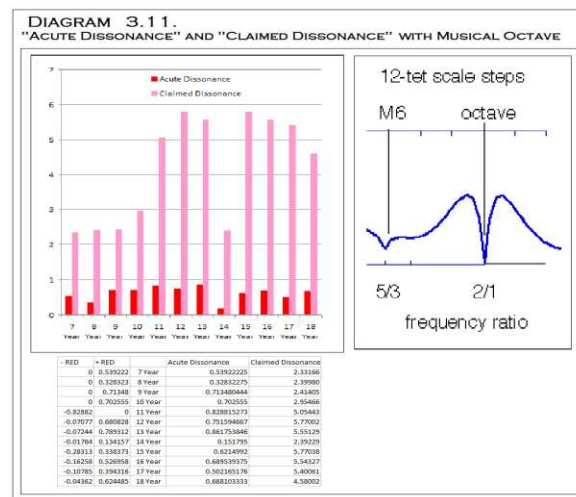
... and then aggregated this form over the period of a single year....



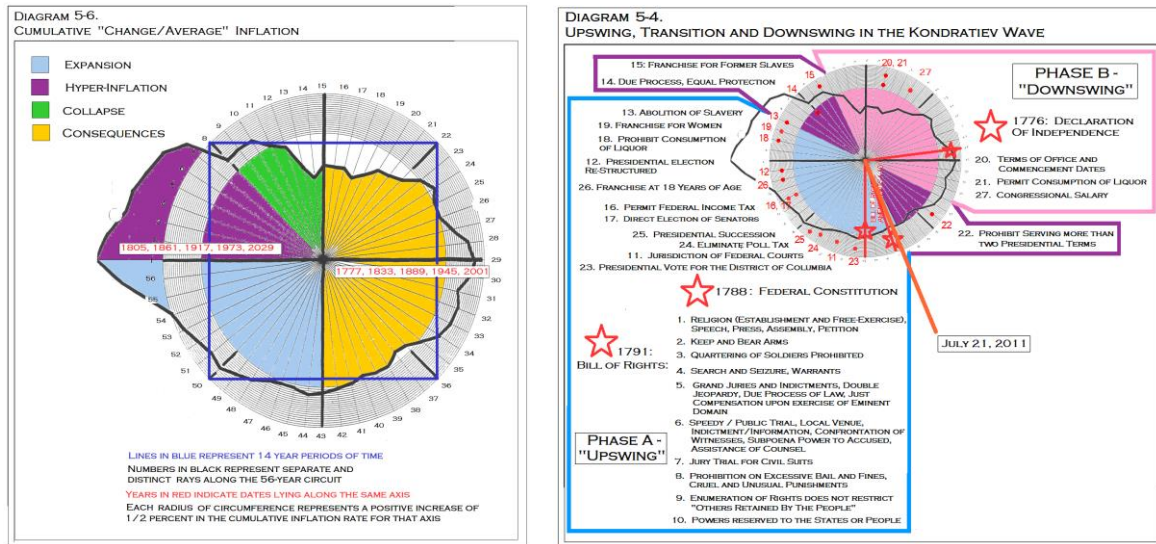
... to establish the 1:pi relationship which is at the heart of the 3:1 ratio pointed out by Okun in his analysis



... thereby bringing into play the life-spans of the people responsible for the creation of the real GNP examined

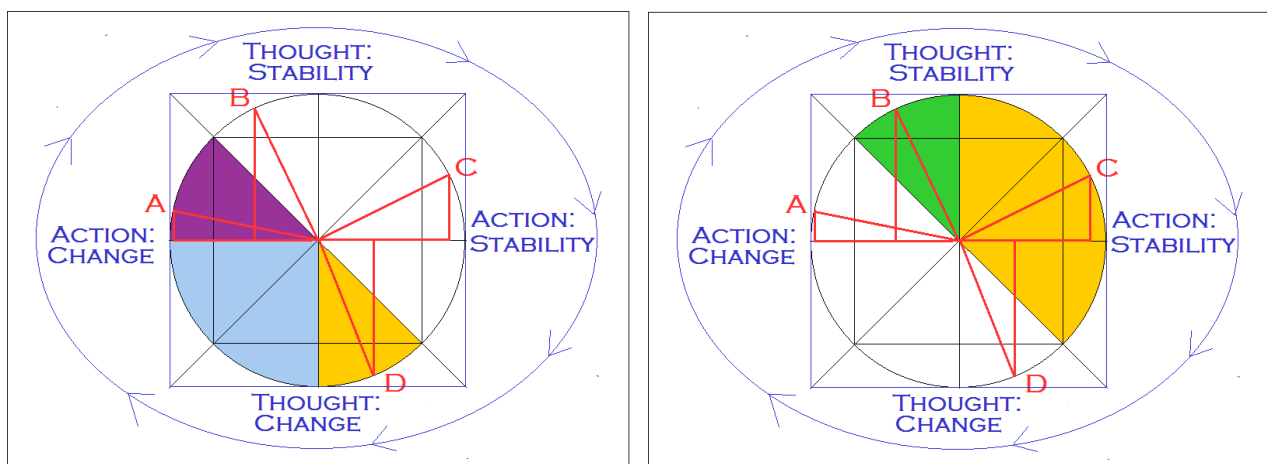


... and the political effect which these lives have on the environment of the United States



... leading in turn to the political re-statement of the original action vs. thought dichotomy with which we began the analysis. In short, making the larger the fractal of the smaller.

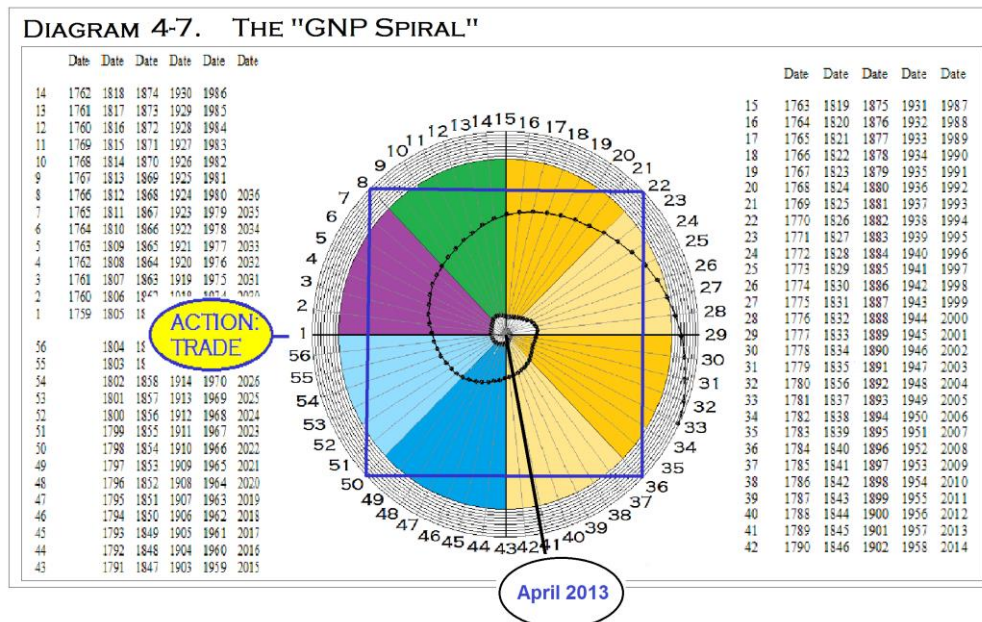
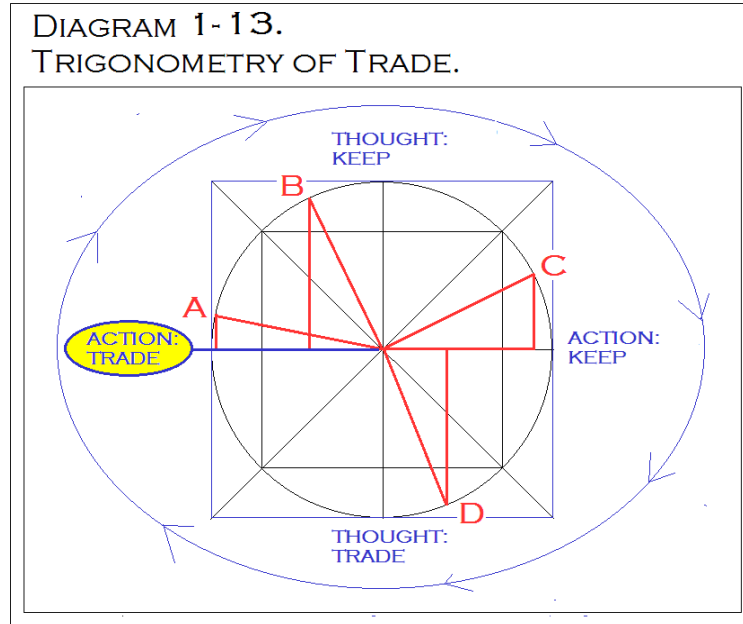
GNP Spiral



It would appear that Okun's Law is in fact a trigonometrically driven proportion. This accounts for its historic stability, heretofore completely un-described in either character or causation. This is demonstrated by a form of number theory engaging the set of feminine ($0 < F < 1$) and masculine ($1 < M$) numbers using a trend line representing a $1:\phi$ ratio for growth over time and a $1:\pi$ ratio for growth to employment as connected by a Harmonic multiplicative inverse. This view of the relationships is considerably enhanced the central tenets of the GNP Spiral generate masculine ($15/14$) and feminine ($14/15$) fractions which can be used to further interpret the interaction of time upon econometric data, however hidden these relationships might appear.

We now have a general theory of microeconomic trading goods and services which matches exactly a theory of macroeconomic trading of social values over a 56-year Kondratiev Wave using the intermediary of a $\pi:1$ value for Okun's Law.

And so it is that the two levels appear as fractals of one another, not unlike Russian dolls wherein the smaller builds into the greater and is contained and congruous to it.



Scott A. Albers
Great Falls, Montana
April 30, 2013

APPENDIX

The following two emails provide Dr. Knotek's data sets for the annualized quarterly calculation (Chart One) and annual calculation (Chart Two) of Okun's Law.

Knotek's Quarterly Data,
Email of November 30, 2011

Quarterly Figure

dydu_avg

1948 27.242819-0.06667

1948 32.330690.1

1948 40.9464520.066667

1949 1-5.85020.833333

1949 2-1.170431.2

1949 34.5715550.833333

1949 4-4.018860.266667

1950 117.45697-0.56667

1950 212.44685-0.83333

1950 316.62782-0.83333

1950 47.493361-0.4

1951 14.934907-0.73333

1951 26.972653-0.4

1951 38.2293880.066667

1951 40.6817630.2

1952 14.241951-0.1

1952 20.264934-0.3

1952 32.6298170.266667

1952 413.80097-0.4

1953 17.75058-0.13333

1953 23.069825-0.13333

1953 3-2.399340.166667

1953 4-5.162770.966667

1954 1-1.953851.566667

1954 20.3726310.533333

1954 34.4959230.166667

1954 48.153291-0.63333

1955 112.02633-0.6

1955 26.710869-0.33333

1955 35.443469-0.3

1955 42.1483740.133333

1956 1-1.85749-0.2

1956 23.2059050.166667

1956 3-0.47861-0.06667

1956 46.686428-1E-15

1957 12.436114-0.2

1957 2-0.98750.166667

1957 33.9623720.133333

1957 4-4.162990.7

1958 1-10.43511.366667

1958 22.3886031.066667

1958 39.560821-0.03333

1958 49.524235-0.96667

1959 17.871279-0.53333

1959 210.93633-0.73333

1959 3-0.309110.166667

1959 41.425710.333333

1960 19.202709-0.46667

1960 2-1.987080.1

1960 30.624260.3

1960 4-5.082140.733333

1961 12.4451740.533333

1961 27.7288660.2

1961 36.636591-0.23333

1961 48.42734-0.56667

1962 17.385135-0.56667

1962 24.466892-0.1

1962 33.7284730.033333

1962 40.984111-0.03333

1963.15.3447790.233333

1963.25.094721-0.03333

1963.37.743873-0.23333

1963.43.1516470.066667

1964.19.274181-0.1

1964.24.731776-0.26667

1964.35.56688-0.2

1964.41.075206-0.03333

1965.110.20532-0.06667

1965.25.515603-0.23333

1965.38.364001-0.3

1965.410.02623-0.26667

1966.110.14659-0.23333

1966.21.395016-0.03333

1966.32.662104-0.06667

1966.43.256599-0.06667

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1968.18.001162-0.16667

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1968.32.755597-0.03333

1968.41.697081-0.13333

1969.16.4561970

1969.21.1461660.033333

1969.32.5012550.133333

1969.4-1.87870

1970.1-0.667410.6

1970.20.7574610.6

1970.33.593940.4

1970.4-4.215330.666667

1971.111.566670.1

1971.22.275839-0.03333

1971.33.208330.133333

1971.41.148736-0.1

1972.17.299849-0.16667

1972.29.78529-0.06667

1972.33.86707-0.13333

1972.47.07894-0.2

1973.110.54887-0.43333

1973.24.7077550

1973.3-2.11387-0.13333

1973.43.877955-0.03333

1974.1-3.421690.366667

1974.21.1582940.066667

1974.3-3.817240.433333

1974.4-1.560760.966667

1975.1-4.699291.666667

1975.22.958451-0.6

1975.36.949137-0.4

1975.45.347146-0.16667

1976.19.313145-0.56667

1976.23.013362-0.16667

1976.31.9297980.166667

1976.42.8956960.033333

1977.14.921894-0.26667

1977.28.087778-0.36667

1977.37.355737-0.23333

1977.4-0.04152-0.23333

1978.11.293793-0.33333

1978.216.7223-0.33333

1978.34.0019750.033333

1978.45.366331-0.13333

1979.10.78088-0.03333

1979.20.381319-0.16667

1979.32.9115260.166667

1979.41.1845530.1

1980.11.2818860.333333

1980.2-7.833391.033333

1980.3-0.662940.333333

1980.47.625528-0.26667

1981.18.3540690.033333

1981.2-3.0838-0.03333

1981.34.9269972E-15

1981.4-8.890950.833333

1982.1-6.398950.6

1982.22.1652840.6

1982.3-1.505380.466667

1982.40.3553290.766667

1983.15.02475-0.3

1983.29.331896-0.23333

1983.38.136903-0.76667

1983.48.439536-0.83333

1984.18.052759-0.66667

1984.27.064234-0.43333

1984.33.948210

1984.43.327199-0.13333

1985.13.744883-0.06667

1985.26.4319420.066667

1985.36.399978-0.1

1985.43.110183-0.16667

1986.13.8804840

1986.21.5946530.133333

1986.33.887249-0.2

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1987.12.657578-0.23333

1987.24.47216-0.33333

1987.33.679965-0.26667

1987.47.170687-0.16667

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1989.41.0191150.133333

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1991.31.9444510.033333

1991.41.8894620.233333

1992.14.2078940.266667

1992.23.9132650.233333

1992.33.9825490.033333

1992.44.480734-0.26667

1993.10.484052-0.23333

1993.22.042349-0.06667

1993.32.068993-0.26667

1993.45.491772-0.16667

1994.14.1319720.06667

1994.25.31865-0.36667

1994.32.260556-0.2

1994.44.770358-0.36667

1995.11.116369-0.16667

1995.20.7192990.2

1995.33.2999580

1995.42.957835-0.1

1996.12.850486-0.03333

1996.26.719298-0.03333

1996.33.39539-0.23333

1996.44.7597790.066667

1997.13.129113-0.1

1997.26.217645-0.23333

1997.35.074293-0.13333

1997.42.982514-0.2

1998.14.500149-0.03333

1998.22.671779-0.23333

1998.34.687050.133333

1998.46.215284-0.1

1999.13.4384730.13333

1999.23.351939-0.03333

1999.34.749838-0.03333

1999.47.301756-0.16667

2000.11.071186-0.03333

2000.26.432867-0.1

2000.3-0.458190.066667

2000.42.084202-0.1

2001.1-0.48860.333333

2001.21.2329270.166667

2001.3-1.397840.433333

2001.41.5866510.666667

2002.12.7442450.2

2002.22.1947780.133333

2002.32.37746-0.1

2002.40.202320.133333

2003.11.2019170

2003.23.4690840.266667

2003.34.7864940

2003.42.653249-0.3

2004.12.959586-0.13333

2004.23.481713-0.1

2004.33.602232-0.16667

2004.42.548063-0.03333

2005.13.072837-0.13333

2005.22.812687-0.2

2005.34.461999-0.06667

2005.44.193643-0.03333

2006.14.820432-0.23333

2006.22.442263-0.1

2006.31.0655490.066667

2006.42.090875-0.23333

2007.10.6015890.033333

2007.23.3822390

2.963692

Knotek's Annual Data,
Email of July 28, 2011

dydu

1949-1.694812.6

195013.43641-2.3

19515.165233-1.2

19525.112117-0.4

19530.4256781.8

19542.6942750.5

19556.523389-0.8

19561.8349440

19572.626411

19582.4209381

19594.88075-0.9

19600.5522621.3

19616.283822-0.6

19624.111255-0.5

19635.3211680

19645.12163-0.5

19658.51134-1

19664.310711-0.2

19672.4609020

19684.940026-0.4

19692.0124590.1

1970-0.172582.6

19714.470982-0.1

19726.894269-0.8

19734.15843-0.3

1974-1.925892.3

19752.5391131

19764.247578-0.4

19770.320694-1.4

19786.68995-0.4

19791.3100010

1980-0.049951.2

19811.178371.3

1982-1.398342.3

19837.720914-2.5

19845.579107-1

19854.171185-0.3

19862.842924-0.4

19874.481766-0.9

19883.659866-0.4

19892.6618550.1

19906.5425550.9

19911.0908731

19924.1458740.1

19932.505805-0.9

19944.113965-1

19952.0172040.1

19964.420611-0.2

19974.342077-0.7

19984.510997-0.3

19994.698444-0.4

20002.239662-0.1

20010.2255331.8

20021.8748740.3

20033.676776-0.3

20043.40021-0.3

20053.149803-0.5

20063.127967-0.4

The following states the annual measures of GNP as compared with Dr. Knotek.

Change in Annual Unemployment vs. Change in Annual GDP

Quarterly GDP, Bureau of Economic Analysis

Table 1.1.6. Real Gross Domestic Product, Chained Dollars

(Billions of chained (2000) dollars); Seasonally adjusted at annual rates

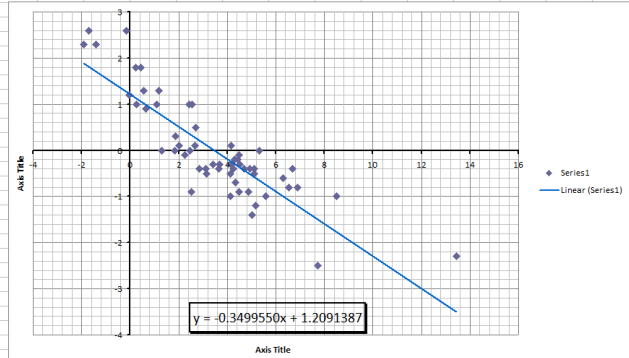
Quarterly data from 1947 to 2007

Bureau of Economic Analysis

Data published September 27, 2007

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				Albers' GDP Calculations from Table 1.1.6, September 27, 2007		Knotek's Annual Data as provided through correspondence	
		Gross domestic product		Quarter 4 divided by Quarter 4 Minus 1	Multiply 100		
1947	4	1,590.9					
1948	4	1,658.0	1948	1.042177	n=m-1 n=mx100	dy	du
1949	4	1,629.9	1949	0.983052	-0.01695	-1.694813	2.6
1950	4	1,848.9	1950	1.134364	0.134364	13.436407	-2.3
1951	4	1,944.4	1951	1.051652	0.051652	5.1652334	-1.2
1952	4	2,043.8	1952	1.051121	0.051121	5.1121168	-0.4
1953	4	2,052.5	1953	1.004257	0.004257	0.4256777	1.8
1954	4	2,107.8	1954	1.026943	0.026943	2.6942753	0.5
1955	4	2,245.3	1955	1.065234	0.065234	6.5233893	-0.8
1956	4	2,286.5	1956	1.018349	0.018349	1.8349441	0
1957	4	2,292.5	1957	1.002624	0.002624	0.2634098	1
1958	4	2,348.0	1958	1.024209	0.024209	2.4209378	1
1959	4	2,462.6	1959	1.048807	0.048807	4.8807496	-0.9
1960	4	2,476.2	1960	1.005523	0.005523	0.5522618	1.3
1961	4	2,631.8	1961	1.062838	0.062838	6.283822	-0.6
1962	4	2,740.0	1962	1.041113	0.041113	4.1112547	-0.5
1963	4	2,885.8	1963	1.053212	0.053212	5.3211679	0
1964	4	3,033.6	1964	1.051216	0.051216	5.1216301	-0.5
1965	4	3,291.8	1965	1.085113	0.085113	8.5113397	-1
1966	4	3,433.7	1966	1.043107	0.043107	4.3107115	-0.2
1967	4	3,518.2	1967	1.024609	0.024609	2.4609023	0
1968	4	3,692.0	1968	1.0494	0.0494	4.9400261	-0.4
1969	4	3,766.3	1969	1.020125	0.020125	2.0124594	0.1
1970	4	3,759.8	1970	0.998274	-0.00173	-0.1725832	2.6
1971	4	3,927.9	1971	1.04471	0.04471	4.4709825	-0.1
1972	4	4,198.7	1972	1.068943	0.068943	6.8942692	-0.8
1973	4	4,373.3	1973	1.041584	0.041584	4.15843	-0.3
1974	4	4,288.9	1974	0.980701	-0.0193	-1.9298928	2.3
1975	4	4,397.8	1975	1.025391	0.025391	2.5391126	1
1976	4	4,584.6	1976	1.042476	0.042476	4.2475783	-0.4
1977	4	4,815.3	1977	1.050321	0.050321	5.030369	-1.4
1978	4	5,137.4	1978	1.066891	0.066891	6.6890952	-0.4
1979	4	5,204.7	1979	1.0131	0.0131	1.3100012	0
1980	4	5,202.1	1980	0.9995	-0.0005	-0.0499548	1.2
1981	4	5,263.4	1981	1.011784	0.011784	1.1783703	1.3
1982	4	5,189.8	1982	0.986017	-0.01398	-1.3983357	2.3
1983	4	5,590.5	1983	1.077209	0.077209	7.7209141	-2.5
1984	4	5,902.4	1984	1.055791	0.055791	5.5791074	-1
1985	4	6,148.6	1985	1.041712	0.041712	4.1711846	-0.3
1986	4	6,323.4	1986	1.028429	0.028429	2.8429236	-0.4
1987	4	6,806.8	1987	1.044818	0.044818	4.4817661	-0.9
1988	4	6,848.6	1988	1.036599	0.036599	3.6598656	-0.4
1989	4	7,030.9	1989	1.026619	0.026619	2.6618579	0.1
1990	4	7,076.9	1990	1.006543	0.006543	0.6542548	0.9
1991	4	7,154.1	1991	1.010909	0.010909	1.0908731	1
1992	4	7,450.7	1992	1.041459	0.041459	4.1458744	0.1
1993	4	7,637.4	1993	1.025058	0.025058	2.5058048	-0.9
1994	4	7,951.6	1994	1.04114	0.04114	4.1139655	-1
1995	4	8,112.0	1995	1.020172	0.020172	2.0172041	0.1
1996	4	8,470.6	1996	1.044206	0.044206	4.4206114	-0.2
1997	4	8,838.4	1997	1.043421	0.043421	4.3430773	-0.7
1998	4	9,237.1	1998	1.04511	0.04511	4.5109975	-0.3
1999	4	9,671.1	1999	1.046984	0.046984	4.6984443	-0.4
2000	4	9,887.7	2000	1.022397	0.022397	2.2396625	-0.1
2001	4	9,910.0	2001	1.002255	0.002255	0.2255327	1.8
2002	4	10,095.8	2002	1.018749	0.018749	1.8748739	0.3
2003	4	10,467.0	2003	1.036768	0.036768	3.6767765	-0.3
2004	4	10,796.4	2004	1.03147	0.03147	3.1470335	-0.3
2005	4	11,107.2	2005	1.028787	0.028787	2.8787374	-0.5
2006	4	11,395.5	2006	1.025956	0.025956	2.5956137	-0.4



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Change in Quarterly Unemployment vs. Change in Quarterly GDP

Change in quarterly figure and previous quarterly figure

Change in Unemployment Adjusted GDP (in % taken from Table 1, 2, 3, Column C) "Knotek's Quarterly GDP" (Verification)

Quarterly Figure

Year

Quarterly Figure

1948-1 3.7 0.488377

1948-2 3.7 0.724319307

1948-3 3.8 0.23909089

1948-4 3.8 0.58651172

1948-5 3.8 0.580040693

1948-6 3.8 0.137943632

1948-7 4.2 0.425370504

1948-8 4.7 0.4188352

1948-9 4.7 0.27409922

1948-10 4.7 0.44884794

1948-11 4.6 -0.162781501

1948-12 4.6 0.430966483

1949-1 3.3 -0.7

1949-2 3.1 -0.475929277

1949-3 3.2 0.2239789

1949-4 3.2 0.681762892

1949-5 3.1 0.43619598

1949-6 3.2 0.26849258

1949-7 3.2 0.262816592

1949-8 3.2 0.18097722

1949-9 3.2 0.770502163

1949-10 3.1 0.00648481

1949-11 3.2 0.299342693

1949-12 3.2 0.136276821

1950-1 3.2 0.136276821

1950-2 3.2 0.136276821

1950-3 3.2 0.136276821

1950-4 3.2 0.136276821

1950-5 3.2 0.136276821

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1950-11 3.2 0.136276821

1950-12 3.2 0.136276821

1951-1 3.2 0.136276821

1951-2 3.2 0.136276821

1951-3 3.2 0.136276821

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1952-1 3.2 0.136276821

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1952-3 3.2 0.136276821

1952-4 3.2 0.136276821

1952-5 3.2 0.1

1963-1 5.8 0.3 5.34477973

1963-2 5.7 0.3 5.04720653

1963-3 5.7 0.3 2.74872628

1963-4 5.8 0.3 1.33140487

1963-5 5.8 0.3 0.74218053

1963-6 5.7 0.3 0.71717081

1963-7 5.7 0.3 0.5647792

1963-8 5.7 0.3 0.10705643

1963-9 5.7 0.3 0.2032847

1963-10 5.7 0.3 0.5506277

1963-11 5.4 0.3 0.38680772

1963-12 5.4 0.3 0.10422799

1964-1 5.9 0.2 0.3046748

1964-2 5.8 0.2 0.19319325

1964-3 5.8 0.2 0.246210014

1964-4 3.7 0.1 0.35618953

1964-5 3.8 0.1 0.38798743

1964-6 3.8 0.1 0.02396632

1964-7 3.8 0.1 0.32125238

1964-8 3.9 0.1 0.30880726

1964-9 3.7 0.1 0.8161821

1964-10 3.3 0.2 0.92917453

1964-11 3.3 0.2 0.70597131

1964-12 3.4 0.1 0.49761118

1965-1 3.4 0.1 0.64567237

1965-2 3.4 0.1 0.14610486

1965-3 3.6 0.1 0.20124731

1965-4 3.6 0.1 0.17890929

1965-5 4.2 0.6 0.48071478

1965-6 4.2 0.6 0.75361240

1965-7 5.2 0.4 0.53910431

1965-8 5.4 0.4 0.22315739

1965-9 5.1 0.3 0.15466879

1965-10 5.9 0.2 0.27748938

1965-11 6.1 0.1 0.26100306

1965-12 6.1 0.1 0.18475929

1966-1 5.8 0.2 0.29948884

1966-2 5.7 0.2 0.2032847

1966-3 5.8 0.2 0.78676979

1966-4 5.7 0.2 0.70794623

1966-5 5.7 0.2 0.48689777

1966-6 4.9 0.1 0.47745934

1966-7 4.9 0.1 0.27745934

1966-8 4.9 0.1 0.1388082

1966-9 4.8 0.1 0.87774596

1966-10 5.1 0.3 0.42187488

1966-11 5.2 0.3 0.12525159

1966-12 5.3 0.6 0.81740432

1967-1 5.6 0.1 0.580776439

1967-2 5.6 0.1 0.49920142

1967-3 5.2 0.9 0.70948138

1967-4 5.2 0.9 0.34714079

1967-5 6.3 0.2 0.54812707

1967-6 6.3 0.2 0.31176231

1967-7 6.3 0.2 0.10318636

1967-8 6.3 0.2 0.12176231

1967-9 6.3 0.2 0.28959189

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1974-12 6.3 0.2 0.12176231

Change in Quarterly Unemployment vs. Change in Quarterly GDP

Change in quarterly figure and previous quarterly figure

Change in Unemployment Adjusted GDP (in % taken from Table 1, 2, 3, Column C) "Knotek's Quarterly GDP" (Verification)

Quarterly Figure

Year

Quarterly Figure

1976-1 6.3 -0.3 1.29379238

1976-2 6 -0.3 1.22720306

1976-3 6 0.4 0.402075148

1976-4 5.9 0.2 0.56332222

1976-5 5.9 0.2 0.7080285

1976-6 5.7 -0.2 0.80118835

1976-7 5.8 0.2 0.51330447

1976-8 5.9 0.1 0.14845285

1976-9 6.3 0.4 0.21838404

1976-10 6.3 0.1 0.31317051

1976-11 7.7 0.4 0.46549026

1976-12 7.4 -0.3 0.42523846

1977-1 7.4 0.1 0.430969217

1977-2 7.4 0.1 0.38375077

1977-3 8.2 0.6 0.33097773

1977-4 8.2 0.6 0.48904762

1977-5 8.8 0.6 0.338972123

1977-6 8.8 0.6 0.21653023

1977-7 8.9 0.3 0.50538441

1977-8 7.7 0.8 0.53528819

1977-9 7.7 0.8 0.52470555

1977-10 7.7 0.8 0.53328949

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1993-8 7.7

In Albers and Albers 2013:108-109 (pages 69-70 in the preprint edition) we stated the following:

As noted previously, to figure the annual increase implied by the GNP Spiral, we may use the formula for simple interest compounded annually...

$$FV = PV (1+r)^t$$

... ; state a present value (PV) of \$1,000,000; a time period (t) of 14 years; and the future value (FV) as given below in proportion to the varying numbers derived in the GNP Spiral. These assumptions give us the following interest rates (r).

	<u>Future Value</u>		<u>Interest rate</u>
x= Circle Analysis:	\$1,618,590	interest rate is:	3.4995226
x= Square:	\$1,618,120	interest rate is:	3.4973756
x= Golden Mean:	\$1,618,033	interest rate is:	3.4969781

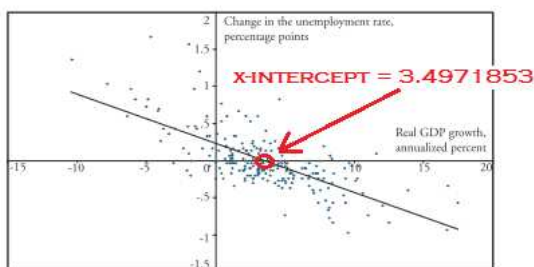
The above “rates of growth” may be contrasted with one of the central empirical regularities of mainstream economics, i.e. Okun’s Law. This rule proposes a roughly 3:1 ratio between increases in real GNP and decreases in the rate of unemployment in the economy of the United States. A trend line may be devised for quarterly data between the second quarter of 1948 and the second quarter of 2007 which gives the slope of this relationship as:

$$y = .23094 + -0.066036x$$

A “steady state” rate of economic growth may be figured for the x-intercept, i.e. that rate of growth which occurs when there is no change in the rate of employment. (y = 0). Using the above equation and trend line, this x-intercept is 3.4971853. (Knotek, 2007, with additional correspondence by the author)

Chart 1

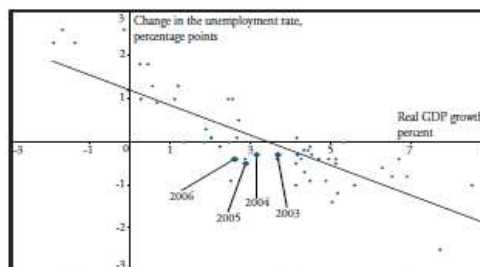
THE DIFFERENCE VERSION OF OKUN’S LAW,
QUARTERLY DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from the second quarter of 1948 through the second quarter of 2007.

Chart 2

THE DIFFERENCE VERSION OF OKUN’S LAW,
ANNUAL DATA



Note: Data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, from 1949 through 2006.

As these figures relate to the annual rate of growth necessary to sustain all values investigated above we have:

<u>Analysis:</u>	<u>Future Value</u>	<u>Promixity to Phi</u>	<u>Rate:</u>	<u>Comparison to Okun's x-intercept at 3.4971853</u>
Circle:	\$1,618,590	1.00034424	3.4995226	1.000668337
Columns:	\$1,618,200	1.00010321	3.4977411	1.000158927
Square:	\$1,618,120	1.00005376	3.4973756	1.000054415
Okun's Law x-axis:	\$1,618,078	1.00002781	3.4971853	1
Golden Mean:	\$1,618,033	1	3.4969781	0.999940752

When this “steady state” rate of growth under Okun’s Law is placed among the “rates of growth” calculated by the GNP Spiral, the x-intercept generates a future value in proximity to the Golden Mean of 2.7/100,000 parts, closer than all other values.

It is possible to calculate additional decimal places using the data sets and econometric techniques provided by Dr. Knotek. Taken to eight places the resulting trend lines for quarterly and annual data for the charts above have the equations.

Quarterly trendline:
 $y = 0.23094226 + -0.06603552x;$ x-intercept = **3.4972429**

Annual trendline:
 $y = 1.20913875 + -0.34995497x;$ x-intercept = 3.4551266

The rounding of the Annualized Quarterly trend line results in a slightly decreased rate of steady state growth. The steady state growth rate in an “un-rounded” trend line increases very slightly, i.e. from 3.4971853 to 3.4972429.

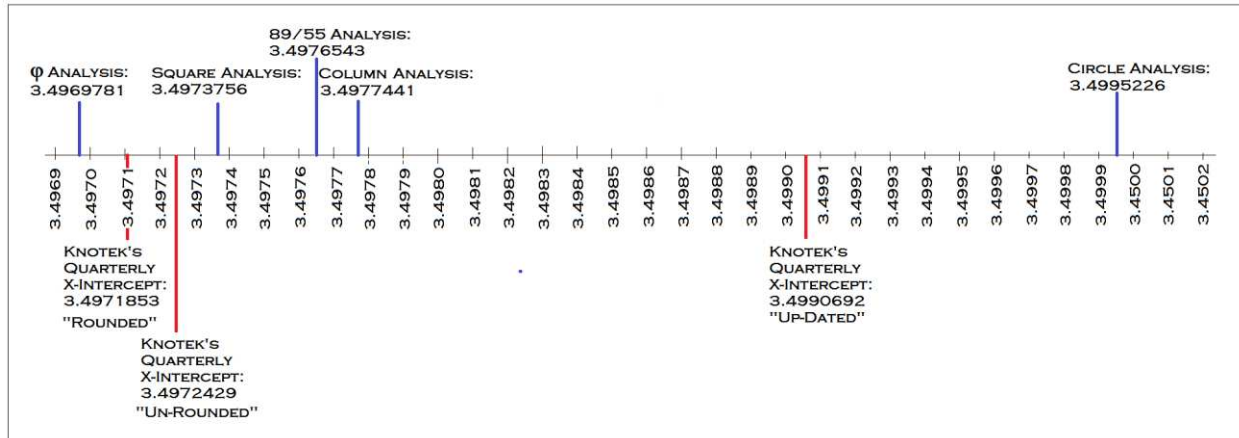
Subsequent to the publication of “How Useful Is Okun’s Law?” (Knotek 2007) the Department of Labor amended various rates of unemployment. In addition, the seasonally adjusted rate of growth for 2007-2 has been amended slightly.

Change in Quarterly Unemployment vs. Change in Quarterly GDP							
					Knotek's Email of November 30, 2011		
Year	Quarterly Figure	Change between quarterly figure and previous quarterly figure	Seasonally Adjusted GDP (as taken from Tab 1, Column G "Quarterly GDP")	Change in Unemployment (as taken from Tab 2.3, Column C "Knotek's Verification")	Quarterly Figure		
2004-1	5.7	-0.1	2.959586339	-0.133333333	2004.1	2.959586	-0.13333
2004-2	5.6	-0.1	3.481713187	-0.1	2004.2	3.481713	-0.1
2004-3	5.4	-0.2	3.602231651	-0.166666667	2004.3	3.602232	-0.16667
2004-4	5.4	0	2.548062616	0	2004.4	2.548063	-0.03333
2005-1	5.3	-0.1	3.072836854	-0.133333333	2005.1	3.072837	-0.13333
2005-2	5.1	-0.2	2.812687066	-0.2	2005.2	2.812687	-0.2
2005-3	5	-0.1	4.461998905	-0.133333333	2005.3	4.461999	-0.06667
2005-4	5	0	1.193642999	0	2005.4	1.193643	-0.03333
2006-1	4.7	-0.3	4.820432229	-0.233333333	2006.1	4.820432	-0.23333
2006-2	4.7	0	2.442262767	-0.1	2006.2	2.442263	-0.1
2006-3	4.6	-0.1	1.065549084	0	2006.3	1.065549	0.06667
2006-4	4.5	-0.1	2.090874781	-0.2	2006.4	2.090875	-0.23333
2007-1	4.5	0	0.601589354	0.066666667	2007.1	0.601589	0.033333
2007-2	4.5	0	3.821335748	0	2007.2	3.822239	0

Although Chart 1 (Knotek 2007) would appear only very slightly altered as a result of these changes, the trendline again changes, with an additional increase in the value of the x-intercept as follow

$$\begin{aligned}
 y &= -0.0660730x + 0.2311940 \\
 x \text{ intercept} &= 3.499069211
 \end{aligned}$$

It must be pointed out that the range between these prospective “rates of growth” is very narrow. The greatest figure (Circle Analysis: 3.4995226) exceeds the least figure (ϕ Analysis: 3.4969781) by a multiple of $3.4995226 / 3.4969781 = 1.0007276$, or 0.072%, or 7.2 parts in 10,000. As these are plotted on an x-axis the following x-intercepts appear, all falling within a range of 7.2 parts in 10,000:



One can see immediately that the small deviations between data sets have had a striking effect on the order of quarterly intercepts and their proximity to the Golden Mean intercept. The claim that Knotek’s Annualized Quarterly intercept as given in Chart One is closer to the Golden Mean analysis than the Square Analysis can no longer be made. Nevertheless the very tight range of values given for these different interpretations of the data supports the central theme of this essay, to wit: that Okun’s Law is a trigonometrically derived function with geometric properties underlying it.

Of “The Pyramid Economy” and “The Political Economy Wave”: Toward the Study of Consciousness as A Predictive Science

By Scott A. Albers*

Abstract: *The paper summarizes the basic ideas of two previous papers. This permits the creation of a new “Political Economy Wave” wherein various dates of significant crisis are predicted as likely to occur.*^{84 85}

JEL classification: B41, B5, C01, C02, C50, C63, E00, E01, E10, E19, E30, N00, N01, N11, Z10, Z13

Keywords: Real GNP, Golden Mean, Phi, Kondratiev Wave, Global Financial Crisis, GNP Spiral, Okun’s Law, Economic Prediction

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⁸⁴ Acknowledgements. Conceptually this article is the third of a three-part series.

Portions of the first paper were originally published as a peer-reviewed research article on August 8, 2011 in *The Middle East Studies Online Journal*, H. Karoui, editor, at <http://www.middle-east-studies.net/?p=22639>, Issue 6, Volume 3, pp. 199-253. This paper was entitled “The Golden Mean, the Arab Spring and a 10-Step Analysis of American Economic History.” Our first thanks go to Professor Karoui and the board members of the MESOJ for accepting this first paper so promptly.

On March 31, 2012 a more extensive paper was deposited in the Munich Personal RePEc Archive, at <http://mpira.ub.uni-muenchen.de/37771/>. We received a request to publish this article on February 12, 2013. Subsequently this article was included as one of nine peer-reviewed articles in the monograph “Globalization of World System Research,” *Entelequia: Revista Interdisciplinar*, University of Malaga, Malaga, Spain, Issue 15, April, 2013, pp. 37-124, <http://www.eumed.net/entelequia/en.art.php?a=15>. Special thanks go to editor of this issue Dr. Arno Tausch, [Privatdozent Universität, Innsbruck, Austria and Institut für Politikwissenschaft, Faculty of Economics, Corvinus University, Budapest](http://www.eumed.net/entelequia/en.art.php?a=15a02), Hungary, for his kind help and encouragement throughout this process. See <http://www.eumed.net/entelequia/en.art.php?a=15a02>. Additional work was published on December 30, 2012 at <http://mpira.ub.uni-muenchen.de/43484/>. The first article of this three-part set is entitled “On the mathematic prediction of economic and social crises – as revised March 21, 2014.” It will be referred to in this paper as “Albers & Albers 2014.” It is located at <http://mpira.ub.uni-muenchen.de/54653/>

The second article is entitled “Okun’s Law as a Pi-to-One Ratio: a harmonic / trigonometric theory as to why Okun’s Law works – Revised March 21, 2014.” <http://mpira.ub.uni-muenchen.de/54654/> The original of this paper on Okun’s Law is found at <http://mpira.ub.uni-muenchen.de/46633/> It replies to Dr. Edward Knotek’s rhetorical question: “How Useful is Okun’s Law?”, <http://www.kc.frb.org/publicat/econrev/PDF/4q07Knotek.pdf>, (*Economic Review* 2007). This article was made possible only because Dr. Knotek has been so generous with his time, information, insights and explanations vis-à-vis that article. It will be referred to as “Albers 2014” in this set.

The third article is entitled “Of ‘The Pyramid Economy’ and ‘The Political Economy Wave’: towards the study of consciousness as a predictive science,” located at <http://mpira.ub.uni-muenchen.de/54655/> A draft is found at <http://mpira.ub.uni-muenchen.de/43484/>. It will be referred to as “Albers 2014” in this set.

See http://www.scribd.com/scott_albers_1 for extensive additional materials.

⁸⁵ This article contains 2,732 words with an abstract of 32 words, paginated as a two page pdf view, odd numbered pages to the left, even numbered pages to the right. This division is important to note in considering the predictions made at the final half of this paper.

Dr. Tesman: With the future! But, good heavens, we know nothing of the future!

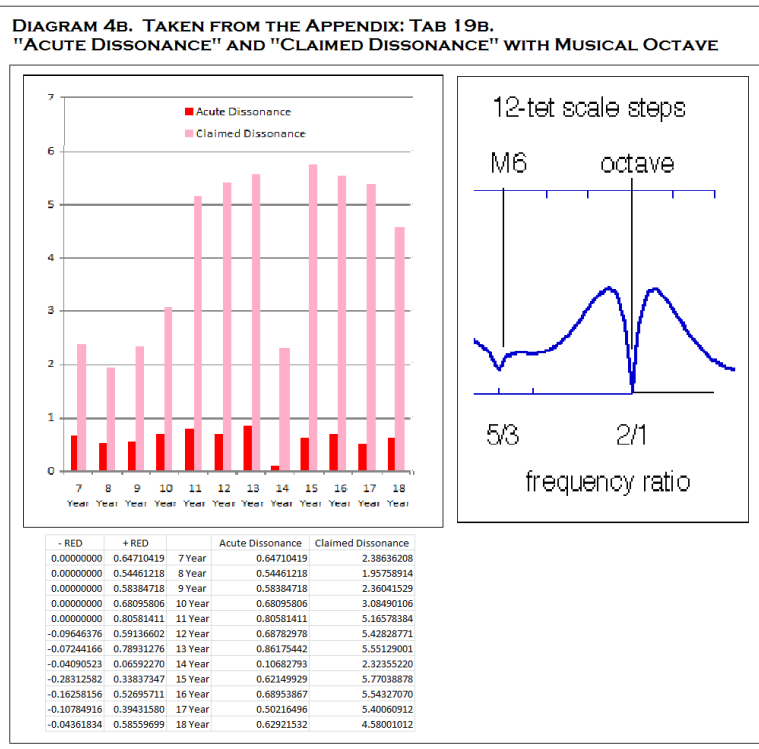
Lovborg: No, but there is a thing or two to be said about it all the same.

from *Hedda Gabler*, Act Two, by Henrik Ibsen

1. The Economic Octave

The first discovery made in these essays has been that at the 14-year spread a graph resembling an acoustic octave can be demonstrated to exist within the real GNP ratios of the United States economy, 1868-present. We wrote:

As demonstrated below, a remarkable and unexpected result occurs when a ratio of real GNP possesses a numerator and the denominator separated by 14 years. At this span of time, the level of Acute Dissonance is the least of all ratios (0.151795) and the level of Claimed Dissonance is second-to-least (2.39229). In addition, the spreads of three years before (11, 12, 13) and after (15, 16, 17) the 14-year spread generate the greatest amount of Claimed Dissonance, more than double that of the 14-year spread. (Albers & Albers 2014)

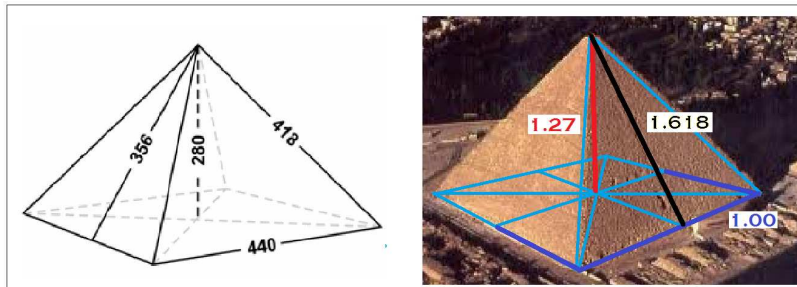


2. “The Pyramid Economy”

On the basis of this octave two principles of economics, the Kondratiev Wave and Okun’s Law, have been shown to work together to shape the economic progress of the American economy.

These two principles as conjoined into one dynamic may be compared to the Great Pyramid of Giza⁸⁶, as follows.

⁸⁶ The proportions of the Great Pyramid of Giza are displayed below. At left are the measurements of the Great Pyramid in cubits, and to the right are the proportions suggested by these lengths.



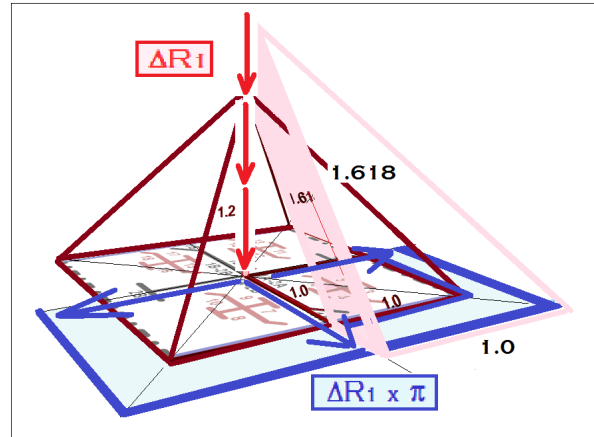
As to the incorporation of π into the design see Tompkins (1971:70) “Taylor then discovered that if he divided the perimeter of the Pyramid by twice its height, it gave him a quotient of 3.144, remarkably close to the value of π , which is computed as 3.14159+. In other words, the height of the Pyramid appeared to be in relation to the perimeter of its base as the radius of a circle is to its circumference.” In accord see DeSalvo (2008:72-73), Skinner (2006:116-119), (Dunn, 1998:59).

As to ϕ see Tompkins (1971:190) “(T)he Pyramid was designed to incorporate not only the π proportion by another and even more useful constant proportion, known in the Renaissance as the Golden Section, designated in modern times by the Greek letter ϕ (pronounced phi) or 1.618. (If the 356 cubits of the Pyramid’s apothem are divided by half the base of 220 cubits, the result is 89/55, or 1.618.)” In accord see Skinner (2006: 119-121), Hemenway (2005:68).

In apparent opposition to both see Livio, (2002:53-61). Calculating a difference from ϕ at “less than 0.1%” (at 56) and “differing (from π) only by about 0.05%” (at 58), he argues that these proportions are not those of an original design by the builder of the Great Pyramid. “(I)t is highly unlikely that either the ancient Babylonians or the ancient Egyptians discovered the Golden Ratio and its properties; this task was left for the Greek mathematicians.” (at 61)

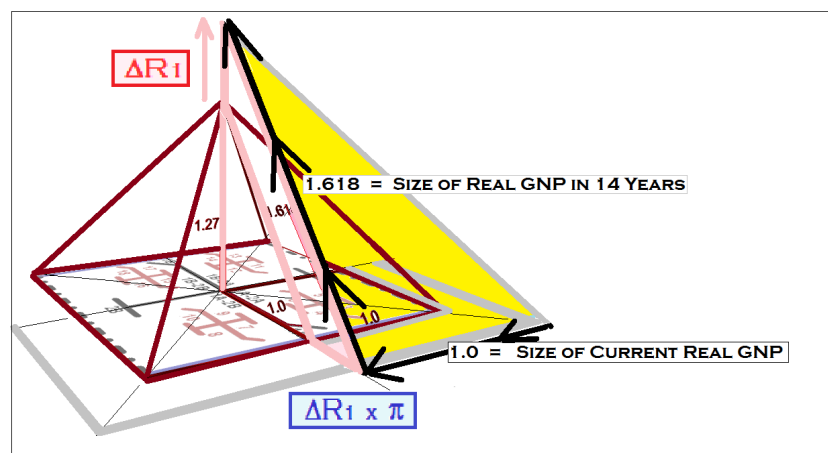
2a. Okun's Law.

Okun's Law states that there is a 3:1 ratio between changes in the size of GNP and changes in the rate of employment. The proportions given by Okun's Law may be transferred to the Great Pyramid of Giza on the suggestion that if the rate of employment is taken as a downward thrust from the top of the Pyramid, then the expansion of any measurement of GNP, represented by the perimeter of base of the Pyramid, will result in a π :1 ratio as between half the perimeter and the height.



2b. The Kondratiev Wave

At any midpoint along this square perimeter will lie an apothem, a 90 degree angle returning to the pinnacle of the Pyramid. The distance from any corner of the Base to this midpoint, representing the GNP production of any given year, taken as a “1,” will lie in a 1:φ ratio between this amount and the GNP of a year 14 years hence, as represented by the ratio between the half-segment to the apothem itself.

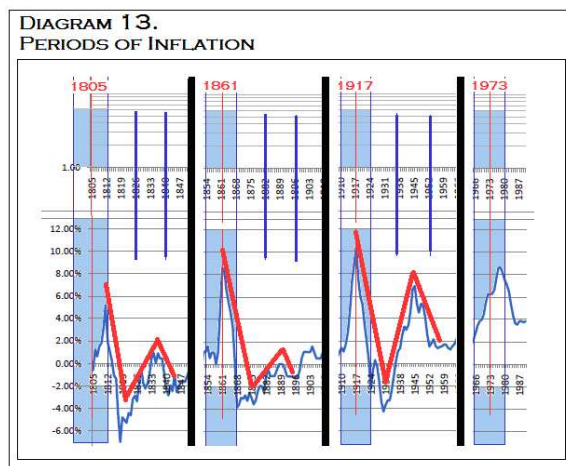


We have demonstrated that these two proportions govern the economic development of the United States beginning in 1801 to the present time.

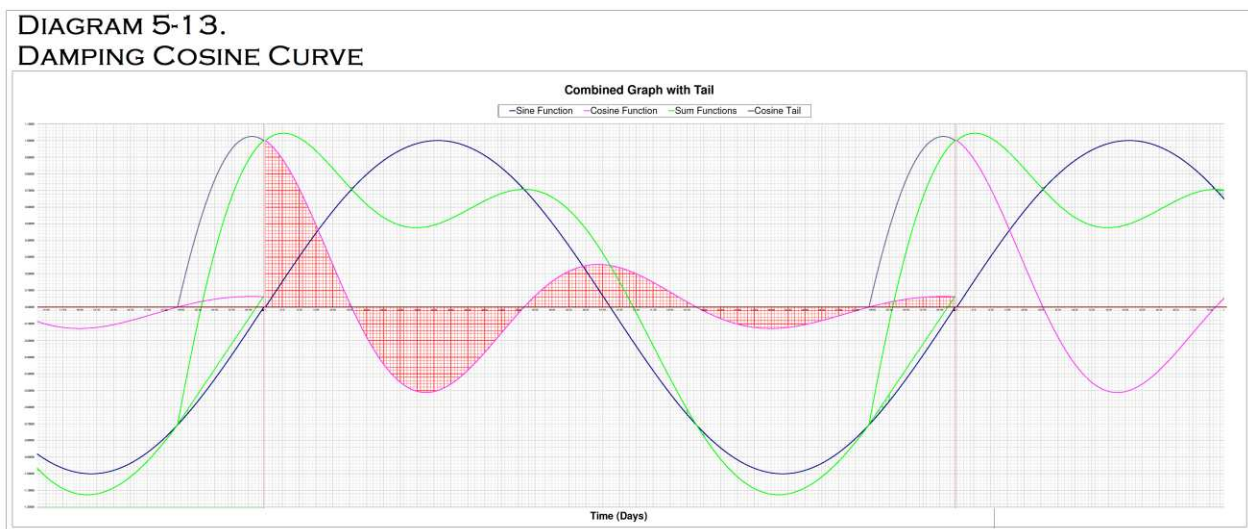
3. The 28-Year Damping Price Wave

Using the 14-year octave American economic history can be divided neatly into four periods of 14 years, using the price index as a damping 28-year price wave over the course of 56 years. We wrote:

We noted in the above that the 56 year period ($14 \times 4 = 56$) between peaks at 1861 through 1917 suggests the possibility that similar periods of time might connect other peak points of inflation. If a 14-year span (blue rectangles above) is drawn around the years 1805, 1861, 1917 and 1973 (each of which is separated by periods of 56 years), virtually all inflationary peaks are contained in a single model. (Albers & Albers 2014)



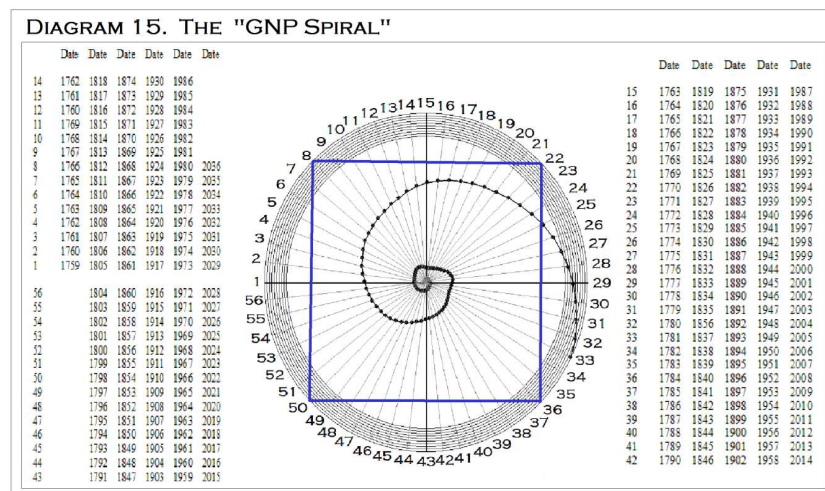
A damping cosine curve may be constructed as follows to fit this pattern.



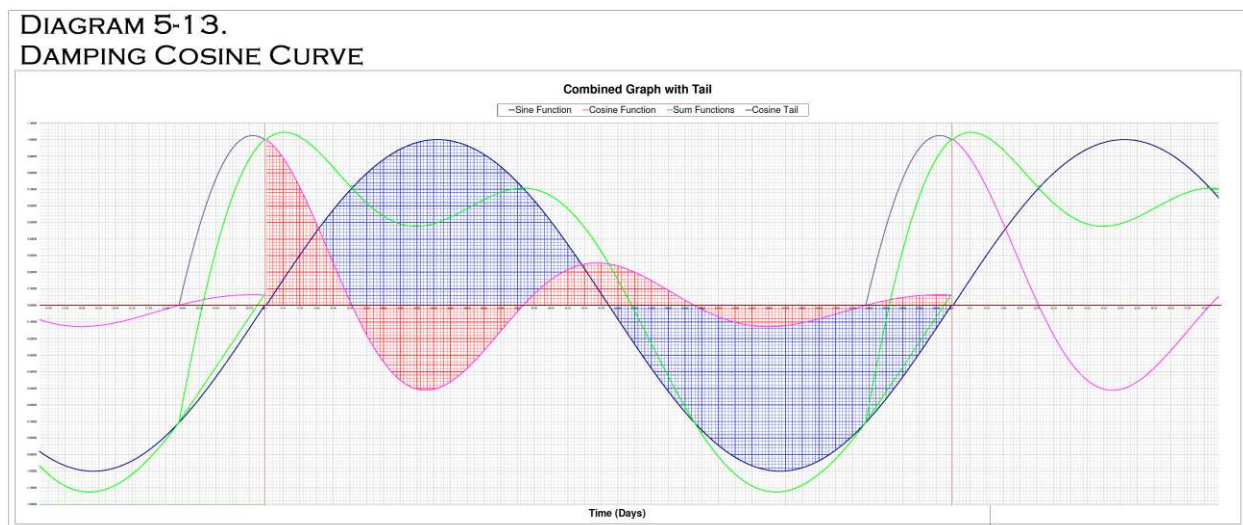
4. The 56-Year Kondratiev Wave

This 56-year period may in turn be used to arrange real GNP figures in a spiral, the basic ratio of which is $1:1.618\dots$, the Golden Mean, or $1:\phi$. We wrote:

We then placed the U.S. real GNP figures given in “Data Set 2 – U.S. Real GNP” in a 56 year circuit, with the four 14-year quarter cycles indicated in blue, to create the spiral below. The center of the spiral, beginning at axis 9 = 1869, represents the real Gross National Product for that year of 23.10 billion dollars in 1958 prices. The Gross National Product for subsequent years in real terms are given along each axis respectively, with each circle of circumference representing ten billion dollars of real GNP in 1958 prices. ... (Albers & Albers 2014)



Placing this sine curve in blue, as superimposed upon the red damping curve, we have the following.



The following color scheme was introduced to consider the nature of the political changes implied in the on-going 56-year GNP Spiral. (Albers 2014)

DIAGRAM 5-7. CHANGE VS. STABILITY - SOUTHWEST CORNER

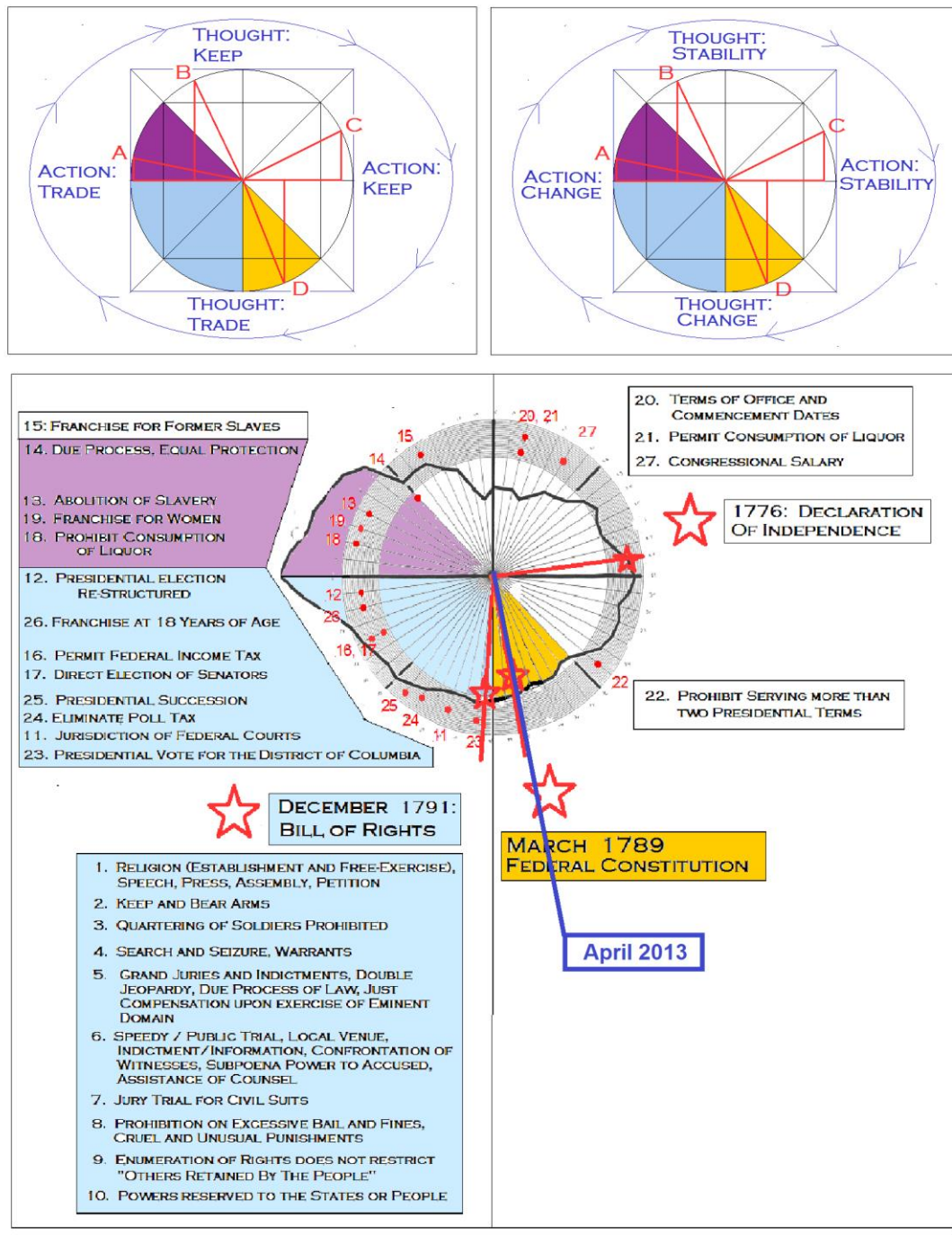
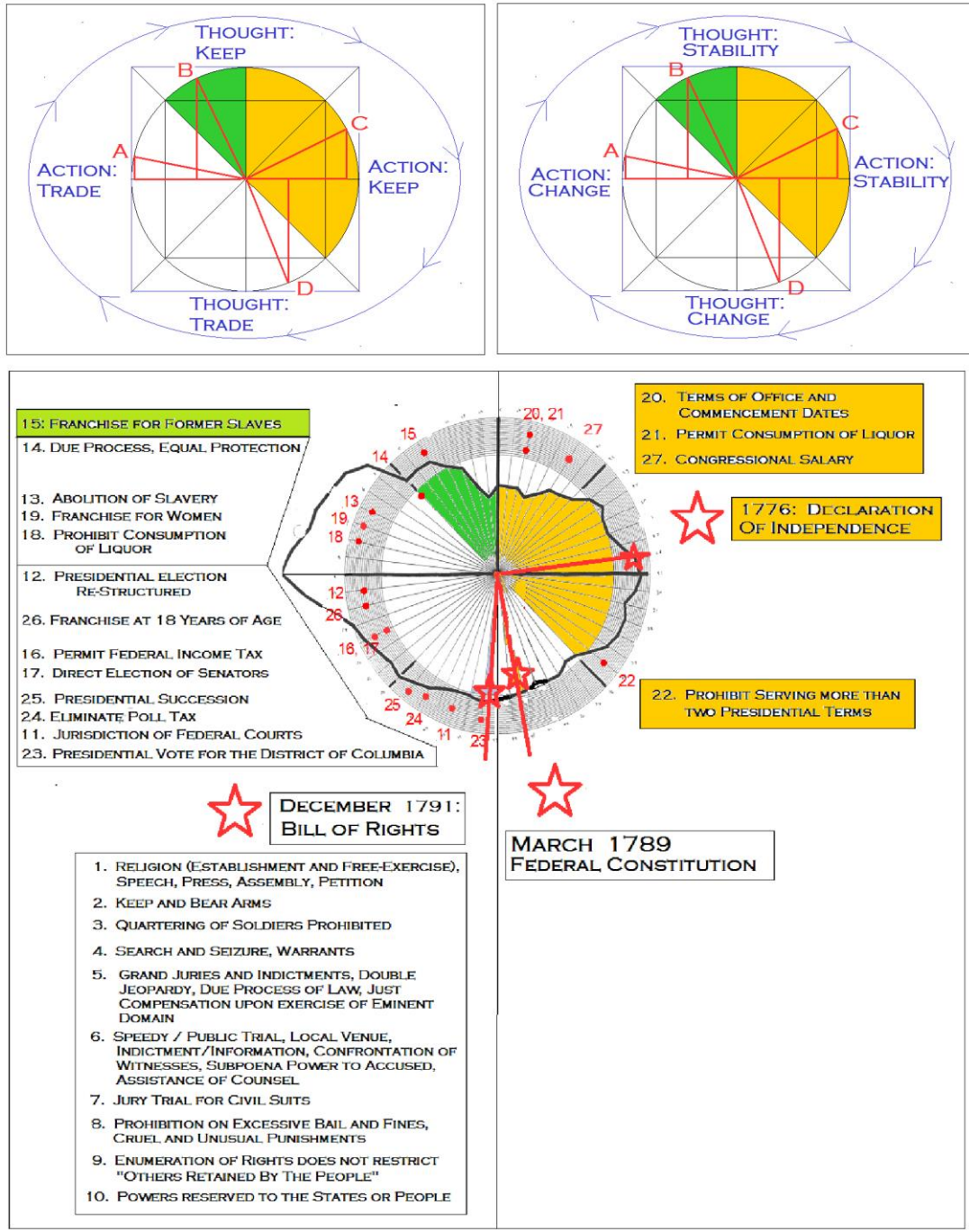
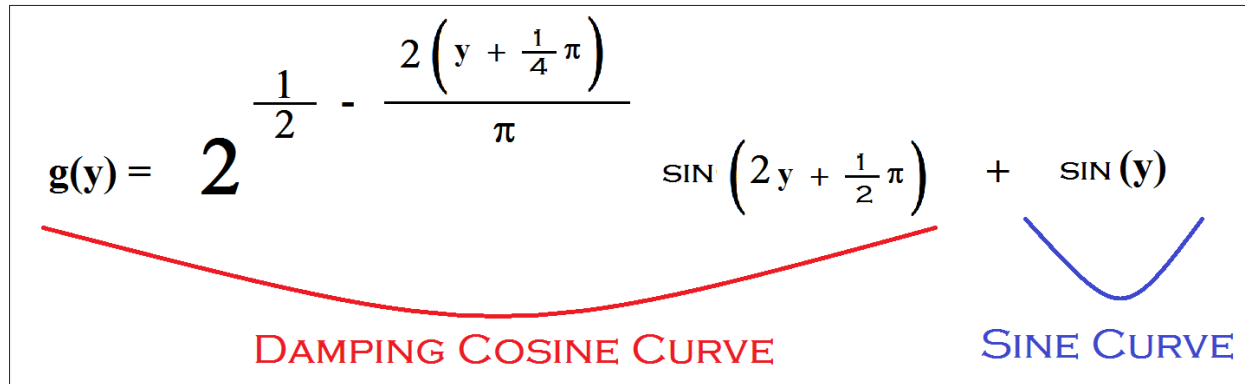


DIAGRAM 5-8.
CHANGE VS. STABILITY - NORTHEAST CORNER



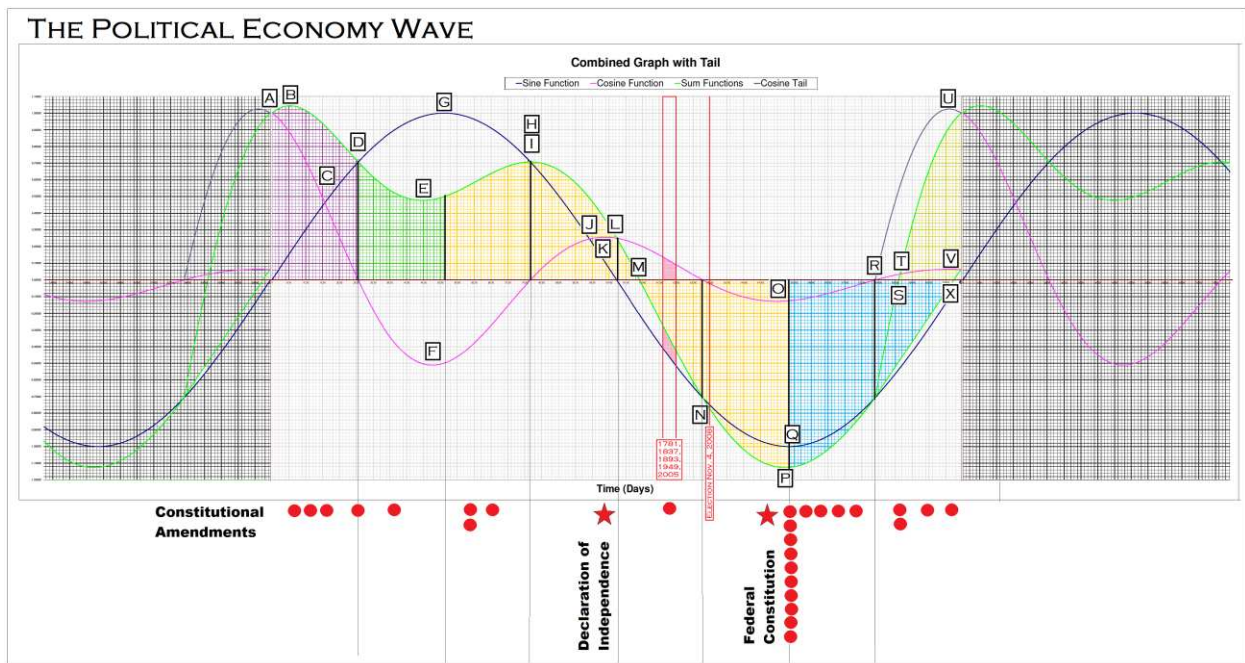
5. The Political Economy Wave

Keeping the peak of the damping cosine wave at the same level as that of the original sine wave (“1”) we may graph the damping to occur by halves. The equation which adds the previous sine curve together with this damping cosine curve is as follows:



To test whether any part of this equation is capable of anticipating dates of economic and / or social crisis, I have plotted the 28-year “economy wave” (damping cosine curve) and a 56-year “political wave” or “Kondratiev Wave” into the 56-year Political Economy Wave by charting a 56-year (20,454 day) period of changes beginning on April 9, 1805, 1861, 1917 and 1973.

Using the same color scheme given for the previous models we will examine in these essays the creation of the following mathematic wave running through American economic and social history.



6. The Objective Determination of a “Crisis”

The x-axis values of the Political Economy Wave represent 20,454 days within a 56-year cycle, beginning with April 9, 1805, 1861, 1917, 1973 and, prospectively, 2029. Positive y-axis values are associated with thoughts in favor of political stability and negative y-axis values are associated with thoughts in favor of political change. After a careful review of all possible intersections of the waves which make up this model, the following points have been found to represent predictable dates of “crises,” or fundamental change, in the behavior of citizens within the United States. These points are:

- (A) the beginning point,
- (B) the first peak, wherein positive y-values reach their greatest level,
- (E) the first trough,
- (H) the second peak,
- (M) the point wherein the wave passes from positive y-values to negative values,
- (P) the second trough, wherein negative y-values reach their lowest point and
- (X) the point wherein the wave passes from negative y-values to positive without the introduction of a new cosine wave.

The pink rectangle charted in the Political Economy Wave represents the year 2005, a date associated with previous financial political-economic crises coming in 56-year increments in 1781, 1837, 1893, 1949 and – prospectively – 2005. The vertical red line represents the election of November, 2008 at which point Senator Barack Obama was elected President of the United States in the midst of a global financial crisis.

In this essay I present seven predictions which may be associated with the seven points given above – A, B, E, H, M, P, and X – vis-à-vis their association with the cover of TIME Magazine. These magazine covers represent a public statement of pressing events which is completely independent of this approach.

The magazine’s interpretation of the event is not in question. Of interest to these essays are the dates associated with the event in question and the bold, unequivocal and “for profit” manner in which the event is stated, i.e. “on the cover.” These covers are linked to this essay for ready reference.

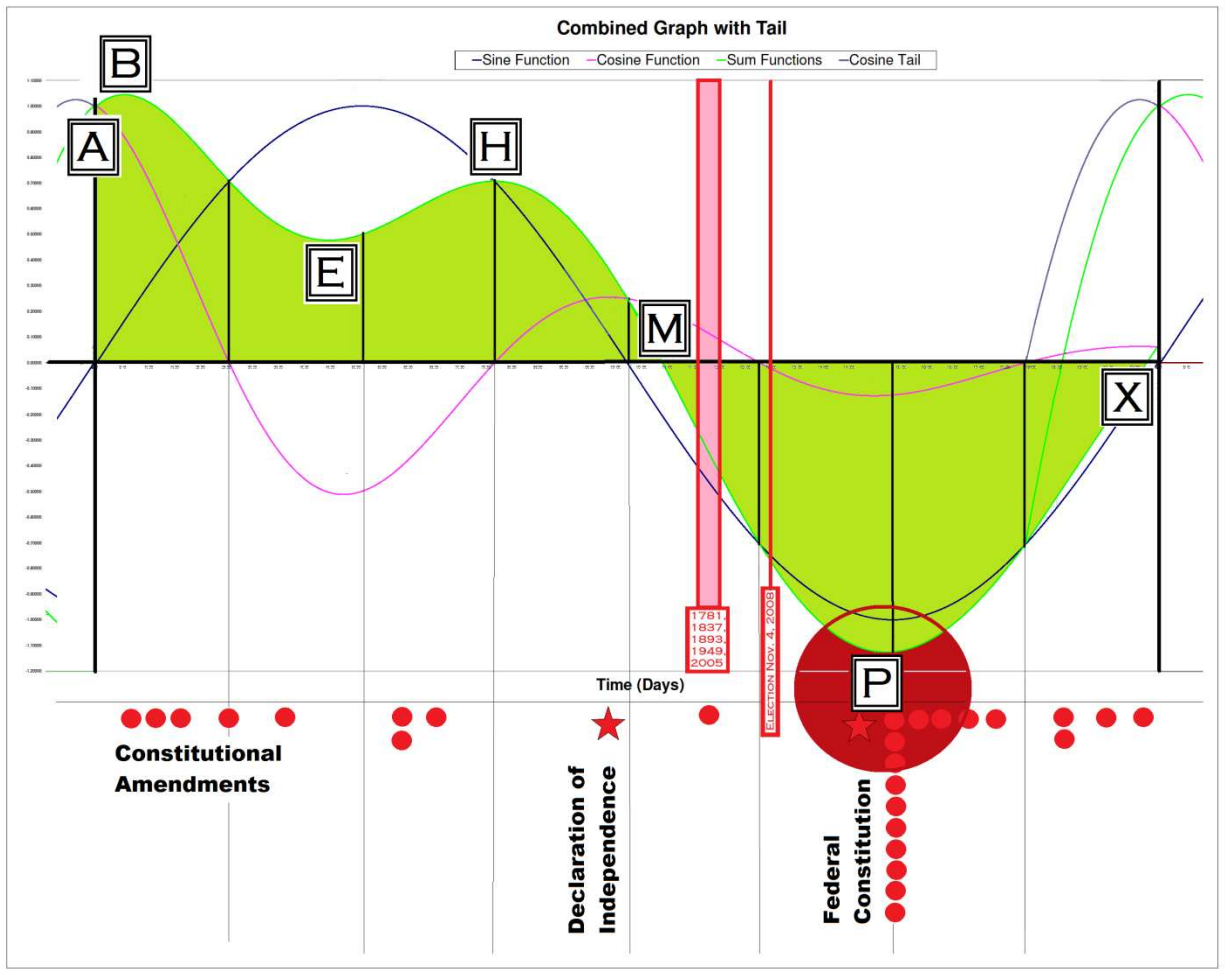
Also provided are proposed correlations for much earlier dates at the same point of in the Political Economy Wave. Links are provided to internet articles pertinent to the crisis described. Predictions are listed in order of proximity to the date of the publication of these essays.

One of the most striking things about this approach is the interesting association of TIME Magazine covers – each of which conveys a serious, pressing and dramatic turn of events – with the dates provided.

A review of the magazine covers linked to these essays, *as well as those covers immediately preceding and subsequent to the dates given*, may be sufficient to confirm the interest and potential usefulness of this approach.

These dates are as follows.

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point P. The second trough.

This point will next be reached between **December 8 to 12, 2014.**

The most recent dates associated with this point are December 8 to 12, 1958.

TIME National Affairs Articles:

Rising racial tension in the South and the threat of nuclear war.

<http://www.time.com/time/covers/0,16641,19581208,00.html>

Interpretation of the Political Economy Wave: Point P introduces Americans to their future, ultimately leading to the wholesale change to which it is directly related at Point A.

Important dates near December 8-12, 2014 at 56-year intervals are:

December 14, 1790: Alexander Hamilton proposes a National Bank, a perennial issue since that time, made vastly more complicated by the Louisiana Purchase of 1803.

<http://www.civil-liberties.com/cases/bank.html>

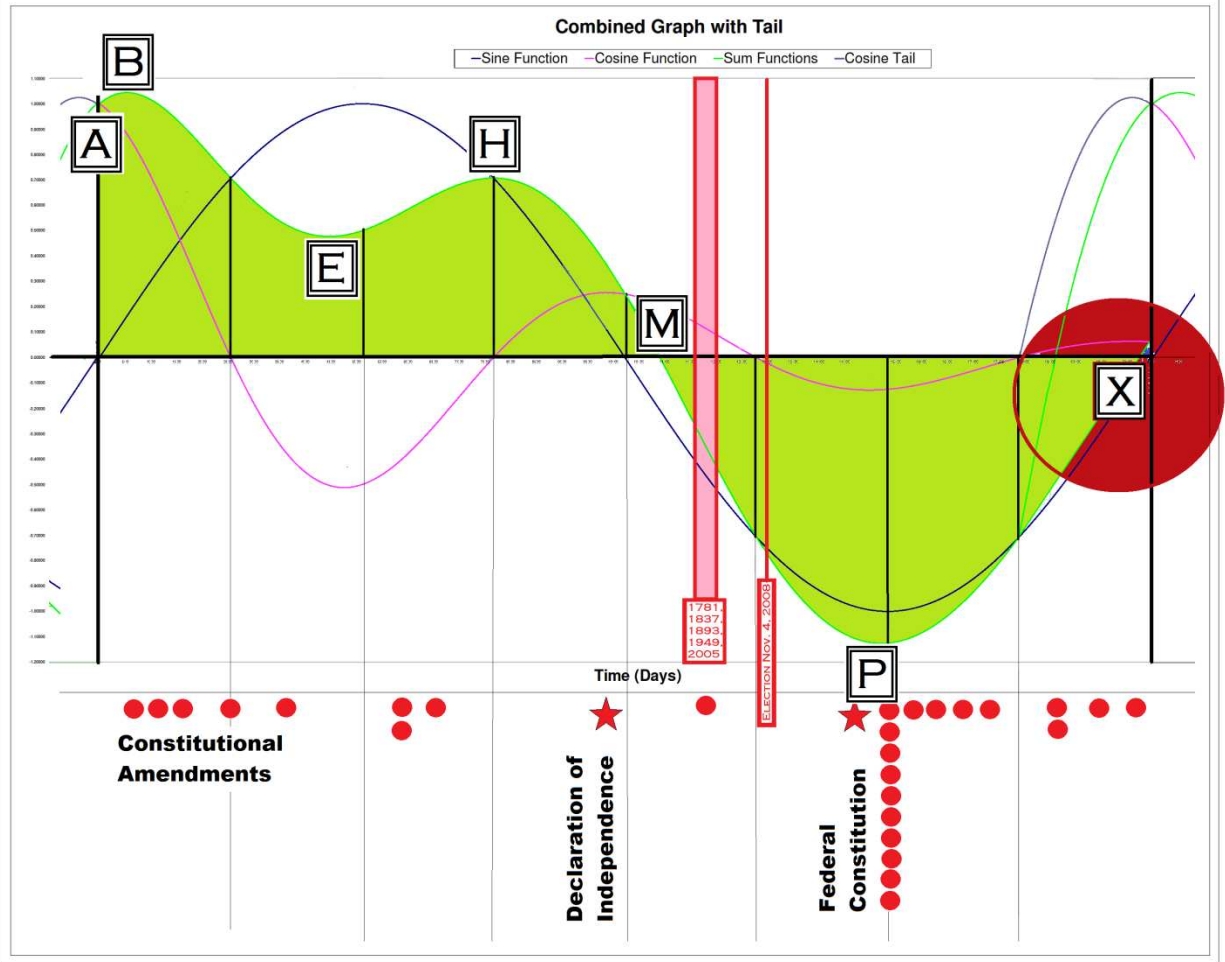
December 6-7, 1846: The Battle of San Pasqual. American troops reach California per annexation agreement ending Mexican-American War, leading to the California Gold Rush and the strengthening of Yankee non-slave commerce throughout the North.

http://en.wikipedia.org/wiki/Battle_of_San_Pasqual

December 7, 1902: British and German ultimatum ignites the Venezuelan Crisis, eventually leading President Roosevelt to the Roosevelt Corollary to the Monroe Doctrine. American imperialism in Latin America is thus codified and leads to an ever more expansive international involvement by the United States and ultimately entry into World War I.

http://en.wikipedia.org/wiki/Venezuela_Crisis_of_1902%E2%80%931903

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point X. The point wherein the wave passes from negative y-values to positive without the introduction of a new cosine wave.

This point will next be reached on **September 13, 2028**.

The most recent date associated with this point is September 13, 1972.

TIME Cover: Massacre of Israeli athletes in Munich.

<http://www.time.com/time/covers/0,16641,19720918,00.html>

Interpretation of the Political Economy Wave: Point X anticipates the tremendous change which arrives at Point A.

Important dates near September 13, 2028 at 56-year intervals are:

September 13, 1804: Lewis and Clark in Brule County, South Dakota, travelling west, yet not reaching the terminus of the available settlements;

<http://www.lewisandclarktrail.com/section2/sdcities/Chamberlain/history1.htm>

September 13, 1860: Senator John Crittenden of Kentucky, a border state, declares that he would stand for the union even if Lincoln won. His Crittenden Compromise of December 18, 1860 was unsuccessful in averting civil war. He returned home and worked to keep Kentucky in the union. Two of his sons would become generals on opposing sides of the war.

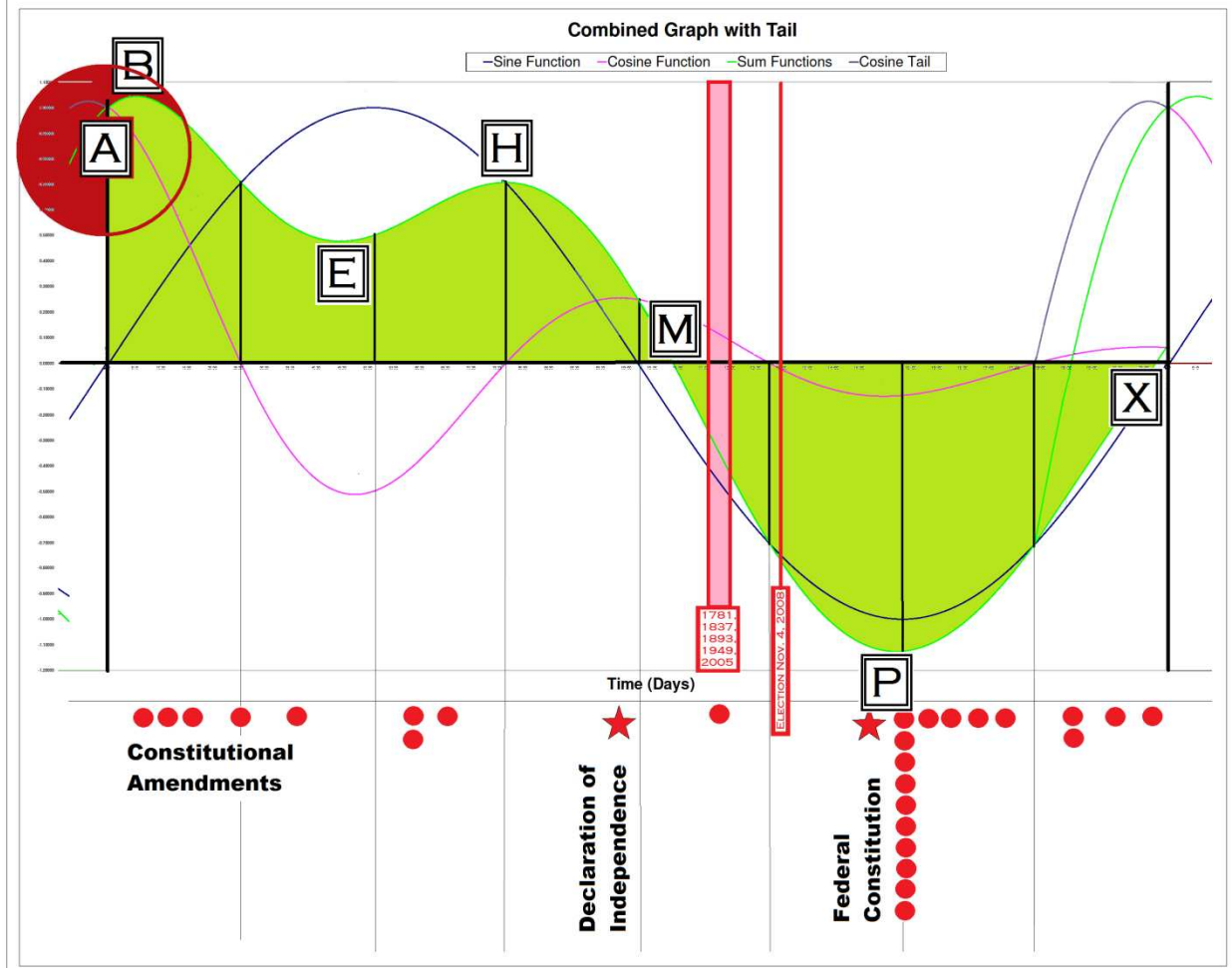
<http://www.civilwar-online.com/2010/09/september-13-1860-senator-john-j.html>

<http://sunsite.utk.edu/civil-war/critten.html>

September 15, 1916: First tank used in World War I, a new military technology which American troops would face upon their entry into France and the European Theatre.

<http://www.eyewitnesstohistory.com/tank.htm>

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point A. The beginning point.

This point will next be reached on **April 9, 2029**.

The most recent date associated with this point is **April 9, 1973**.

TIME Cover: High inflation rates sweep the nation.

<http://www.time.com/time/covers/0,16641,19730409,00.html>

Interpretation of the Political Economy Wave: Point A ends all previous associations with previous historic development and begins something entirely new, hitherto untried and unknown.

Important dates near April 9, 2029 at 56-year intervals are:

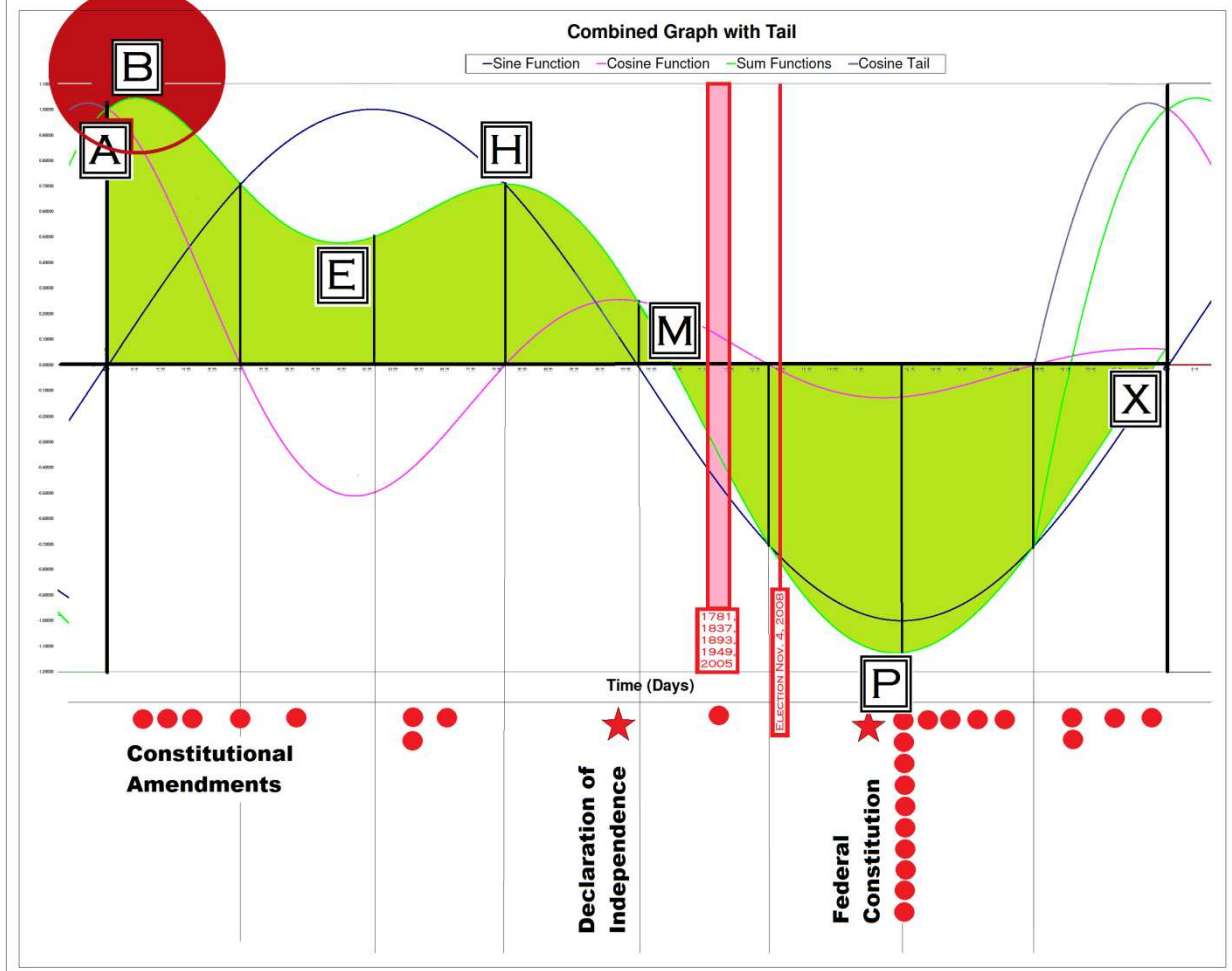
April 6, 1805: Lewis and Clark depart Fort Mandan, North Dakota: “We were now about to penetrate a country at least 2000 miles in width upon which the foot of civilized man had never trodden.” <http://www.infoplease.com/t/hist/lewis-clark-journal/day329.html>

April 12-14, 1861: South Carolina fires on Fort Sumter, beginning the American Civil War. http://en.wikipedia.org/wiki/Battle_of_Fort_Sumter

April 6, 1917: Entry of the United States into World War I.
http://en.wikipedia.org/wiki/American_entry_into_World_War_I

Of the 71 Time Magazine covers between points A (April 9, 1973) and Point B (September 16, 1974) 37 covers – slightly over half – specifically refer to events involving the Watergate scandal. Included in this sequence of events were the resignation of Vice President Agnew on October 10, 1973, the appointment of Gerald Ford as Vice President on December 6, 1973, the resignation of President Nixon and the beginning of the presidency of Gerald Ford on August 9, 1974.

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point B. The first peak, wherein the y-values reach their greatest level.

This point will next be reached between **September 16-October 1, 2030.**

The most recent dates associated with this point are **Sept. 16 – Oct. 1, 1974.**

TIME Cover: President Ford pardons ex-President Nixon for his role in the Watergate scandal.

<http://www.time.com/time/covers/0,16641,19740916,00.html>

<http://www.time.com/time/covers/0,16641,19740923,00.html>

<http://www.time.com/time/covers/0,16641,19740930,00.html>

<http://www.time.com/time/covers/0,16641,19741007,00.html>

Interpretation of the Political Economy Wave: Point B resolves the intense conflict / difficulty running between Points A and B.

Important dates near September 16-October 1, 2030 at 56-year intervals are:

September 23, 1806: Lewis and Clark complete their journey, arriving in St. Louis.

<http://www.lewisandclarktrail.com/section1/mocities/St.Charles/1806history1.htm>

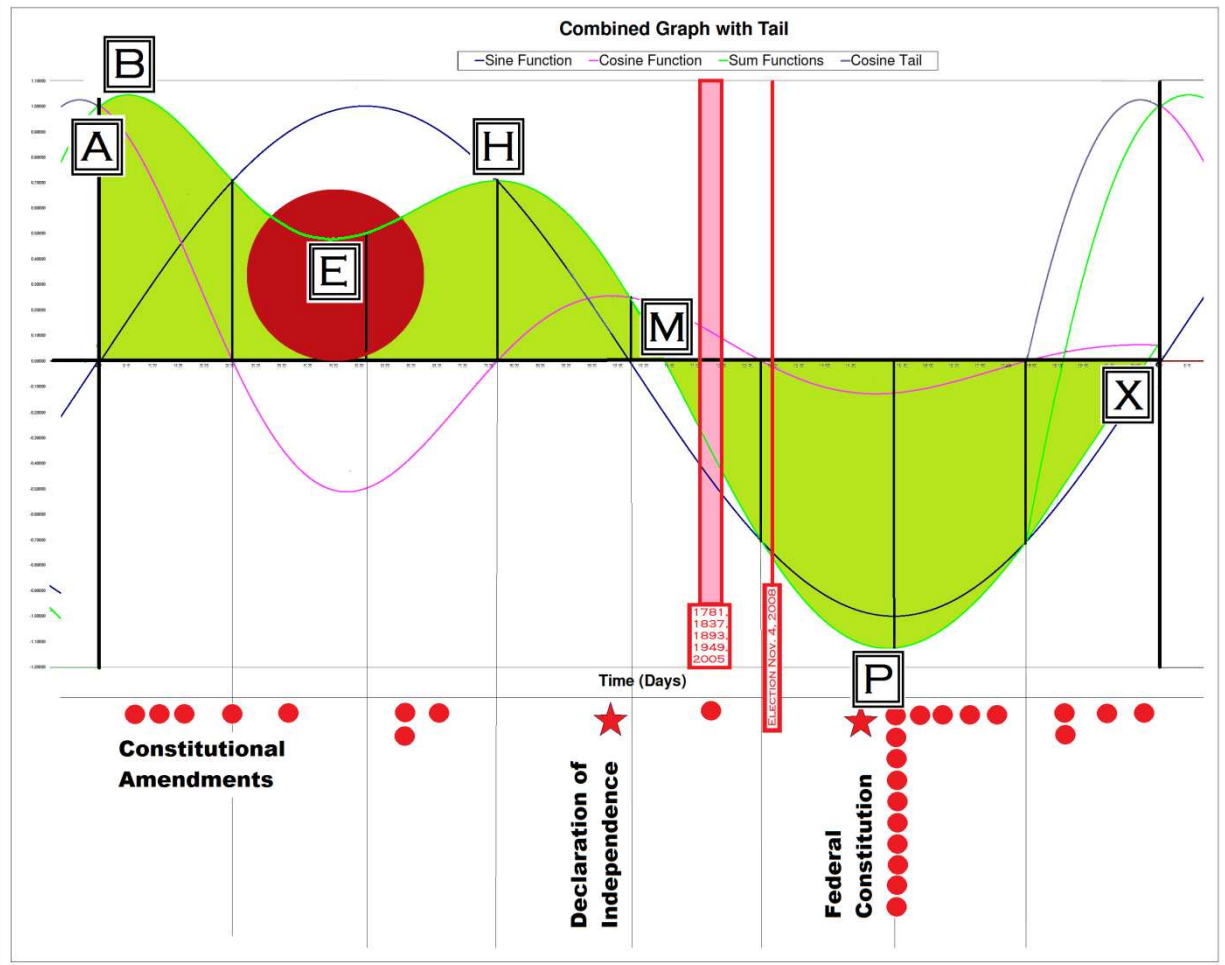
September 17, 1862: Battle of Antietam, Union victory in “the bloodiest single day in American military history” giving Lincoln the military success he desired to prelude the Emancipation Proclamation and forestall British and French recognition of the Confederacy.

http://en.wikipedia.org/wiki/Battle_of_Antietam

August 18-September 16, 1918: The last stage of the Second Battle of the Marne, the Oise-Aisne Offensive, first use of independent American forces in Europe at St. Mihiel September 12-16, 1918, with the Americans freeing the St. Mihiel salient on September 16, 1918 and “the beginning of the end of the Great War” with an armistice declared 100 days later.

http://en.wikipedia.org/wiki/United_States_campaigns_in_World_War_I

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point E. The first trough.
This point will next be reached between **June 28 – July 20, 2041**.
The most recent dates associated with this point are June 28 – July 20, 1985.

TIME Cover: Hijacking / Terrorism of TWA Flight 847 and the return of 151 of 152 hostages.

<http://www.time.com/time/covers/0,16641,19850624,00.html>

<http://www.time.com/time/covers/0,16641,19850701,00.html>

<http://www.time.com/time/covers/0,16641,19850708,00.html>

<http://www.time.com/time/covers/0,16641,19850715,00.html>

Interpretation of the Political Economy Wave: Point E resolves long-standing prior difficulties with success.

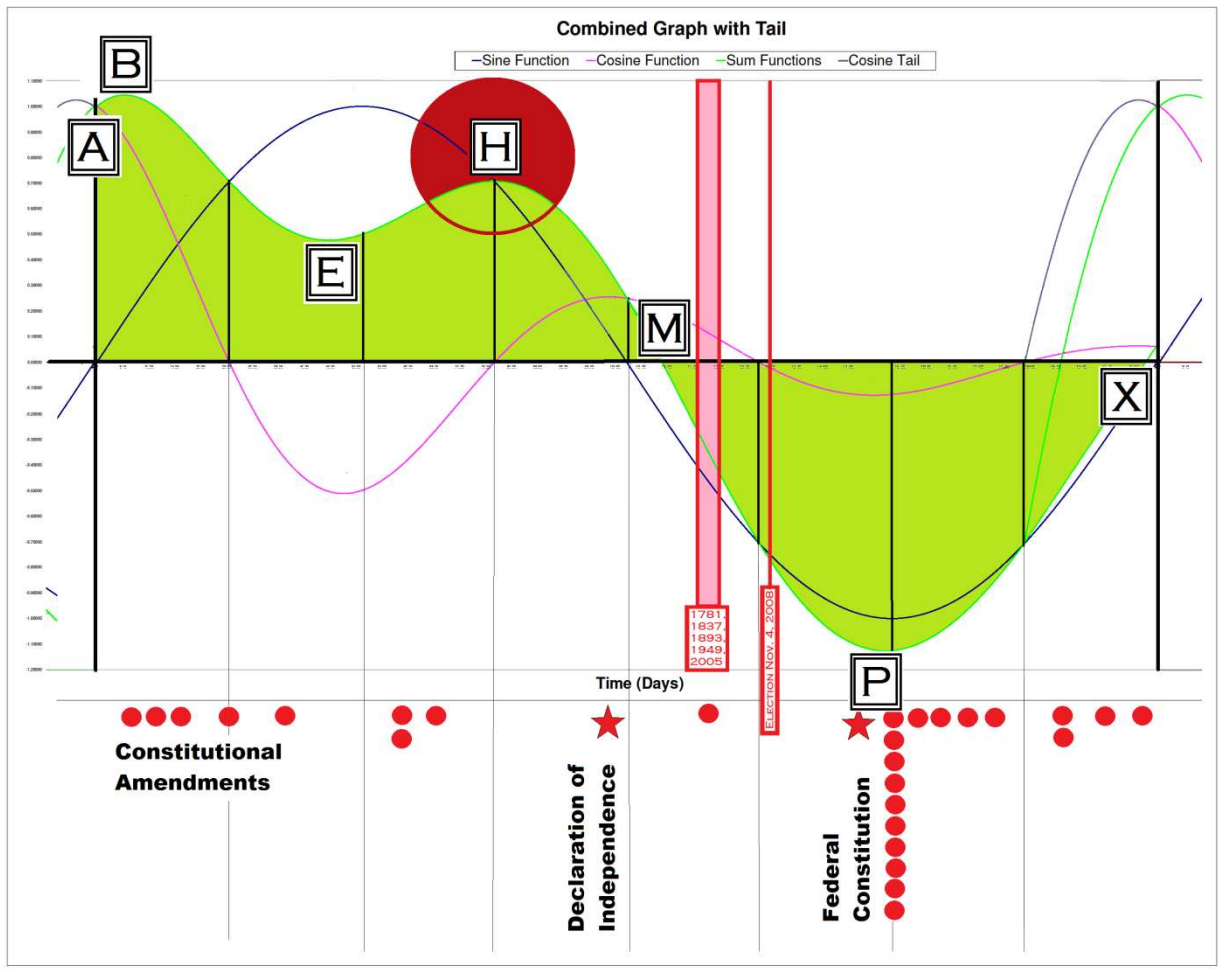
Important dates near June 28 – July 20, 2041 at 56-year intervals are:

July 4, 1817: construction on the Erie canal begins, resolves difficulty of transportation across long distances, sets off a “canal mania” and extensive investment in canals in the United State. http://en.wikipedia.org/wiki/Erie_Canal

July 8, 1873: the Modoc War, last of the Indian Wars in California and Oregon, resolves for California ongoing Indian conflicts ending with convictions and the death sentences of the Indians involved on July 8, 1873. http://en.wikipedia.org/wiki/Modoc_War

July 24, 1929: the Kellogg-Briand Pact comes into effect, whereby signatory states promised not to use war to resolve "disputes or conflicts of whatever nature or of whatever origin they may be, which may arise among them." Parties failing to abide by this promise "should be denied the benefits furnished by this treaty." This treaty resolves the legality of war for territorial aggrandizement, a law still binding law in the United States.
http://en.wikipedia.org/wiki/Kellogg%E2%80%93Briand_Pact

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point H. The second peak.
This point will next be reached between **April 4 – April 14, 2050**.
The most recent dates associated with this point are April 4 – April 14, 1994.

TIME Cover: The Whitewater Scandal, Stock Market Meltdown and the Rise of Derivatives.

<http://www.time.com/time/covers/0,16641,19940404,00.html>

<http://www.time.com/time/covers/0,16641,19940411,00.html>

Interpretation of the Political Economy Wave: Point H raises difficult international issues left unresolved, presaging troubles in the near future.

Important dates near April 4 – April 14 2050 at 56-year intervals are:

April 12, 1770: in light of the Boston Massacre of the previous month (March 5), Parliament repeals all duties imposed by the earlier Townshend Act except that on tea (April 12), thereby permitting further colonial dissent from English policies;

http://en.wikipedia.org/wiki/Townshend_Acts

April 1, 1826: Samuel Morey, an American inventor, patents the first internal combustion engine, a central part of the modern economy.

<http://kinnexions.com/smlsource/samuel.htm>

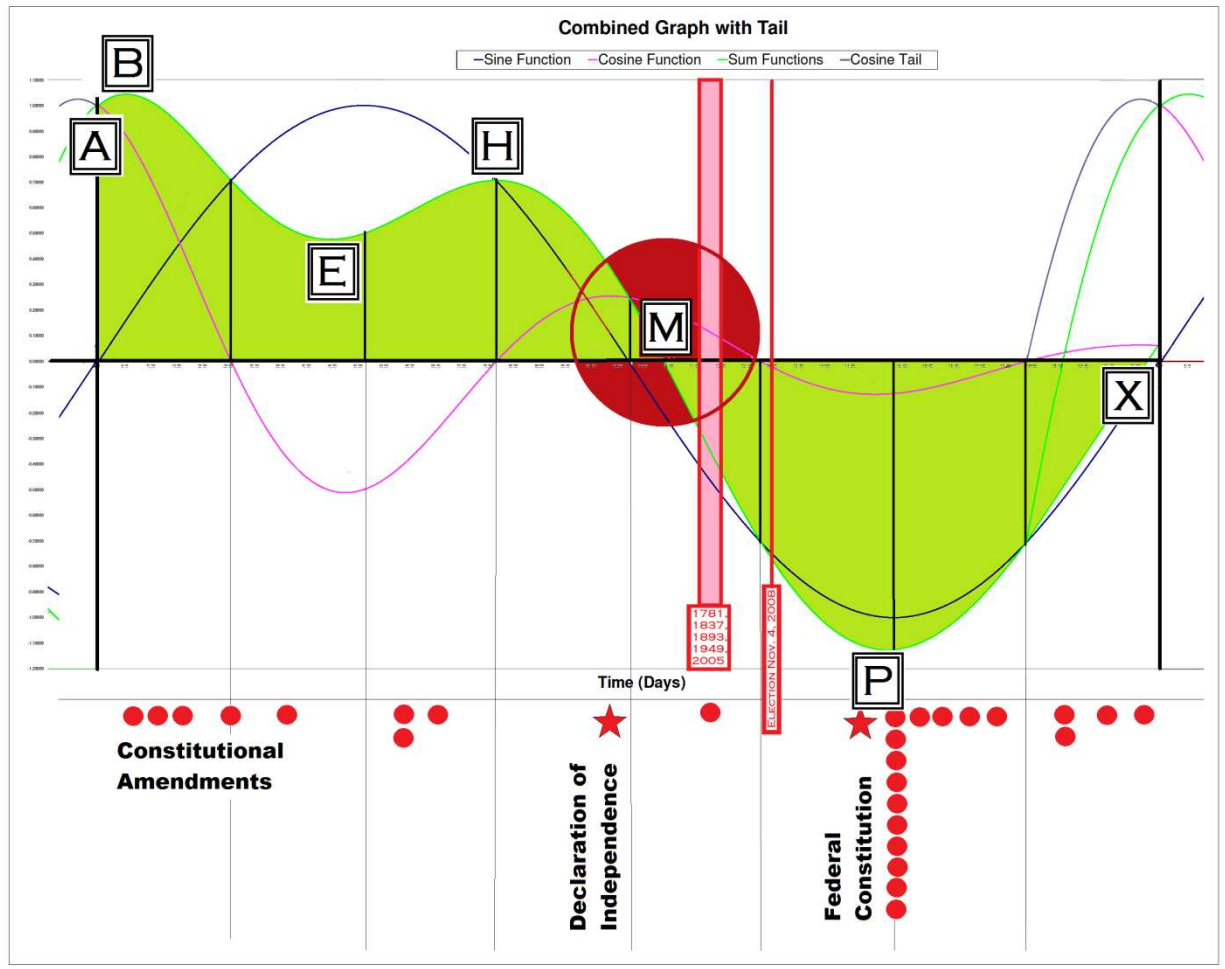
April 13, 1882: Anti-Semitic League formed in Prussia, a society dedicated to the expulsion of all Jews in Europe, raises the question of its possible success and under what terms;

<http://quod.lib.umich.edu/m/moajrnl/bac8387.0033.193/135:17?rgn=full+text;view=image>

April 10, 1938: Plebiscite in Austria approves Anschluss by Germany by 99%, leading to the expansion of Nazi Germany on a wave of public enthusiasm.

<http://www.otr.com/Linz.html>

INTRODUCTORY DIAGRAM 4. THE "POLITICAL ECONOMY WAVE"



Point M. The point wherein the wave passes from positive y-values to negative values.
This point will next be reached on **February 21, 2059**.
The most recent date associated with this point is February 21, 2003.

TIME Cover: President G. W. Bush's effort to invade Iraq.
<http://www.time.com/time/covers/0,16641,20030224,00.html>

Interpretation of the Political Economy Wave: Point M enormously and controversially expands the idea of American democracy and its applicability to new groups of people.

Important dates near February 22, 2059 at 56-year intervals are:

February 25, 1779: Gen. G. W. Clark captures the British fort at Vincennes, Indiana, thereby doubling the colonial geographic area of the United States.
http://en.wikipedia.org/wiki/Illinois_campaign;

February, 1835: "Democracy in American" Volume I by Alexis de Tocqueville is published, a work still used to analyze American character and civic identity in the United States.
http://en.wikipedia.org/wiki/Democracy_in_America;
<http://www.loc.gov/loc/lcib/9712/kammen.html>

February 22-25, 1891: First meeting of National Council of Women of the United States held in Washington, D. C. leading to the 19th (prohibition) and 20th (suffrage) Amendments.
http://books.google.com/books/about/Transactions_of_the_National_Council_of.html?id=bpU0xGnVETsC

February 17, 1947: The Voice of America begins broadcasts into Eastern Europe and the USSR.
<http://www.history.com/this-day-in-history/voice-of-america-begins-broadcasts-to-russia>

Conclusion

These dates are calculated in order to demonstrate the power – or inaccuracy – of this approach. Descriptions of the events anticipated will become more astute as this method becomes more established and the dynamics underlying it better understood.

Scott Albers
Great Falls, Montana
March 21, 2014

Do the Principles of Special and General Relativity Help to Explain the Architecture of the Rings of Saturn?

by Scott A. Albers⁸⁷

Abstract: The concept of relative space and measurement, as given in the Special Theory of Relativity, may be embodied physically in the gravitational architecture of the rings of Saturn.

Keywords: Rings of Saturn, Kaluza, Fifth Dimension, General Relativity

The new feature of (Special Relativity) was the realization of the fact that the bearing of the Lorentz transformation transcended its connection with Maxwell's equations and was concerned with the nature of space and time in general. A further new result was that the "Lorentz invariance" is a general condition for any physical theory. This was for me of particular importance because I had already previously found that Maxwell's theory did not account for the micro-structure of radiation and could therefore have no general validity.

A. Einstein

The wake of a ski boat presents at least two “phenomenological” views of a wave: the point of view of the skier directly behind the boat, and the point of view of the person on shore as the wave strikes the shoreline. The skier behind the boat will have an objective experience of the wave behind the ski boat as a set of solid “mounds” or “hills” of stationary water. The person on the shore will experience this same wave as a repeating decrease and increase of the height of the water line at shore.

The single point of reference for the skier behind the boat, the “1” which is implied by this apparently stationary position between two sets of hills of water, is to be distinguished from the wave motion striking the shore as experienced by the person standing on the shore. Both are “the wave,” but the difference in points of view is significant. The wave can be seen as both simultaneously; it is a spectrum of decision as to whether the wave is “mostly solid” (i.e. close to the boat and taking the perspective of the skier) or “mostly moving” (i.e. close to the shore and taking the perspective of the observer of the skier as positioned on the shore).

⁸⁷

I would like to thank theoretical physicist Jeremy Marcq of the Imperial College in London and the London School of Economics; Dr. Gregory St. George of the Mathematics Department of the University of Montana for his help with the equations provided herein; Mary Stelling, Alex Huffield and Stelling Engineers, Inc. of Great Falls, Montana for the creation of the spreadsheets necessary to this work. The author works as a criminal defense attorney in northwestern Montana, scott_albers@msn.com. Additional volumes on related topics may be found at <http://mpira.ub.uni-muenchen.de/view/people/Albers=3AScott=3A=3A.html>.

Both of these objective experiences represent valid pictures of “the wave” and yet each is different from the other in tangible terms. If we compare the wave experienced by the skier as “absolute” in the sense that it appears to be fixed, motionless and “eternal” (from the point of view of the skier), and compare the wave as experienced by the person at short as “relative” in the sense that the movement of the wave motion is measured against some third baseline of existence i.e. the shore (from the point of view of the observer), then we have an understanding of the interest of this paper. Is it possible to place into mathematics a framework for understanding these two different *experiences* of the speed of light as a constant?

The reason that this seems to be an important question to answer lies in the centrality of the speed of light as a central constant in modern physics. In so far as Special Relativity requires that the speed of light in a vacuum is (1) a constant, and (2) is the ultimate physical velocity, its $E=mc^2$ equation lays the ground foundation for any understanding of mass *and all energy to which that mass is related*. General Relativity represents the consideration of mass in four dimensions, three of space and one of time.

If mass-energy represents the same sort of spectrum implied by the wave behind the ski boat, then the single point behind the boat might be compared with the “mass” of an object. Conversely the energy released by any object might be compared to the radiating waves of energy which are, in fact, part of the wave as well.

If we re-write $E=mc^2$ as $E/m = c^2$, then the singleness of this mass-energy relationship on the left has been compared to a geometric figure, a square of relationships, both of which constitute the speed of light, i.e. $c \times c$. What sort of phenomenological differences between these different “c”s might we discern in the construction of reality to permit such an inquiry?

As the planets neighboring our own and possessing ring systems are undoubtedly subject to the demands of both Special and General Relativity, it may be that these ring systems demonstrate the distinction between an “absolute” and “relative” phenomenology of the speed of light when “mass” is taken to enormous proportions and rotated quickly.

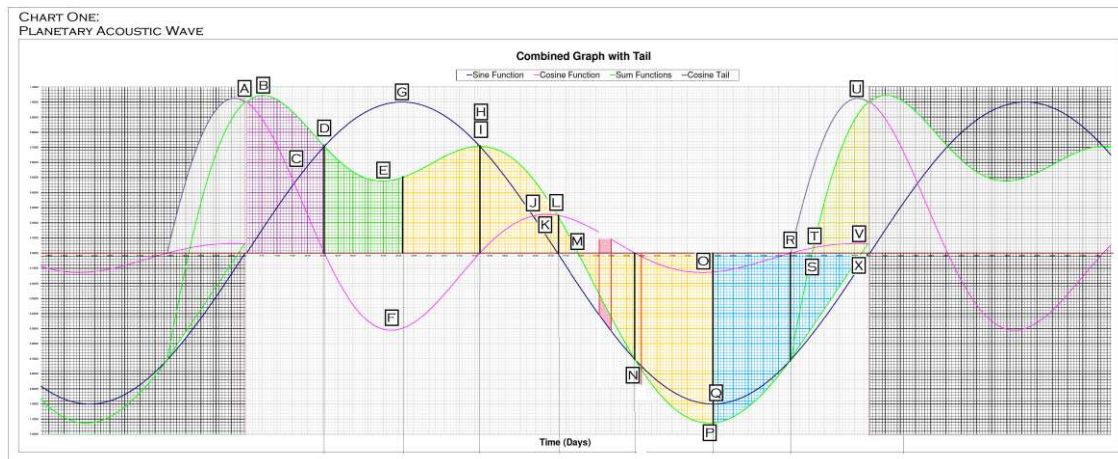
Therefore, to return to the question:

Is it possible to place into mathematics a framework for understanding these two different *experiences* of the speed of light as a constant?

To answer this question, this paper is divided into six parts. These are:

Introduction 1: A short statement of the importance of Special Relativity, General Relativity and the work of Theodore Kaluza is given.

Introduction 2: A mathematic picture of the relationship between the phenomenology of “absolute” motion and “relative” motion is given, resulting in the following graph.



Part One: The above graph is divided into 20,454 separate points or “days”. These in turn are correlated with each of the known gaps in the Rings of Saturn. We will see that each “day” or division of the 20,454 divisions represents 3 kilometers of radial span in the rings, and each peak or trough along the graph corresponds closely to a gap in the Rings of Saturn.

Part Two: The high velocity spin of Saturn creates three definitions of radius, these being: (1) the rotating radius at the equator, (2) the radius at the poles, and (3) the radius of Saturn as a non-rotating sphere, this being the average of the equatorial and polar radius. The distinction between these various radii appears to set up a “stress” in the ring field, thereby causing some gaps to appear much larger than others.

Part Three: Describes a new nomenclature for the Rings based upon this factorization of the Rings themselves.

Part Four: Speculations as to further potential proof, and a Conclusion.

In this paper I propose that the “identity” of Saturn, its phenomenological status as a rotating mass, creates the unusual pattern of gaps between its rings. This “identity” should be considered a formal “fifth dimension” under T. Kaluza’s approach to unify General Relativity with Maxwell’s equations for electrodynamics.⁸⁸ (Kaluza 1919) The psychologic aspects of Special Relativity and its understanding of “simultaneous events” may be built into the construction of gravitational orbits within the rings, providing a basis for a describing a “relativistic identity” in our understanding of nature. Consequently there is no need for moons to orbit in order to create the gaps in question. Rather the moons are themselves the product of the gaps, not the other way around.

Introduction One.

The Special Theory of Relativity

In 1905 Albert Einstein proposed the Special Theory of Relativity. Foundational to this theory is his systematic inquiry into the possibility of “simultaneous events.” In turn, this analysis hinges on the “identity” of an event. When the speed of light is held to be a constant, a contrast comes about between “the event” in an absolute sense with “the ability to perceive or measure the event” in a relative sense.

Einstein reasoned that if a sudden explosion takes place in the center of a car on a train as it passes by the station this event is perceived in different ways by (a) a person on the train and (b) a person standing on a stationary platform as the train passes.

To a person standing on the platform, the explosion of light in the middle of the car will strike the oncoming wall before the retreating wall of the train car because the light will have less of a distance to travel. This distinction will be lost on the person on the train because the distance travelled by the reflected light will balance out the distance travelled by the initial beam of light to the walls themselves.

This makes the specific moment of the event one of two different interpretations: one of a person standing in the moving train car in which the event occurs (which will be called here “absolute” where the light hitting either oncoming or retreating walls is balanced by the reflected light to the observer to form an instantaneous event), and one for the person standing on the platform seeing the event occur from a distance on a motionless platform (which will be called here “relative,” one in which the balancing of these paths of light does not take place).

Einstein then used the Lorentz equations which had calculated the effect of this distortion and proposed that this equation could be rewritten as the famous $E = mc^2$ equation wherein an equivalence between mass and energy is postulated.

⁸⁸ I use the word “identity” because it is an idea which goes far beyond the physical sciences, and includes the “identity” of a nation state or a human being. By examining these other “identities” we may better be able to explore the operation of this fifth dimension, and better understand the universe as one of various repeating levels of identity, this being the chief position of the fifth dimension itself. Additional volumes on related topics may be found at: <http://mpira.ub.uni-muenchen.de/view/people/Albers=3AScott=3A=3A.html>

The Wikipedia article on Special Relativity provides the following discussion of the relationship between the Lorentz transformations and the $E = mc^2$ equation of Special Relativity. Additional videos may be found at: <https://www.youtube.com/watch?v=202fU9qIVK4>

In developing [special relativity](#), Einstein found that the [kinetic energy](#) of a moving body is

$$E_k = m_0(\gamma - 1)c^2 = \frac{m_0c^2}{\sqrt{1 - \frac{v^2}{c^2}}} - m_0c^2,$$

with v the [velocity](#), m_0 the rest mass, and γ the [Lorentz factor](#). He included the second term on the right to make sure that for small velocities the energy would be the same as in classical mechanics, thus satisfying the [correspondence principle](#):

$$E_k = \frac{1}{2}m_0v^2 + \dots$$

Without this second term, there would be an additional contribution in the energy when the particle is not moving. Einstein found that the [total momentum](#) of a moving particle is:

$$P = \frac{m_0v}{\sqrt{1 - \frac{v^2}{c^2}}}.$$

and it is this quantity which is conserved in collisions. The ratio of the momentum to the velocity is the [relativistic mass](#), m .

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

And the relativistic mass and the relativistic kinetic energy are related by the formula:

$$E_k = mc^2 - m_0c^2.$$

Einstein wanted to omit the unnatural second term on the right-hand side, whose only purpose is to make the energy at rest zero, and to declare that the particle has a total energy which obeys:

$$E = mc^2$$

which is a sum of the rest energy m_0c^2 and the kinetic energy. This total energy is mathematically more elegant, and fits better with the momentum in relativity. But to come to this conclusion, Einstein needed to think carefully about collisions. This expression for the energy implied that matter at rest has a huge amount of energy, and it is not clear whether this energy is physically real, or just a mathematical artifact with no physical meaning.

General Relativity

In a series of papers beginning in 1916 Einstein further developed Special Relativity by extending it to considerations of the gravitational impact of mass in a three dimensional space with an additional fourth dimension of time. This approach was done using tensor analysis.

Theodore Kaluza

In a paper published in 1919 Theodore Kaluza proposed that if the tensor equations for general relativity were re-written using a “fifth dimension” that operated only on the mathematic calculations as an undetectable “1”, that the resulting additional equations were exactly the equations given for electro-dynamics by Maxwell in 1862. This “cylindar condition” premises the impact of the fifth dimension on a central point of unity within the shell of cylindar wherein the other four dimensions are deemed to take place. Thus Einstein’s approach to gravity and Maxwell’s approach to electrodynamicism were unified in Kaluza’s approach (notably excepting quantum mechanics), but only upon the hypothesis of an additional fifth dimension which was, by definition, undetectable in any experiment.

This paper proposes that the “identity” of any object may be taken as the “fifth dimension” proposed by Kaluza. If we re-consider the idea of light taken as a constant and ultimate velocity in the universe, there is the possibility that the “identity” of the events considered in Special Relativity are built into the structure of the matter, thereby constructing a universe where the very being of mass gives to the surrounding space a form which is visible in the gravitational fields of great size.

In effect, the status of any event must be considered under two different understandings of the speed of light taken as an ultimate and constant speed. These differences may be referred to as light taken as a form of absolute motion, and secondarily as a form of relative motion.

Introduction Two.

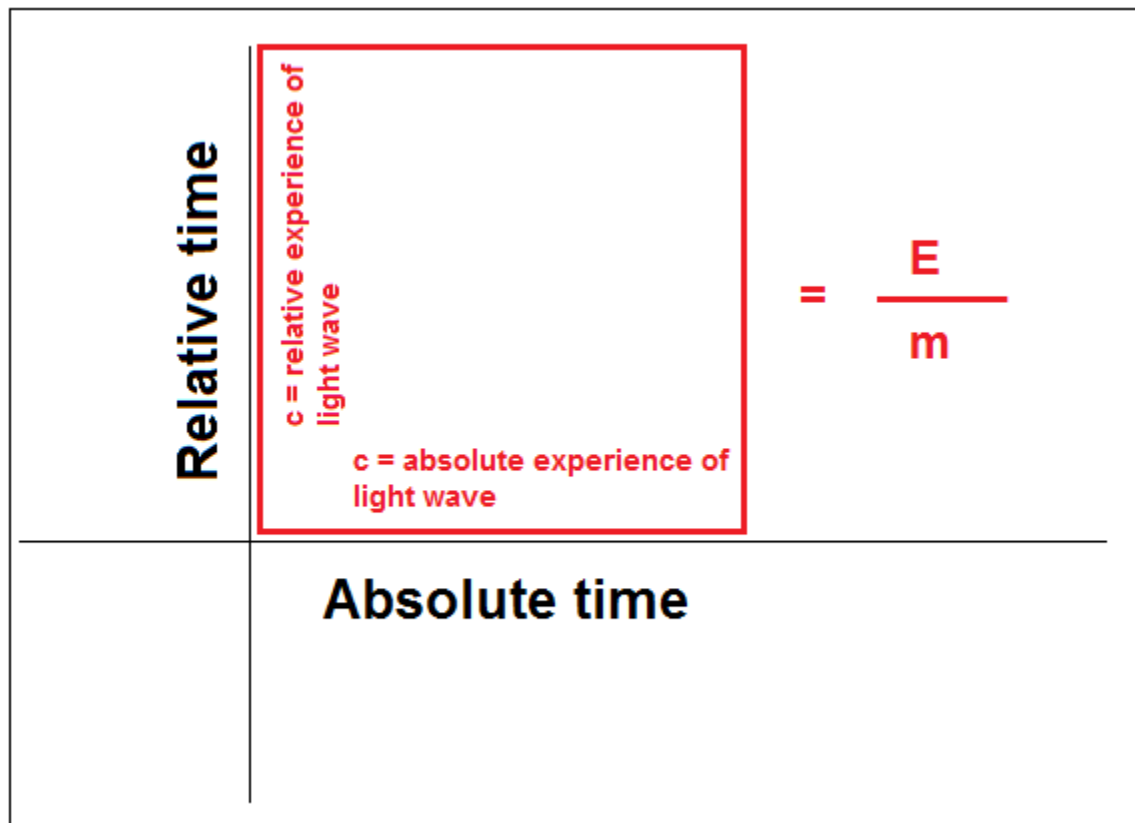
(1) Absolute Motion

If the speed of light is taken as an absolute maximum speed at which mass-energy may travel then a time dilation must take place at very high velocities. This idea of time has two components, these being (1) time as an absolute, in the sense of always a steady move forward into new events and (2) time as relative, in the sense that one can not retreat in time to a previous moment.

If we let the x axis of a sine wave represent the steady progression of time, and the y axis of the same diagram represent changes in the relative time which has passed, we may be able to devise a method whereby the $E = mc^2$ equation may be considered as

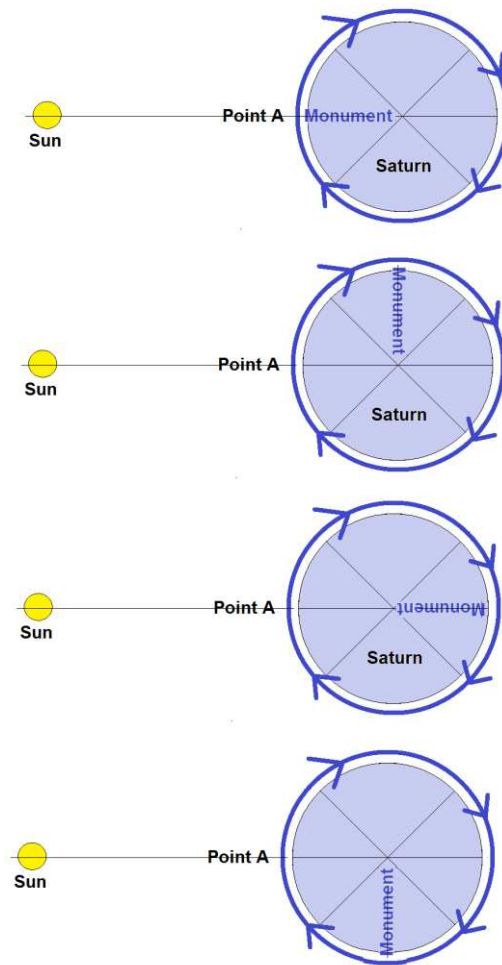
$$E/m = c^2,$$

and then this c^2 is seen as a continual field of absolute and relative time along different axes.



Viewing light as a constant might in an “absolute” sense may be compared to a consideration of the rotational motion of “A Monument” on the equator and surface of Saturn, directly between the Sun and the center of Saturn itself. For the purposes of this discussion, these three objects – the Sun, the Monument, and the Center – will be considered to be of theologic importance, eternal fixtures each of which is “immovable” in its own sense, the Sun, the Monument and the Center each taking on a resolute motionlessness comparable to that of the Great Pyramid.

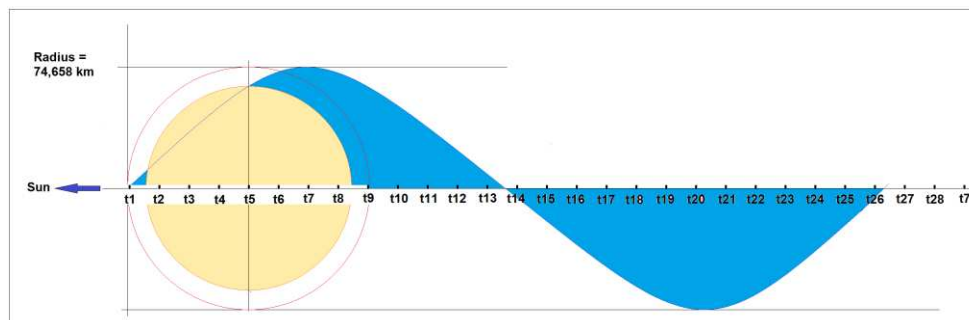
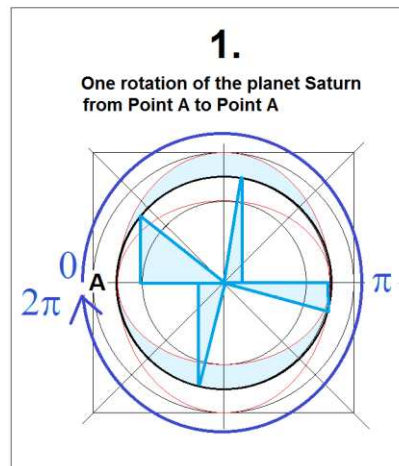
When these three are perfectly aligned in a straight line as a single “Point A” – Sun, Monument, Center – a “moment” may be deemed to have taken place. Subsequently the rotation of Saturn will create a series of points of even duration between them resulting in a continuum of sequential moments, i.e. motion along the continuum from one “Point A1,” “Point A2,” etc.



As the Monument moves clockwise from this initial first “Point A1”, it creates a single, smooth motion from the original “Point A1” to a subsequent “Point A2 ” upon its return. This set of “Point A’s” represents the separate points along a continuum, a scaffold of points along a line, each being connected to the others but independent and separate as well.

Point A1	Point A2	Point A3	Point A4	Point A5	Point A6	Point A7	Point A8	Point A9	Point A10	Point A11	Point A12
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As The Monument travels in a circle around the center of Saturn, it creates a set of trigonometric relationships vis-à-vis the Sun and the Center of Saturn. The right triangle created by the position of the Monument to its initial position and to the radius of Saturn sums as a sine curve. As the Monument moves clock-wise away from this beginning point, and then returns to this point, a sine wave is created simply by listing the full set of fractions created by this movement.



I refer to this as a model of “Absolute Motion” because the terms of the motion are fixed: the center of Saturn and the position of the Sun do not change in this illustration. The Monument alone is subject to motion, and this constant, steady, recurring motion around a fixed point yields the “absolute sine wave” mentioned above.

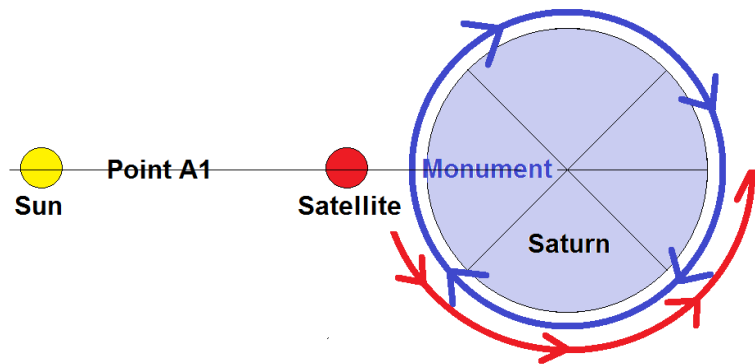
One would expect that the moment of an explosion would fall upon a single point, and from the viewpoint of the person standing on the train, this will indeed appear to be the case.

This absolute set of points will have a single point at which the explosion takes place and this single point will be the “absolute” point of the “identity” of the event.

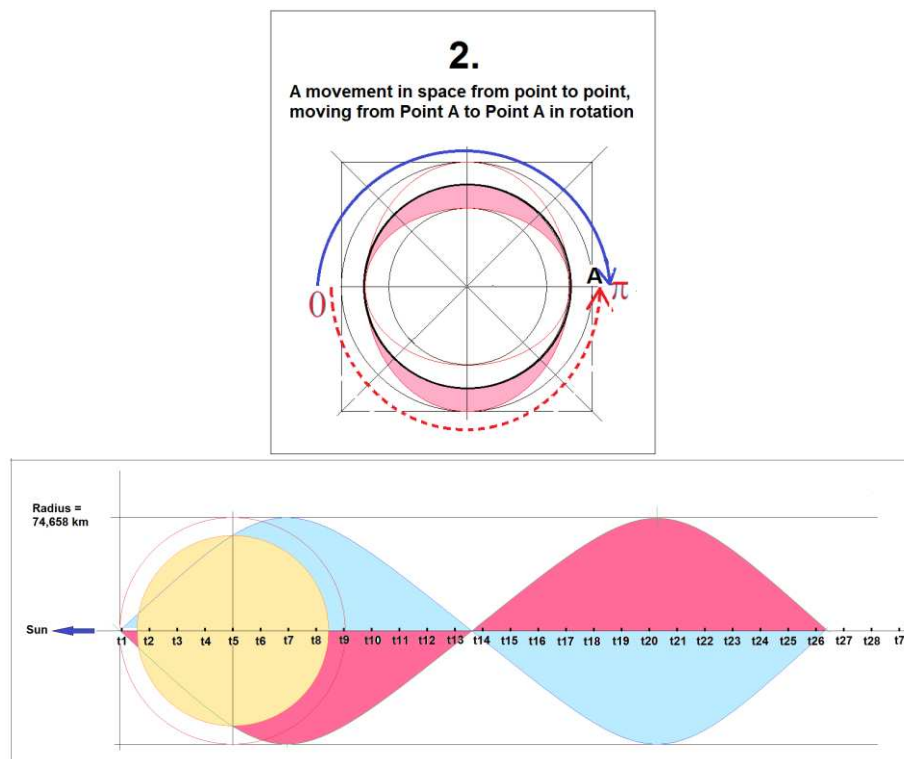
(2) Relative Motion

We may consider the interaction of this “Absolute Motion” with a “Relative Motion” if the speed with which the Monument travels around the equator of Saturn is transferred to a satellite in Saturn’s orbit, travelling in the opposite direction, and then *this Monument* is used to measure the motion of the satellite as its fixed position of reference.

(2a) Taking the Sun as a fixed point and the Center of Saturn as a second fixed point, the Satellite moves in a direction opposite the travel of the Monument.

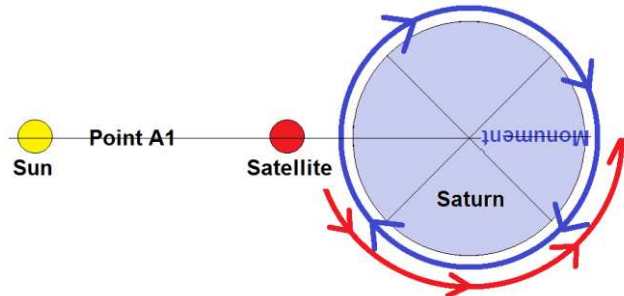


(2b) As the satellite moves counter-clockwise, it will create a negative sine wave, one which is the mirror image of the sine curve created by the Monument.

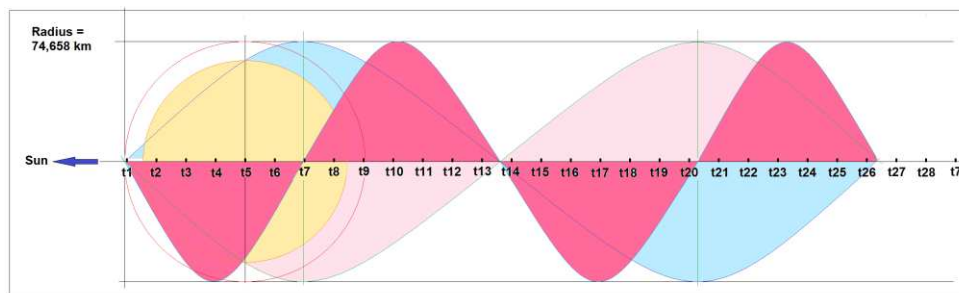
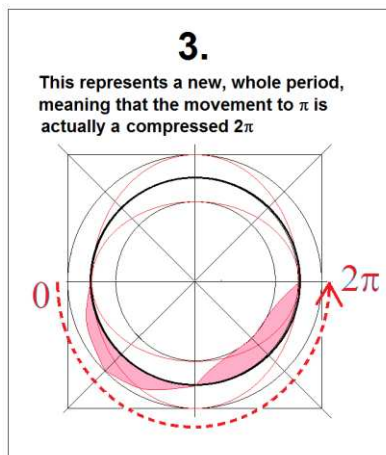


(2c) However once the Satellite reaches the place to where *the Monument* has now re-located, which is exactly 180 degrees from where it began, one half the distance has been covered as compared to the rotation of Saturn described previously.

It will be met again on the Satellites return to its original position.

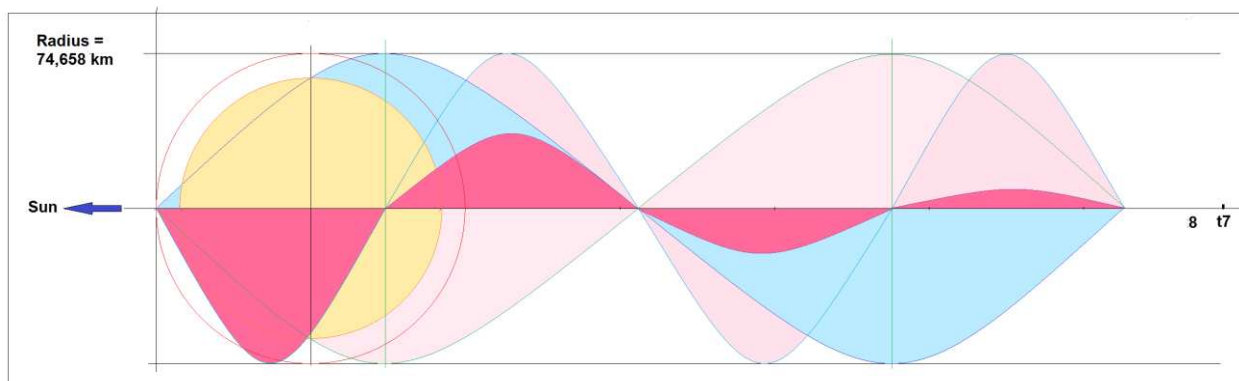
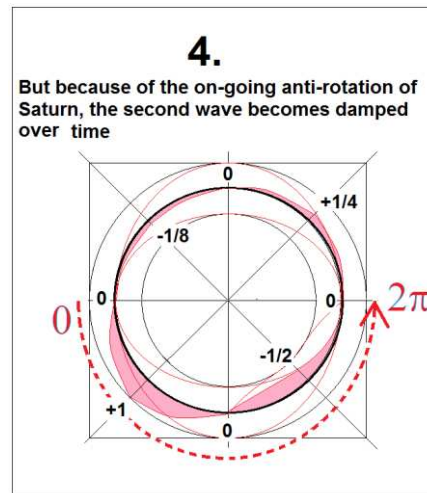


In order to accommodate this *relative* motion from the place where the Monument began to where it is now, *two* negative sine waves, each of which are one half the duration of the original sine wave, are necessary to complement the original sine curve created by the movement of the Monument.



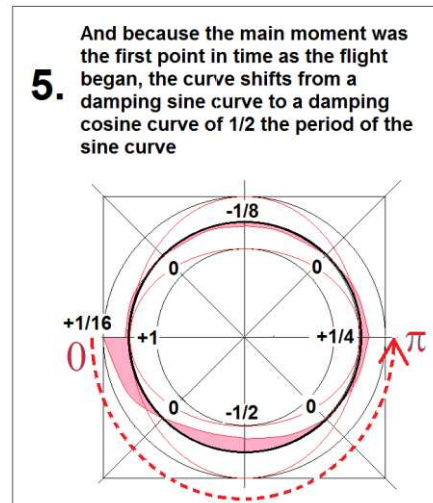
I refer to this as “Relative Motion” because, although the position of the sun and the center of Saturn remain fixed, the “point of beginning” has now altered in reference to the change *in the Monuments’s location*.

(2d) But meeting this Monument at the opposite side of Saturn means that some period of *relative time* has passed, one which is controlled by forces other than the sun and the center of Saturn. This *relative time* may be stated by using the y-axis to represent *relative motion*. This relative, time-based motion as created by the moving Monument, may be distinguished from the sine wave given earlier by damping the relative wave by half.

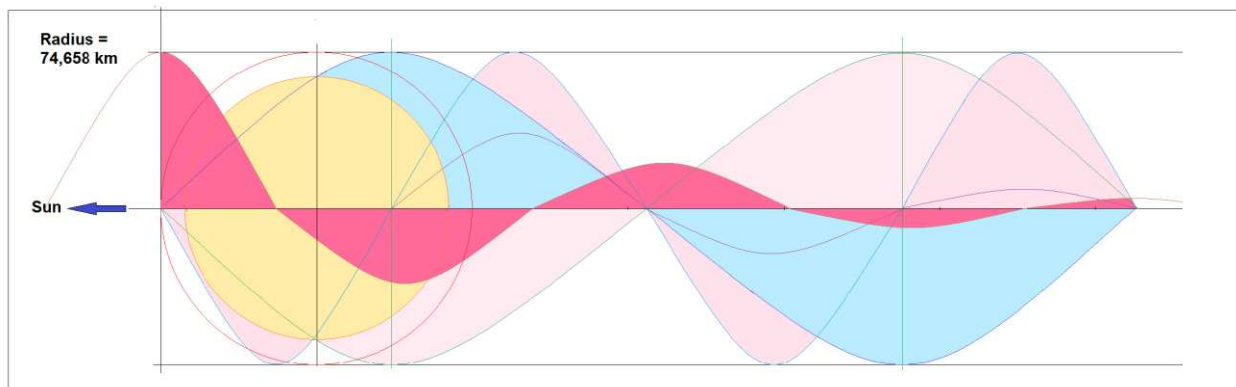


In this fashion a mathematic expression is given to the existence of the passage of the satellite back to its initial starting point, one which is verticle, rather than horizontal.

(2e) Finally, this now damping wave must begin its circuit at the number “1”, thereby permitting a beginning point of departure for the model of relative motion to take place. This creates a damping cosine curve of $\frac{1}{2}$ the period of the original sine wave, i.e. it begins a $y = +1...$



...with a period $\frac{1}{2}$ of the previous wave.



The first graph (above in blue) views the speed of light as a constant, an “Absolute Motion” because it has no reference to any motion other than its own. The speed of light, taken as a constant, creates thereby an endless stream of “Point A” moments which are in turn connected to the underlying rotation of Saturn as a single, unifying object.

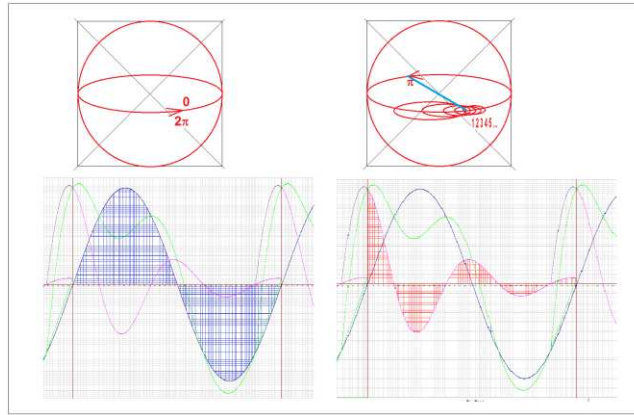
The second graph (above in red) places a “Relative Motion” before us. It denies the wave length of light an “absolute” return to the first position because it is based upon the motion of the Monument travelling around Saturn, and not the two fixed points of the Sun and the center of Saturn.

Both are necessary for a statement of the “relativistic identity” of an existing object in space.

The Architecture of the Rings of Saturn

If the energy given by any mass is $E = mc^2$, then these two different versions of the speed of light (absolute and relative) must be present in the existence in all mass, in effect combining in pure energy, but affecting mass in two interrelated ways. The squaring of this speed of light represents this combination of the two understandings of light itself ($c \times c$).

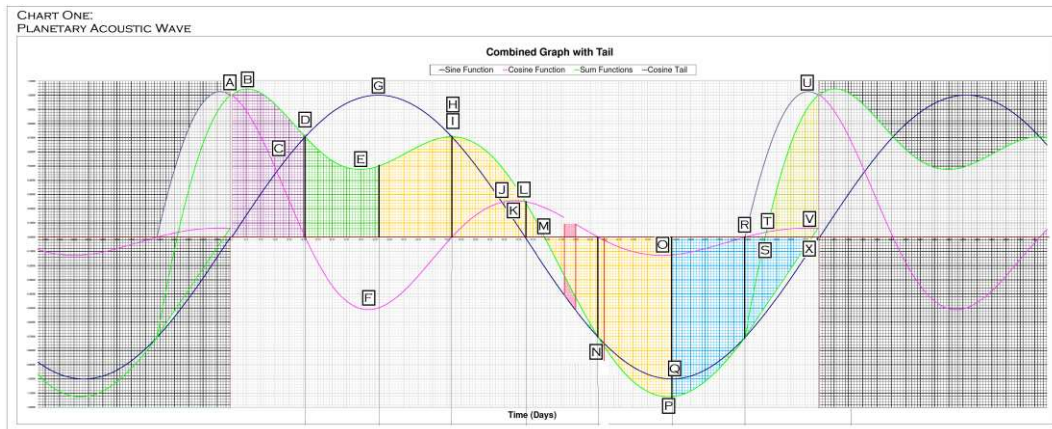
The comparison of these two approaches to motion may be graphed as follows.



The combination of these two waves results in the following equation...

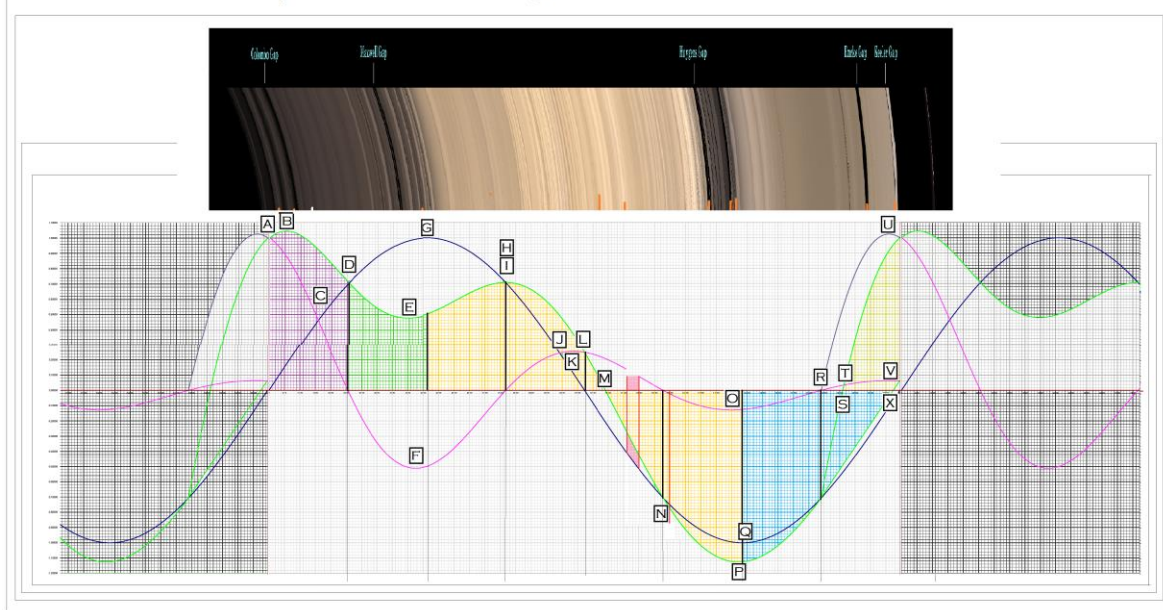
$$g(y) = \underbrace{\sin(y)}_{\text{SINE CURVE}} + 2 \underbrace{\frac{1}{2} - \frac{2\left(y + \frac{1}{4}\pi\right)}{\pi} \sin\left(2y + \frac{1}{2}\pi\right)}_{\text{DAMPING COSINE CURVE}}$$

... and the graph below:



Below is a photograph of the Rings of Saturn as contrasted with the wave previously described. In order to test this hypothesis, the “Identity Wave” was divided into 20,454 separate points, and these points were compared with the radial span of Saturn’s rings. The innermost C Ring begins at 74,658 km from the center of Saturn, and the outermost edge of the A Ring ends at 136,775 km from the center of Saturn, a radial field of 62,117 km. Each of the 20,454 points of the Identity Wave is thereby correlated with a 3 km radial span of the C, B and A Rings.

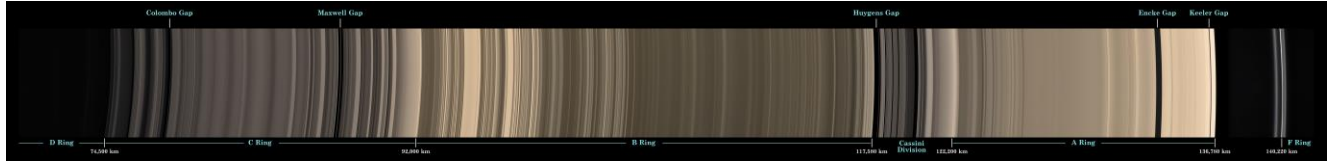
Chart 1: The "Identity" Wave and the Rings of Saturn



The question is whether there exists some way to test the accuracy of these associations which are made on the basis of visual observation alone.

Data

The Cassini project of NASA has provided measures of various features of Saturn's rings as placed in a Wikipedia article on "Rings of Saturn." This includes the following photograph...



and the following data <http://planetarynames.wr.usgs.gov/Page/Rings>. After consulting a number of sources for the radial measurement of the features of the rings the Wikipedia article on "Rings of Saturn" was found to be the most current. These are copied here:

Major subdivisions of the rings

Name ⁽³⁾	Distance from Saturn (from center, in km) ⁽⁴⁾	Width (km) ⁽⁴⁾	Named after
D Ring	66,900 – 74,510	7,500	
C Ring	74,658 – 92,000	17,500	
B Ring	92,000 – 117,580	25,500	
Cassini Division	117,580 – 122,170	4,700	Giovanni Cassini
A Ring	122,170 – 136,775	14,600	
Roche Division	136,775 – 139,380	2,600	Édouard Roche
F Ring	140,180 ⁽¹⁾	30 – 500	
Janus/Epimetheus Ring ⁽²⁾	149,000 – 154,000	5,000	Janus and Epimetheus
G Ring	166,000 – 175,000	9,000	
Methone Ring Arc ⁽²⁾	194,230	?	Methone
Anthe Ring Arc ⁽²⁾	197,665	?	Anthe
Pallene Ring ⁽²⁾	211,000 – 213,500	2,500	Pallene
E Ring	180,000 – 480,000	300,000	
Phoebe Ring	~4,000,000 – >13,000,000		Phoebe

Structures within the C Ring

Name ⁽³⁾	Distance from Saturn's center (km) ⁽⁴⁾	Width (km) ⁽⁴⁾	Named after
Colombo Gap	77,870 ⁽¹⁾	150	Giuseppe "Bepi" Colombo
Titan Ringlet	77,870 ⁽¹⁾	25	Titan , moon of Saturn
Maxwell Gap	87,491 ⁽¹⁾	270	James Clerk Maxwell
Maxwell Ringlet	87,491 ⁽¹⁾	64	James Clerk Maxwell
Bond Gap	88,700 ⁽¹⁾	30	William Cranch Bond and George Phillips Bond
1.470R_s Ringlet	88,716 ⁽¹⁾	16	its radius
1.495R_s Ringlet	90,171 ⁽¹⁾	62	its radius
Dawes Gap	90,210 ⁽¹⁾	20	William Rutter Dawes

Structures within the Cassini Division

Name ⁽³⁾	Distance from Saturn's center (km) ⁽⁴⁾	Width (km) ⁽⁴⁾	Named after
Huygens Gap	117,680 ⁽¹⁾	285–400	Christiaan Huygens
Huygens Ringlet	117,848 ⁽¹⁾	~17	Christiaan Huygens
Herschel Gap	118,234 ⁽¹⁾	102	William Herschel
Russell Gap	118,614 ⁽¹⁾	33	Henry Norris Russell
Jeffreys Gap	118,950 ⁽¹⁾	38	Harold Jeffreys
Kuiper Gap	119,405 ⁽¹⁾	3	Gerard Kuiper
Laplace Gap	119,967 ⁽¹⁾	238	Pierre-Simon Laplace
Bessel Gap	120,241 ⁽¹⁾	10	Friedrich Bessel
Barnard Gap	120,312 ⁽¹⁾	13	Edward Emerson Barnard

Structures within the A Ring

Name ⁽³⁾	Distance from Saturn's center (km) ⁽⁴⁾	Width (km) ⁽⁴⁾	Named after
Encke Gap	133,589 ⁽¹⁾	325	Johann Encke
Keeler Gap	136,505 ⁽¹⁾	35	James Keeler

These have been compared with Chapter 13, “The Structure of Saturn’s Rings” by J. E. Colwell, P. D. Nicholson, M. S. Tiscareno, C. D. Murray, R. G French, and E. A. Marouf; and Hedman, et al, 2009, at p. 232.

Method

Construction of the the “Identity Wave” begins with a sine wave with a maximum of “1” and a damping cosine wave, combined together and subdivided into 20,454 cells in an Excel spreadsheet. Each cell represents a single “moment” – referred to herein as a “day” – of $1 / 20,454^{\text{th}}$ of the sine wave generated by a single rotation of Saturn. In this paper the word “day” is used to convey this idea of a portion of this sine wave, a single moment in the wave; it is not intended to connect to a day of time in Saturn’s rotation around the sun, now a single complete rotation of Saturn on its axis.

Next to the cells representing the sine wave is constructed a damping cosine wave with a height of “1” at the y-axis, but with a period one-half of the sine wave and extending over the same length of time.

The Identity Wave is the addition of these two. Because the damping cosine wave exceeds “1” prior to its y-axis intercept, additional Excel columns were constructed to investigate the significance of this fact, both prior to and subsequent to the main period of the Identity wave. In Chart One these additional periods are placed in grey to the left and right.

The equation used to create this spreadsheet is as follows.

$$g(y) = \underbrace{\sin(y)}_{\text{SINE CURVE}} + 2 \frac{\frac{1}{2} - \frac{2\left(y + \frac{1}{4}\pi\right)}{\pi}}{\pi} \underbrace{\sin\left(2y + \frac{1}{2}\pi\right)}_{\text{DAMPING COSINE CURVE}}$$

This set of curves easily translates into a number of mathematic points of intersection, peaks, troughs, etc. These are set out in Chart One, supra. The Rings of Saturn were placed upon it in a fashion which seemed most likely to render associations between the data.

The calculations of this graphs were taken to five decimal places. Because of the long period of time and the extended Excel spreadsheet necessary to create this graph, the peaks and troughs of the graph frequently extended over periods of days. This is not unlike the features of the Rings of Saturn which have gaps varying from 10 km to 300 km.

The innermost, midpoint, and outermost points of both the Identity wave and the Rings of Saturn were determined. Multiples were then figured which would lead, in that particular case, to a perfect alignment between the features.

These multiples were then compared and placed in **bold red ink** to permit easy association between them.

It was discovered that the rotation of Saturn, and is consequently oblate shape, has much to do with this analysis of the Ring structure.

Saturn, the sixth planet in the solar system, has a polar radius of 54,364 km, an equatorial radius of 60,268 km, and a “average” of these two raddi for a radius of 57,316 km. This last is the radius of a non-rotating Saturn. The average of the non-spinning radius and the equatorial spinning radius is 58,792 km.

Saturn makes a full rotation in 10.57 hours. Taking the equatorial radius as multiplied by 2π , an equatorial circumference of 378,674 km is stated. Dividing this by 10.57 yields a speed of rotation at the equator of 35,825 km per hour, or 9.95 km/second at the equator.

A person standing on the equator of the earth (circumference = 40,075 km) is, in terms of rotation, travelling at more than 1,669 kilometers per hour. A person standing on the equator of Saturn is travelling approximately 21.5 times this speed.

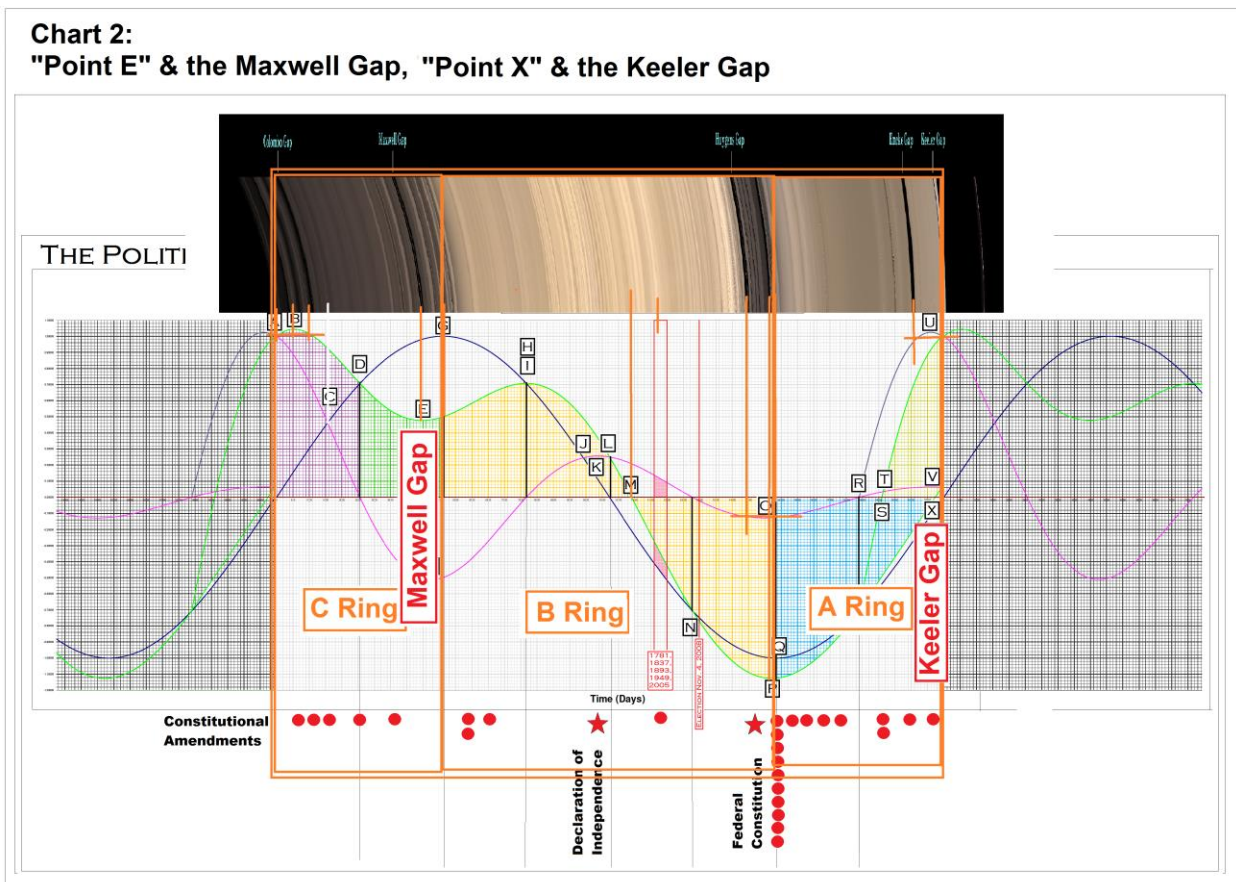
Part One. Procedure

The Maxwell Gap (Point E) and the Keeler Gap (Point X)

The Identity wave aligns with the C, B and A Rings, moving from inner to outer rings. The C Ring is generally dark, the B Ring quite bright, and the A Ring more neutral in tone. These divisions generally align with the first quarter, the middle two quarters, and the final quarter of the Identity Wave, respectively. Two possible features appeared useful in associating this “Identity Wave” directly with Saturn’s Rings.

The first of these was the Maxwell Gap. This gap appears toward the outer edge of the C Ring and is found above “Point E” of the Identity Wave.

Chart 2:
"Point E" & the Maxwell Gap, "Point X" & the Keeler Gap



Identity Wave	Point E: (First depth of the Identity wave)			
	Inner	Midpoint	Outer	
Days	4,463	4,473	4,485	22 days
Y-value	+0.47704	+0.47704	+0.47704	
Saturn Rings	Maxwell Gap:			
	Inner	Midpoint	Outer	
	87,500	87,635	87,770	270 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	12,842	12,977	13,112	
Divided by				
No. of Days	<u>4,463</u>	<u>4,473</u>	<u>4,485</u>	
	2.877	2.901	2.923	

The second feature which immediately seems pertinent is the Keeler Gap. This gap is found at the very outer edge of the A Ring, and appears to align directly with “Point X” of the Identity Wave.

Identity Wave	Point X: (The Identity wave crosses “y=0” at the end of the series)			
	Inner	Midpoint	Outer	
Days	20,246		20,247	1 day
Y-Value	-0.00009		+0.00021	
Saturn Rings	Keeler Gap:			
	Inner	Midpoint	Outer	
	136,530	136,547	136,565	35 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	61,872	61,889	61,907	
Divided by				
No. of Days	<u>20,246</u>	<u>20,246.5</u>	<u>20,247</u>	
	3.056	3.056	3.057	

It was encouraging that two prominent gaps, located approximately 50,000 kilometers apart and joined by no obvious force, were within an approximate multiples of 2.9 to 3.0 for each midpoint calculation.⁸⁹

⁸⁹ It must be added as well that the distance between the D Ring ending and the C Ring beginning (74,658 – 74,510 = 148 km), as compared to the distance between the Keeler Gap and the end of the A Ring (136,775 – 136,565 = 210 km) is but 62 km. This distance seems to be analogous in light of the mirror image of the Columbo Gap and the F Ring, and the beginning of the D Ring and the R’ point of the Damping Cosine curve, see infra. Measuring the outer edge of the A Ring to the inner edge of the C ring yields a distance of 62,117 km for the range of the main part of the rings (136,775 – 74,658 = 62,117 km), a multiple of 0.001 of the variance.

A Tuning Fork Approach

This correlation between the Maxwell Gap and the Keeler Gap permits us to use these two as a form of tuning fork for the whole array. In the preceding example we considered multiples which link two features of Saturn's Rings against the two analogous features of the Identity wave. We may also compare these features to the entire body of Saturn's Rings and the Identity wave.

Midpoint to Midpoint

The midpoint of the Maxwell Gap lies at 12,977 km from the beginning of the C Ring, and the midpoint of the Keeler Gap lies at 61,889 km of the C Ring. This means that a span of $61,889 - 12,977 = 48,912$ km lies between these two positions in the Rings of Saturn.

The midpoint of "Point E" of the Identity wave occurs at Day 4,473 and the midpoint of "Point X" occurs at Day 20,246. This means that a span of $20,246 - 4,463 = 15,783$ days lies between midpoints on the Identity wave.

$48,912 / 15,783 = 3.099$ as a multiple between these two points.

Nearest to one another

The outer edges of the Maxwell Gap lies at 13,122 km from the beginning of the C Ring, and the inner edge of the of the Keeler Gap lies at 61,872 km of the C Ring. This means that a span of $61,872 - 13,122 = 48,750$ km between these two positions in the Rings of Saturn.

The greatest point of "Point E" of the Identity wave occurs at Day 4,485 and the least point of "Point X" occurs at Day 20,246. This means that a span of $20,246 - 4,485 = 15,761$ days lies between these nearest points on the Identity wave.

$48,750 / 15,761 = 3.093$ as multiple between these two points.

Furthest from one another

The inner edge of the Maxwell Gap lies at 12,842 km from the beginning of the C Ring, and the outer edge of the Keeler Gap lies at 61,907 km of the C Ring. This means that a span of $61,907 - 12,842 = 49,065$ km lies between these two positions in the Rings of Saturn.

The least point of "Point E" of the Identity wave occurs at Day 4,463 and the greatest point of "Point X" occurs at Day 20,247. This means that a span of $20,247 - 4,463 = 15,784$ days lies between the furthest points of the Identity wave.

$49,065 / 15,784 = 3.108$ as a multiple between these two points.

Entire range

These figures might be compared to the distance between the inner edge of the C Ring (74,658 km) and the outer rim of the A Ring (137,775 km). This distance is $137,775 - 74,658 = 63,117$ km.

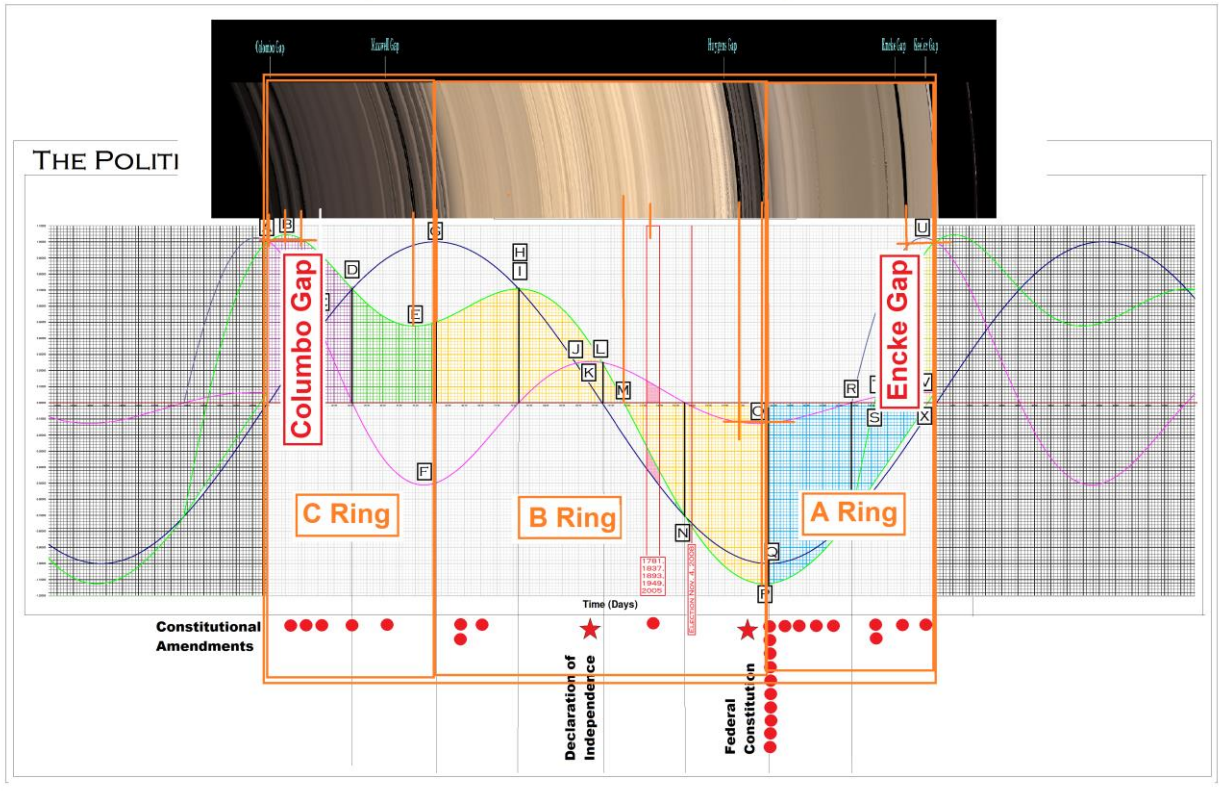
$63,117 / 20,454 = 3.085$ as a multiple between these two points.

These multiples may be kept in mind as the findings of the rest of the paper progress.

The Encke Gap (Point U') and the Colombo Gap (Point B')

It was noticed that whenever any of the waves which make up the Identity wave or the Damping Cosine Wave exceed “y = 1” a point exists to test the relationship between this wave and the Rings of Saturn. This led to an consideration of the Encke Gap (toward the outer edge of the A Ring) and the Colombo Gap (at the inner edge of the C Ring).

Chart 3:
"Point U' " & the Encke Gap, "Point B' " & the Colombo Gap



Identity Wave **Point U': (Damping Cosine curve passes “y = 1”)**

	Inner	Midpoint	Outer	
Days	19,759			1 day
Y-Value	+1.00014			

Saturn Rings **Encke Gap:**

	Inner	Midpoint	Outer	
	133,570	133,732	133,895	325 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	58,912	59,074	59,237	
Divided by				
No. of Days	<u>19,759</u>	<u>19,759</u>	<u>19,759</u>	
	2.981	2.989	2.997	

Next let us consider the Columbo Gap in the C Ring, which requires the determination of a Point B' in the Identity wave.

Identity Wave **Point B': (The Identity wave, having reached a maximum at "B" descends and crosses the "y = 1" threshold at "B'").**

	Inner	Midpoint	Outer	
Days	1,127			
Y-Value	+1.00000			1 day
Saturn Rings	Columbo Gap:			
	Inner	Midpoint	Outer	
	77,800	77,850	77,900	100 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	3,142	3,192	3,242	
Divided by				
No. of Days	<u>1,127</u>	<u>1,127</u>	<u>1,127</u>	
	2.787	2.832	2.876	

Alternative: Because these multiples are outside the range of the previous 2.9-3.0 multiple considered previously, an alternative calculation was considered as generating the Columbo Gap.

If we take the number of days from Point A (the point which begins this analysis), to Point B (the peak of the Identity wave and a date of significant crisis), and then double this range we obtain a point in time retreating from the crisis equal to the time preceding it.

In this case the peak of B occurred during days 525-540 at a upper most point of 1.04386. Innermost, midpoint and outermost points of Point B' therefore are 525 days x 2 = 1050 days; 532.5 days x 2 = 1065 days; and 540 days x 2 = 1,080 days respectively. The points of the Columbo Gap would then be divided by this number instead of the point where the Identity wave crosses the "y = 1" threshold.

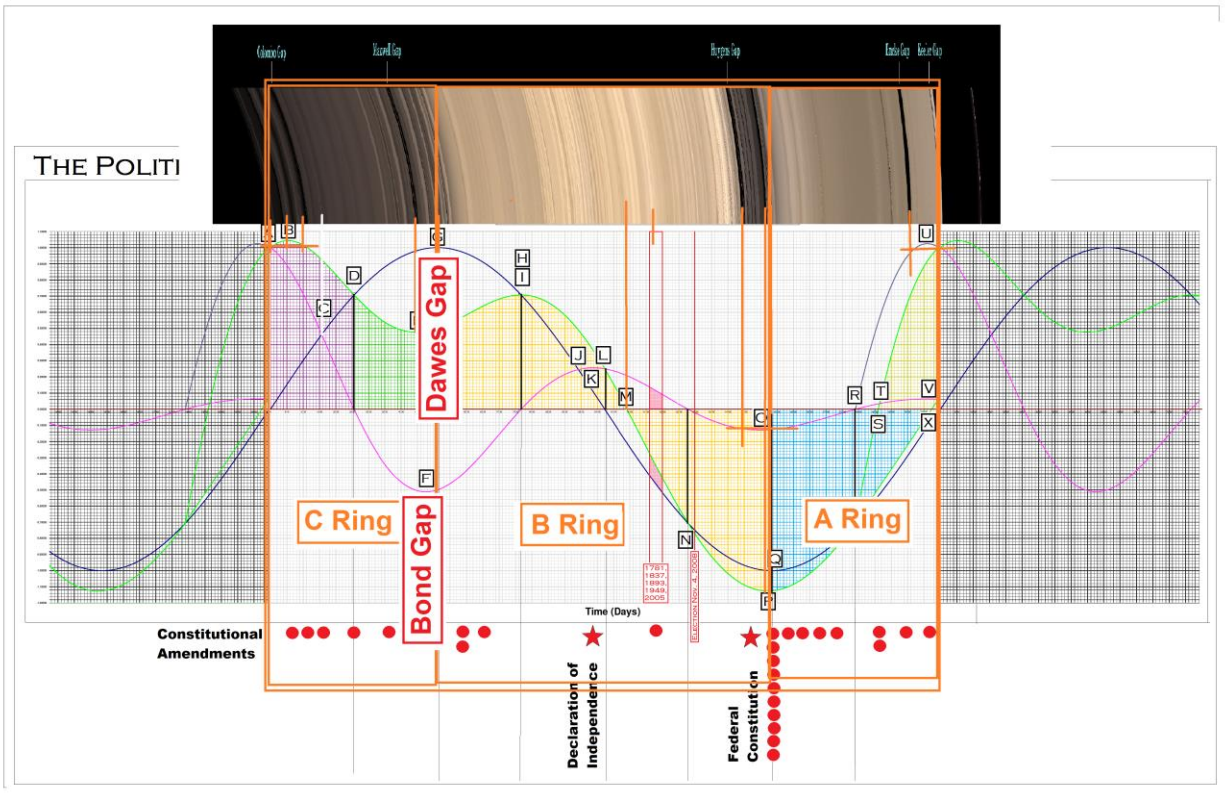
Saturn Rings	Columbo Gap:			
	Inner	Midpoint	Outer	
	77,800	77,850	77,900	100 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	3,142	3,192	3,242	
Divided by				
No. of Days	<u>1,050</u>	<u>1,065</u>	<u>1,080</u>	
	2.992	2.997	3.001	

This set of multiples is more consistent with the first set, but the "right" approach is not clear.

The Bond Gap (Point F) and the Dawes Gap (Point G)

This brought up the possibility of calculating the multiple implied in figuring the Bond Gap (as aligned with “Point F”) and the Dawes Gap (as aligned with “Point G,”) both found at the outer edge of the C Ring.

Chart 4:
"Point F" & the Bond Gap, "Point G" and the Dawes Gap



Identity Wave **Point F: (First descent of the Damping Cosine curve)**

	Inner	Midpoint	Outer	
Days	4,753	4,760	4,767	14 days
Y-Value	-0.51222			
Saturn Rings	Bond Gap:			
	Inner	Midpoint	Outer	
	88,700	88,715	88,730	30 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	14,042	14,057	14,072	
Divided by				
No. of Days	<u>4,753</u>	<u>4,760</u>	<u>4,767</u>	
	2.954	2.953	2.951	

Identity Wave	Point G: (Height of Sine curve)			
	Inner	Midpoint	Outer	
Days	5,104	5,113	5,123	19 days
Y-Value	= +1.00000			
Saturn Rings	Dawes Gap:			
	Inner	Midpoint	Outer	
	90,200	90,210	90,220	20 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	15,542	15,552	15,562	
Divided by				
No. of Days	<u>5,104</u>	<u>5,113</u>	<u>5,123</u>	
	3.045	3.041	3.037	

Initial Averages of Multiples

Simply taking the average of the figures for the Inner, Midpoint and Outer calculations so far we have:

	Inner	Midpoint	Outer
Major Gaps:			
“E” & Maxwell Gap	2.877	2.901	2.923
“X” & Keeler Gap	3.056	3.056	3.057
“B’ ” & Columbo Gap	2.787	2.832	2.876
“U’ ” & Encke Gap	2.981	2.989	2.997
“F” & Bond Gap	2.954	2.953	2.951
“G” & Dawes Gap	<u>3.045</u>	<u>3.041</u>	<u>3.037</u>
	17.7	17.772	17.841
Divided by	<u>6</u>	<u>6</u>	<u>6</u>
	2.950	2.962	2.973
compare:			
Alternative Columbo Gap	2.992	2.997	3.001
compare Maxwell Gap to Keeler Gap comparisons:			
inner Maxwell Gap to outer Keeler Gap		3.093	
midpoint Maxwell Gap to midpoint Keeler Gap		3.099	
outer Maxwell Gap to inner Keeler Gap		3.108	
compare entire system multiple:		3.085	

The Dawes Gap as an Alternative Division Line between the C Ring and the B Ring

An issue which might be raised at this juncture is the appropriate characterization of the Dawes Gap, a thin gap of but 20 km.

If the Dawes Gap was taken as the terminal outer edge of the C Ring and the beginning edge of the B Ring, we would have a clear separation of the C Ring from the B Ring at Point G, i.e. the height of the Sine Curve.

At present the B Ring is deemed to begin at 92,000 km from the center of Saturn, or $92,000 - 74,658 = 17,342$ km after the beginning of the C Ring. The midpoint of “Point G” is Day 5113. Dividing $17,342 / 5113 = 3.3917$, a multiple quite out of line with the association of “Point G” with the present denomination of the beginning of the B Ring.

Conversely the Dawes Gap presents a very clear possible alternative at 90,210 km from the center of Saturn, or 15,552 km from the beginning of the C Ring. The midpoint multiple for this association was **3.041**, a number much closer to the other multiples.

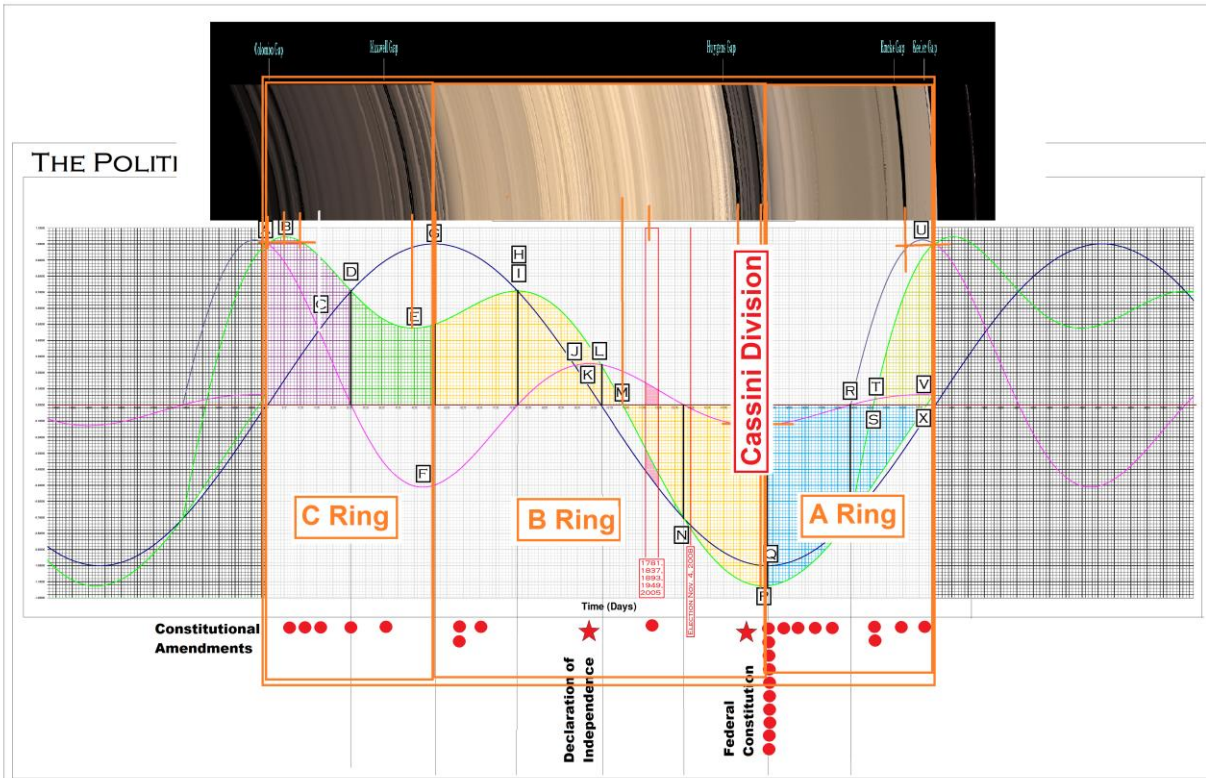
If there is no obvious reason that the next 1,790 km of the C Ring past the Dawes Gap to be designated as part of the B Ring, this alternative might be considered.

This matter will be raised again with “Point Q” and the Barnard Gap. The midpoint of the Barnard Gap is found at 120,305 km from the center of Saturn, or 45,647 km from the inner edge of the C Ring. The midpoint for the PE wave “Point Q” is Day 15,340 for a multiple of **2.975**. This is another thin gap of 13 km, found at the depth of the Sine Curve.

The Cassini Division

This brought forward an investigation of the Cassini Division. Notice first that each of the three waves which are considered – the Sine curve, the Damping Cosine curve and the Identity wave – (1) are negative, (2) are relatively flat for long periods of time, and (3) are not synchronous to one another. This means that a large number of days is necessary to actually chart the curve at these points. This means as well that each of the curves reach their deepest negative values at different points in time.

**Chart 5:
The Cassini Division**



Saturn Rings	Cassini Division:			
	Inner	Midpoint	Outer	
	117,500	119,835	122,170	4,670 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	42,842	45,177	47,512	

There are two Gaps within the Cassini Division which exceed 200 km. These are (1) the Huygens Gap (400 km) and (2) the Laplace Gap (238 km). The full set of Gaps is as follows, with the possible associations to the Political Economy wave.

End present B Ring 117,580 km
Cassini Division:

Name(3)		Distance from Saturn's center (km)(4)	Width (km)
Point O	Huygens Gap	117,680 (1)	285–400
	Huygens Ringlet	117,848 (1)	~17
Point O?	Herschel Gap	118,234 (1)	102
	Russell Gap	118,614 (1)	33
	Jeffreys Gap	118,950 (1)	38
	Kuiper Gap	119,405 (1)	3
Point P	Laplace Gap	119,967 (1)	238
	Bessel Gap	120,241 (1)	10
Point Q	Barnard Gap	120,312 (1)	13

Begin present A Ring 122,170 km

Identity Wave	Point O: (Second depth of Damping Cosine curve)			
	Inner	Midpoint	Outer	
Days	14,968	14,987	15006	38 days
Y-Value	-0.12805	-0.12805(*)	-0.12805	
Saturn Rings	Huygens Gap: (within Cassini Division)			
	Inner	Midpoint	Outer	
	117,680	117,880	118,080	400 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	43,022	43,222	43,422	
Divided by				
No. of Days	<u>14,968</u>	<u>14,987</u>	<u>15,006</u>	
	2.874	2.883	2.893	
Saturn Rings	Herschel Gap: (within Cassini Division)			
	Inner	Midpoint	Outer	
	118,234	118,285	118,336	102 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	43,576	43,627	43,678	
Divided by				
No. of Days	<u>14,968</u>	<u>14,987</u>	<u>15,006</u>	
	2.911	2.910	2.910	

Identity Wave	Point P: (greatest depth of Identity wave)			
	Inner	Midpoint	Outer	
Days	15,199	15,200	15,202	3 days
Y-Value	-1.12600	-1.12600	-1.12600	
Saturn Rings	Laplace Gap: (within Cassini Division)			
	Inner	Midpoint	Outer	
	119,848	119,967	120,086	238 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	45,190	45,309	45,428	
Divided by				
No. of Days	<u>15,199</u>	<u>15,200</u>	<u>15,202</u>	
	2.973	2.980	2.988	

The Cassini Division: the Dividing Line between the B Ring and the A Ring (Point Q)

Point Q might easily be associated with the present line dividing the B Ring from the A ring at 122,170 km. In this case the multiple necessary for a perfect alignment between the two is between 3.095 and 3.099.

Identity Wave	Point Q: (Depth of Sine curve)			
	Inner	Midpoint	Outer	
Days	15,331	15,340	15,350	19 days
Y-Value	-1.00000	-1.00000	-1.00000	
Saturn Rings	Begin "A Ring"			
	Inner	Midpoint	Outer	
	122,170	122,170	122,170	
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	47,512	47,512	47,512	
Divided by				
No. of Days	<u>15,331</u>	<u>15,340</u>	<u>15,350</u>	
	3.099	3.097	3.095	

The Barnard Gap as an Alternative Division Line between the B Ring and the A Ring

While the above set of multiples is within the range of those we have come across, there is at least one other possibility. “Point Q,” the depth of the Sine Curve, is in a similar position to “Point G” and the Dawes Gap at the height of the Sine Curve. If the midpoint of “Point Q,” which is 15,340 days, would be associated with the Barnard Gap at 120,305 km from the center of Saturn (1865 km prior to the existing demarcation for the A Ring) the following calculation would apply:

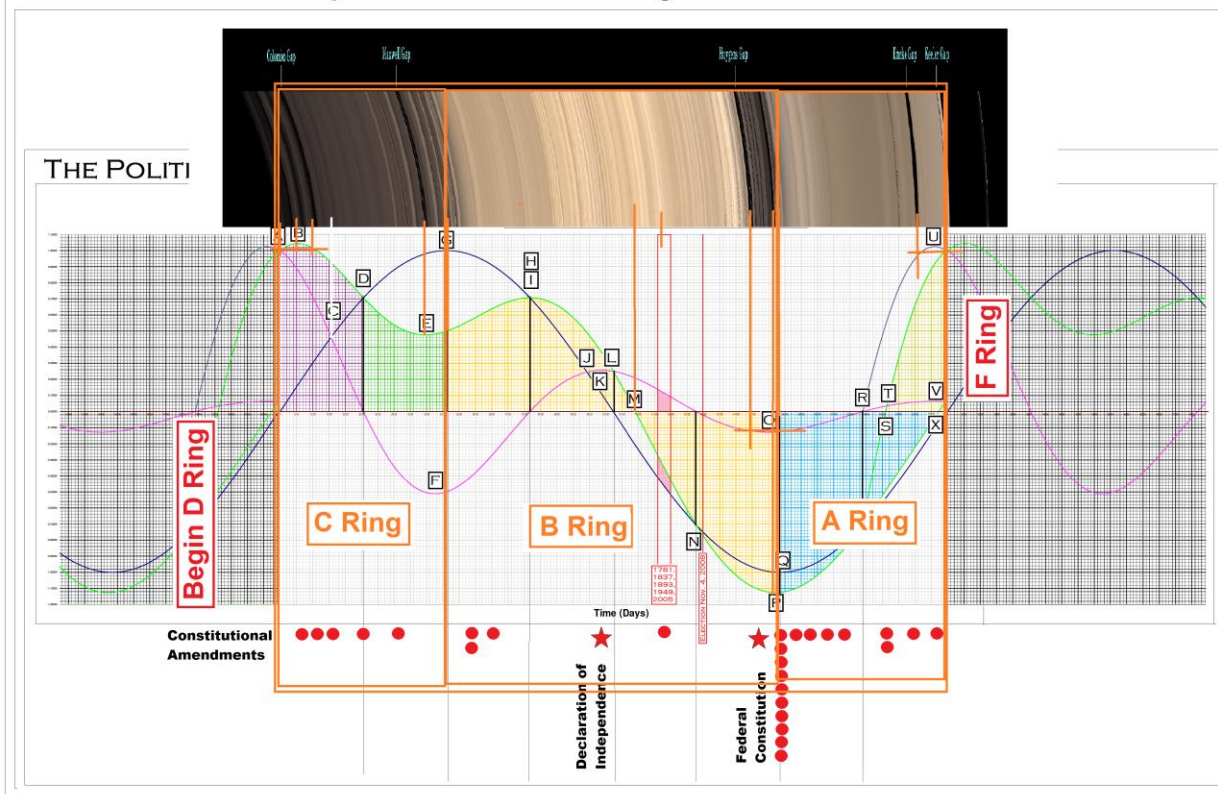
Identity Wave	Point Q: (Depth of Sine curve)			
	Inner	Midpoint	Outer	
Days	15,331	15,340	15,350	19 days
Y-Value	-1.00000	-1.00000	-1.00000	
Saturn Rings	Barnard Gap:			
	Inner	Midpoint	Outer	
	120,312	120,318	120,325	13 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	45,654	45,660	45,667	
Divided by				
No. of Days	<u>15,331</u>	<u>15,340</u>	<u>15,350</u>	
	2.977	2.976	2.975	

This second multiple is more typical of those we have seen. There are, moreover, several considerations which might be made in favor of using the Dawes Gap as the dividing line between the B Ring and the A Ring. See “Clues as to Causation,” *infra*.

The Prelude and Postlude Rings: Rings D (Point R') and F (Point B'')

The foregoing considerations led to the possibility that the D Ring and the F Ring might be part of an extension of this model, as would be required to fully state the model itself.

Chart 6:
"Point R' " & the D Ring, "Point B' " & the F Ring



As to the beginning of the D Ring, “Point R” and “Point S”, taken from the middle of the A Ring, stood out as possibilities.

“Point R,” which is the beginning point of the Damping Cosine wave as it leaves the x-axis and makes its way to the beginning “Point A” of the entire series, could be taken as the beginning point of the D Ring. To do this we simply figuring its distance to the end of the cycle, and then take this distance as preceding “Point A,” which begins the Identity wave. This gives us a simple way to work backwards to a new point of consideration, “Point R’ ”.

“Point S,” which is the point at which the Identity wave crosses the x-axis and makes its way to Point A, could also be taken as the beginning point of the D Ring, by the same method.

These occur as single points crossing the X-axis at “Point R” = 17,898 and “Point S” = 18,602. From these numbers we may subtract the length of the entire series, 20,454 days. This gives us Point R’ ” = -2556 and “Point S’ ” = -1852 respectively.

The D Ring commences at 66,900 km. The C Ring commences at 74,658 km. This gives the measured distance of the D Ring at 74,658 – 66,900 = 7,758 km.

We begin with the fact that the D Ring commences $74,658 - 66,900 = 7,758$ km prior to the C Ring.

	Point R' precedes:		Point S' precedes:
	7,758		7,758
divided by number of days			
which "Point R" or "Point S"			
"Point A"	<u>2,556</u>	vs.	<u>1,852</u>
	3.035		4.188

Considering consistency with the rest of the multiples, it would appear that the D Ring is a manifestation of "Point R' ", the Damping Cosine wave as it leaves the X-axis at "y = 0" to join the Y-axis in this model at "Point A".

As to the F Ring, the most obvious guess is that it is a repetition of the B' Columbo Gap. This Gap appeared when the Identity wave returned to a value of "1", after exceeding it at Point B. This occurred on Day 1,127. (See similar discussion of the Encke Gap, *supra*.)

The F Ring occurs between 140,224 km and 140,724 km of the center of Saturn.

Identity Wave Point B'': (PE wave is less than "y = 1")				
	Inner	Midpoint	Outer	
Days	20,454	20,454	20,454	
	<u>+1,127</u>	<u>+1,127</u>	<u>+1,127</u>	
	21,581	21,581	21,581	1 day
Y-Value	-1.00000	-1.00000	-1.00000	
Saturn Rings F Ring: (Extension of a new descent to "1".)				
	Inner	Midpoint	Outer	
	140,224	140,494	140,724	500 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	65,566	65,836	66,066	
Divided by				
No. of Days	<u>21,581</u>	<u>21,581</u>	<u>21,581</u>	
	3.038	3.050	3.061	
Using the "Alternative Approach to the Columbo Gap" we have a different point of comparison, i.e. an equivalent number of days both before and after the Identity wave reaches "Point B". In this case the 20,454 days would have added to previous days, i.e. 1,050 , 1,065 and 1,080 for inner, midpoint and outermost points respectively. Notice that because we have added an entire cycle of 20,454 days and the collective span of the C, B and A rings, these multiples are virtually identical to those above. This operation has the effect of making the F Ring (width = 500 km) the mirror image of the Columbo Gap (width = 100 km).				
Identity Wave Point B'': (Depth of sine curve)				
	Inner	Midpoint	Outer	
Days	20,454	20,454	20,454	
	<u>+1,050</u>	<u>+1,065</u>	<u>+1,080</u>	
	21,504	21,519	21,534	1 day
Y-Value	-1.00000	-1.00000	-1.00000	
Saturn Rings F Ring: (Extension of a new descent to "1".)				
	Inner	Midpoint	Outer	
	140,224	140,494	140,724	500 km
Minus				
Inner C Ring	<u>74,658</u>	<u>74,658</u>	<u>74,658</u>	
	65,566	65,836	66,066	
Divided by				
No. of Days	<u>21,504</u>	<u>21,519</u>	<u>21,534</u>	
	3.049	3.059	3.067	

Summary of Multiples

The collected average multiples to form a perfect alignment with this model are as follows. One can see that on average each day of this model (out of 20,454) equates with between 2.950 and 3.046 kilometers of distance in the radial span of Saturn's Rings. Taking the midpoint between these two extremes we have a general multiple of 3.005 with an average 3.2% variance from this midpoint.

	Inner	Midpoint	Outer
Major Gaps:			
"E" & Maxwell Gap	2.877	2.901	2.923
"X" & Keeler Gap	3.056	3.056	3.057
"B' " & Columbo Gap	2.787	2.832	2.876
"U' " & Encke Gap	2.981	2.989	2.997
"F" & Bond Gap	2.954	2.953	2.951
"G" & Dawes Gap	<u>3.045</u>	<u>3.041</u>	<u>3.037</u>
	17.7	17.772	17.841
Divided by	<u>6</u>	<u>6</u>	<u>6</u>
	2.950	2.962	2.973
Cassini Division:			
"O" & Huygens Gap	2.874	2.883	2.893
"P" & Laplace Gap	2.973	2.980	2.988
"Q" & Begin A Ring	<u>3.099</u>	<u>3.097</u>	<u>3.095</u>
	8.946	8.960	8.976
Divided by	<u>3</u>	<u>3</u>	<u>3</u>
	2.982	2.986	2.992
External Rings:			
"S' " and D Ring begins	3.032	3.032	3.032
"B' ' " and F Ring	<u>3.038</u>	<u>3.050</u>	<u>3.061</u>
	6.070	6.082	6.093
Divided by	<u>2</u>	<u>2</u>	<u>2</u>
	3.035	3.041	3.046
compare:			
Alternative Columbo Gap	2.992	2.997	3.001
Alternative F Ring	3.049	3.059	3.067
compare:			
Dawes Gap as beginning of B Ring at "Point G":		3.045	
Barnard Gap as beginning of A Ring at "Point Q"		2.976	

Arranging these in sequence, from the beginning of the D Ring to the end of the F Ring, we have the following

	Inner	Midpoint	Outer
“R’ ” and D Ring begins	3.035	3.035	3.035
“B’ ” & Columbo Gap	2.787	2.832	2.876
Alternative Columbo Gap	2.992	2.997	3.001
“E” & Maxwell Gap	2.877	2.901	2.923
“F” & Bond Gap	2.954	2.953	2.951
“G” & Dawes Gap	3.045	3.041	3.037
“G” & Dawes Gap begin B Ring	3.045	3.045	3.045
“O” & Huygens Gap	2.874	2.883	2.893
“P” & Laplace Gap	2.973	2.980	2.988
“Q” & Barnard Gap begin A Ring	2.975	2.976	2.977
“U’ ” & Encke Gap	2.981	2.989	2.997
“X” & Keeler Gap	3.056	3.056	3.057
“B’ ’ ” and F Ring	3.038	3.050	3.061
Alternative F Ring	3.049	3.059	3.067
as contrasted with:			
“G” begin B Ring		3.391	
“Q” begin A Ring	3.099	3.097	3.095

The least multiple above is 2.787 and the greatest is 3.067, excluding the “G” and “Q” figures which are not associated with the suggested beginnings of the B Ring and the A Ring. Their average is 2.927 with approximately 5% spread either way in multiples.

Several explanations may be given for the lack of complete uniformity. These include:

(1) the rings may be in the process of evolution and although “anchored” by the locations they are still subject to fluctuation;

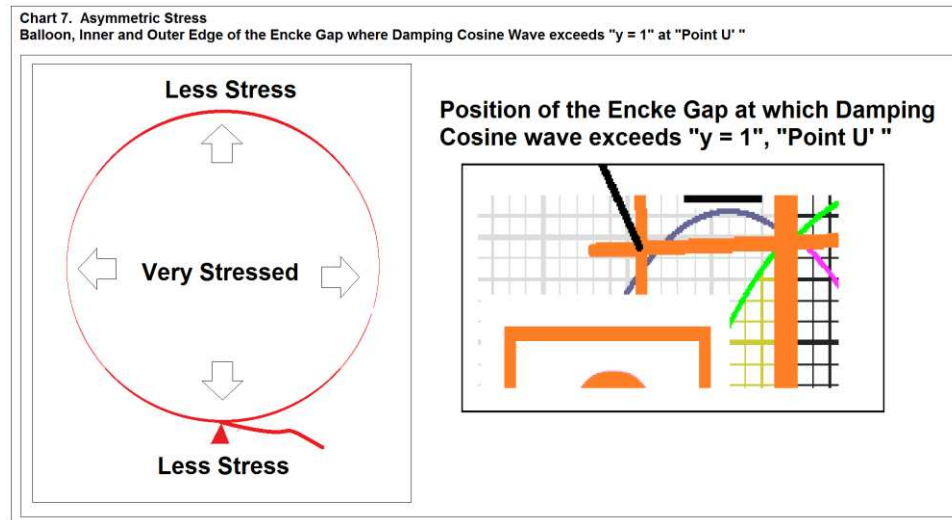
(2) the rings themselves may not be stationary and therefore remain affected by outside influences, including the stability of the other rings; and

(3) the data may be incomplete.

Part Two: Clues as to Causation

Given the close range within which these multiples occur, one may suggest that a possible form of causation for these gaps might be a “tearing” of the fabric of “identity,” resulting in asymmetric points of stress. For example, if a globe-shaped balloon is marked with similar lines in ink, the equatorial circumference will be far more stretched than the polar circumference. Moreover the side of the circumference nearest the equator will be more obviously stretched than the more relaxed side closest to the pole.

The following photographs of the inner and outer edge of the Encke Gap may support this proposition. The inner edge of the Encke Gap appears to be far more stressed and torn than the outer edge, given the nature of the stress placed upon it.



This differentiation between the inner and outer edges of the Encke Gap is below.

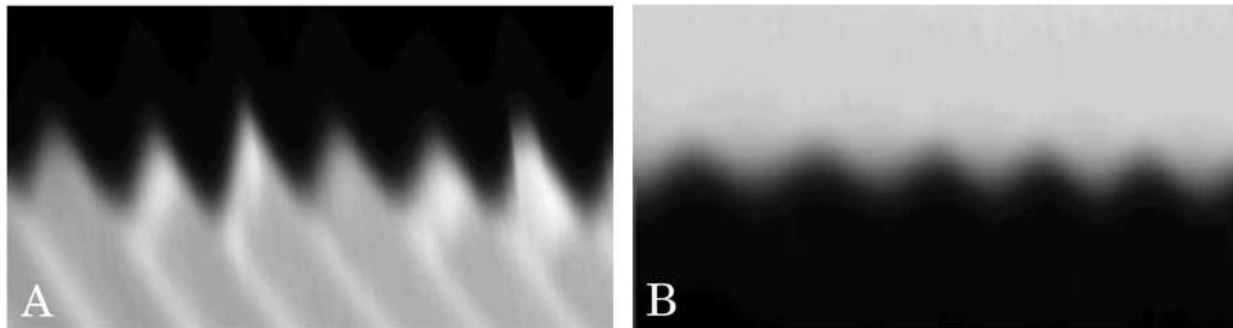


Fig. 9. Encke Gap. (A) Inner and (B) outer edges of the Encke gap as seen in Fig. 7C, mapped into a longitude-radius system, enhanced in contrast and brightness and radially stretched by a factor of 20.

As taken from p. 1235, Porco, c. et al, (2004) “Cassini Imaging Science: Initial Results on Saturn’s Rings and Small Satellites,” 22 February 2005, Vol. 307, Science, www.sciencemag.org, and <http://www.ciclops.org/sci/docs/RingsSatsPaper.pdf> pp. 1234-1236. Public Domain.

As to these strange gap edges of the Encke Gap, let us consider three points.

1. If the Dawes Gap is taken to be the endpoint of the C Ring and the beginning point of the B Ring, then it is significant that the Bond Gap precedes it in relation to Saturn.
2. Similarly if the Barnard Gap is taken to be the endpoint of the B Ring and the beginning of the A Ring, then it is significant that the Cassini Division precedes it with eight gaps preceding the Barnard Gap.
3. Another important consistency arguing in favor of using the Dawes Gap and the Barnard Gaps as demarcation for the beginning and the end of the B Ring is that, besides being preceded by closely associated gaps, no gaps follow them subsequently, at least not in close proximity.

Stress and “Identity”

These prior gaps, coming just before the +1 and -1 of the Sine Wave, suggest that the stress originates with Saturn. In short, the tearing of the fabric of the identity of Saturn, has an origin, and it is Saturn itself.

Moreover there is a significant distinction between the stress placed upon the rings as between the Sine wave and the Damping Cosine wave. As can be seen below, the Sine wave brings about relatively minor tears (the Dawes Gap of 20 km and the Barnard Gap of 13 km) while the Damping Cosine wave, or its combination in the Identity wave, initiates quite severe tears. These distances are as follows.

Begin C Ring	Damping Cosine wave hits Y axis, Sine = 0	
Columbo Gap	PE wave “Point B’ ”	150 km
Maxwell Gap	PE wave “Point E,” first trough	220 km
Bond Gap	Damping Cosine wave, “Point F,” first trough	30 km
Huygens Gap	Damping Cosine wave, “Point O,” second trough	285 - 400 km
Herschel Gap	Second Depth of Damping Cosine curve	102 km
Laplace Gap	Greatest Depth of PE wave	238 km
Encke Gap	Damping Cosine exceeds “y = 1”, “Point U’ ”	325 km
Keeler Gap	PE wave crosses “y = 0”, “Point X”	35 km

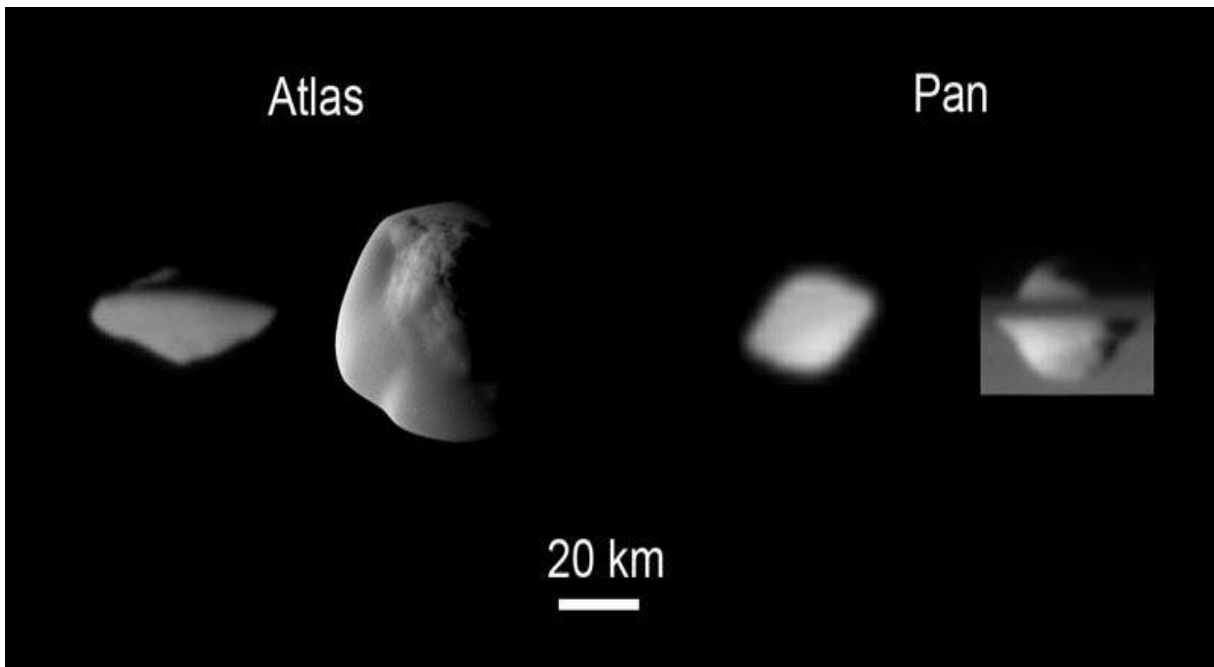
as opposed to:

Dawes Gap	Sine wave = +1	20 km
Barnard Gap ⁹⁰	Sine wave = -1	13 km

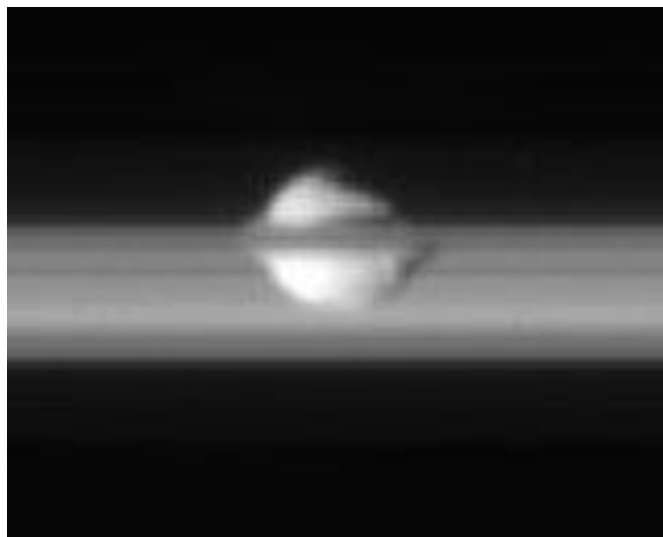
⁹⁰ Recall that the inner edge of the Huygens Gap is the outer edge of the B Ring, as presently understood. See Hedman (2009). “The Barnard Gap inner edge is a special case because it is the only inner edge of a gap in the Cassini Division besides the B-ring edge that cannot be fit to a simple eccentric model. All the other non-circular, non-eccentric edges are either on ringlets within the gaps (Herschel and Laplace) or at the outer edges of gaps containing such ringlets (Huygens and Herschel). Furthermore, the mean radius of the Barnard Gap’s inner edge is 120,304 km, which is very close to the predicted location of the Prometheus 5:4 inner Lindblad resonance (ILR) at 120,303.7 km.”

If the gaps of the Rings of Saturn are caused by stresses in the fifth dimension, Pan's behavior is likely more akin to a marble rolling in the track of tree bark, a small ball of contiguous matter falling into Saturn's gravitational pull yet remaining whole based upon its electrodynamic integrity, caught in the cracks between blocks of concrete sidewalk.

As the stresses which create these rings operate upon what may have been a bubble of lava within a hardened shell, weaknesses were created in alignment with the plane, and the lava oozed out forming a disk parallel to the plane itself. One can see the effects of Saturn's equator "tearing" at both Pan in the Encke Gap as it aligns with the A Ring.



in the Public Domain, see http://www.nasa.gov/mission_pages/cassini/multimedia/pia08405.html



in the Public Domain, see http://commons.wikimedia.org/wiki/File:Pan_side_view.jpg

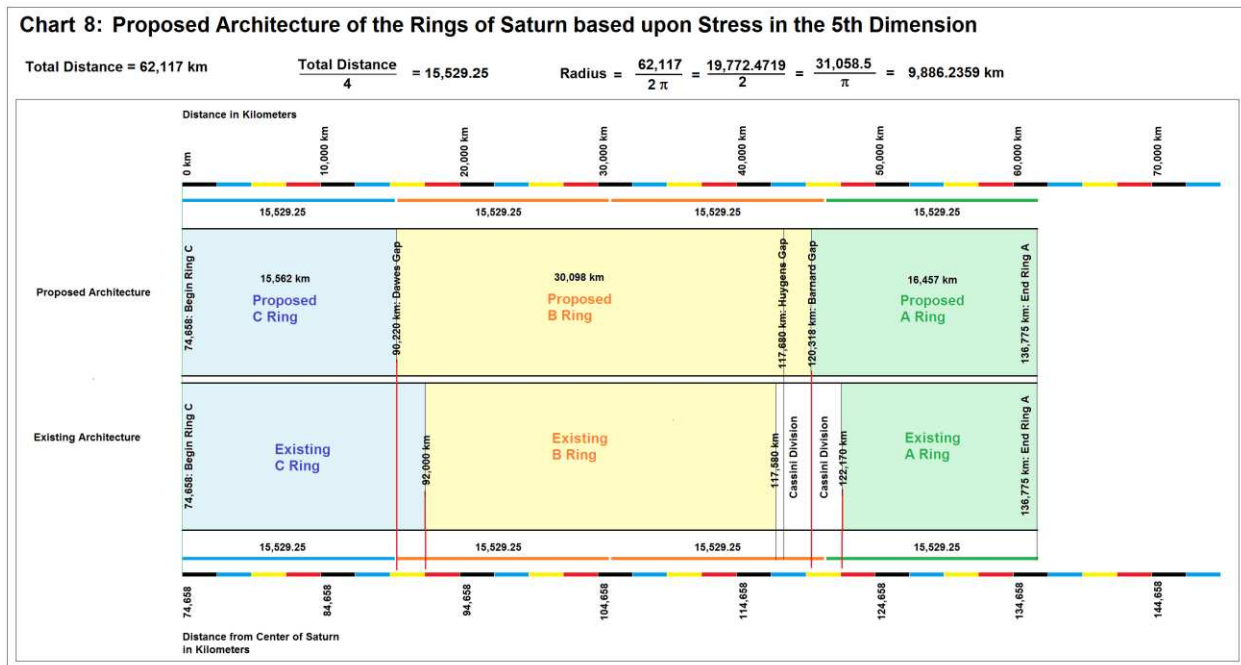
Part Three: A New Arrangement of the Rings

The following Chart 8 displays the differences in interpretation of the data as to the proposed and existing architecture of the Rings of Saturn.

The B Ring is extended toward Saturn, beginning with the Dawes Gap.

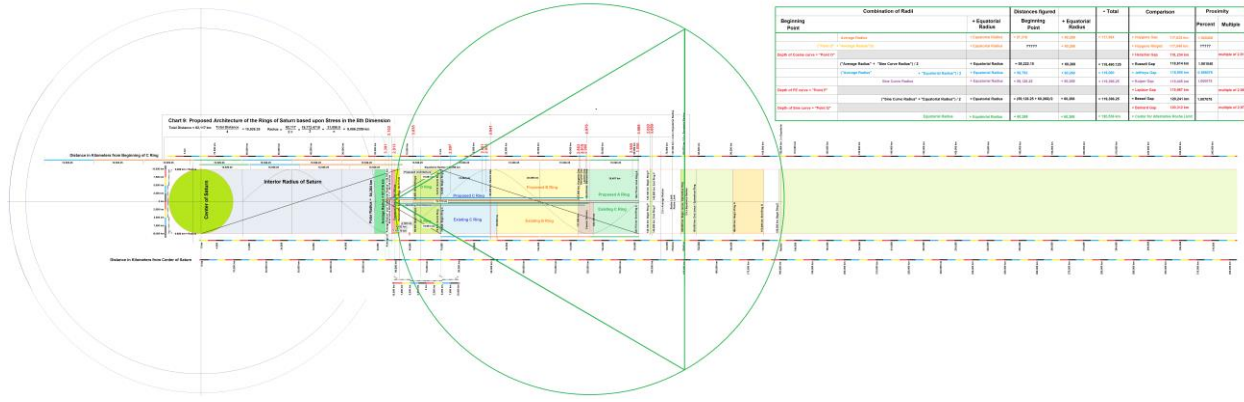
The Proposed Architecture eliminates the existing demarcations for the “Cassini Division” as a separate group. In its place the series of eight gaps are placed at the end of the B Ring as a formal subdivision of the B Ring, and a formal division between the B Ring and the A Ring declared at the Barnard Gap.

Similarly the alignment of the B Ring with the two most wide-apart gaps in the series aligns the B Ring virtually exactly with the sine curve of the Identity wave. This division is indicated by the two orange horizontal lines above the B Ring, as distinguished from the first quarter of the sine curve, indicated by a horizontal line in blue; and by the fourth quarter of the sine curve, indicated by a horizontal line in green.



Seven Rules for the Construction of Saturn's Rings and Gaps

Taking the foregoing into consideration the remaining gaps in the Rings of Saturn were drawn carefully on a map of the rings.



The first horizontal scale toward the top of the chart is marked in units of 10,000 km; it begins at the innermost point of the C Ring, as the “ $x = 0$ ” origin of the scale in both a positive (away from the center of Saturn) and negative direction (toward the center of Saturn). Each small colored rectangle in the sequence – black, blue, yellow, red –indicates a unit of 2,500 km.

The second horizontal scale begins with the center of Saturn, but makes its major notation marks in units of 10,000 km beginning with $74,658 - 70,000 = 4,658$ km. The reason for this is to aid in finding more quickly the placement of any point in the rings from the innermost point of the C Ring at 74,658 km.

The third horizontal scale begins with the center of Saturn, and marks the distance from this central point in the typical fashion, uniformly positive and moving away from the center of Saturn, in units of 10,000 km.

In addition, two sine curves are charted, one using the dimensions of the Identity wave as they move toward the center of Saturn, the other using the same dimensions as they begin at the center of Saturn and move outward. These assist in locating points which might be important in our understanding of the dynamics underlying the Rings of Saturn.

Toward the upper right of the chart each of the eight gaps of the Cassini Division is interpreted as resulting from the methods employed in this paper. The proximity between these estimates and the existing data is given in the multiples necessary to give the adjustment. These multiples fall within a range of between 0.999 to 1.007 of the values given by NASA.

It was found that the radius of Saturn has an important impact upon the gaps, both as a structure and as individual features of the rings. There are three definitions of “radius” which will apply to this analysis.

The “Equatorial Radius” of Saturn is the radius of the planet as it spins upon its polar axis. This length is 60,268 km.

The “Average Radius” of Saturn is the (polar radius + the equatorial radius) / 2. This length is 57,316 km. This radius equates with the radius of Saturn as a stationary ball of gas which is not rotating.

The average of these two, (“Average Radius” + “Equatorial Radius”) / 2. This length is the 58,792 km. This represents the half-way mark between two equally important physical features of Saturn.

Based upon the previous analysis of the PE wave and its relation to several of the gaps in the Rings, seven rules might be given for the construction of the rings themselves.

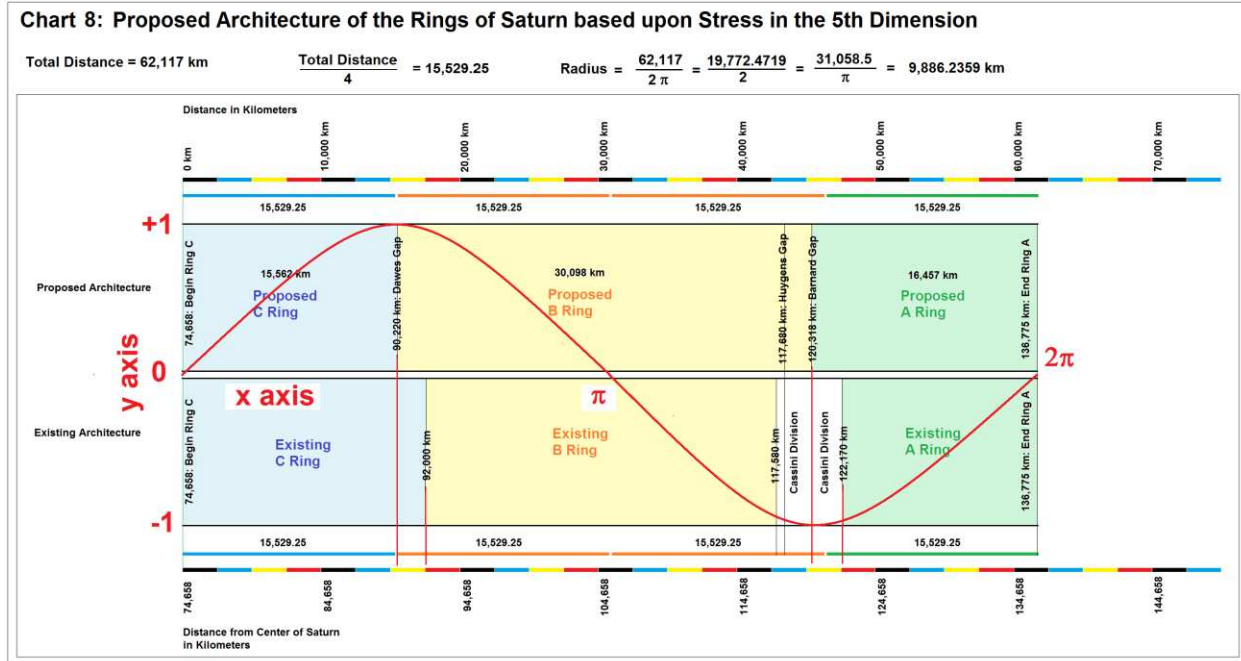
- 1) The Rings are based upon a Sine curve.
- 2) The amplitude of the Sine curve is “1.”
- 3) The period of the Sine curve is “ 2π .” (the standard unit circle)
- 4) The “ $x = 0$ ” origin of the Sine curve begins at the innermost point of the C Ring.
- 5) The distance from the x-axis intercept on the “Average Radius,” non-rotating sphere to the point +1, and to -1, of the amplitude measure, and between +1 and -1, will all equal one another. (i.e. = 2)
- 6) The $1/4^{\text{th}}$ Sine curve preceding “ $x = 0$ ” (a trough) will begin at the depth of the Sine curve at:
$$\frac{(\text{radius of non-rotating sphere}) + (\text{radius of rotating sphere})}{2}$$
- 7) The distance between the first trough to the second trough will always be less than the length of the rotating radius.

Let us examine how these rules dictate the dimensions and activity in the Rings of Saturn.

The Main Sine Wave

The precise delineation of the innermost point of the C Ring (74,658 km) through the outermost point of the A Ring (136,775 km), and its association with a Sine curve of that length, permits a form of trigonometry to be considered as foundational to the entire series of rings.

In this manner the proposed architecture of the rings follows an independent gauge, one which is closely connected with the entire set of gaps within the rings. (See Part I)

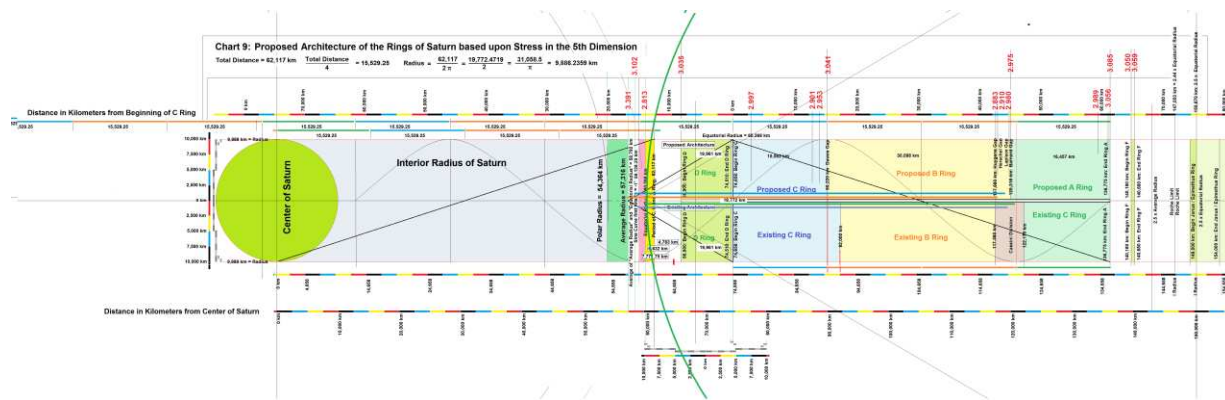


The Unit Circle

If we accept that the inner edge of the C Ring begins the “x = 0” origin of an x-axis Sine curve, then the wave itself must be proportional to the radius of the unit circle leading to its creation.

To determine the length of a radius of the series, we take the distance from the beginning of the C Ring to the outer edge of the A Ring, and divide by 2π . This equation is $(136,775 - 74,658) / 2\pi = 62,117 / 6.28318 = 9,886$ km. This distance represents the y-axis distance from the x-axis when Sine y = 0, the beginning of the inner edge of the C Ring.

The sine curve in question is drawn below, along with an angle sloping negatively at a rate of $1:\pi$. Twice the distance, $9,886 \times 2 = 19,772$ km, represents the diameter of a circle which generates the Sine curve of this graph. This circle is placed in green at the far left of the chart below to give a sense of the unit circle generating the Sine curve which underlies the structure of the C, B and A rings as a single unit. This diameter is used as the basic rectangle organizing our approach to Saturn’s Rings.



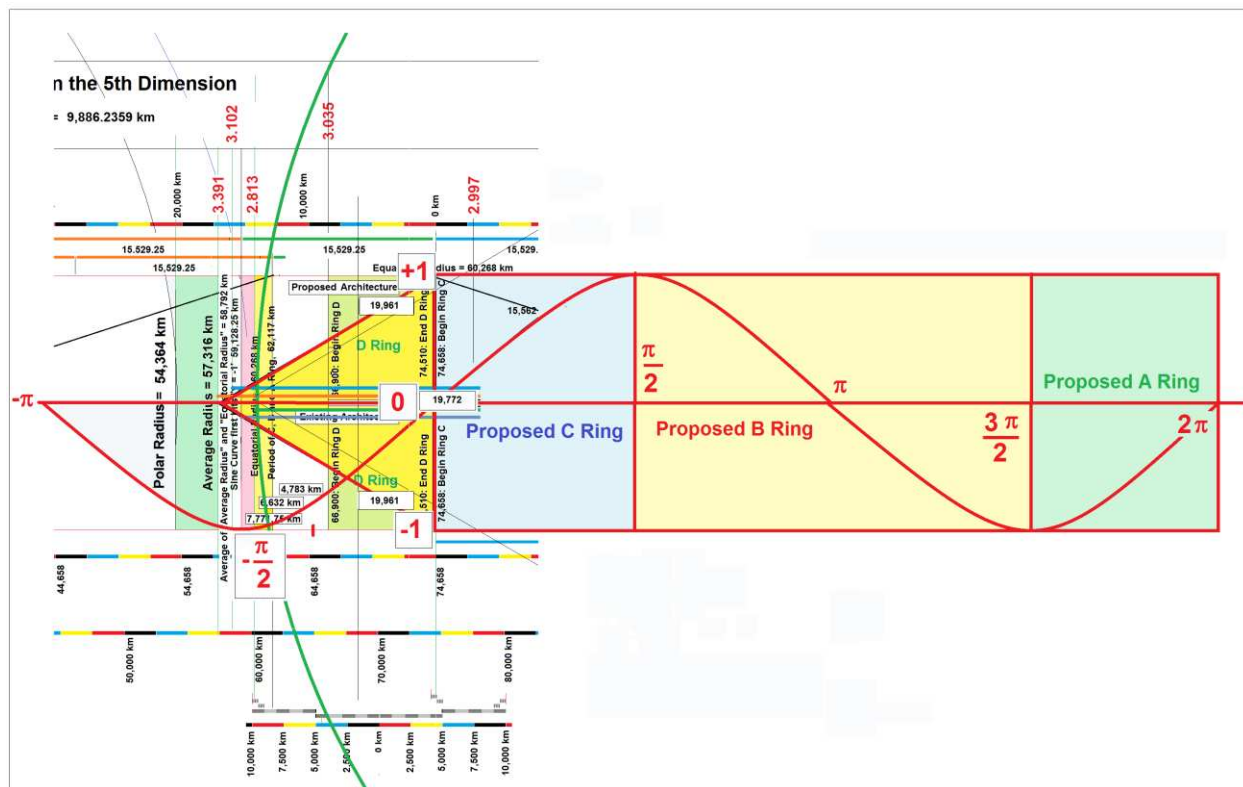
This leads to an interest as to where these dimensions, and particularly the radius and/or circumference of this unit circle, might be found within the architecture of Saturn. In as much as they appear to emanate from Saturn itself, several possibilities were considered. These, as marked below, are:

- (1) the Polar Radius (54,364 km),
- (2) the average between the Polar Radius and the Equatorial Radius, a distance representing the radius of Saturn as a stationary sphere and not rotating, simply named here the ‘Average Radius’ (57,316 km),
- (3) the average between the “Average Radius” (Saturn not rotating) and the “Equatorial Radius” (Saturn rotating) (58,792 km), and
- (4) the “Equatorial Radius,” i.e. the radius of Saturn at the equator which is significantly enlarged due to the rapid rotation of Saturn upon its polar axis (60,268 km).

The Retreating Sine Curve

It was found that the Sine curve, when traced back to the surface of Saturn (59,128.25 km) came closest to (3) above, i.e. the average of the “Average Radius” (non-rotating) and the “Equatorial Radius (rotating) (58,792 km). A multiple of 3.102 is stated between the economically derived Identity wave and the kilometric distance implied by the same point in the architecture of Saturn’s Rings. This multiple is generally within the range of the multiples given in Part One, and certainly close to the multiples of the others given for the peak and trough of the Sine curve throughout the C, B and A Rings, these being: 3.035, 3.041, 2.975, and 3.085, the average of which is 3.034.

It was also found that an equalateral triangle begins at the edge of the “Average Radius” (non-rotating) and extends to the y-axis of the C Ring, from whence the sine curve supporting the C, B and A Rings is generated. The dimensions of the triangle are 19,961 km, 19,961 km and 19,772 km, a distance between these numbers of 189 km, or 1.009 multiple.



If this dynamic holds true, then the faster Saturn spins, the gaps will expand, the period of the rings will lengthen, the identity of Saturn will move out across the equatorial plane, and the rings will become more charged.

The Equatorial Radius as Basic Unit of Length

It was found that the distance from the center of Saturn to the equatorial radius may be used as a measuring rod. Applying this fixed measurement to each of the previously mentioned points leads to a direct association with the gaps in the Cassini Division, as follows. The description of the gaps already considered in Part One is added as well, with the multiples used by way of comparison.

	Combination of Radii		Distances figured		+ Total	Comparison	Proximity			
	Beginning Point	+ Equatorial Radius	Beginning Point	+ Equatorial Radius			Percent	Inner Multiple	Middle Multiple	Outer Multiple
D Ring	Damping Cosine curve leaves x-axis = "Point B"					= Begin D Ring 66,600 km			3.035	
	PE curve intercepts x-axis = "Point B"									
	Damping Cosine curve intercepts PE curve = "Point T"									
	Height of Damping Cosine curve = "Point U"									
	Height of Damping Cosine curve = "Point V"									
	Point W									
	PE curve intercepts x-axis = "Point X"									
	Point Y									
	Point Z									
C Ring	Begin Sine curve = "Point A"					= Begin C Ring 74,656 km			3.085	
	Height of PE curve = "Point B"					= Columbo Gap 77,800 km	2.992	2.997	3.081	
	Sine curve meets Damping Cosine curve = "Point C"									
	Sine curve meets PE curve = "Point D"									
	First trough of PE curve = "Point E"					= Maxwell Gap	2.877	2.901	2.953	
B Ring	First depth of Damping Cosine curve = "Point F"					= Bond Gap	2.954	2.953	2.951	
	Height of Sine curve = "Point G"					= Dovers Gap	3.045	3.041	3.037	
	Sine curve intercepts PE curve = "Point H"									
	Second height of PE curve = "Point I"									
	Sine curve intercepts Damping Cosine curve = "Point J"									
	Second height of Damping Cosine curve = "Point K"									
	Damping Cosine curve intercepts PE curve = "Point L"									
	PE curve intercepts x-axis = "Point M"									
	Negative Sine curve intercepts PE curve = "Point N"									
	Average Radius	+ Equatorial Radius	= 57,316	+ 60,268	= 117,584	= Huygens Gap 117,632 km	1.000468			
	("Point O" + Average Radius) / 2	+ Equatorial Radius	?????	+ 60,268	?????	= Huygens Ringlet	?????	?????	?????	?????
	Depth of Damping Cosine curve = "Point O"					= Herschel Gap 118,234 km	2.911	2.910	2.910	
	(("Point O" + ("Average Radius" + "Sine Curve Radius") / 2) / 2	+ Equatorial Radius	?????	+ 60,268	?????	= Herschel Ringlet	?????	?????	?????	?????
	("Average Radius" + "Sine Curve Radius") / 2	+ Equatorial Radius	= 58,222.15	+ 60,268	= 118,490	= Russell Gap 118,514 km	1.001045			
	Average Radius + ("Equatorial Radius") / 2	+ Equatorial Radius	= 58,792	+ 60,268	= 119,060	= Jeffreys Gap 119,550 km	0.999079			
	Sine Curve Radius	+ Equatorial Radius	= 59,128.25	+ 60,268	= 119,396.25	= Kuiper Gap 119,405 km	1.000078			
A Ring	Depth of PE curve = "Point P"					= Laplace Gap 119,967 km		2.973	2.980	2.988
	("Point P" + Sine Curve Radius) / 2	+ Equatorial Radius	?????	+ 60,268	?????	= Laplace Ringlet	?????	?????	?????	?????
	("Sine Curve Radius" + ("Equatorial Radius") / 2	+ Equatorial Radius	= (59,128.25 + 60,268) / 2	+ 60,268	= 119,316.25	= Bessel Gap 120,241 km	1.007075			
	Depth of Sine curve = "Point Q"					= Barnard Gap 120,312 km		2.975		
	Equatorial Radius	+ Equatorial Radius	= 60,268	+ 60,268	= 120,536 km	= Center for Alternative Roche Limit				
	Damping Cosine curve leaves x-axis = "Point R"									
	PE curve intercepts x-axis = "Point S"									
	Damping Cosine curve intercepts PE curve = "Point T"									
	Height of Damping Cosine curve = "Point U"									
	Height of Damping Cosine curve = "Point V"									
F Ring	Point W									
	PE curve intercepts x-axis = "Point X"					= Keeler Gap 136,547 km	3.056	3.056	3.057	
	"Point Y"									
	"Point Z"									
	End of Sine curve = "Point A"					= End of A Ring 137,775 km		3.085		
	Repeat B = "Point B"					= F Ring	3.049	3.059	3.067	

In summary of the manner in which these gaps are scheduled is as follows, using midpoints.

<u>Proximities</u>	<u>Equatorial Addition</u>	<u>PE wave comparison</u>
Begin D Ring		3.035
Begin C Ring		3.085 (for entire series)
Columbo Gap		2.997
Maxwell Gap		2.901
Bond Gap		2.953
Dawes Gap		3.041
Begin B Ring		
Huygens Gap	1.000408	
Huygens Ringlet	???	
Herschel Gap		2.910
Herschel Ringlet		???
Russell Gap	1.001045	
Jeffrey's Gap	0.999076	
Kuiper Gap	1.000075	
Laplace Gap		2.980
Laplace Ringlet		???
Bessel Gap	1.007075	
Barnard Gap		2.975
Begin A Ring		
Encke Gap		2.989
Keeler Gap		3.056
F Ring		3.059

Analysis

In the above set of numbers, those in red reveal a process directly connected to the Identity wave and the non-rotating “Average Radius” which begins the equilateral triangle, which in turn sets up the length of the Identity wave in the rings. If Saturn was non-rotating, or rotating very slowly and with an equilateral radius equal to the polar radius, the retreating Sine curve would fall so closely to the “Average Radius” that its effect upon the Rings might go unnoticed. This in turn may cause the gaps to be so small, or so slightly charged, that the rings would go unnoticed entirely.

The numbers in black represent a process directly connected to the rapid rotation of Saturn, its oblate shape, its shortened “Polar Radius” and its elongated “Equatorial Radius.” The rapid rotation of Saturn creates thereby a fundamental unit of length which affects the Rings. This process is directly responsible for the creation of the majority – but not all – of the gaps in

the Cassini Division. As this “Equatorial Radius” adds itself to the “Average Radius,” the “average of the ‘Average Radius’ and the ‘Equatorial Radius’ ” and etc., it causes new stresses and strains on the Rings, and these in turn result in many – but not all – of the gaps within the Cassini Division. It is probably responsible also for the mountainous waves in the rings just preceding the Huygens Gap, the place where the “Average Radius” and the “Equatorial Radius” meet as parts of a sum for the first time.

In addition the nature of the ringlets and the gaps themselves may be suggested. If the gaps represent a “tearing” of “identity,” then the seam of this tear may be capable of collecting material from the ring, creating a ringlet. Moreover if the material pulled into the tear exceeds the depth of the seam, this material may slide in and around the seam as apparently is the case with the “Strange” ringlet in the Huygens Gap.

The age of the Rings might be interpreted in a number of ways. First, because the dynamics of the rings are so largely dependent upon the size and speed of rotation of Saturn, it would be important to estimate the causes of this spin. The existence of this mathematics must occur with every planetary body held together by gravity. It appears that the speed of Saturn’s spin exacerbates this mechanism thereby charging the fifth dimension with an additional attractive power.

The Cassini Division is interesting because both (1) the “Average Radius” and the Identity wave, as well as (2) the “Equatorial Radius” and its addition, play a part in the rings. The interaction of these two processes indicate that the “identity” of Saturn may be considered as a basic idea of this approach.

Part Four: Speculations

The Big Slam

If we collect these ideas into a single proposal the following chronology of the Rings is possible.

1. The Identity wave, as constructed from the Sine curve and Damping Cosine curve as these are constructed from the “Average” (non-rotating) radius of Saturn, are three dimensional structures without reference to the spin of Saturn, and inhabit all the space around the planet itself, activating a 2.5 “identity” in every direction.

2. A large moon enters within this 2.5 radius of the non-rotating Saturn and begins its spiral descent into the depth of Saturn itself, gathering speed while at the same time disintegrating along the way.

3. The speckled dust of this falling-apart moon creates a large spiral in a single plane, but one which is organized quickly by Saturn’s “identity,” i.e. the Identity wave, the Sine curve and the Damping Cosine curve the non-rotating (or slowly rotating) Saturn creates.

4. This disintegrated moon then slams into a single, particular spot of Saturn, tremendously compressing the gas in this spot, and creating a much faster spin through the force of this blow.

5. The debris in the plane, which has settled into place within the existing “identity” pattern of the Identity wave, the Sine curve and the Damping Cosine curve, is suddenly jolted by the force of the change which comes suddenly over the equatorial radius of Saturn. As this Average Radius, which previously had added with itself to create the “identity” of 2.5 Radians of

Saturn, is suddenly extended to an entirely different 2.5 times the quickly spinning Equatorial Radius.

6. The force of this blow jolts the far end of the C Ring immediately, into the “land of mountains” recently described.

7. The tear which occurs in the Identity wave, the Sine curve and Damping Cosine curve suddenly affect each of these various points as now a “Gap,” a place where the old must give rise to the new expanded addition of the equatorial Radius.

8. As the Equatorial Radius is quickly added to the “Average Radius,” the “average of the ‘Average Radius’ and ‘Equatorial Radius’,” the “Equatorial Radius” the majority of gaps in the Cassini Division open up. These, however, are not “tears” in the fabric of consciousness. Rather they are extensions of it, and therefore do not open “seams” in the fabric to be filled with ringlets or moons. Rather they are empty gaps brought on by a process different from the tearing of the other gaps.

The main exception to this is the Huygens Ringlet, which is brought about by the direct force of the “Equatorial Radius” striking the “Average Radius.” The force of this shocks the Huygens Gap sufficiently to create the Huygens Ringlet AND the Strange Ringlet at the same time.

9. The striking of the moon into Saturn sends shock waves throughout its “identity,” and these radiate from Saturn outward.

10. Conversely waves at the outer end of this ring system send back to Saturn the reflective nature of these waves.

11. And the tidal pull of Saturn’s suddenly increased rotation pulls on each inch of thread around it as a ball of yarn tugs as it is tightened.

Alternatively, the seam may create a track in which the small “shepherding moons” travel. This approach to Saturn’s Rings would not anticipate that these moons affect the rings as bodies which carve out the gaps themselves. Rather the gaps take place based upon the more fundamental dynamic of Saturn and the speed of its spin, and small satellites are trapped within the seams thereby created.

12. If the “Land of the Mountains” equates with the moment in time when Saturn’s Equatorial Radius first – and suddenly – slammed into the construction of the Rings themselves, then this moment would be marked at a different spot on the exterior of the Rings. If we could find this spot on the outside of the Rings, and then rewind time to the point at which these were both existing at the same moment, then we would have an idea of the impact date which first created the Rings as we know them.

13. It would have created a sudden bulge in what we now know as the Huygen’s Gap.

14. This would also have created all the eccentricities of the various ringlets.

15. Therefore figuring the date at which this “slam” into the side of Saturn took place would equate with that date on which all the eccentricities align with the Land of Mountains. In essence, this event would have been the equivalent of setting a clock, which we can now unwind to determine the date on which the rings were created. Investigating the core of Saturn at this radius should lead us to see within the density structure of Saturn some unevenness, and this would be the shadowy remnant of the disintegrated moon whose substance has given us the Rings.

16. Once the equatorial spin of Saturn became a fundamental feature of its “identity” further additions to its mass, as long as they are relatively insubstantial, simply act to increase the

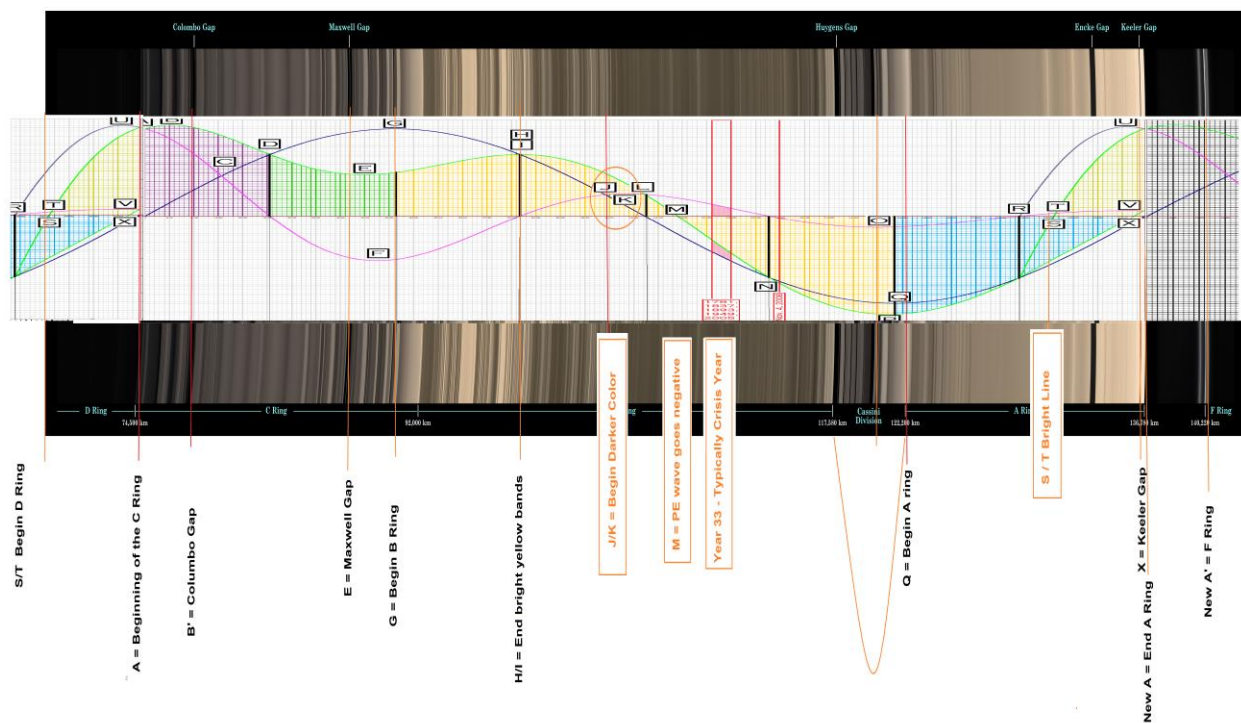
mass spinning in the direction of the prior spin, the way children on a merry go round pull into the same direction of the plane, despite their size or the position of their horse.

17. Once this spin took over as a mass of rotating gas, its pressure at the poles decreasing and its pressure at the equator increasing, a magneto-sphere also took existence and began to “light up” the rings in a fashion similar to the lighting of a fluorescent bulb.

Anticipated Further Proof

Given the relatively close association between the multiples necessary for a perfect alignment with the Identity wave, it seems at least plausible that the Identity wave is descriptive of a similar wave which underlies the architecture of these rings. Using this as the model, the B Ring begins at the Dawes Gap and Ends at the Barnard Gap. It contains as one of its central features the Cassini Division. The logic of the negative values in the damping cosine wave, the Identity wave and finally the midpoint of the depth of the Sine Wave are all contained within this projected B Ring. The A Ring then commences with a steady upsweep to the outer edge of the A Ring. This analysis is possible because we have a mathematic statement of the rings as a unit, each part of which is shaped by reference to the whole.

In addition to aiding in the investigation of recognized phenomena, this approach also permits the researcher to look for heretofore unnoticed events in the architecture of Saturns Rings. For example the following photograph elongates the Identity wave.



Notice that Point C, the intersection of the Sine wave with the Damping Cosine wave midway through the C Ring, seems to be without obvious connection to the Rings of Saturn. This may be completely illusory. If so, the effect of this association should be felt as a relationship to Day 1,565. Figuring this point at a multiple of 2.927 this area of the C Ring should occur at $74,658 + (1,565 \times 2.927) = 79,238$ km from the center of Saturn.

Notice that Point H/I the second peak of the Identity wave, beings a markedly different color in the series. This occurs at Days 7665 through 7675. Figuring this period at a multiple of 2.927 this area of the B Ring should occur at $74,658 + (7665 \times 2.927) = \mathbf{97,093 \text{ km through } 97,122 \text{ km}}$ from the center of Saturn.

Notice that at “Point J” there is a marked difference in color in this photograph of the B Ring. This occurs at Day 9,420 where the Sine curve at $\text{Sin} = 0.24537$ meets the Damping Cosine curve at $\text{Cos} = 0.24532$. Figuring this at a multiple of 2.927, this change should take place at $74,658 + (9,420 \times 2.927) = \mathbf{102,230 \text{ km}}$ from the center of Saturn.

Notice that Point K, the intersection of the Identity wave with the Damping Cosine wave, occurs at the same Day 10,227 as Point L, the point at which the Sine wave becomes less than “y = 0.” Figuring this point as a multiple of 2.927 this area of the B Ring should occur at $74,658 + (10,227 \times 2.927) = \mathbf{104,592 \text{ km.}}$

Notice that two particularly remarkable periods of crisis – “Point M” (Day 10,909) and Year 33 (Days $365 \times 33 = 12,045$ through Day $365 \times 34 = 12,410$) – are at the center of the dark grey band within the second half of the B Ring. One would anticipate that the logic and cohesion of the ring system would change dramatically at these point. Figuring these at a multiple of 2.927 these areas may be anticipated to appear as unusual features of the B Ring at Point M = $74,658 + (10,909 \times 2.927) = \mathbf{106,588 \text{ km}}$, and Year 33 = $74,658 + (12,045 \times 2.927)$ through $74,658 + (12,410 \times 2.927) = \mathbf{109,913 \text{ km through } 110,982 \text{ km.}}$

Notice that the remaining gaps in the Cassini Division may represent the stress of a variety of types, each of which relates to the nature of the waves interacting. Particularly interesting is the Herschel Gap. The Herschel Gap aligns more with Point O than does the Huygens Gap. In addition the much smaller gaps may take their clues from other unnoticed aspects of the rings or the effects of multiple negative curves simultaneously interacting.

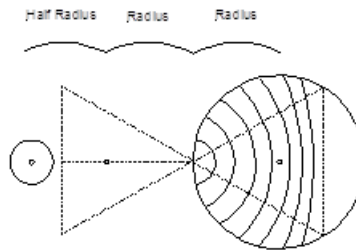
Notice that a particularly bright ring at either “Point S” (Day 18,601) or “Point T” (Day 18,641) or perhaps lying between them, alligns with the Identity wave as it increases to more than “y = 0.” Figuring this line at a multiple of 2.927 this line should occur at Point S = $74,658 + (18,601 \times 2.927)$ through Point T = $74,658 + (18,641 \times 2.927) = \mathbf{129,103 \text{ km through } 129,220 \text{ km.}}$

Note that if the gaps between rings results from stress in the fifth dimension, an alternative understanding is possible of the orbit of Pan, a small object found in the Encke Gap. At present this object is referred to as a “shepherding moon” and is understood to create the Encke Gap by gravitational attraction.

An Alternative Derivation of the Roche Limit

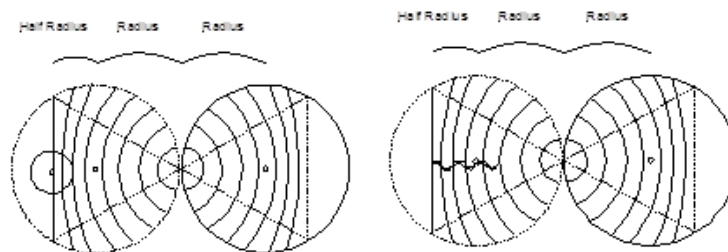
The idea that a Sine curve, and a Damping Cosine curve, when added together create a wave which structures the Rings of Saturn suggests that the “Identity” of Saturn is connected to these curves and their resulting wave. These waves must both push the outer boundary of Saturn’s “identity” while being anchored firmly in the center of Saturn, thereby resulting in a “tearing” of the fabric of this “identity,” as displayed at a fundamental level of reality. Moreover if the Universe “blinks” on an off after the fashion of a three-dimensional cinematic movie, (see Appendix), then this blinking and intermingled consciousness might be best seen if we look at very massive bodies and investigate their behavior.

If a circular pizza pan is filled with water, and then tapped gently at one point on the circumference, this tapping represents the recurring “blink” of the moon as it nears the larger planet, and as the planet as it attracts the moon. The wave then flattens out in an equilateral triangle with the point creating the wave as one of the angles of the triangle.



If the “ontologic” approach of the moon to Saturn (its “blinking” motion) is mirrored by the “epistemologic” identity of Saturn itself, then a “reflective” wave representing the “identity” of the larger planet could be proposed to exist. This reflective “identity wave” would equate with the Sine curve, the Damping Cosine curve, and their addition in the identity wave described to this point. If this is the case, then it serves to reason that when the moon approaches within this boundary its “moon” identity will be lost to the larger and more powerful “planet” identity at some point.

If this wave become orthogonal to the moon’s approach at 2.5 radians of the larger planet, then a disintegration of the moon based upon the loss of its identity as a gravitational body could be suggested as the dramatic tearing, top to bottom, of the smaller planet takes place. This means that a moon disintegrates in the gravitational attraction of Saturn at 2.5 radians of the larger planet and that the wave characteristics of the larger planet play out against the space around it as a violin humming in a crowded room.



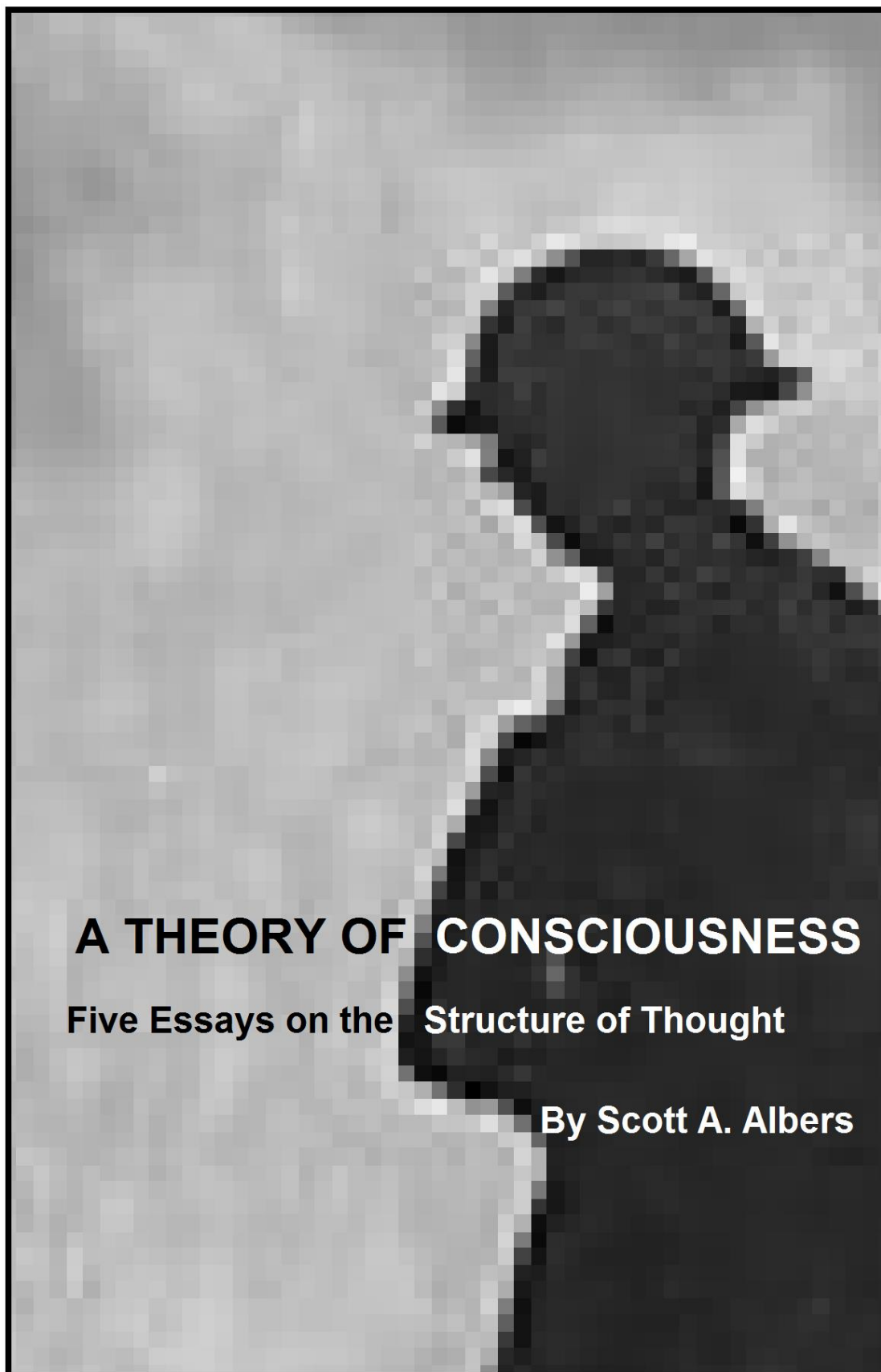
At the present time the Roche Limit defines this gravitational decimation as 2.44 radians of the larger planet. http://en.wikipedia.org/wiki/Roche_limit The 2.5 limit is presented here, with the additional caveat that the extension of an imaged planet 3 radians into space should be quite noticeable.

Conclusion

The approach taken by this paper has several advantages:

- (1) the difference between the boundary calculated herein and the historic Roche limit runs between 3,262 (polar radii compared) and 3,617 kilometers (equatorial radii compared). A planet degrading prior to the 2.44 limit, but within the 2.5 limit, would support this theory. This geographic distance between the two limits should be sufficient to observe and test;
- (2) it suggests a way in which to include the larger, amorphous G ring as within 3 times the radius of the larger planet;
- (3) it explains why the E ring commences at 180,000 km from the center of Saturn at three times the equatorial radius of Saturn;
- (4) it describes the nature and position of the “gaps” within the rings as consistent with an understanding of a new “fifth dimension” which is quite subject to investigation, i.e. macroeconomics; and
- (5) only this theory supports a limit wide enough to hold the nearest 1,670 km of the Janus/Epimetheus Ring at 149,000 to 154,000 km or to explain its “surprising” existence <http://saturn.jpl.nasa.gov/photos/imagedetails/index.cfm?imageId=2277> outside the existing Roche limit.

Scott Albers
Great Falls, Montana
December 29, 2014



A THEORY OF CONSCIOUSNESS

Five Essays on the Structure of Thought

By Scott A. Albers

Essay One: A Game of Gin Rummy

What is important is the gradual development of a theory, based on a careful analysis of the ... facts. ... Its first applications are necessarily to elementary problems where the result has never been in doubt and no theory is actually required. At this early stage the application serves to corroborate the theory. The next stage develops when the theory is applied to somewhat more complicated situations in which it may already lead to a certain extent beyond the obvious and familiar. Here theory and application corroborate each other mutually. Beyond lies the field of real success: genuine prediction by theory. It is well known that all mathematized sciences have gone through these successive stages of evolution.

John von Neumann

ABSTRACT

Aims: To introduce the basic idea that consciousness has a definable structure which resonates at all levels of reality.

Study design: Philosophic / Mathematic discussion of Russell's Paradox and its correlation to the economic model described in the five previous essays.

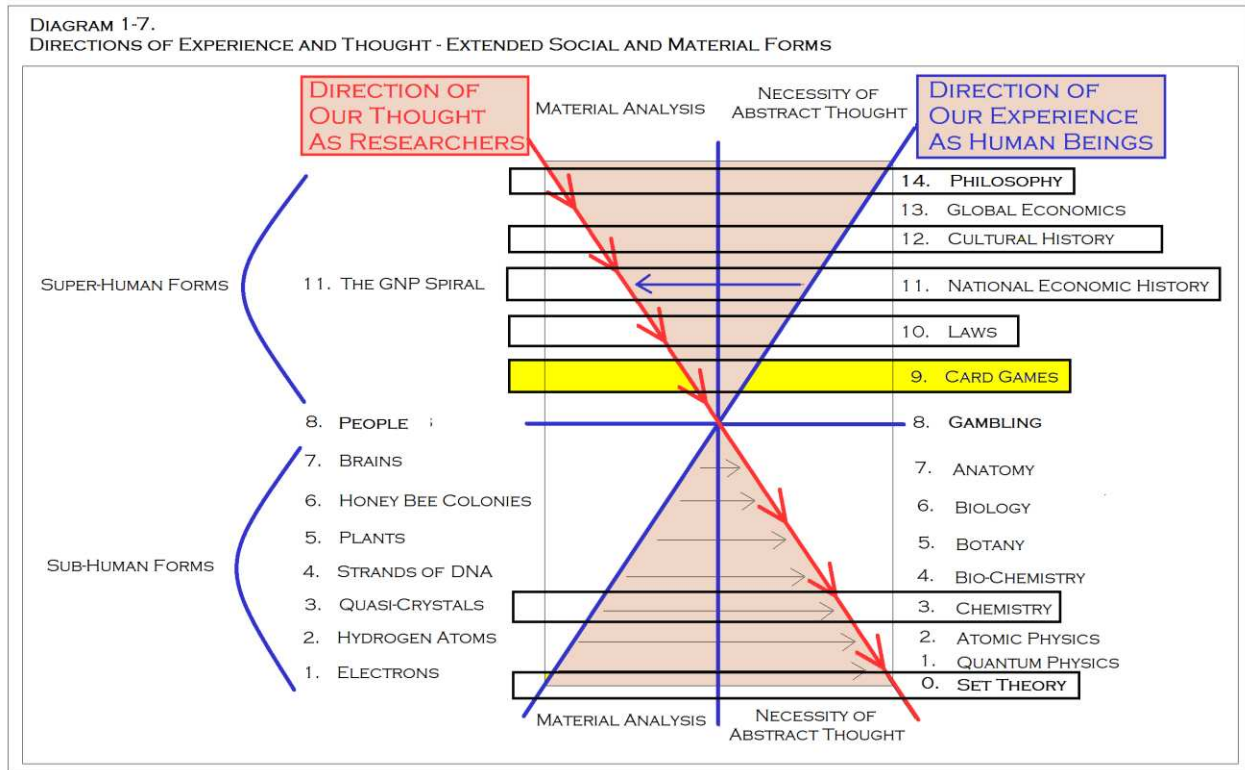
Place and Duration of Study: Library research.

Methodology: In this essay we dissect the basic parts of one of the most famous mathematic puzzles of the twentieth century, Russell's Paradox. We chart correlations between the map thereby developed and the pattern of economic development within the United States.

Conclusions: If Russell's Paradox is an example of the structure of consciousness, it may be the key to understanding the organization of all levels of reality.

INTRODUCTION

In this essay we begin with a description of psychology, i.e. the careful dissection of a simple two-handed card game, Gin Rummy.



METHODOLOGY

1. Hypothesis

We propose that the patterns explored previously enter the psychological realm through the interaction of people with one another. We propose that this pattern may be seen in the pattern underlying Gin Rummy, a simple two-hand card game.

2. Methods

We use the dichotomies introduced previously to explain the basis for social patterns.

3. Data

We use the structure of a card game of Gin Rummy to investigate patterns which underlie social consciousness generally.

4. Procedure – A General Theory

4.0 An Ordered Psychology

In any game of cards players attempt to complete an "evolution" of cards from the first to the last play of cards. As one card is drawn and other cards given up, a player's hand of cards - be it in poker, bridge, rummy or others - slowly takes shape. The direction of this development is towards a hand which under the circumstances and decisions of the players strikes a player as most toward his or her advantage in the attempt to survive the competition of the game and to emerge the winner. The game of Gin Rummy is chosen to display the "consciousness" of an individual because it provides clear and simple categories which support the changes in the game, and which demonstrate the "evolution" of the individual's decisions - consciousness - from beginning to end.

In the game Gin Rummy two players compete with one another to obtain a hand of cards in which each card is joined in matching sets with the others. Three planes - Definition, Relationship, Conclusion - are suggested as the underlying basis of this psychological evolution.

First, let us shuffle and then deal a deck of 52 cards, a card for you, a card for me, ten times. We have then:

Your Hand

My Hand

The object of the game is to place (or "meld") all the cards in one's hand in sets of three or more cards, either by same number (3♦, 3♠, 3♥) or in sequence (3, 4, and 5♣). If I have the following sequence of cards in My Hand...

3♠ 3♦ 5♦ 8♦ 9♥ 10♣ Jack♣ Queen♠ King♠ Ace♥

... I might arrange them in a manner best suited to their possible combinations:

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠

In the above arrangement I am hoping to obtain an extra three to go with my set of threes,

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠

... or a four of diamonds to go with my 3 and 5 of diamonds,

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠

... or a six and seven of diamonds to fill in between my 5 and 8 of diamonds,

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠

... a 9 or Queen of clubs to make a set from my 10 and Jack of clubs,

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠

... or a Jack or Ace of spades to make a set of my Queen and King of Spades.

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠

We next turn over the remaining 32 cards in the deck face down (called the Stock Pile) hiding all of them from the view of both players ...

Stock Pile (32 cards, unknown to both players)

Your Hand (10 cards, known to you, unknown to me)

My Hand (3♠, 3♦, 5♦, 8♦, 9♦, Ace♥, 10♣, Jack♣, Queen♠, King♠, known to me, unknown to you)

... and turn over the top card of the Stock Pile - perhaps the Jack of Diamonds - for both you and I to see (called the Discard Pile).⁹¹

Stock Pile (31 cards, unknown unknown to both players)

Your Hand (10 cards known to you, to me)

Discard Pile
Jack ♦

My Hand
(3♠, 3♦, 5♦, 8♦, 9♥, Ace♥, 10♣, Jack♣, Queen♠, King♠, known to me, unknown to you)

⁹¹ It should be mentioned that the play of cards in a two-handed card game, like the notation of moves on a chess board, describes a point-by- point form of motion. In chess, for example, the notation...

- | White | Black |
|----------|-----------|
| 1. P-K4 | P-K4 |
| 2. N-KB3 | N-QB3 |
| 3. B-QN5 | P-QR3 ... |

... provides a common statement of opening moves on a chess board. This point by point description of motion, as unified in the consciousness of the players in the game, is the same as that explored in this essay. It is also quite similar to the note-by-note movement described briefly in the Introduction as an answer to Zeno's Paradox.



Since I dealt the cards, you must:

- (1) choose either the top *unknown* card from the Stock Pile OR take the top *known* card from the Discard Pile,
 - (2) place the card chosen among the other cards in Your Hand in the manner you think best to meld the cards, and then
 - (3) discard one of the cards from Your Hand into the Discard Pile.
- It is then my turn to do the same.

Through this process of drawing one card and discarding another the players strive to reach a hand of cards in which all cards are "melded" into groups. The first player to have a hand of cards in which each card is part of a set of three or more wins the game.

To win the game I might hope to alter the cards in My Hand from:

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠; to:

I might discard one by one the remaining cards, to wit:

9♥ A♥ Q♠ K♠

If these cards help Your Hand, however, I may find that I have given you by my discard the cards necessary to ensure my defeat.

We have proposed that the Discard pile begins with the Jack of Diamonds.

Stock Pile (31 cards, unknown
to both players)

Your Hand (10 cards known to you,
unknown to me)

Discard Pile

Jack ♦

My Hand,

(3♠, 3♦, 5♦, 8♦, 9♥, Ace♥,
10♣, Jack♣, Queen♠, King♠,
known to me, unknown to you)

If you decide to take this card, you must place it in Your Hand as best fulfills the requirements of winning the game.

Stock Pile (31 cards, unknown
to both players)

Your Hand (Jack ♦ known to me, 10 cards
known to you and unknown to me)

Discard Pile

My Hand,

(3♠, 3♦, 5♦, 8♦, 9♥, Ace♥,
10♣, Jack♣, Queen♠, King♠,
known to me, unknown to you)

I place the name of this card chosen by you and placed in Your Hand in parentheses to indicate the hidden nature of the cards in Your Hand. So long as Your Hand is unrevealed to me, only the cards which you have drawn from the Discard Pile are known to me. I may guess at the identity of the cards held in Your Hand (1) based upon your desire to discard cards which you do not want or (2) to ignore cards which I discard. The more cards you choose from the Discard Pile, the more cards I know with certainty to be held in Your Hand. This knowledge may assist me greatly in my own decisions regarding the game.

Stock Pile (31 cards, unknown to both players)

Your Hand (Jack ♦ known to me, 10 cards known to you and unknown to me)

Discard Pile

My Hand,

(3 ♠, 3 ♦, 5 ♦, 8 ♦, 9 ♥, Ace ♥, 10 ♣, Jack ♣, Queen ♠, King ♠, known to me, unknown to you)

You must now discard a card, perhaps the 2 ♣.

Stock Pile (31 cards, unknown to both players)

Your Hand (Jack ♦ known to me, 9 cards known to you and unknown to me)

Discard Pile
2 ♣

My Hand,

(3 ♠, 3 ♦, 5 ♦, 8 ♦, 9 ♥, Ace ♥, 10 ♣, Jack ♣, Queen ♠, King ♠, known to me, unknown to you)

My question now becomes:

(1) do I want this card, 2♣, or would I prefer to draw an unknown card from the Stock Pile?, and

(2) which card should I discard in order to avoid giving you a card which will help Your Hand?

For some reason you have discarded the 2♣, and this may give me clues as to those cards which you want - or do not want - in Your Hand. But I can really not be sure of your strategy – at least at this point – because the cards in Your Hand are unknown to me.

Because I have the following cards in My Hand...

3♠ 3♦ 5♦ 8♦ 9♥ Ace♥ 10♣ Jack♣ Queen♠ King♠;

... I see that there is no advantage at all in taking the 2♣ into My Hand. That is, it places me no closer to matching sets of cards in My Hand than before. I must therefore take a card from the Stock Pile, perhaps the 6♣.

I must now decide which card to “throw away” in the Discard Pile. If I discard a card which you want for Your Hand, I have hurt my own chances of winning. On the other hand if I keep a card which does not help to complete sets in My Hand, I might again hurt my chances of winning.

Because the 6♣ does not create a set of cards in My Hand any more than I have at present, I decide to discard it and permit you the chance to take it into Your Hand if you wish.

Stock Pile (30 cards, unknown to both players)

Your Hand (Jack ♦ known to me, 9 cards known to you and unknown to me)

Discard Pile

2♣, 6♣

My Hand,

(3♠, 3♦, 5♦, 8♦, 9♥, Ace♥, 10♣, Jack♣, Queen♠, King♠, known to me, unknown to you)

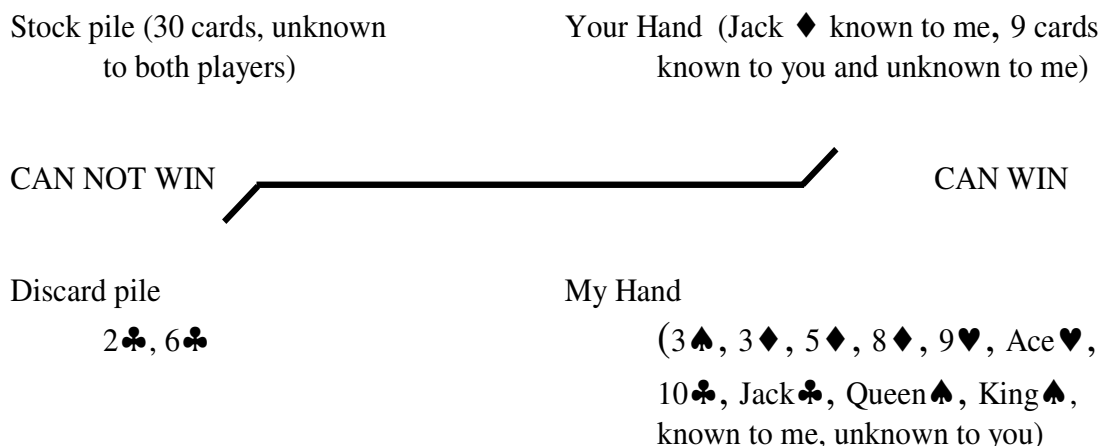
You are permitted now to take the top card of the Discard Pile into Your Hand - here, the 6♣, (not the 2♣) - or to take the top unknown card from the Stock Pile. The game continues in this fashion until one player "knocks," i.e. obtains the desired hand of 10 cards melded into sets as described. Note that the cards in My Hand have not changed during this first round of play.

Having the basic rules of the game before us, let us analyze briefly the psychological aspects of the game. We enter here into a description of a general model whereby we may unify a number of different levels of reality. This model will be referred to as "A System of Movement."

4.1 The Plane of Definition

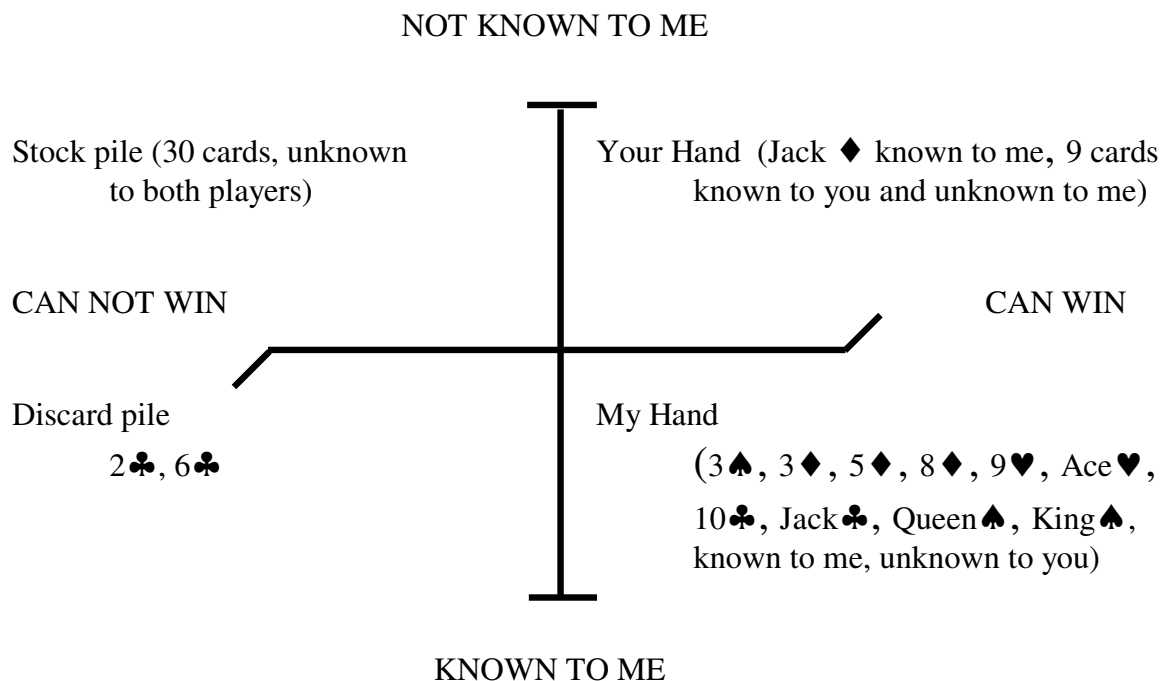
A simple way of analyzing the relationship between these four sets of cards may begin by noting that the groups on the right (Your Hand, My Hand) are in competition with each other because each CAN WIN THE GAME, and that the groups to the left (Stock Pile, Discard Pile) CAN NOT POSSIBLY WIN THE GAME. To the left: The cards in the Stock Pile are completely *unknown to both players*; the cards in the Discard Pile are both *open to and known by both players*. On the right: the hands of the individual players - you and I - are controlled by us individually to "meld" the cards, to create relationships between the cards (1) of all the same number or (2) of a three-card run of cards in the same suit.

Our control of the cards within our hand enables us to challenge each other and – hopefully – to prevail in the game, to win. We *may* know, or we *may not* know, what is held in our opponent's hand; but I *always* know what is in My Hand. The first dichotomy which forms the basis of the game - CAN WIN, CAN NOT WIN - will be termed in these essays simply "The Primary Opposition." The Primary Opposition represents a *difference in kind*, a difference in the basic nature of two things, as opposed to oppositions arising from a struggle between similar elements or a difference in gradation between similar elements.



A Secondary Opposition is created when we consider those cards which are unknown to me, i.e. Your Hand and the Stock Pile. I neither see them nor know their relationships to one another. True, if you take the 6♣ into Your Hand I will know that it is there, just as I must remember that your first decision was to draw the Jack♦ from the Discard Pile. However the basic nature of the group of cards itself is *unknown* to me, hidden from my view. Contrast this with the cards at the bottom of our diagram (Discard Pile, My Hand) both of which are *known* to me. This "unknown/known" dichotomy forms a second dichotomy of the game referred to in these essays as "The Secondary Opposition."

The Secondary Opposition represents an opposition based upon like natures in conflict or in some competition with one another as *gradations of the same basic nature*. To some extent I can guess about the cards in Your Hand or the cards remaining in the Stock Pile. I am not sure, and I can not guarantee, my conclusions. The Secondary Opposition, unlike the Primary Opposition, is not absolute or complete. Rather the Secondary Opposition states oppositions which are based upon difference within like categories, not differences in kind between the categories themselves.



A fundamental point is this: The cards as arranged have relationships with one another by way of their unique contribution to the 52 card deck. There is only one Ace ♠, one 2 ♥, etc. Thus if I know that the Jack ♦ is in Your Hand, I know that it is not in any other set - My Hand, the Discard Pile, the Stock Pile - in the game.

Moreover the nature of the sets is different. *Your Hand* is in opposition to *My Hand* - you want Your Hand of cards to beat mine, and I want My Hand of cards to beat yours. The *Discard Pile* is the result the players' choice of card to discard at each turn; all cards in the Discard Pile are known to both players. The *Stock Pile* is a randomly arranged remainder of cards the internal order of which is unknown to any player. An important rule of Gin Rummy protects the uncertainty of the cards in the Stock Pile.

"Drawn Game. If only two cards remain in the stock and neither player has knocked (won the game), the game ends in a draw: The final discard may not be taken. The same dealer deals again."

After I subtract from a 52 card deck the 10 cards in My Hand, 10 cards in Your Hand and one card for the beginning Discard Pile, 31 cards remain for the Stock Pile. My odds of choosing any particular card in the Stock Pile are no better than one in 31, but even this number is uncertain because the card *may* be in Your Hand. One's final play occurs when three cards are in the Stock Pile, odds roughly of one in three for drawing a particular card. The game ends when only two cards are left in the Stock Pile.

By keeping your cards "close to your chest" you may be able to encourage me in the false hope that the cards which I seek are in the Stock Pile. My odds of finding them in the Stock Pile may be zero if you hold them in Your Hand. Perhaps if I am very careful not to give you an indication of the cards which I seek, I may be able to persuade you to discard a card from Your Hand a card which otherwise you would not discard. In any event, given the unknown nature of the Stock Pile I can not be sure of the identity of the NEXT card to be drawn from the Stock Pile. Frequently in Gin Rummy one can not be sure of which cards the Stock Pile contains.

This first description of cards may be called the "Definitional Plane." This first plane defines the essential categories of cards upon which all evolution of the game is based. These definitions are based upon two oppositions, the Primary Opposition, i.e.

- 1.a. CAN WIN
- 1.b. CAN NOT WIN

and the Secondary Opposition, i.e.

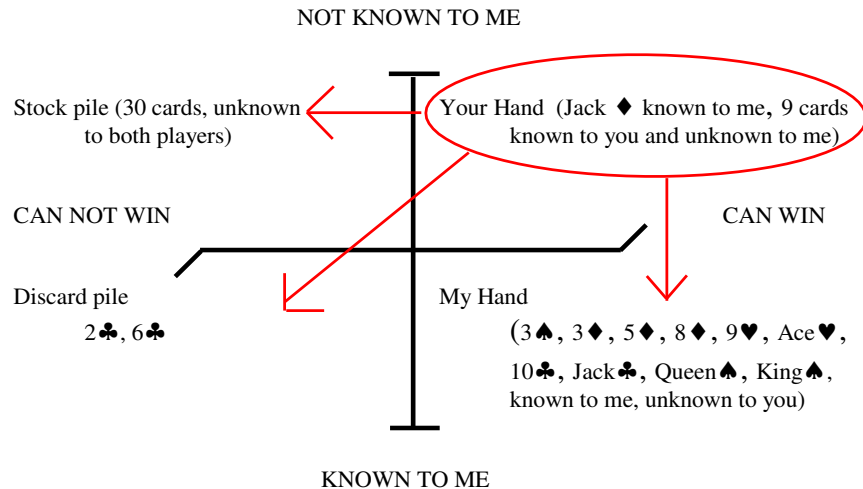
- 2.a. NOT KNOWN TO ME
- 2.b. KNOWN TO ME.

This set of oppositions has given rise to four separate categories of cards, defined as:

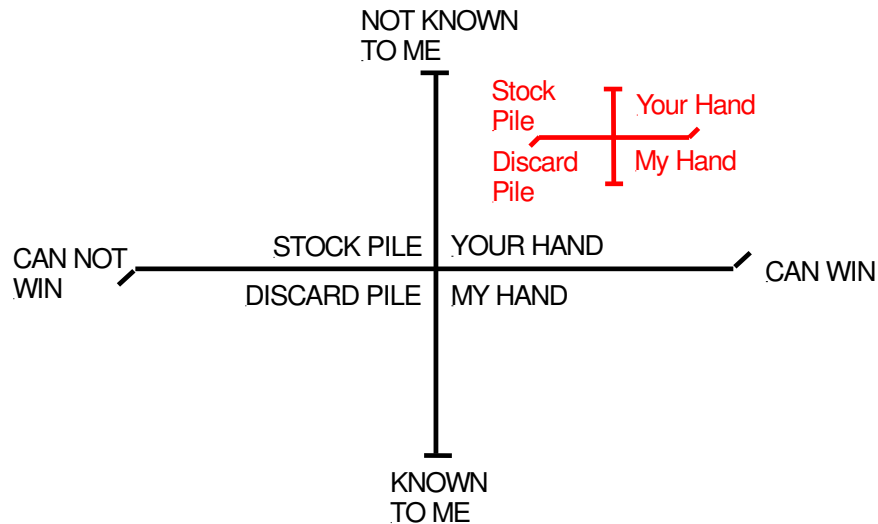
A First Opposite:	1.a. + 2.a.	Your Hand
A Second Opposite:	1.a. + 2.b.	My Hand
A Third Opposite:	1.b. + 2.a.	The Stock Pile
A Fourth Opposite:	1.b. + 2.b.	The Discard Pile.

4.2 The Plane of Relationship

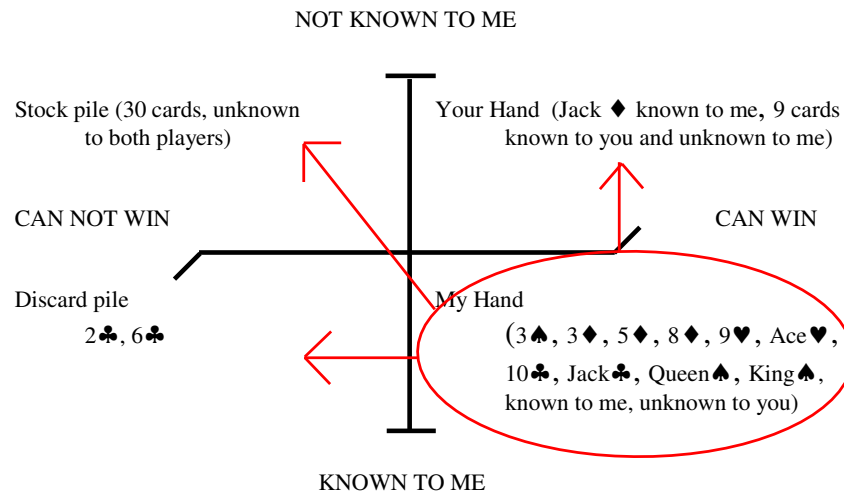
These sets of cards now form relationships with each other. The relationships created are unique; each relationship is unlike any other. For example, each of the cards in *Your Hand* has a relationship with the other cards in *Your Hand*. *Your Hand* also has a relationship with the cards in *My Hand*, with the top card in the *Stock Pile*, and with the cards in the *Discard Pile*.



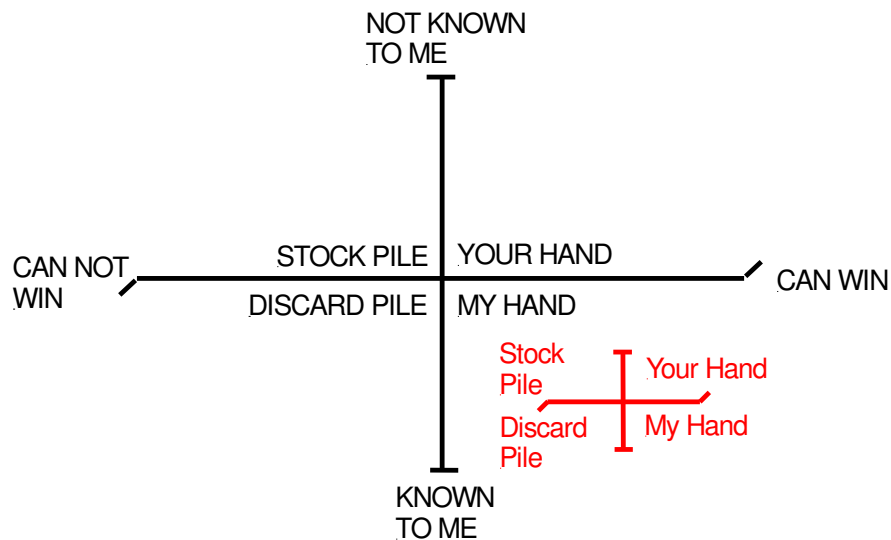
As I consider these relationships I calculate according to the definitions already given. In order to win the game I must consider each card I know or believe to be in *Your Hand* in relation to the other cards I believe to be in *Your Hand*, with the cards I know to be held in *My Hand*, with the cards I believe to be or hope to be in the *Stock Pile*, and the cards which both of us plainly see in the *Discard Pile*. This could be written as:



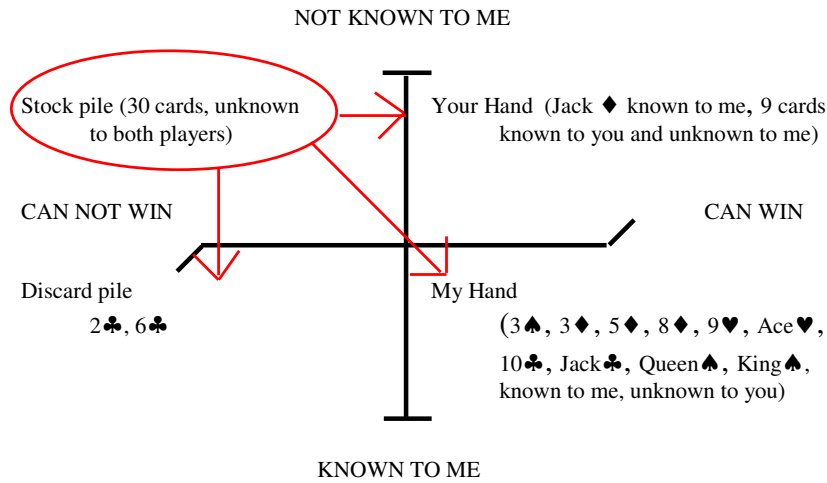
Similarly, each of the cards in *My Hand* has a relationship with the others in *My Hand*, with the cards in *Your Hand*, with the top card in the *Stock Pile* and with the cards in the *Discard Pile*.



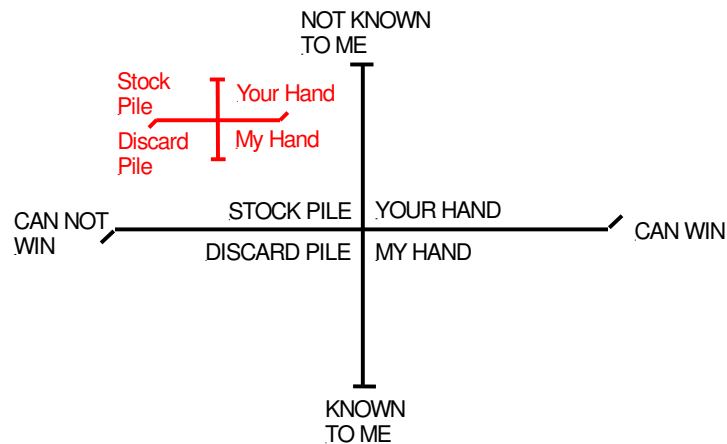
This could be written as:



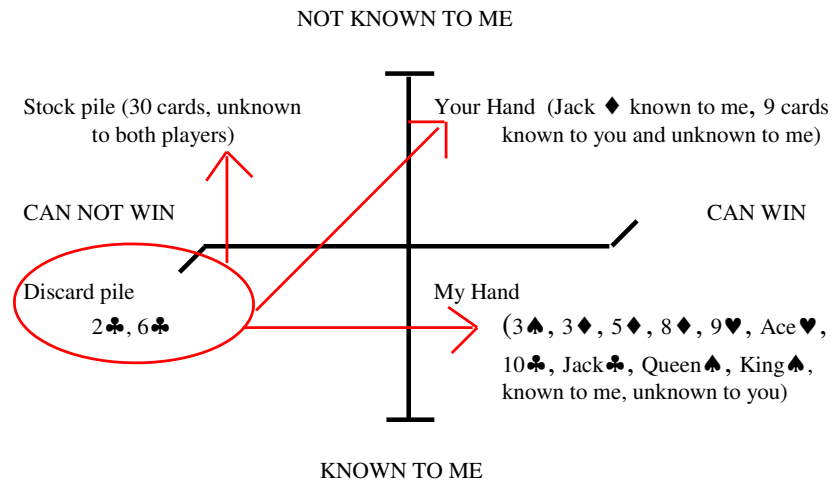
The top card in the *Stock Pile* has a relationship with the other cards in the *Stock Pile* (one card is first, one last, one second, and so on), with the cards in *Your Hand*, with the cards in *My Hand*, and with the cards in the *Discard Pile*.



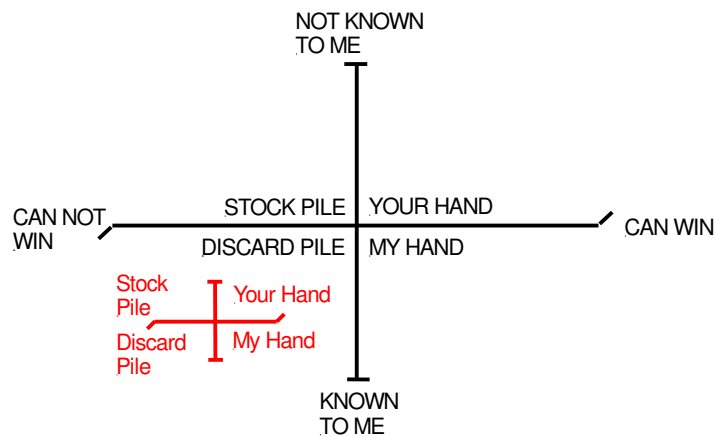
This could be written as:



And the top card in the *Discard Pile* has a relationship between the other cards in the *Discard Pile*, with the top card in the *Stock Pile*, with the cards in *My Hand*, and with the cards in *Your Hand*.

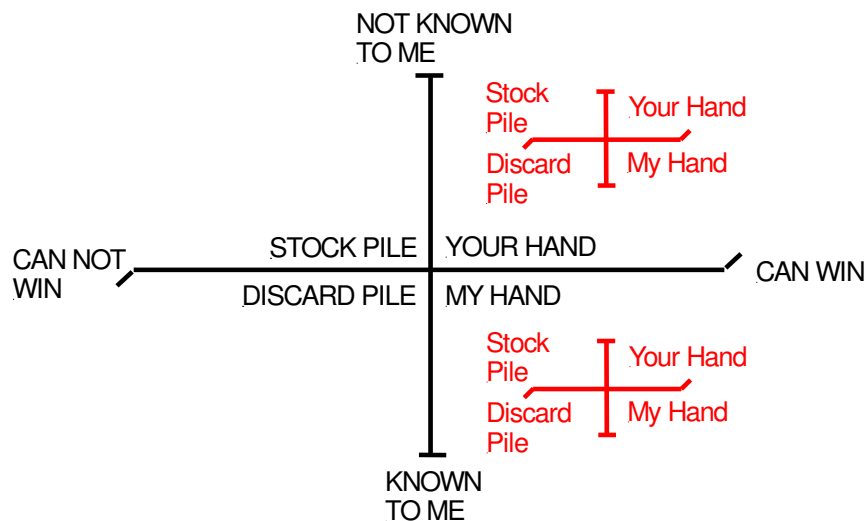


This could be written as:

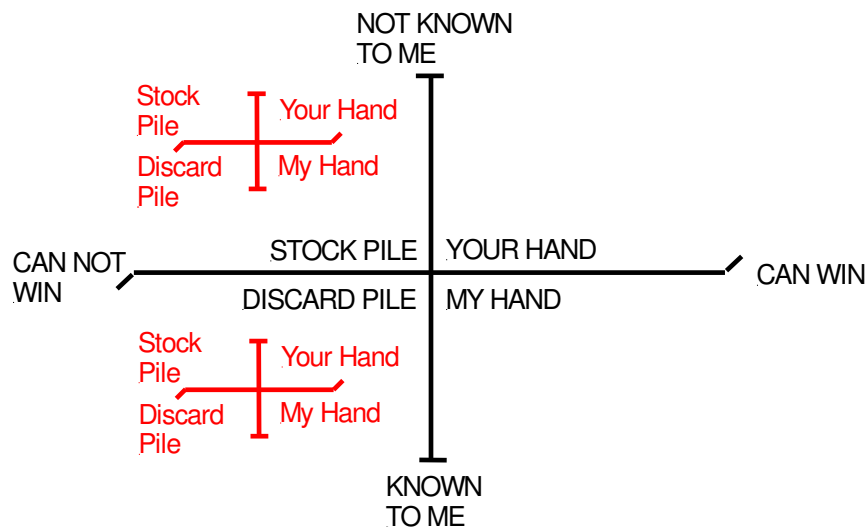


The relationships between the cards are part of the system whereby each player seeks to win the game. As each player attempts to win the game, each decision must be based upon (1) the categories of cards set up by the game and (2) the relationships which these four categories of cards have to one another.

My understanding of these groups of cards and their interrelationships is divided between the two groups in competition TO WIN the game (Your Hand, My Hand) ...

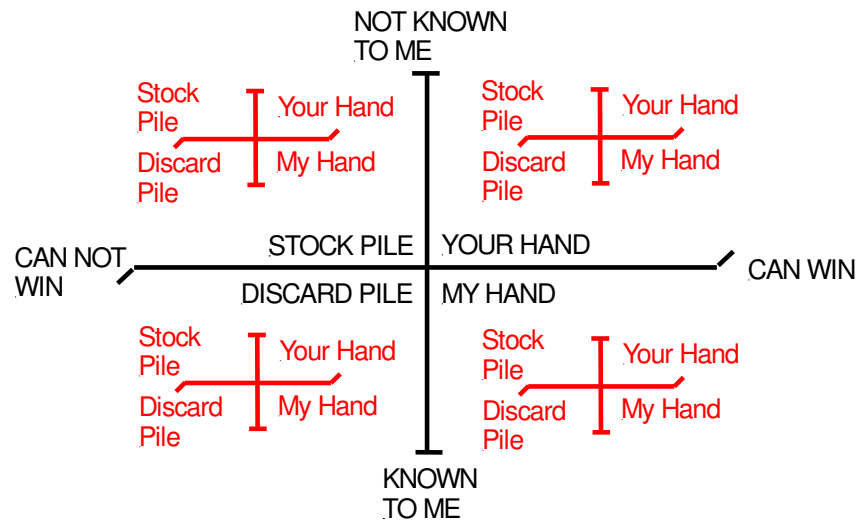


as opposed to the two groups which CAN NOT WIN the game (the Stock Pile, the Discard Pile).

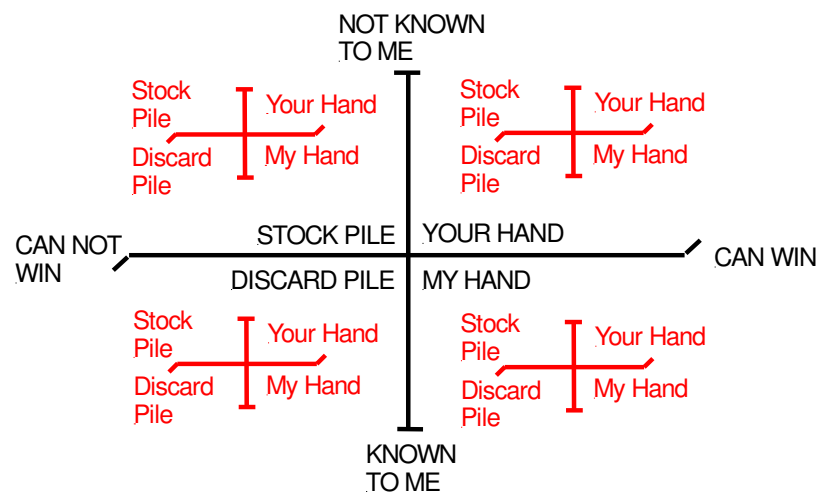


The entire point of our competition is to bring one's hand to completion, to "meld" the cards of one's hand prior to that of the opponent. Noting this distinction, a set of two dichotomies (CAN WIN / CAN NOT WIN; UNKNOWN TO ME / KNOWN TO ME) have rendered four groups of relationships.

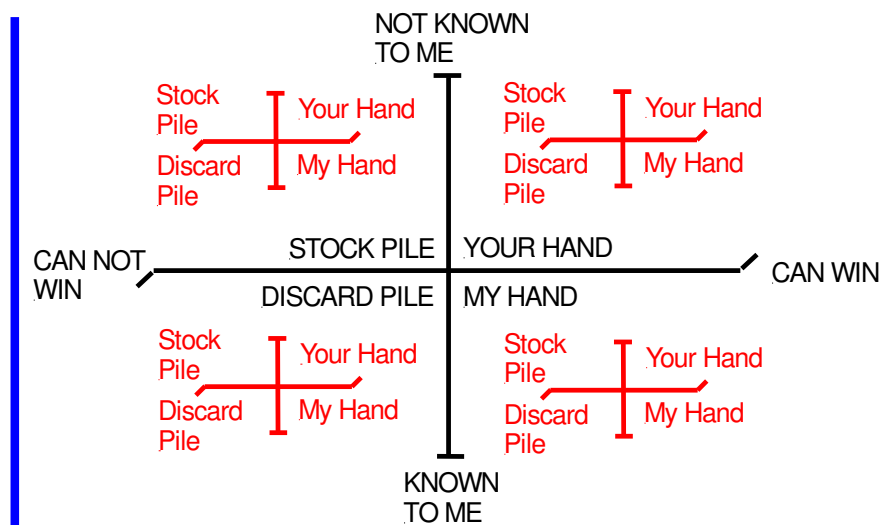
At this point we have simply squared the number of considerations of the card game based the "relationships" of the game as superimposed upon the original four categories of cards "defined" by the game.



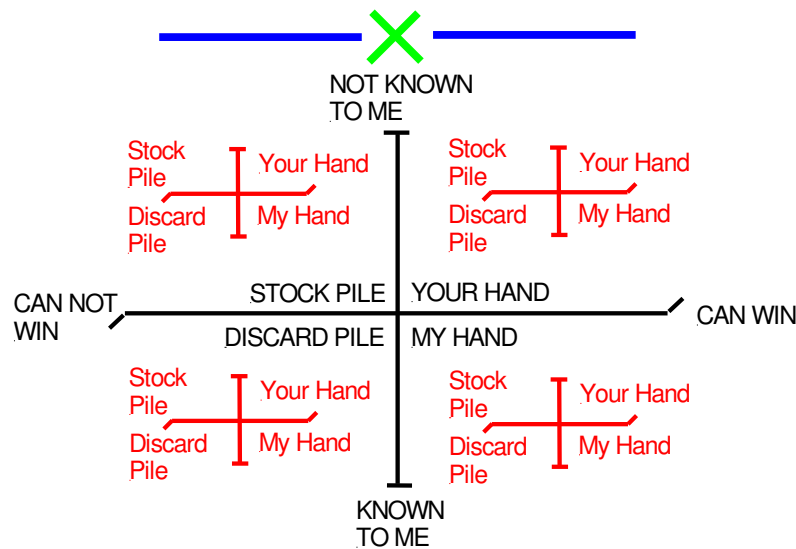
Regarding the distinction between “Primary Opposition” and “Secondary Opposition,” first note that the two categories on the right are directly related to each other in that they are in competition with each other. The direct relationship provided by the Secondary Opposition is given as a solid blue line. Two categories of cards - Your Hand, My Hand - are in competition with each other. Either CAN WIN THE GAME. They interplay with one another to out-manuever or outplay the other.



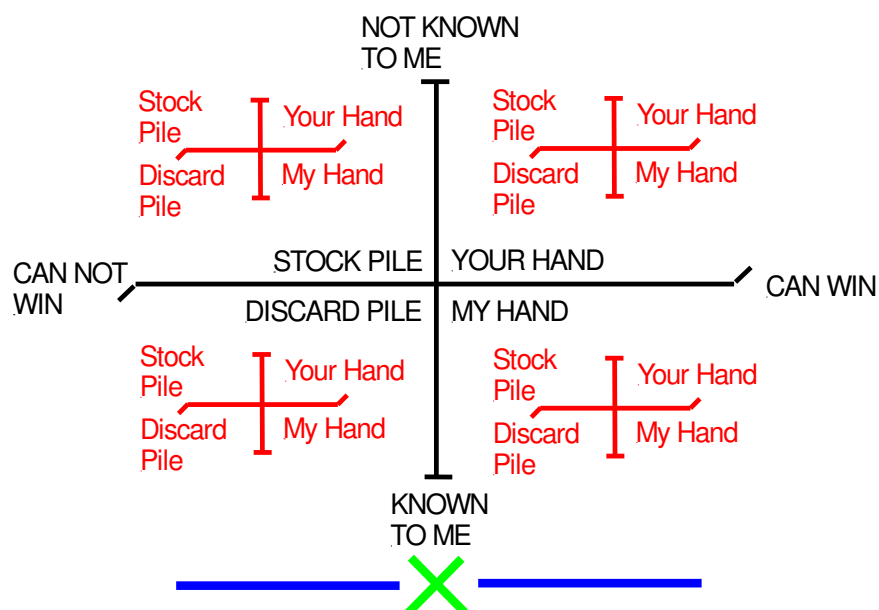
Two categories of cards to the left – the Stock Pile, Discard Pile - are similar in that they CAN NOT WIN the game. They exist as separate entities to be manipulated in the game. They serve different purposes, and neither can win.



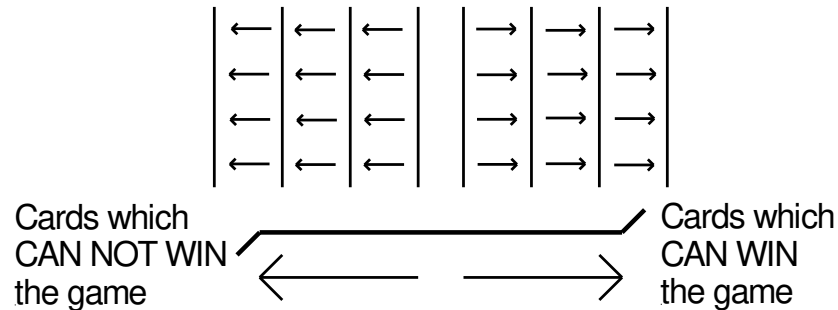
On the other hand, the two upper sets of cards - Your Hand, Stock Pile - are separated by the Primary Opposition, a separation of kind, not of gradation, given here by a broken blue line. They are similar only in that their basic nature is to be hidden from me.



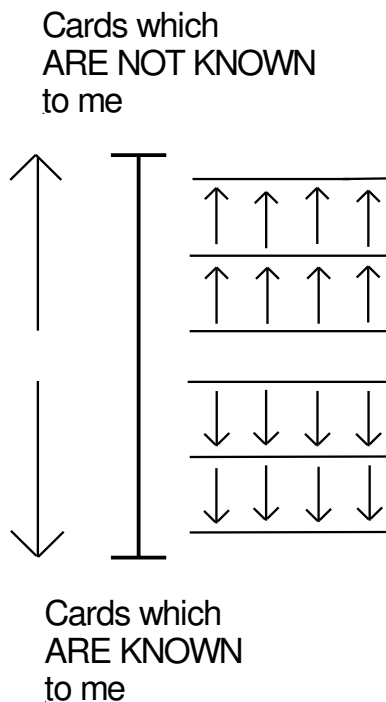
In a similar fashion the two lower sets of cards - My Hand, Discard Pile - are separated by a difference in kind. My Hand may win, and the Discard Pile can never win. This is sufficient to ensure that these two categories will never be in competition against one another, although the Discard Pile may influence greatly my own ability to win the game.



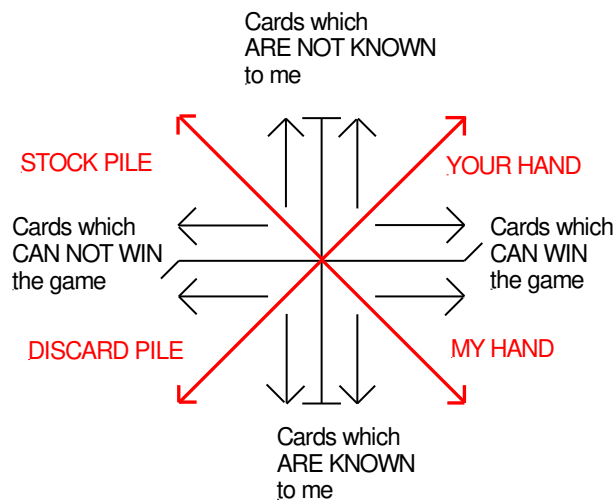
We deal here with two fundamentally different types of oppositions. These create four separate categories within each system. Let us imagine that the Primary Opposition, the opposition between “Can Win The Game” and “Can Not Win The Game,” sets off a straight wave something akin to a rod striking a calm pool of water.



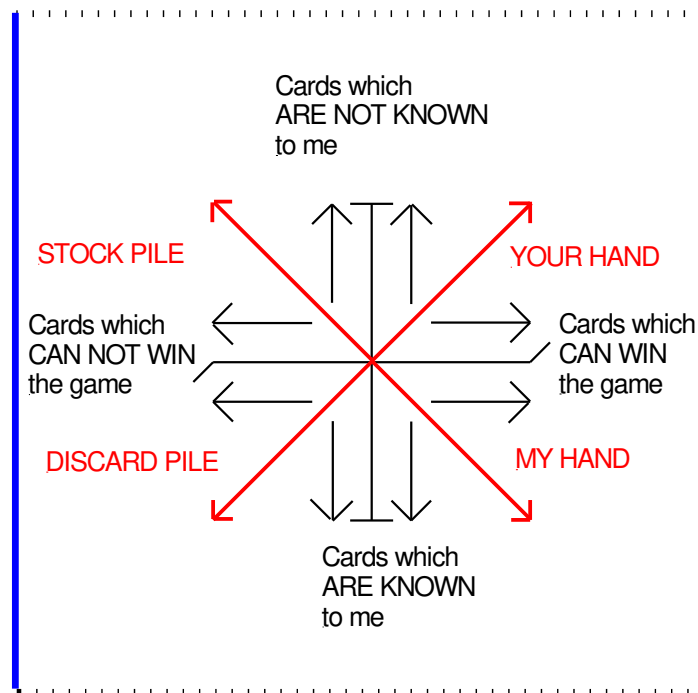
The Secondary Opposition between “Not Known To Me” and “Known To Me” may be imagined as a second, similar wave caused by a rod striking the same pool of water but perpendicular to the first.



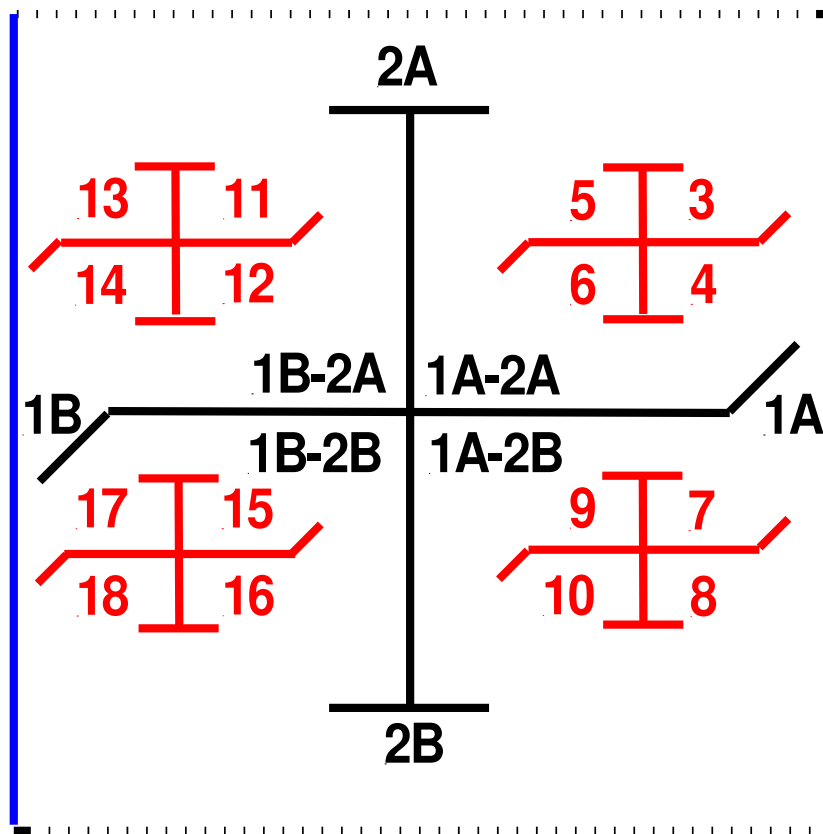
With these combined waves, four “vectors” come into existence, i.e. the intersections of the waves themselves. In the game of Gin Rummy, these vectors are “Your Hand,” “My Hand,” “The Stock Pile,” and the “Discard Pile.” In other words, the desire to “Win The Game” motivates the game itself, and brings into being four opposing but related categories, Your Hand, My Hand, the Stock Pile and the Discard Pile.



If we see that these opposing vectors are equally necessary to the game and therefore of equivalent length, we create a “square of tension” as these sets of cards relate to one another. Let a solid blue line represent the effect of the Secondary Opposition, and a broken black line represent the effect of the Primary Opposition.



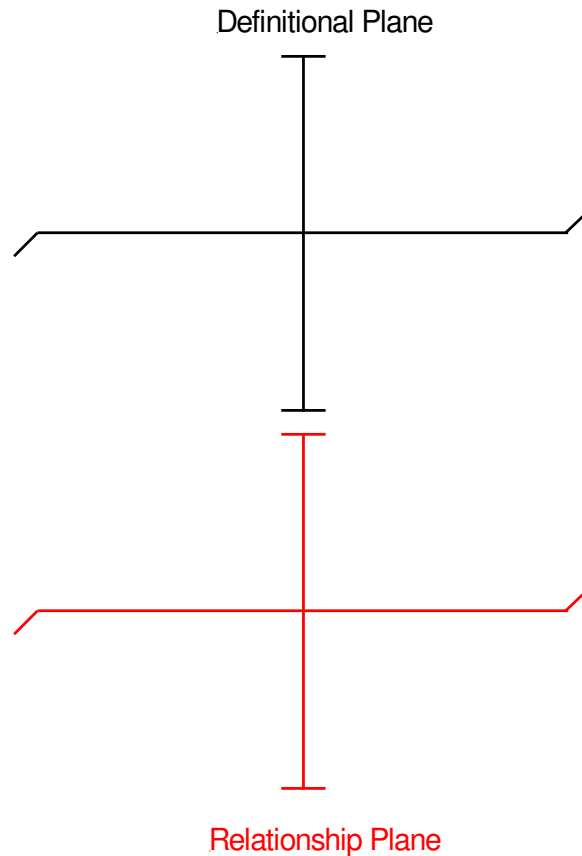
If we number these quadrants in order of appearance in the square previously described, we have the following:



This numbering system permits us to refer quickly refer to the model given in any context.

4.3 The Plane of Conclusion

The two planes which we have described so far are the:



If we add to this analysis the possibility of “conclusions,” we find that the symmetry of the arrangement is broken, in part. *This comes about because the game itself is based upon simple dichotomies which render categories which are themselves not truly symmetrical.* The categories of Stock Pile, Your Hand, My Hand, and the Discard Pile embody types of knowledge which quite deliberately are neither similar, uniform nor equal. The Stock Pile, by definition, is *unknown* to both you and me. The Discard Pile is *known* to both you and me. My Hand and Your Hand are *known to ourselves* but more or less *unknown to each other*. These differences, which are brought on by the nature of the game itself, affect my ability to control my destiny in the game.

To imagine a “Plane of Conclusion,” we might treat the concept of "defining" in Gin Rummy, and of interpreting "relationships" between defined categories of cards, as two separate aspects which "control" our “conclusion” to any question.

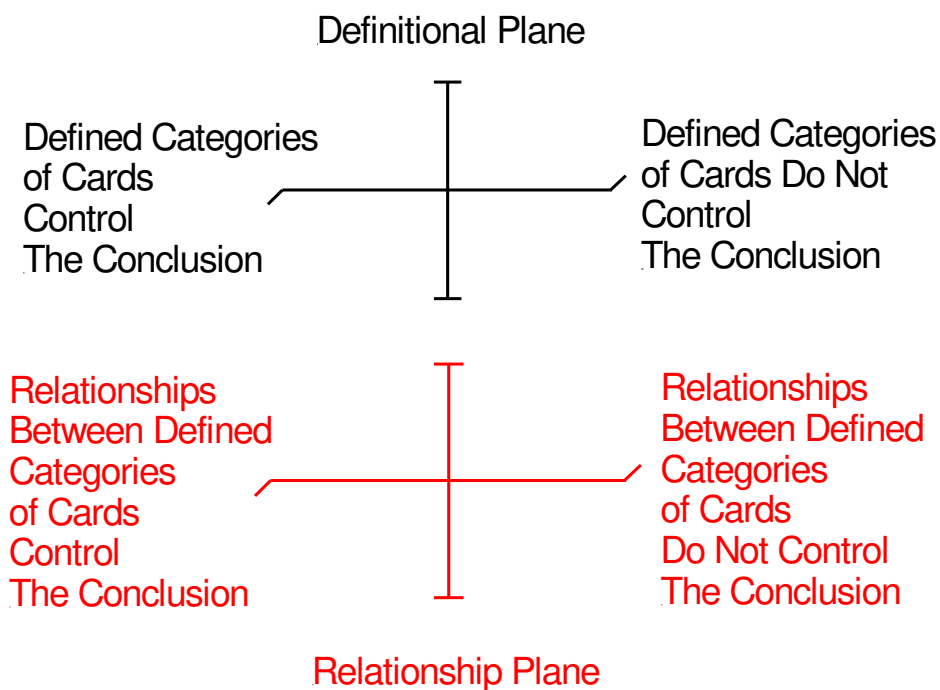
For example, if we ask which set of cards is known to me and which can win the game, the answer is My Hand, *by definition*. If we ask whether we might know for certain which card is on top of the stock pile, the answer is “No,” again by definition. If we ask how many cards are in Your Hand, the answer is ten, by definition. If we ask how many cards are in the Stock Pile at the beginning of the game, the answer is 31, by definition.

If we ask whether you might be likely “to knock” – that is, to go out, to win – with a run of Jacks, the answer depends upon *the relationships* between the cards held in Your Hand. If you have two other Jacks, the answer may be Yes. But even if the answer is “No,” it will be because the relationships between the cards in Your Hand do not permit the proper relationship between cards to be obtained.

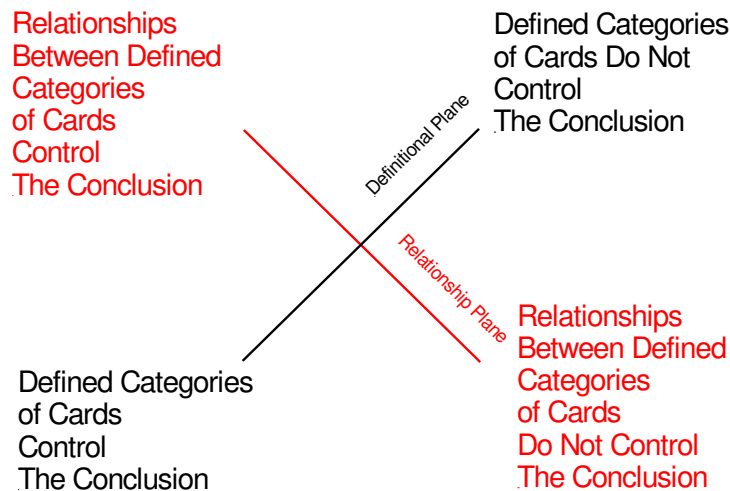
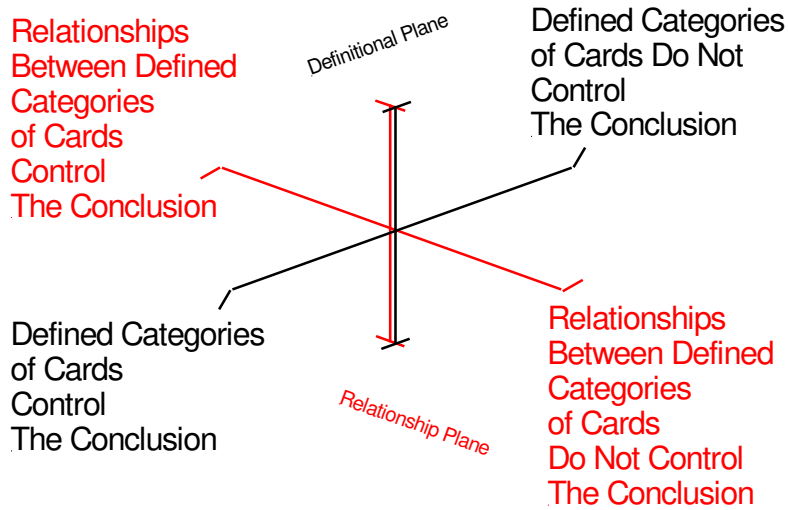
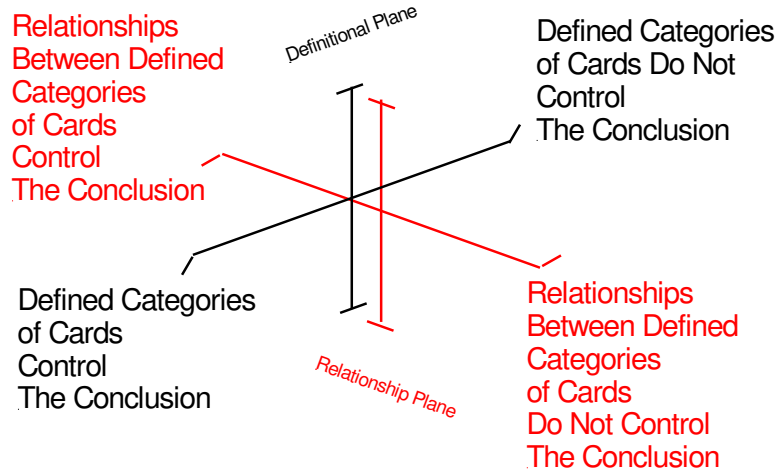
If we ask “Who is the King of Greece?” *neither the categories defined, nor the relationships contemplated*, answer the question. Not every question is answered under the terms of the game.

If we ask whether I should discard my Jack♣, the answer might be “No,” because I recall that you hold in your hand the Jack♦. Discarding a Jack♣ might provide you with the opportunity to obtain a second Jack, which in turn could give you a set of three Jacks. The analysis of whether to discard the Jack♣ depends upon *both* (1) the *relationships* which exist between the defined categories of cards - My Hand, Your Hand, the Discard Pile, the Stock Pile - *and* (2) the *defined* categories of cards themselves.

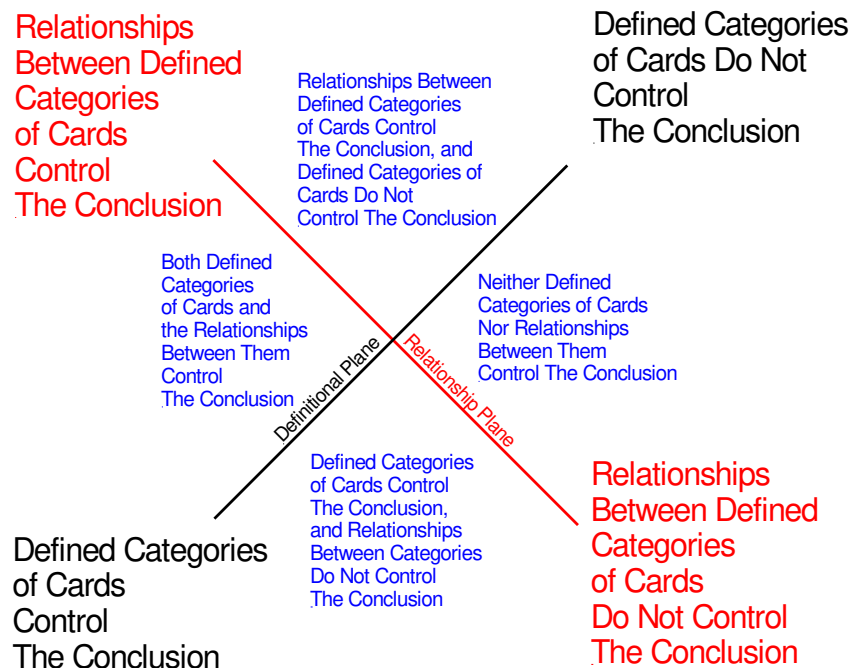
To imagine the development of a “Plane Of Conclusion” we might state the "Plane of Definition" with the "Plane of Relationship" separately, and then align them along a common axis.



To answer any question in the game of Gin Rummy, either the definitions proposed, or the interrelationships specified, must CONTROL the answer. The player must reach any specified conclusion based upon the adequacy of the definition of a given set of cards, or upon the relationships mandated by the definitions adopted. The alignment of these concepts can be imagined as follows:



The card player now is expected to come to conclusions regarding the interplay between the definitions proposed and the interrelationships inherent in the definitions proposed. We should treat the concept of "defining" in Gin Rummy, and of interpreting "relationships" between defined entities, as two separate aspects which "control" our answer to any decision in the game. As this pertains to Gin Rummy, we would then have the following "conclusion" plane:



A fundamental expectation of every game is that one of these quadrants will render an appropriate answer.

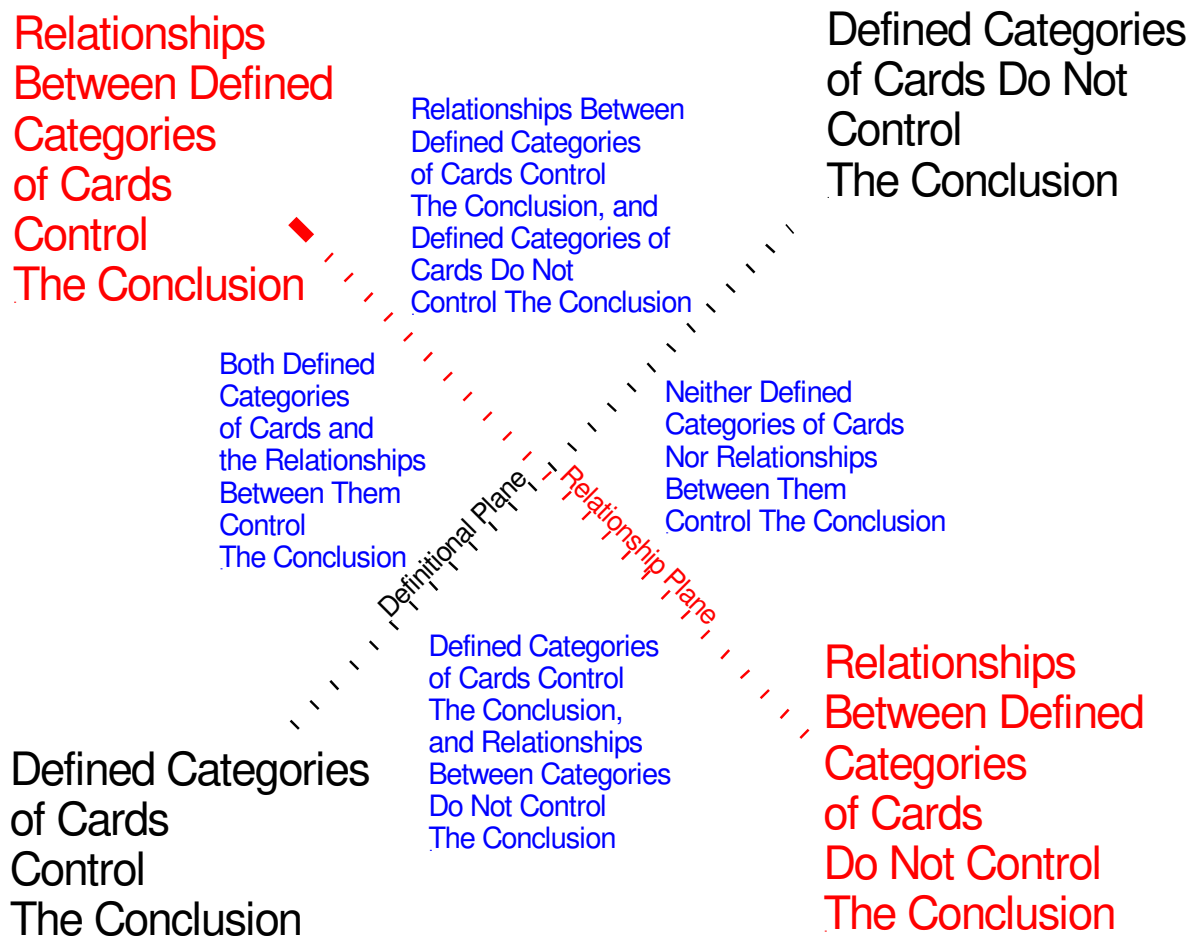
4.3.1. Conclusions regarding the Stock Pile

If I ask myself whether or not I should draw a card from the top of the Stock Pile, one fundamental point becomes obvious: *Under no circumstances are we, the players, permitted to know the identity of this card.* By definition this card is always unknown to both players. Even if I suspect that a card which I seek is in the Stock Pile, I can not be sure *where* in the Stock Pile, or whether eventually I will be lucky enough to choose it. Moreover the particular card I seek may be hidden from my view in Your Hand and *not* located in the Stock Pile at all.

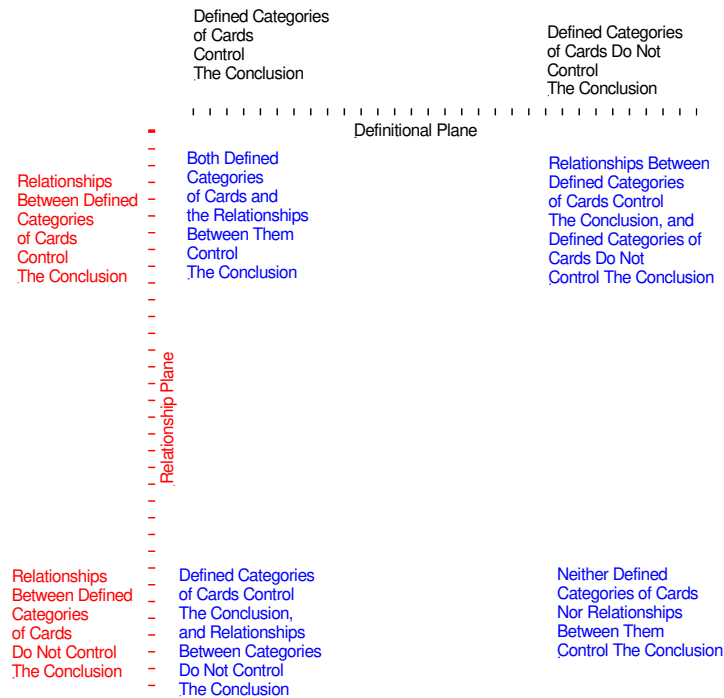
There is a logical contradiction to this situation which should be considered. If I *violate* the rules and "peek" at the top card of the Stock Pile I have cheated. In effect I am no longer *playing* the game because I have violated the rules which form the basis of the game itself.

On the other hand if I do *not* violate the rules and "peek," I am forever uncertain as to the exact identity of the top card in the Stock Pile; in consequence I may *lose* the game. If I *refuse* to peek at the identity of the top card in the Stock Pile, I may end up choosing a card *which does not help me*. Or I may select a card from the Discard Pile instead, and thereby *miss* the very card (albeit unknown to me) which might have helped me as it was available as the top card of the Stock Pile.

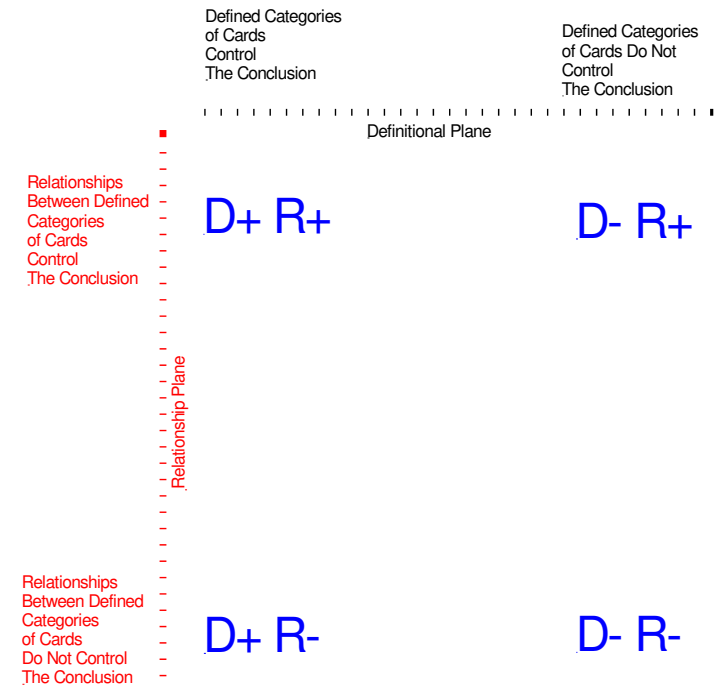
Nevertheless, despite this uncertainty I am required to choose this card for my hand, or decline to take this card into my hand, *never knowing with certainty whether it will – or will not – help me*. As this uncertainty affects the game my understanding of the “Definition” of the categories of cards, and the “Relationships” between cards in the game, can never fully answer my question as to whether I should - or should not - choose the top card in the Stock Pile. The uncertain usefulness of “Definitions” and “Relationships” in the game might be drawn with a series of dashes - rather than a solid straight line – to indicate the questionable utility of these concepts in determining whether I should – or should not – choose the top draw card from the Stock Pile.



This could be pictured slightly differently as follows:



A short-hand method of referring to this arrangement is the following:



The uncertainty created by the unknown identity of the top card in the Stock Pile creates a new and unavoidable variable in the matter. This variable is the extent to which the “Definitions Are Uncertain In Controlling The Conclusion,” and the extent to which “Relationships Are Uncertain In Controlling The Conclusion.”

	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	Both Defined Categories of Cards and the Relationships Between Them Control The Conclusion		Relationships Between Defined Categories of Cards Control The Conclusion, and Defined Categories of Cards Do Not Control The Conclusion
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion			
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	Defined Categories of Cards Control The Conclusion, and Relationships Between Categories Do Not Control The Conclusion		Neither Defined Categories of Cards Nor Relationships Between Them Control The Conclusion

This checkerboard pattern, as simplified is as follows:

	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	D+ R+		D- R+
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion			
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	D+ R-		D- R-

When we deal with the unknown identity of the top card in the Stock Pile the uncertain usefulness of our Definitions renders the following two new possibilities.

	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	Both Defined Categories of Cards and the Relationships Between Them Control The Conclusion	Relationships Between Defined Categories of Cards Control The Conclusion and Defined Categories Are Uncertain In Controlling The Conclusion	Relationships Between Defined Categories of Cards Control The Conclusion, and Defined Categories of Cards Do Not Control The Conclusion
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion			
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	Defined Categories of Cards Control The Conclusion, and Relationships Between Categories Do Not Control The Conclusion	Relationships Between Defined Categories Do Not Control The Conclusion and Defined Categories Are Uncertain In Controlling The Conclusion	Neither Defined Categories of Cards Nor Relationships Between Them Control The Conclusion

A question mark - “D?” - will be used to indicate those quadrants in the checkerboard wherein the Definitions proposed are uncertain in their assistance in controlling the conclusion to a question.

	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	D+ R+	D? R+	D- R+
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion			
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	D+ R-	D? R-	D- R-

Similarly when we deal with the unknown identity of the top card in the Stock Pile the uncertain usefulness of the Relationships between cards renders two more possibilities.

	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	Both Defined Categories of Cards and the Relationships Between Them Control The Conclusion	Relationships Between Defined Categories of Cards Control The Conclusion and Defined Categories Are Uncertain In Controlling The Conclusion	Relationships Between Defined Categories of Cards Control The Conclusion, and Defined Categories of Cards Do Not Control The Conclusion
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Control The Conclusion and Relationships Between Defined Categories Are Uncertain In Controlling The Conclusion		Defined Categories of Cards Do Not Control The Conclusion and Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	Defined Categories of Cards Control The Conclusion, and Relationships Between Categories Do Not Control The Conclusion	Relationships Between Defined Categories Do Not Control The Conclusion and Defined Categories Are Uncertain In Controlling The Conclusion	Neither Defined Categories of Cards Nor Relationships Between Them Control The Conclusion

A question mark - “R?” - will be used to indicate those quadrants in the checkerboard wherein the Relationships proposed are uncertain in their assistance in controlling the conclusion to a question.

	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	D+ R+	D? R+	D- R+
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion	D+ R?		D- R?
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	D+ R-	D? R-	D- R-

The uncertain usefulness of *both* Definitions and Relationships together renders one final possibility for a Conclusion. The checkerboard of possibilities below represents the uncertainty *inherent* in the unknown identity of the top card in the Stock Pile. To determine whether the top stock pile card should be chosen I face nine separate possibilities:

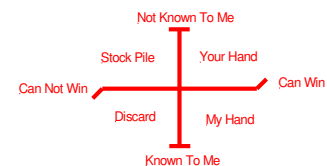
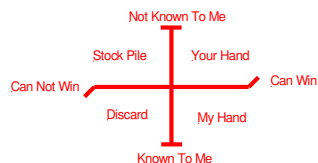
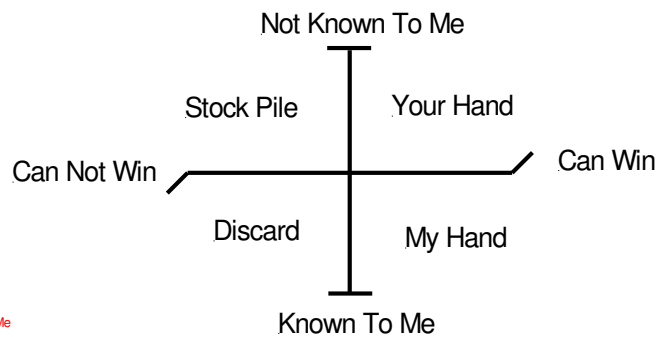
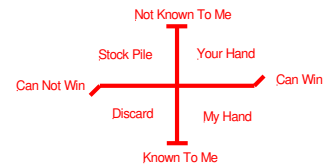
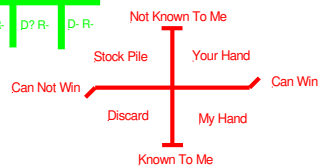
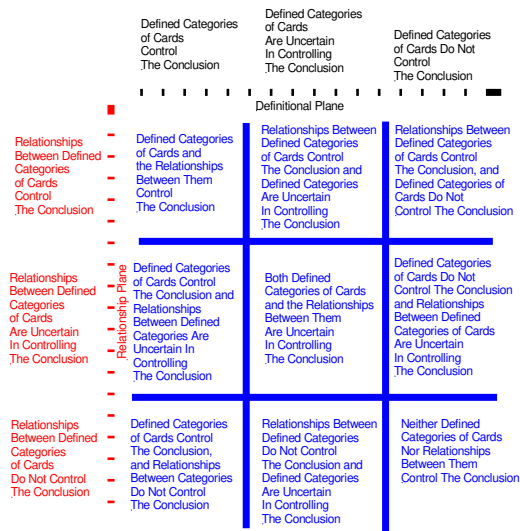
	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	Both Defined Categories of Cards and the Relationships Between Them Control The Conclusion	Relationships Between Defined Categories of Cards Control The Conclusion and Defined Categories Are Uncertain In Controlling The Conclusion	Relationships Between Defined Categories of Cards Control The Conclusion, and Defined Categories of Cards Do Not Control The Conclusion
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Control The Conclusion and Relationships Between Defined Categories Are Uncertain In Controlling The Conclusion	Both Defined Categories of Cards and the Relationships Between Them Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion and Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	Defined Categories of Cards Control The Conclusion, and Relationships Between Categories Do Not Control The Conclusion	Relationships Between Defined Categories Do Not Control The Conclusion and Defined Categories Are Uncertain In Controlling The Conclusion	Neither Defined Categories of Cards Nor Relationships Between Them Control The Conclusion

... or in simplified notation:

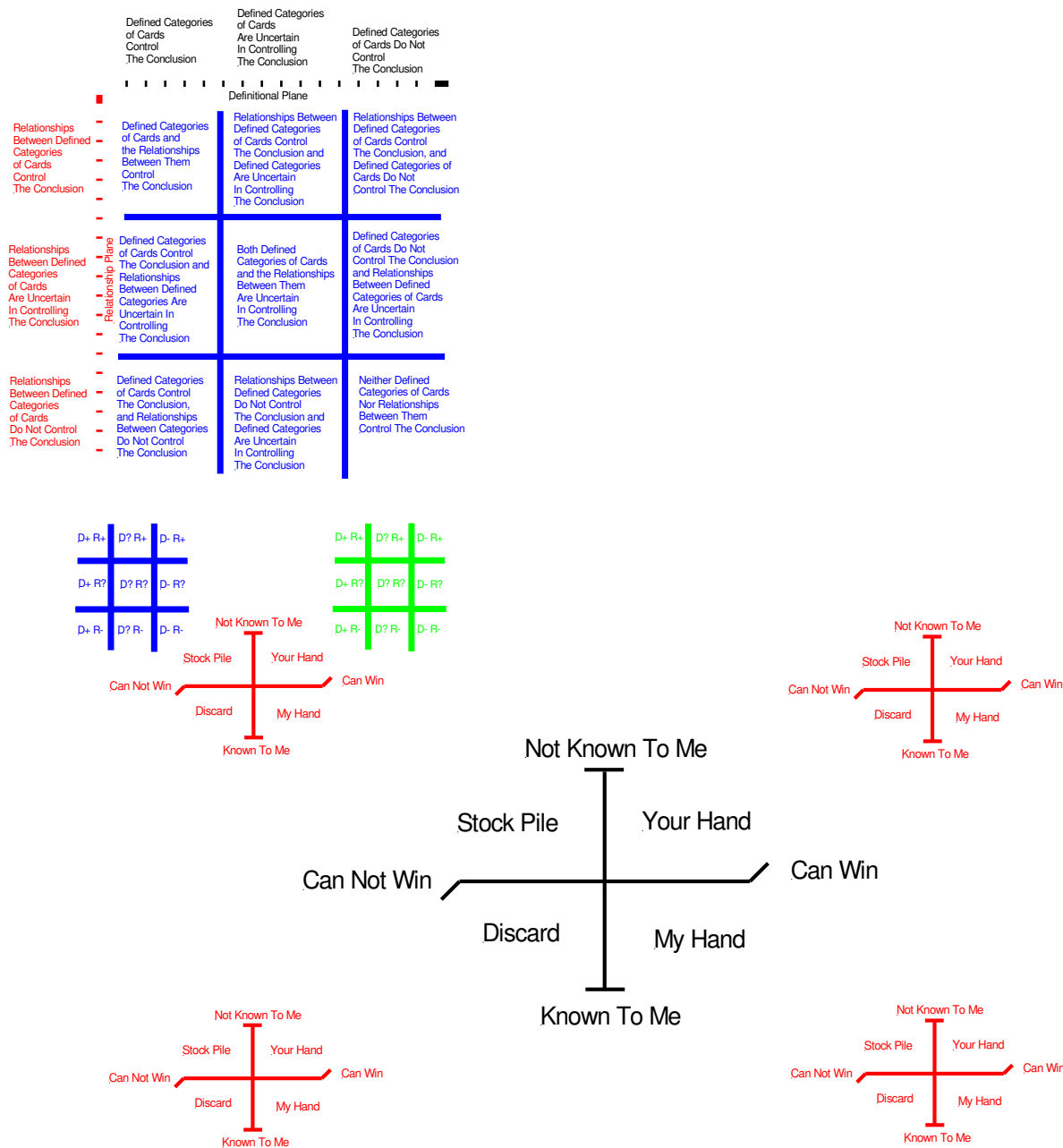
	Defined Categories of Cards Control The Conclusion	Defined Categories of Cards Are Uncertain In Controlling The Conclusion	Defined Categories of Cards Do Not Control The Conclusion
	Definitional Plane		
Relationships Between Defined Categories of Cards Control The Conclusion	D+ R+	D? R+	D- R+
Relationships Between Defined Categories of Cards Are Uncertain In Controlling The Conclusion	D+ R?	D? R?	D- R?
Relationships Between Defined Categories of Cards Do Not Control The Conclusion	D+ R-	D? R-	D- R-

That is to say, in attempting to align the concepts of definition and relationship to answer whether the top card in the Stock Pile should be chosen, we have nine possible answers, none of which takes precedence over the others.

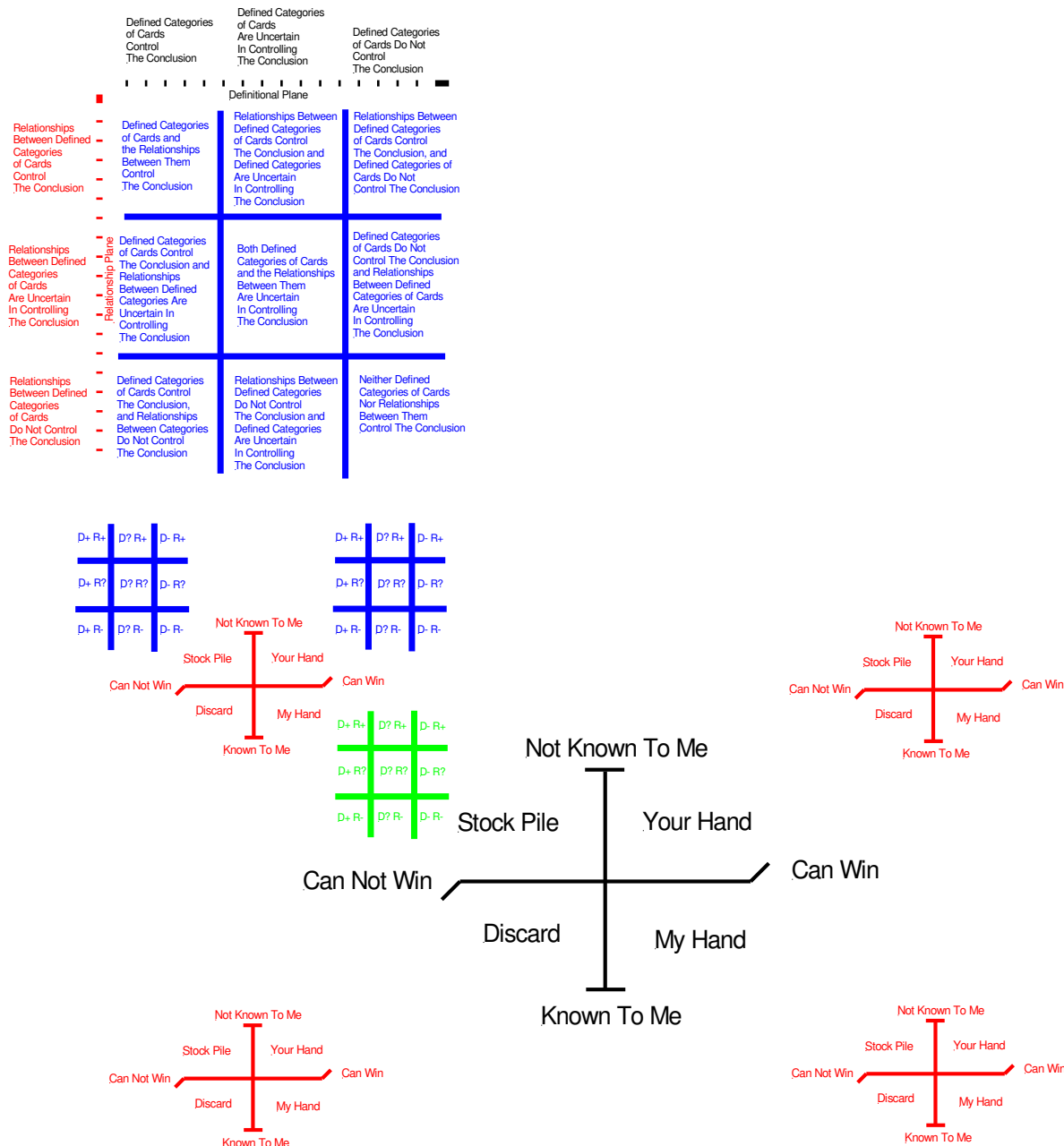
The unknown identity of the top card in the Stock Pile is directly related to the nature of the Stock Pile itself. I am completely unsure *which* card lies *where* in the Stock Pile. The Defined Categories of Cards, and the Relationships Between These Categories, may be completely unable to answer my question as to whether I should choose from the Stock Pile with any certainty at all.



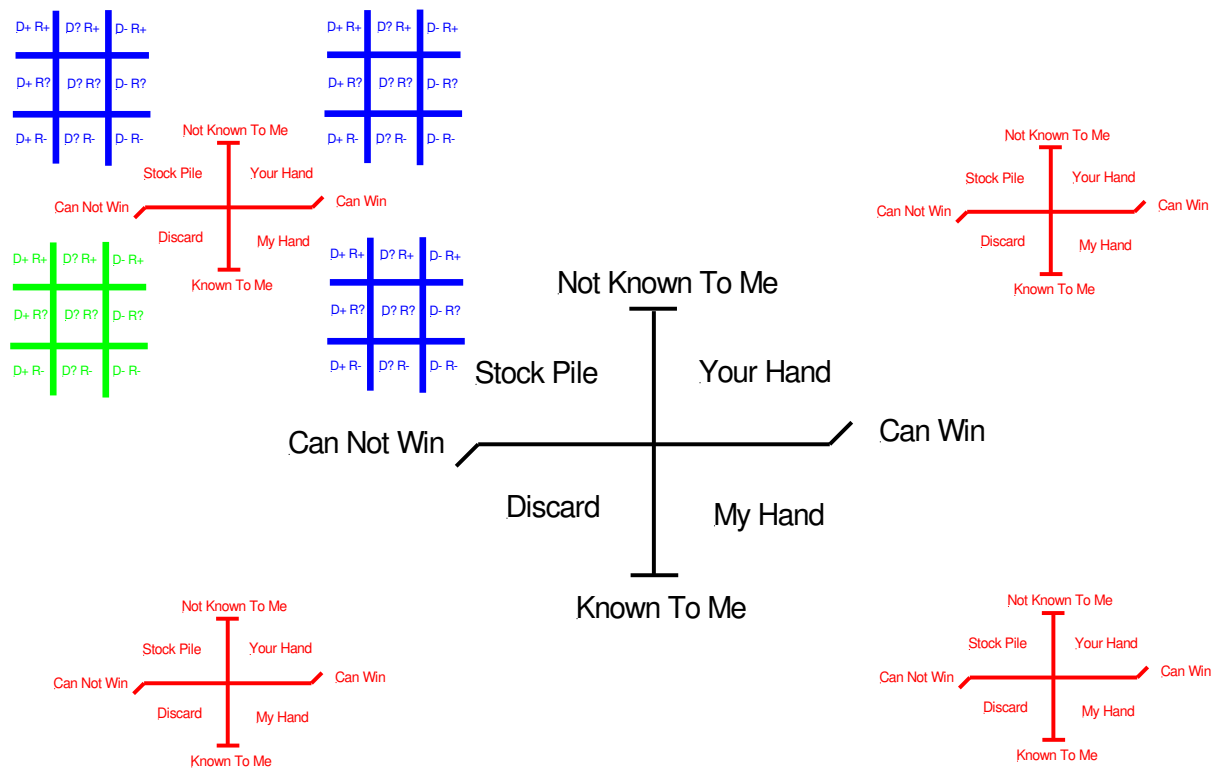
What Conclusion should we draw as to *any* relationship which the top card in the Stock Pile has as to the cards in Your Hand? If I am unable to state clearly *which* cards are within the Stock Pile, or *where* they are within the Stock Pile, or which card is the *next to be drawn*, I am also unable to state with certainty the relationship of the top card in the Stock Pile to Your Hand. The nine-part uncertainty arises again.



What Conclusion should we draw as to any relationship which the top card in the Stock Pile has as to the cards in My Hand? Once again, if I am unable to state clearly *which* cards are within the Stock Pile, or *where* they are located in the Stock Pile, or which one is the *next to be drawn*, an *inherent* uncertainty exists, one which prohibits my ability to state with certainty a relationship between the top card of the Stock Pile and My Hand. The nine-part uncertainty is stated once again.



Finally what Conclusion should we draw as to the relationship between the top card of the Stock Pile and the cards in the Discard Pile? Once again if I am unable to state clearly *which* cards are within the Stock Pile, or *where* they are located in the Stock Pile, or which one is the *next to be drawn*, an *inherent* uncertainty exists, one which prohibits my ability to state with certainty a relationship between the top card of the Stock Pile and the Discard Pile. Once again the nine-part uncertainty must be repeated.

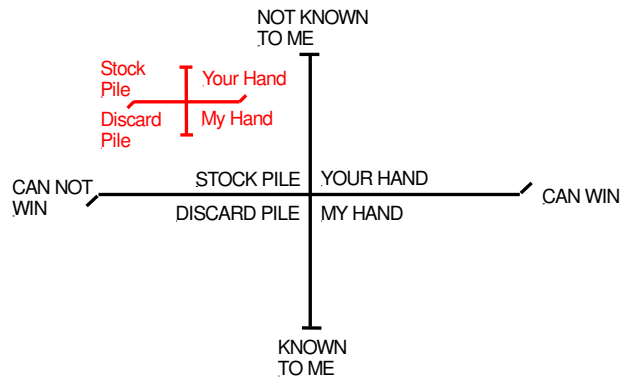


The essential ambiguity of the identity of the cards in the Stock Pile, their placement within the Stock Pile, and the identity of the top card creates an uncertainty as to the utility of “Defined” categories or “Relationships” between them in answering whether I should – or should not – choose a card from the Stock Pile. We then are unable to establish clear Conclusions for the top card in the Stock Pile as to the other cards in the Stock Pile, Your Hand, My Hand and with the Discard Pile.

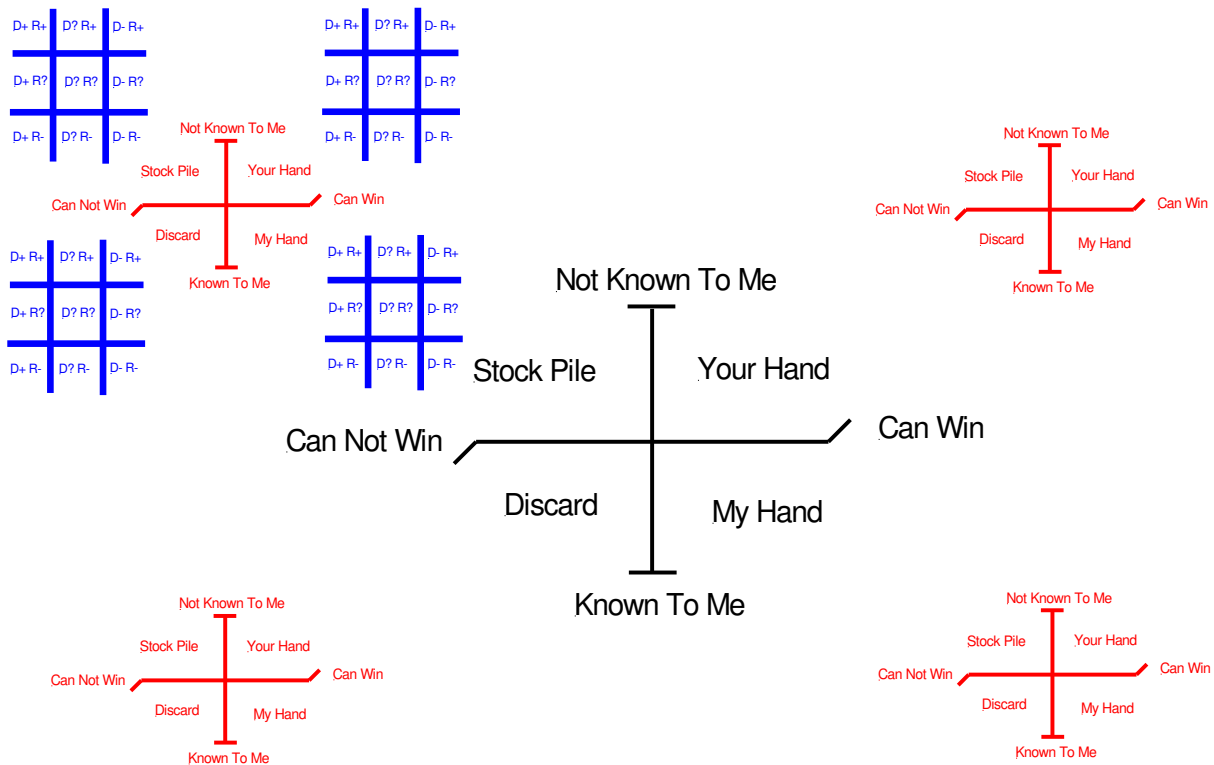
This pattern is one of necessity, created by the terms of the game. The logical impossibility *inherent* in identifying the top card of the Stock Pile makes impossible further description of its relationship with other categories of cards. If we are unable to identify the top card in the Stock Pile we cannot discuss with certainty its relationships with Your Hand, My Hand, and the Discard Pile.

This uncertainty is the basis for the game, its challenge and its good or bad fortune. This situation arises in no other place in the game of Gin Rummy.

In other words, while the top card in the Stock Pile obviously has *relationships* with the groups of cards *defined* by the game ...



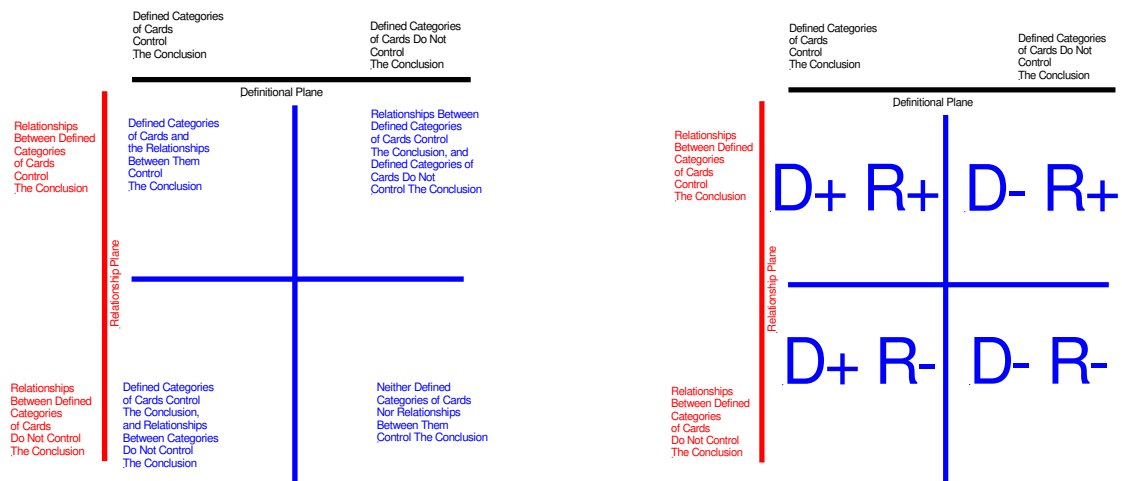
... the *utility* of these definitions and relationships, the ability to use the definitions and relationships to reach *conclusions* about whether or not to choose the top card of the Stock Pile and incorporate it into one's hand of cards, must remain an *inherently* uncertain part of the game itself.



4.3.2 Conclusions Regarding Categories of Cards Which CAN WIN the Game (Your Hand, My Hand)

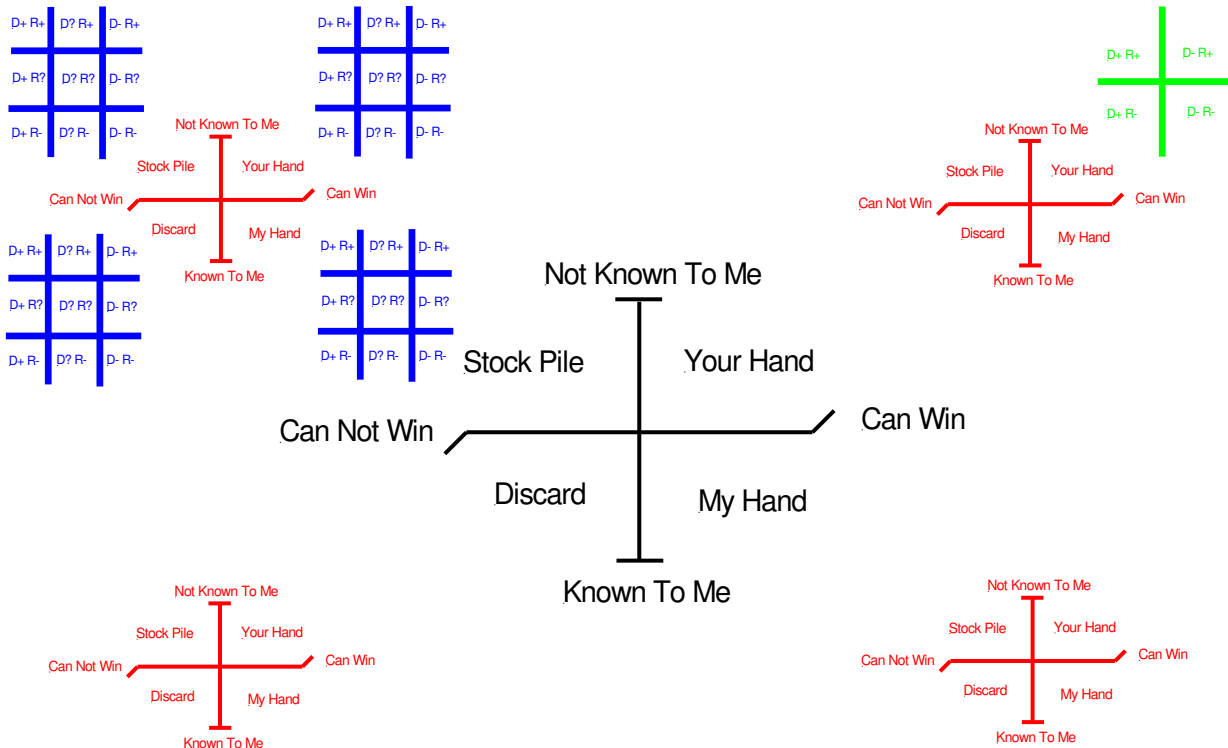
We might expect that this same uncertainty would ruin any chance of a decent card game. We might expect that these same nine quadrants of uncertainty would “infect” every other category of cards – Your Hand, My Hand, the Discard Pile.

This, however, is not the case. If I ask you to reveal the identity of the cards in Your Hand, you could tell me. This would assist me greatly in my effort to win the game. The identity of the cards in Your Hand are not in question, nor are they inherently unknown; they are simply unknown to me. For this reason *neither* the Definitions nor the Relationships are *inherently* uncertain when it comes to Conclusions regarding Your Hand. Because we have no *inherent* uncertainty or contradiction in Your Hand, we may return to a simple and straightforward placement of planes. This simple blue cross indicates that only four possibilities of conclusion are possible. Once again, these are:



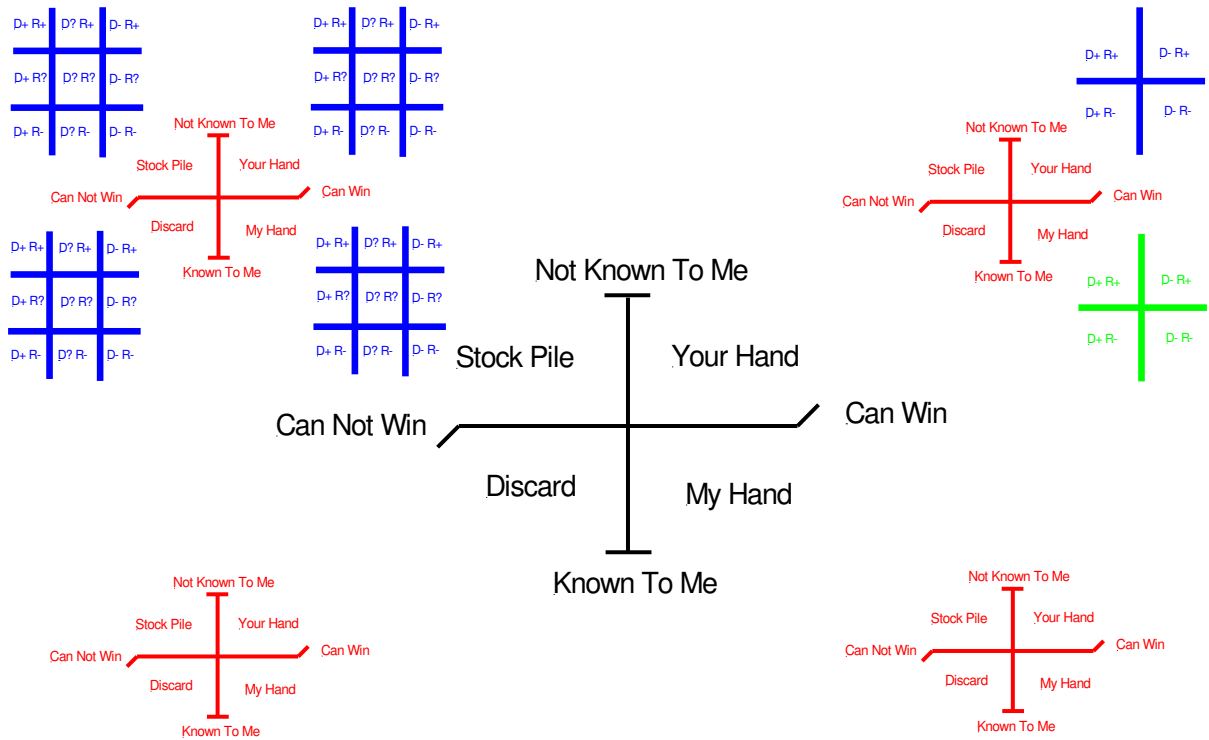
or,...

Regarding the relationship which the cards in Your Hand have to each other, we have:

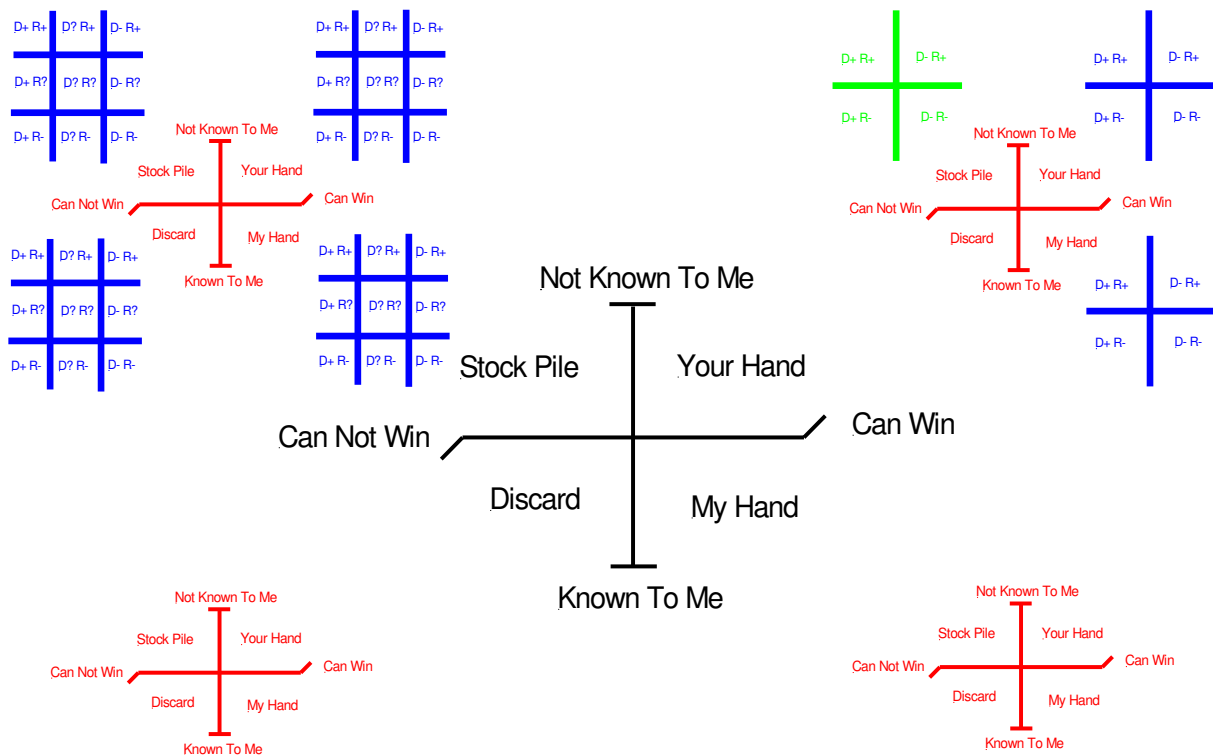


When dealing with cards in Your Hand the identity of these cards are – *by definition* – known and the *relationships* which they have to each other must be clear to you. Although these cards may not be known to me, they are not *inherently* uncertain. As mentioned in the Introduction it is important to bear in mind that the Conclusion Plane seeks to relate the Definitions (either helpful or not) with Relationships (either helpful or not) as abstract possibilities. The question is whether the Definitions and Relationships described aid in the understanding of something, or whether they do not. In the above the possibility of a Conclusion made without inherent uncertainty is simply noted, and we move on.

If I ask what Conclusions can be drawn between the cards in Your Hand to the cards in My Hand, we again deal with cards which are known to you and controlled by you. There is no *inherent* ambiguity or uncertainty.



Considering what Conclusions may be drawn between the cards in Your Hand and those in the Stock Pile, there is an element of uncertainty in knowing the identity of the top card in the Stock Pile. Nevertheless the cards in Your Hand must be played with this uncertainty taken into account for the best possible move. *This uncertainty does not eliminate the game; it creates the game.*

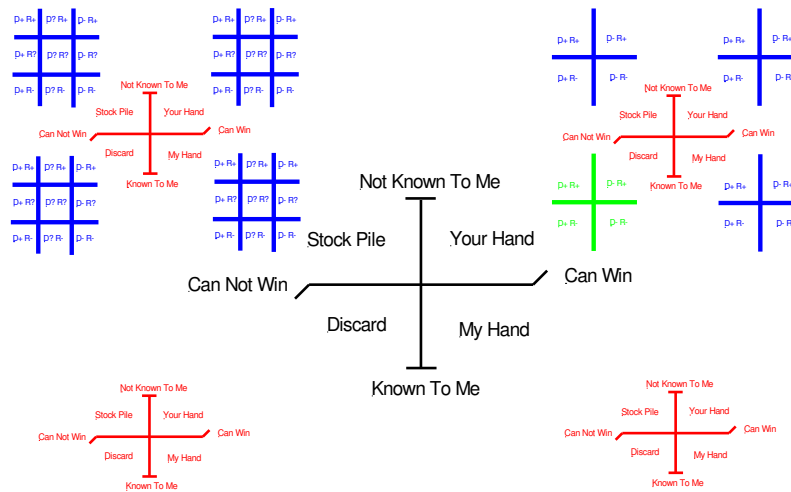


Regarding our previous discussion of the impossibility of determining the identity of the top card in the Stock Pile, we may notice that this uncertainty is non-commutative. In other words, in this instance the statement “ $A + B = B + A$ ” is not necessarily a true statement. Put another way: “My relationship with Elizabeth Taylor is not the same as Elizabeth Taylor’s relationship with me.”

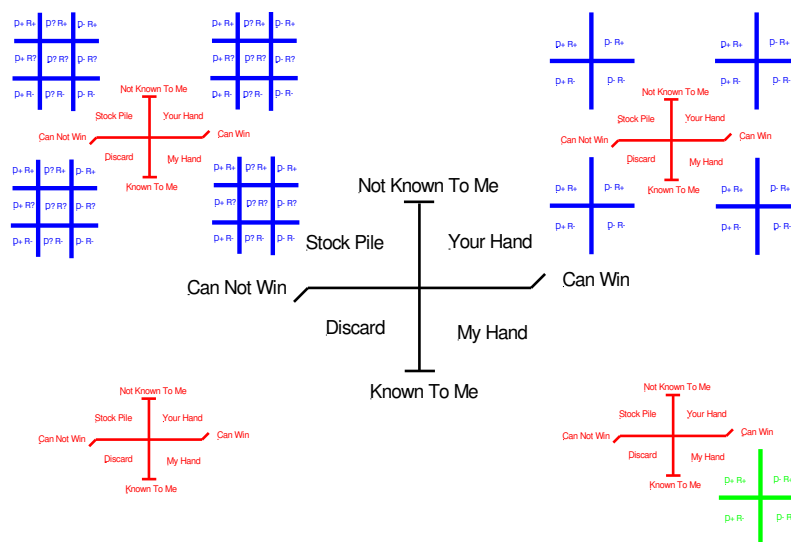
From the point of view of the identity of the cards in Your Hand, there is no particular problem in seeing that they must take into account the cards still undiscovered in the Stock Pile and in particular the top card in the Stock Pile.

From the standpoint of the Stock Pile however, and in particular from the point of view of the top card in the Stock Pile, any attempt to draw relationships between the Stock Pile and the rest of the game is plagued by an *inherent* uncertainty, an *inherent* uncertainty which is absolutely essential to the progress of the game.

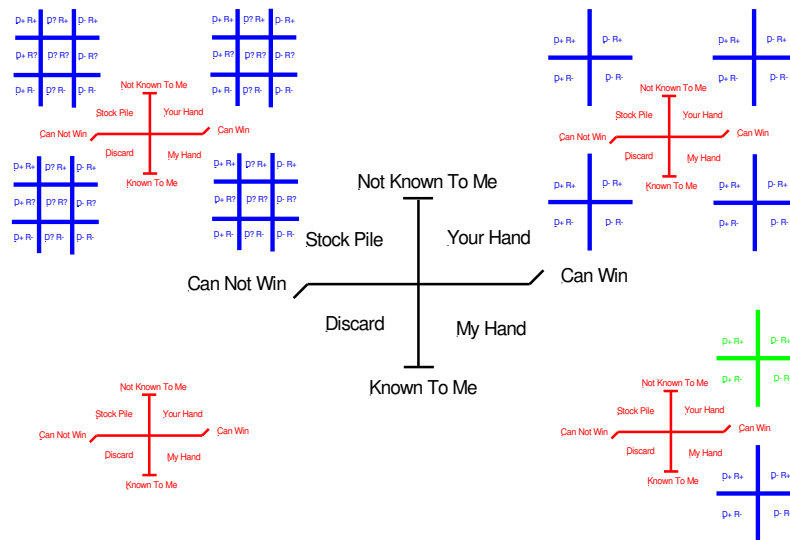
If we ask what Conclusions may be drawn between the cards in Your Hand and those in the Discard Pile, we see that there is no uncertainty at all. The cards in the Discard Pile are known to both of us and Your Hand is known to you. Although I may not know the identity of the cards in Your Hand, there is no *inherent* uncertainty about them or their relationship to the top card of the Discard Pile.



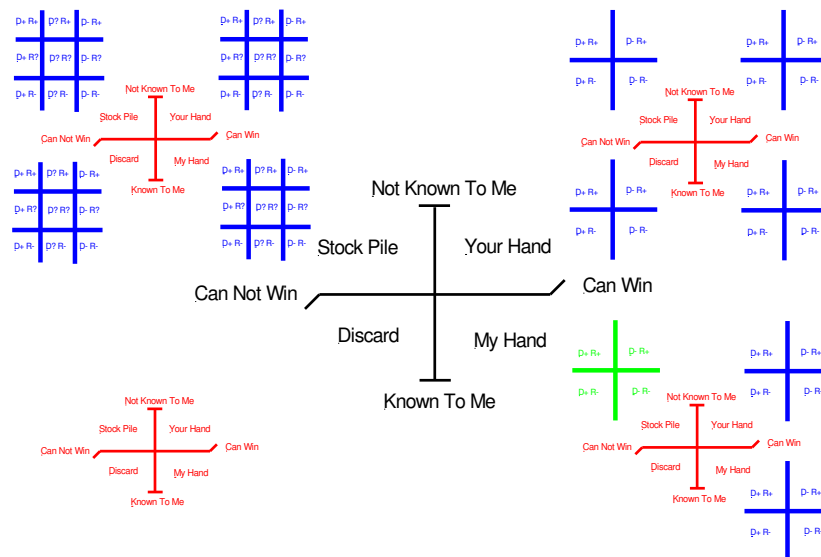
If we ask what Conclusions may be drawn between the cards in My Hand amongst themselves, we see that there is no uncertainty at all. The cards in My Hand are seen clearly by me, without ambiguity. Upon their relationships I will win or lose the game.



If we ask what Conclusions may be drawn between the cards in My Hand and the cards in Your Hand, we see that there is no *inherent* uncertainty. You can see each card in Your Hand and you could show them to me if you wish. Independently I know the cards in Your Hand which you have drawn from the Discard Pile. I may not be fully informed of the identity of *all* the cards in Your Hand, but Your Hand is known at least to you. Therefore it is not *inherently* uncertain.



If we ask what Conclusions may be drawn between the cards in My Hand and the cards in the Stock Pile, and in particular to the top card in the Stock Pile, there is no *inherent* uncertainty. I must develop my strategy using the knowledge I have of the cards in My Hand with the uncertainty of the top card in the Stock Pile born in mind.

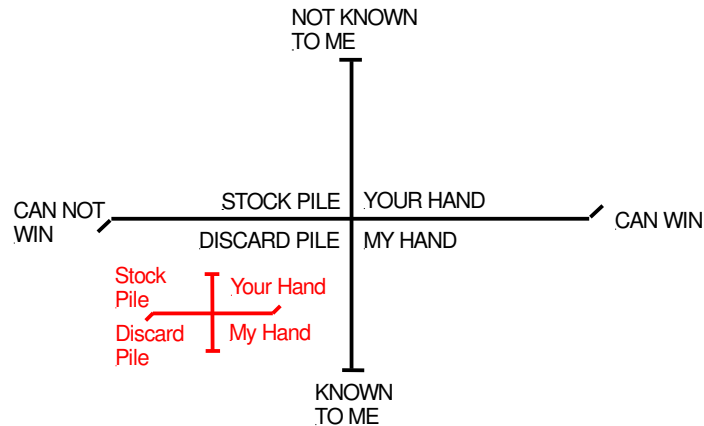


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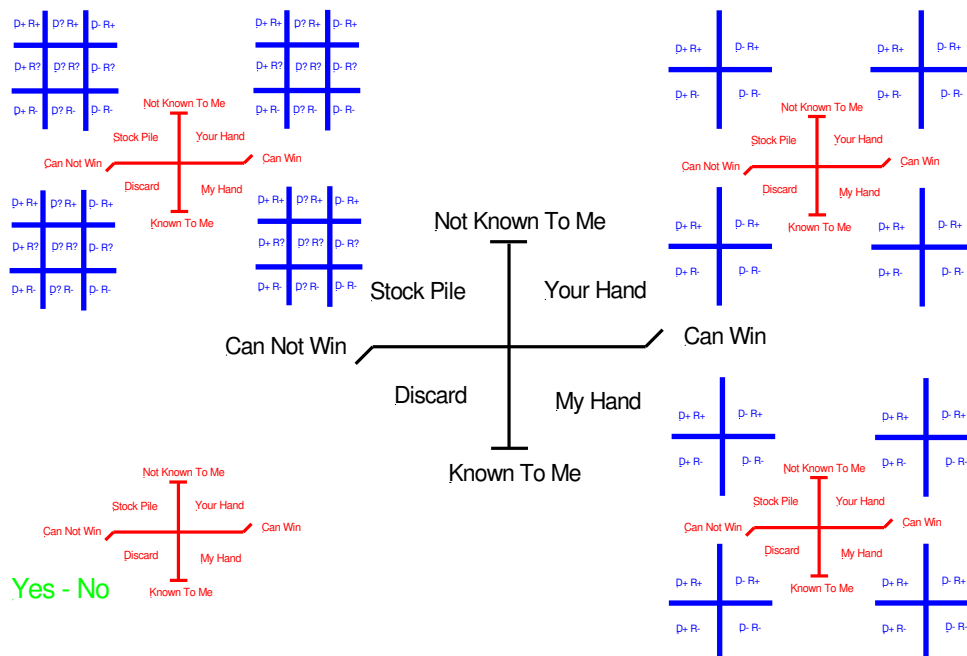
4.3.3 Conclusions regarding Discard Pile

We have already specified that there exist “relationships” between the cards in the Discard Pile.



When we move to the Plane of Conclusion however the issue is no longer what “relationship” exists between the cards of the Discard Pile. Rather the question becomes “Do I want the card?” The identity of the card is known, there is no uncertainty about the card itself nor in its relationship to the rest of the cards. We may answer this question simply, Yes or No.

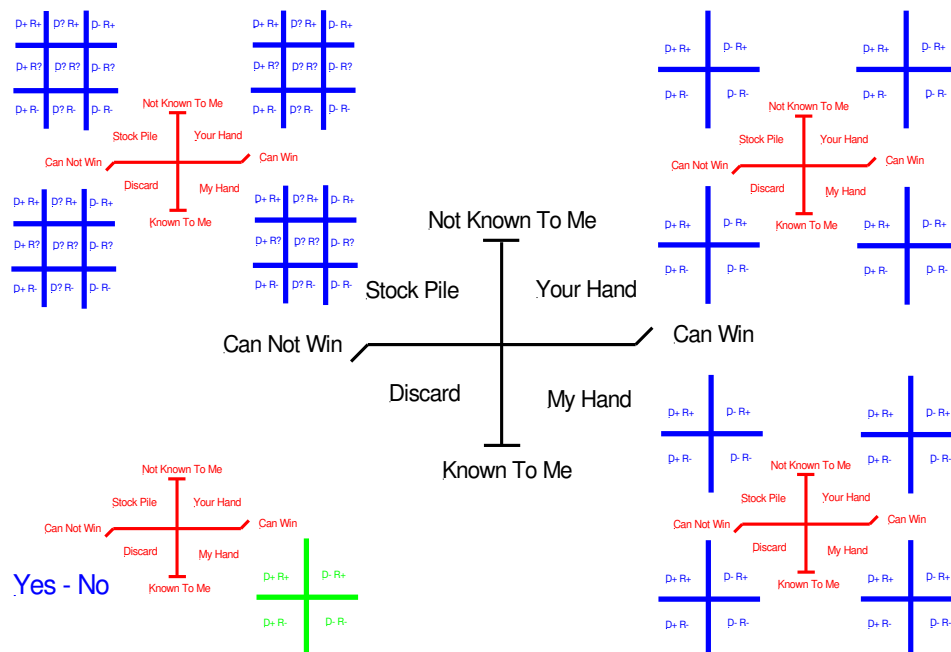
In this case, unlike the top card of the Stock Pile, the top card of the Discard Pile is not inherently uncertain. Here the answer must be “Yes-or-No.” Although there may be a strategic choice involved based upon the alignment of the cards in the rest of the game, there is no built-in preference either way. Let us simply mark this card as a Yes-No choice.



If we ask what Conclusions may be drawn between the top card in the Discard Pile and the cards in My Hand, there is no uncertainty in the identity of the top card of the Discard Pile nor in the relationship of this card to the cards in My Hand.

If we have given a "Yes" to the first question ("Yes, I want the card.") the top card of the Discard Pile is taken into my hand, and another card is discarded by me. On the other hand, if we have answered "No" ("No, I do not want the card.") the card remains in the Discard Pile, and I draw from the Stock Pile. I then discard a new card, and the top card of the Discard Pile possesses a new identity.

The "conclusion" reached in this quadrant is not subject to any *inherent* uncertainty or contradiction. The simple blue cross is in tact, although the specific answer given relies entirely on the issue presented in the previous "Yes or No" quadrant.

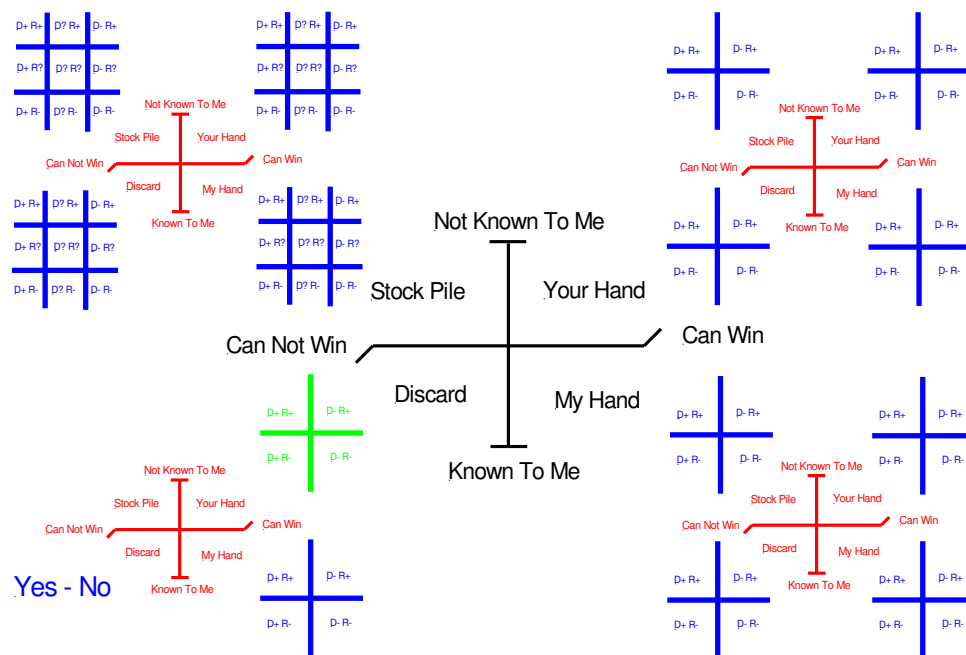


If we ask what Conclusions may be drawn between the top card in the Discard Pile and the cards in Your Hand, there is again no *inherent* uncertainty in the identity of the top card itself nor in its relationship to Your Hand.

If I have answered "Yes" ("Yes, I want the card.") the top card of the Discard Pile is taken into My Hand and you are not permitted to obtain it for yourself. I then discard another card which you may or may not want for your hand.

On the other hand if I have answered "No" to the first question ("No, I do not want the card.") the top card remains in the Discard Pile, I draw from the Stock Pile, I discard a new card, and the top card of the Discard Pile possesses a new identity. This new card is then subject to the same "Yes-No" choice which you put in place for me.

Once the answer is determined, the conclusion reached is not subject to any *inherent* uncertainty or contradiction. The simple blue cross remains in tact although the specific answer given relies entirely on the issue presented in the first "Yes – No" choice.

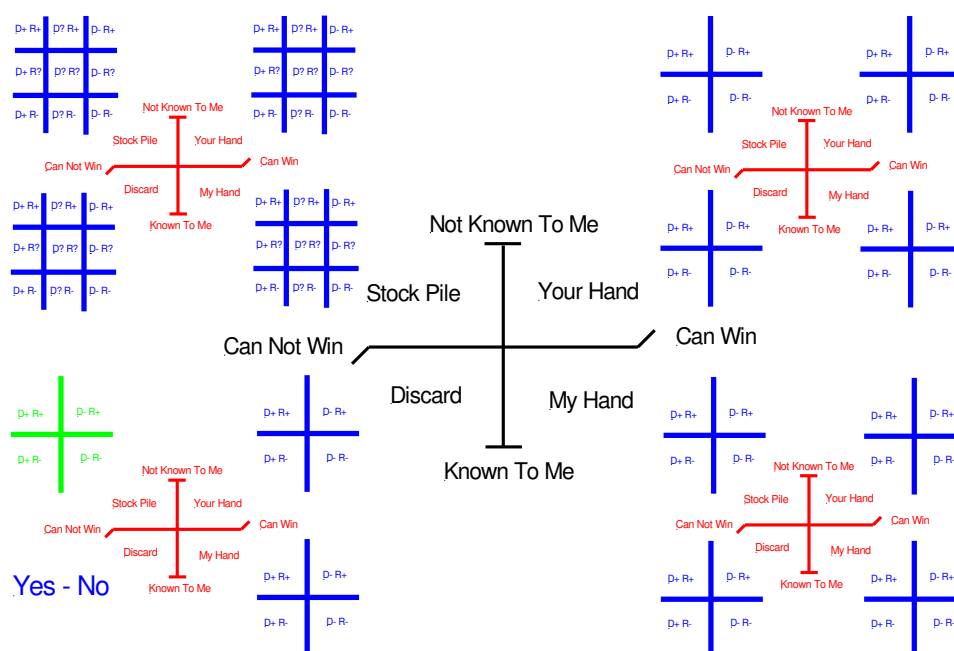


If we ask what Conclusions may be drawn between the top card in the Discard Pile and the cards in the Stock Pile, there is again no uncertainty in the identity of the top card in the Discard Pile itself.

If we have given a "Yes" to the first question ("Yes, I want the card.") the top discard is taken into My Hand and the top card in the Stock Pile is left for you to choose if you want it. I then discard another card which you may or may not want for your hand.

On the other hand, if I have answered "No" to the first question ("No, I do not want the top card of the Discard Pile.") the card remains in the discard pile, I draw from the Stock Pile, discard a new card and the Discard Pile possesses a new identity in its top card. This new card is then subject to the same "Yes-No" choice which you gave to me by your previous discard.

Once the answer is determined, the conclusion reached in this question is not subject to any *inherent* uncertainty or contradiction. The simple blue cross is in tact, although the specific answer given relies entirely on the issue presented in the first question.



CONCLUSION

This pattern – “A System of Movement” – will be used in the remaining essays to explore similarities between levels of reality. It is presented here as the first essay of this second set to serve as a brief reference for later ideas of far greater abstraction.

Essay Two: The Prohibition Against Hearsay

A clear fire, a clean hearth, and the rigour of the game.

Inscription in the fireplace mantel of the
University of Missouri at Columbia School of Law

ABSTRACT

Aims: To use the pattern developed previously at the level of law.

Study design: Philosophic / Mathematic discussion of the Prohibition Against Hearsay.

Place and Duration of Study: Library research.

Methodology: In this essay we dissect one of the most complicated and abstract rules of law, the Prohibition Against Hearsay.

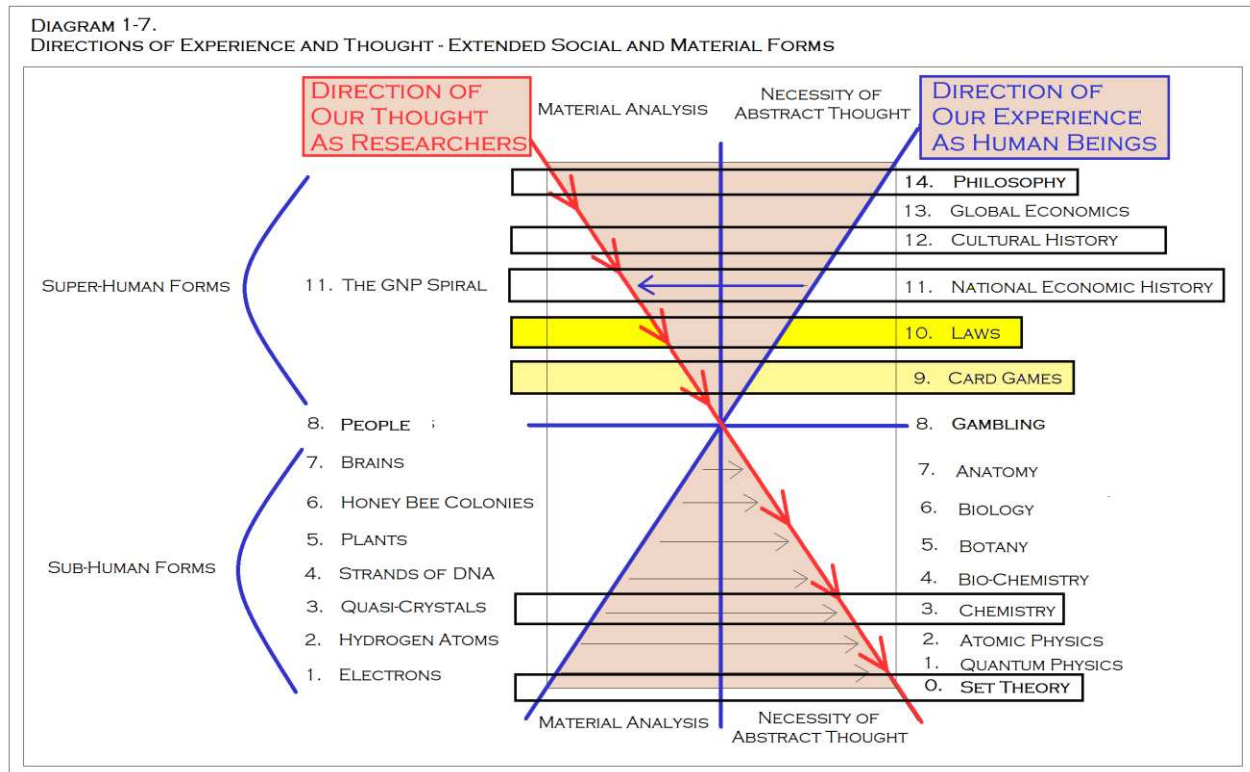
Conclusions: We suggest that just as the evidence comes into court proceedings according to the “map” we have devised of consciousness, so does society “think” through its problems.

JEL classification: B41, B5, C01, C02, C50, C63, E00, E01, E10, E19, E30, N00, N01, N11, Z10, Z13

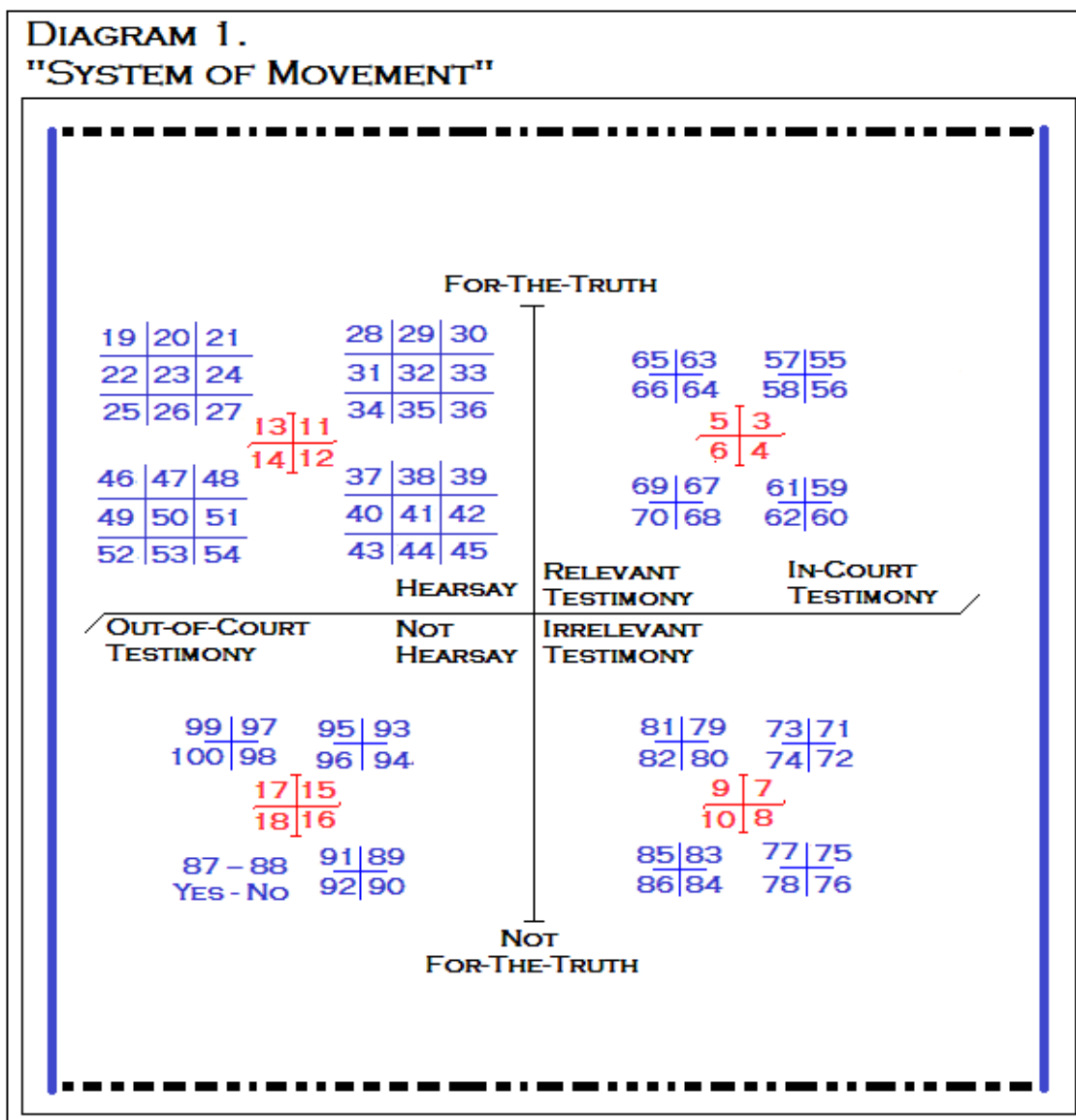
Keywords: Real GNP, Kondratiev Wave, Golden Mean, American Economic History, Steady-State Rate of Growth, Musical Octave

INTRODUCTION

We turn in this essay to the field of law, to investigate whether the System of Movement pattern may be found therein.



This essay proposes that the common law of England and of the United States, as it has evolved over the course of centuries, has created within the Law of Evidence a set of rules for understanding which, when applied to other levels of reality, resolve a number of problems and conflicts. The pattern has been explored in previous essays and is described herein as a “system of movement,” as follows:



I propose that the position of law as “superior” to the individual human mind is merely the subordinate human mind “writ large.” I suggest also that this same human mind is itself superior to a number of physical phenomena, including mathematic constructions which are, in turn, subordinate to the human mind.

If these propositions are true, then it is possible that these levels of intellectual endeavor are “fractals” of one another, i.e. geometric configurations which repeat themselves at different levels of our experience.

METHODOLOGY

1. Hypothesis

I propose that the “System of Movement” presented in the previous essay may be useful in understanding the law, specifically the “law of evidence” of the English common law and its Prohibition Against Hearsay. Understanding the significance of the law of evidence in relation to American social development provides an opportunity to understand this development as a “fractal” whereby the personal insights of jurors serve as the foundation for American legal development. I highlight in yellow the position of this current essay, and place in beige the position of the former essay.

2. Methods

The dichotomies introduced previously are used to explain the introduction of evidence in a jury trial.

3. Data

Review of the literature regarding the Prohibition Against Hearsay used routinely in the courts of the United States.

4. Procedure

4.0 What is Hearsay?

A poetic description of hearsay – synonyms for which are “gossip” and “rumor” – is found in Shakespeare’s *Henry IV Part Two* as prologue:

Enter RUMOUR painted full of tongues.

Open your ears; for which of you will stop
The vent of hearing when loud Rumour speaks?
I, from the orient to the drooping west,
Making the wind my post-horse, still unfold
The acts commenced on this ball of earth:
Upon my tongues continual slanders ride,
The which in every language I pronounce,
Stuffing the ears of men with false reports.
I speak of peace, while covert enmity
Under the smile of safety wounds the world:
And who but Rumour, who but only I,
Make fearful musters and prepared defence,
Whiles the big year, swoln with some other grief,
Is thought with child by the stern tyrant war,
And no such matter? Rumour is a pipe
Blown by surmises, jealousies, conjectures
And of so easy and so plain a stop
That the blunt monster with uncounted heads,
The still-discordant wavering multitude,
Can play upon it.

The Prohibition Against Hearsay is a rule of evidence which seeks to keep rumor, gossip – hearsay – from introduction into evidence at trial. Therefore our analysis begins with a description of “going to court.”

4.0.1 The Jury Trial in the American Experience

It is worth considering at the outset the almost unbelievable social power given to a jury in the United States. In an enormous circuit of social power, the same “common” people who voted for the legislative representatives to make the laws, voted for the executives to enforce the laws, and voted for the judges (directly or indirectly) to decide cases arising under the laws, retain for themselves ultimate power to decide - as jurors - the cases before the courts.

Although the democratic populace of the United States is not trained in law as such, the American court system operates to make these persons the ultimate and generally final arbiters of fact. “The People” thereby decide the verdicts in cases wherein life, lives, reputation, billions of dollars and thousands of jobs might be at stake. International corporations must fear the anger of juries, and persons of great social power can not be assured that a jury will act in their favor or against their opponents.

Jury service is one of the main socializing factors of the United States. For example, in *Thiel v. Southern Pacific Company*, 328 U.S. 217, 223-225 (1946), the clerk of court excluded daily wage earners from the panel of prospective jurors. The United States Supreme Court reversed the ultimate verdict, holding as follows:

... Jury service is a duty as well as a privilege of citizenship; it is a duty that cannot be shirked on a plea of inconvenience or decreased earning power. Only when the financial embarrassment is such as to impose a real burden and hardship does a valid excuse of this nature appear. Thus a blanket exclusion of all daily wage earners, however well-intentioned and however justified by prior actions of the trial judges, must be counted among those tendencies which undermine and weaken the institution of jury trial. ‘That the motives influencing such tendencies may be of the best must not blind us to the dangers of allowing any encroachment whatsoever on this essential right. Steps innocently taken may one by one lead to the irretrievable impairment of substantial liberties.’

This rule was expanded in *Batson v. Kentucky*, 476 U.S. 79, 86-88 (1986). In *Batson* the race-based exclusion of a potential juror through the use of a peremptory challenge - a challenge “by right” given to either side of a trial regardless of the juror’s qualifications - was found to violate the right to equal protection, not only of the defendant, but *of the potential juror*.

Racial discrimination in selection of jurors harms not only the accused whose life or liberty they are summoned to try. Competence to serve as a juror ultimately depends on an assessment of individual qualifications and ability impartially to consider evidence presented at a trial. ... A person’s race simply “is unrelated to his fitness as a juror.” ... As long ago as *Strauder (vs. West Virginia)*, 1880), ... the Court recognized that by denying a person participation in jury service on account of his race, the State unconstitutionally discriminated against the excluded juror.

The American jury plays an essential role in evaluating the claims and the rights of the parties which come before it. This fact has profound implications for American society.

4.0.2 The Prohibition Against Hearsay

If the jury is to be given such social authority, it must be protected from information which is not germane to its decision or which is unreliable. In particular, the ability of witnesses and parties to “create” testimony through malicious gossip and rumor, spoken in secret and then repeated to the jury, might well deprive the opposing party of the opportunity of a fair trial. The American jury is entitled to hear testimony first hand and the Prohibition Against Hearsay ensures this. But such a Prohibition must consider many things and many situations.

Approximately one-half of the typical law school course on evidence is dedicated to an understanding of the prohibition against “hearsay” entering into the trial; the remainder of the course covers everything else in the law of evidence. There are three definitions for the term “Hearsay” which cover the waterfront of a frequently confusing and abstract topic.

As prohibited throughout the trial, hearsay is:

- 1) An out-of-court statement offered for the truth of the matter asserted.
Federal Rules of Evidence, Rule 110
- 2) A statement unable to be cross-examined.
Wigmore
- 3) A statement in which the jury is forced to reason from the witness' belief of a statement or even to the truth of that event, via an understanding of the ambiguity, sincerity, perception or memory of the witness.
Morgan, Tribe, Hunvald, et al.

In effect, the Law of Evidence is the pattern or map of social “consciousness” for all trial attorneys in the United States. This branch of law will bring before us the three separate “planes” of judge (“Definition”), lawyer (“Relationship”) and jury (“Conclusion”).

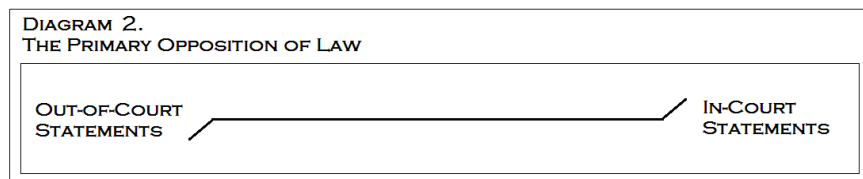
4.1.0 The Court's Point of View

The first and most oft-used definition of "Hearsay" is:

An out-of-court statement offered for the truth of the matter asserted.
Federal Rules of Evidence, Rule 110. (Judge's Point Of View)

The standard definition of hearsay stated above reveals two essential dichotomies inherent in the law of evidence. The first dichotomy is between the believability of statements which are made "*in court*" as opposed to statements made "*out of court*" and then repeated by a witness at the time of trial.

This dichotomy between statements which are made "in-court" and statements which are made "out-of-court" is the Primary Opposition of the Law of Evidence. The Primary Opposition represents a *difference in kind*, a difference in the basic nature of two things. By the term "Primary Opposition" we mean an absolute dichotomy, separation, gulf or chasm between two opposing things, akin to the philosophic principle of non-contradiction, the philosophic axiom that "a thing can not 'be' and 'not be' at the same time in the same way."



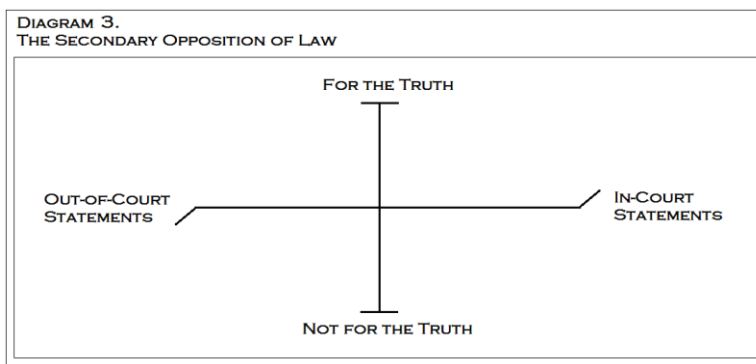
For example a witness' description of the weather *which she experienced* at a particular time, if told to the jury, is an "*in court* statement." The witness is available for cross-examination on any part of her experience. The jury may take none / part / all of her testimony to be true depending upon their view of the facts of the case.

On the other hand the witness' description of the weather report by a television weatherman does not present *her* observations of the weather. The weather report is an "*out-of-court* statement." In some cases the witness' description of the televised weather reporter may be subject to the prohibition against hearsay. In other cases circumstances may permit this testimony to come before the jury despite the fact that the statements were made "out-of-court."

The definition given for Hearsay presents a second dichotomy between statements which are presented to the court "*for the truth* of the matter asserted" and statements which are submitted to the court for some reason *other than the literal truth* of the statement itself.

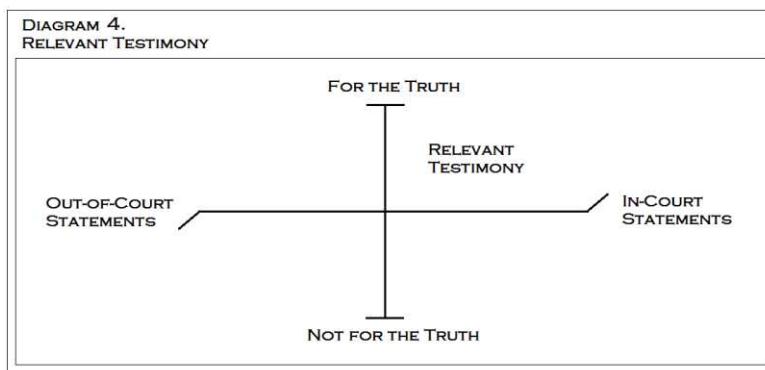
This dichotomy represents the Secondary Opposition of the Law of Evidence, an opposition which suggests degrees of separation or shades of gradation between two things which have something in common.

Judges are called upon frequently during the trial to limit the scope of an otherwise important inquiry. Judicial discretion is called upon to decide when "far enough" has "gone too far." The ability to distinguish when testimony is being offered "for the truth" as opposed to gratuitously and therefore "not for the truth" is a uniquely judicial role.



These two dichotomies create four quadrants of possibility. These are as follows.

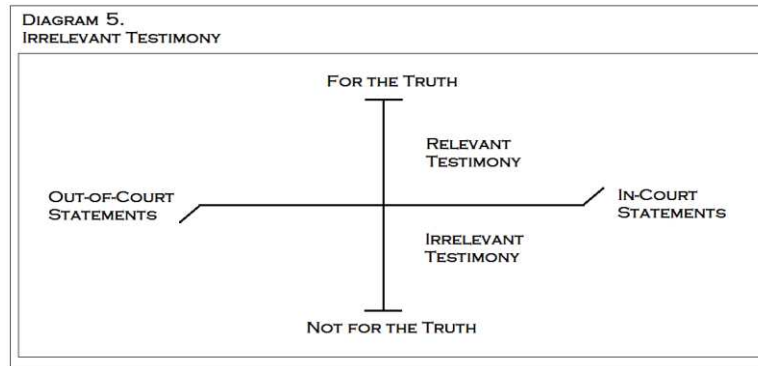
4.1.1 Relevant Testimony



As indicated above, the first quadrant "relevant testimony" is in-court testimony offered for the truth of the matter asserted. "Relevant evidence" means evidence having a tendency "*to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.*" Federal Rule of Evidence 401

When dealing with "Relevant Evidence," the advocate will be expected to show that the questions asked and the answer sought is relevant to the lawsuit, that the truth of the answer given in some fashion has a bearing on the ultimate determination of the suit.

4.1.2 Irrelevant Testimony



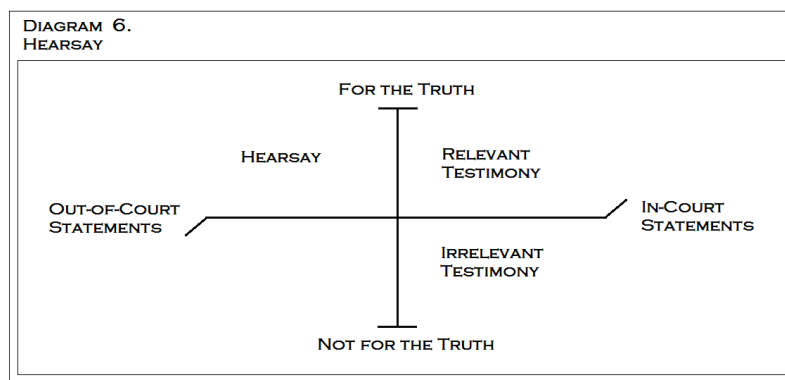
"Irrelevant testimony" is testimony which does *not* have a tendency "to make the existence of any fact that is of consequence to the determination of the law suit more or less probable than it would be without the evidence." The second quadrant "irrelevant testimony" is common in every trial.

For example, every advocate at some point asks a witness if he or she understands that these questions are not meant to embarrass or harass, and etc. These comments are not made because they are true or because they have a bearing on the case; they are simply pleasantries.

It might also be mentioned that advocates specialize in asserting as "irrelevant" that which is, indeed, extraordinarily relevant, however harmful to their cause it might be.

Nevertheless, much material entering a trial is, technically, irrelevant and when someone objects such statements or documents may be excluded from evidence. However irrelevant testimony is a normal part of every trial, excluded or not.

4.1.3 Hearsay



The third quadrant "hearsay" is "an out-of-court statement offered for the truth of the matter asserted." Federal Rule of Evidence 801. Hearsay is *prohibited* from introduction at trial. American law provides that only sworn testimony should be provided to the jury. The fundamental point is that no person should be permitted to swear as being true the observations or statements of someone else.

For example, in a case concerning an auto collision at a street corner, Paul's out-of-court comment to Mary that "the light was red" is inadmissible under the Rule Against Hearsay. Under the Rule Against Hearsay, neither Paul nor Mary would be allowed to discuss Paul's comment to Mary about the color of the light at any given time. Paul could tell the jury personally that *he saw* the light was red, and Mary could tell the jury personally that *she saw* the light was red. But Paul's out-of-court statement to Mary that the light was red is prohibited hearsay if offered to prove that the light was red.

Hearsay evidence is excluded because the safeguards which are present when a witness testifies in person and on the basis of his own knowledge are lacking. The absent person, whose statement is offered in court, may not have been under oath when he made the statement; there is no opportunity for the opposing party at the present trial to cross-examine the absent person as to the accuracy of the statement, his ability to know the facts to which the statement relates and the existence of bias, prejudice, error, misstatement, or any of the other factors that would impeach the statement if made in court; and the jury is unable to observe the appearance, demeanor, and conduct of the absent witness as he makes his statement. Moreover, there is danger that the present witness himself may falsely state what he was told by the third person. It is difficult to show that the present witness was not truthful where the claimed author of the statement is not available for examination or is not even identifiable, as in the case of the writer of business records. Even if the statement is alleged to have been made by the absent person is shown to be false, the perjuring witness may conveniently claim that all he knows is what the absent person told him, thereby shifting the blame for the falsity upon the absent person. Further, in the case of an oral statement, it is probable that the present witness is not restating it exactly as it was stated to him.

Because of a faulty memory or some other reason, a conscious or unconscious rearranging of the words of the absent person may give the repeated statement a significantly different meaning. It is because of these dangers of error, perjury and distortion that the law excludes hearsay evidence.⁹²

It may seem odd that more than one definition would be necessary to define and exclude hearsay. However conduct can also be considered as a form of out-of-court statement.

For example, a witness' observation of someone waving their arms at a passing motorist may be offered in court as a sign of distress. But is this gesture really one indicating trouble or need for help? Was this gesture one of merely wishing a ride? Was this gesture aimed at a particular vehicle? Was it really a gesture at all? Another example might be that of a witness who views the defendant walking down the street whistling merrily. This testimony might be offered as evidence of a person's innocent frame of mind shortly after a tragic event. But does this whistling convey an innocent frame of mind or rather an intention to deceive? To what extent could the witness truly perceive the emotional outlook of the person walking down the street? Is the witness truly capable of explaining what they saw, or are they exaggerating?

⁹² *Wharton's Criminal Evidence*, 14th Edition, Volume 2, Clark, Boardman Callaghan, Deerfield, Il., cc. 1986 by Lawyers Cooperative Publishing Company, Section 257, pp 121-122.

Contrast these forms of conduct with the up-and-down nod of a person's head in response to a question, or the left-right shake a person's head in apparent response to the same question. These actions generally are taken to mean "yes" and "no" respectively. Should a contract dispute between two parties permit this evidence before the court even though technically no "statement" has been made? What about the smile and wink of one person and the immediate reaction of others at the time? In what way should the court understand the Rule Against Hearsay as applied to these and other unanticipated acts?

If testimony is offered about out-of-court conduct which is intended to convey some form of out-of-court and unsworn statement, additional definitions of hearsay help to clarify the legal situation and exclude "hearsay conduct." These additional definitions are framed around the point-of-view of (2) The Advocate (on either side of a given proposition), and (3) The Jury, the Trier of Fact.

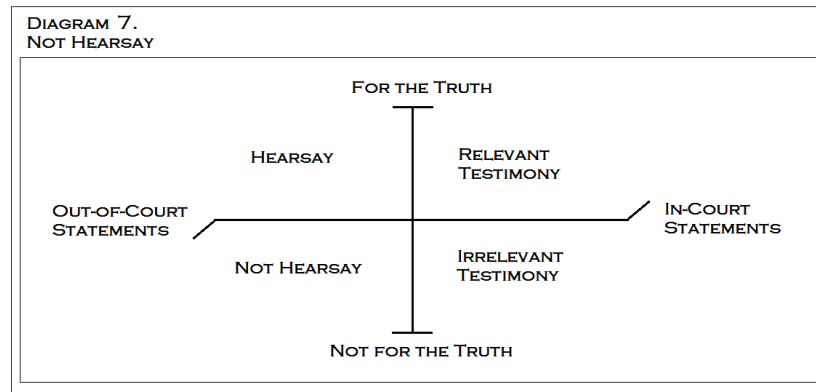
Advocate: Hearsay is a statement unable to be cross-examined.

Jury: Hearsay is a statement in which the jury is forced to reason from the witness' belief of a statement or even to the truth of that event, via an understanding of the ambiguity, sincerity, perception or memory of the witness.

Under each of these definitions the above examples of hearsay conduct may be excluded by the court as hearsay, even though technically no "statement" out-of-court has been offered. In this area courts look particularly at the evidence which might suggest that a statement was intended to be made through the gesture. Once such an intent is located, the conduct is treated as an out-of-court statement subject to the parameters and exceptions of the Rule Against Hearsay.

When courts do not find indications of an intent to make a statement through a particular act, the law is in conflict as to whether such acts should be excluded as hearsay. Simply put, some courts will exclude as hearsay evidence of such conduct because of the danger of allowing parties to fabricate "statements" from ambiguous evidence of conduct. Other courts will find that the lack of the intent to convey a statement makes the Rule Against Hearsay inapplicable and permit the evidence to come before the jury.

4.1.4 Not Hearsay



The fourth quadrant of "not hearsay" is a specific type of testimony and when relevant to the proceedings is admissible in evidence. These are out-of-court statements offered not for their truth, but for some other reason.

There are three common nonhearsay uses of evidence. First, the proponent may argue that the statement is circumstantial evidence of the declarant's state of mind. If the declarant's state of mind is logically relevant in the case, the proponent may use the declarant's statements as circumstantial proof of such states of mind as malice, hatred, premeditation, and love. Sometimes the mere fact that a person makes a certain statement gives us insight into that person's frame of mind.

Second, the statement may be an operative fact or verbal act in the case. In some situations, legal consequences flow directly from the use of certain words such as the offer in a contract suit or the slander in a tort action. Again the mere fact that the declarant uttered the words is logically relevant; the words themselves have legal consequences.

Finally, the proponent can prove the statement to show its effect on the state of mind of the hearer or reader. For example, if it is disputed whether the defendant knew of a certain dangerous condition, it is logically relevant to prove that someone told him of the condition. Quite apart from the truth of the third party's statement, the statement puts the defendant on notice.⁹³

The above situations are examples of statements out-of-court which are admissible - not because they are true or even alleged to be true - but rather because they shed light on the circumstances of the case regardless of whether the statement in and of itself is true.

⁹³

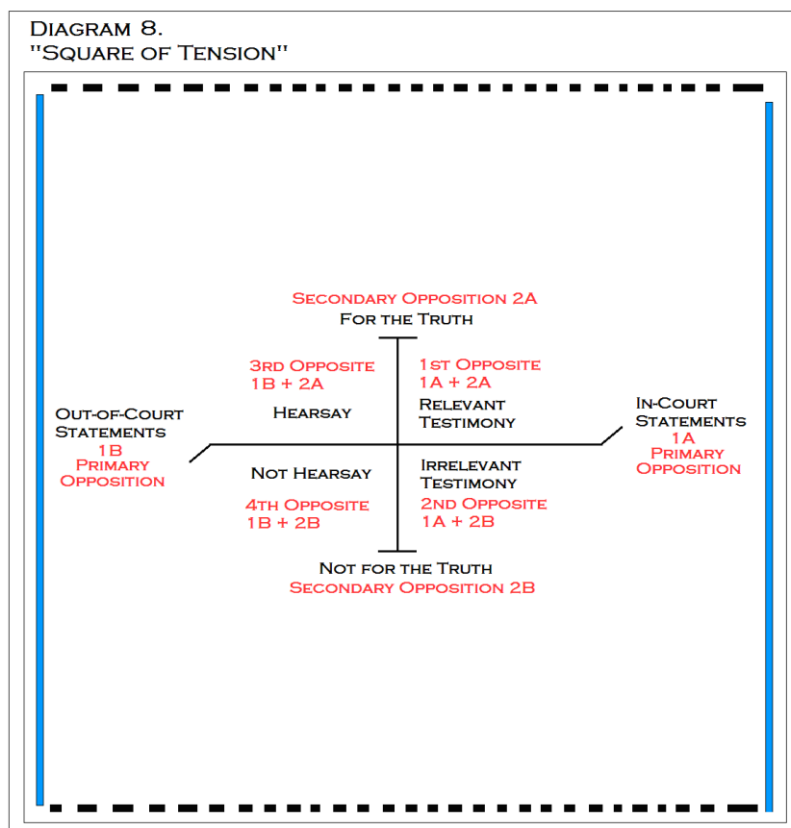
Edward J. Imwinkelried, *Evidentiary Foundations*, Michie Co., 1995, p. 266.

Let us imagine the opposition between *in court* and *out-of-court* testimony as a “force” or “wave” in the law, in the collective mind of society, separating in court testimony from out-of-court testimony by an enormous logical gulf or chasm. One might imagine a rod striking the water, sending up a series of waves moving in opposite directions from one another.

Second, the opposition between the purposes of the testimony itself can be pictured as a separate force, or a separate wave, in law. To offer testimony *for the truth* of the matter sworn to by the witness is often wholly different from offering testimony *for some purpose other than the literal truth* of the statement. Our first definition of hearsay makes this distinction clearly.

Third, we might imagine that the combination of these two different oppositions creates four “vectors,” four logical outcomes which must play out through the rest of the discussion.

These four vectors, or logical outcomes, are the four corners of this “map” of the law of evidence. These corners represent the four forms of evidence which the jury can hear, to wit: “Relevant Evidence,” “Irrelevant Evidence,” “Hearsay,” and “Not Hearsay.” The following square of tension can be understood to lie at the root of the law of evidence.



The dotted lines indicate the chasm between evidence which is received “in court” and the mass of potential evidence which lies outside the courtroom itself.

Statements made “In Court” are those made by witnesses taking the stand before a judge and jury after being sworn to tell the truth. Statements made “Out of Court” are statements made without the forgoing formalities and then repeated in court at a later time. A statement can not simultaneously be offered “in-court” for the truth of the matter asserted, and “out-of-court” for the truth of the matter asserted. Such an event simply is impossible to imagine.

Varying degrees of judicial discretion are noted by the vertical blue lines below in our model.

Note that the definitions of relevant and irrelevant testimony – “in court testimony” – allow for a great deal of latitude for the court to determine whether the proposed testimony is in fact relevant or irrelevant. The delineation of “relevant” and “irrelevant” frequently depends upon the interrelationship of facts brought before the jury and the claims to be decided by the court. Courts exercise a great deal of discretion in these matters, as they must.

Definitions of hearsay and not hearsay – “out-of-court testimony” – require a decision as to the nature of some out-of-court testimony. Should the matter come in as “Not Hearsay” or be excluded as “Hearsay”? This depends upon the Court’s evaluation of the arguments of the attorneys.

Is the evidence presented for some reason other than the truth of the matter asserted *really* (“Not Hearsay”), or is it *really* presented for the truth of the matter asserted (making it prohibited “Hearsay”)?) The distinction calls frequently for the exercise of discretion by the judge, and often the answer is not entirely clear.

Finally, it is important to note that these four quadrants are points of tension within the trial itself. If a judge permits irrelevant material to enter the trial, the decision may be wholly impossible to correct short of ordering a new trial. Moreover these categories are ones over which attorneys sometimes fight vigorously, and with much at stake.

So begins the law of evidence as taken from the point of view of the Judge. As the definition of hearsay has been presented, the four quadrants are simply hollow categories; there is nothing within them to consider as specific facts in a case.

But this is not the only point of view impacting the law.

4.2.0 The Art of Advocacy

The importance placed upon juries and the “jury verdict” in the United States has led to the development of lawyers specialized in advocacy before such juries – trial attorneys. The comparison between the painter at work on a canvas and a trial lawyer before the jury is frequently used as a descriptive analogy. In this analogy:

The canvas of the trial lawyer is the *jury’s mental imagination*;

The colors of the canvas are *witness’ testimony* on various points, dabbed here and there throughout the trial for the purpose of “painting” a mental picture in the jury’s imagination;

Particularly striking bits of color are provided by *physical exhibits*;

The paintbrush is the *subpoena power*, the power to compel testimony and evidence to be given in court;

The title of the piece is the lawyer’s *theme* at trial;

The physical frame stretching the canvas is the *judicial attitude* framing the trial itself, shaping the jury’s mental understanding;

The idiosyncrasies of canvas, paper, plaster, stucco, wood, etc. are the *jury’s prejudices and presumptions* peculiar to a particular locale or jury pool;

The ultimate success of the piece is representative of the lawyer’s *talent and style*; and

The effort to bring this together at a single time and place is the lawyer’s *work*.

Following upon this analogy, a criminal case begins when the State undertakes to paint its picture of the defendant's guilt in the jury's imagination with the evidence and testimony in its possession. The Defense counters on the same canvas with slightly different bits of shading, new or unexpected figures or objects here and there, a different theme and ultimately a different set of relationships between the main figures in the State's work.

Ultimately, the jury decides which of these images - State or Defense, Goya or Hogarth - is better grounded in the law and fact, the verdict is declared, and the trial is over.

4.2.1 The Lawyer's Point Of View

According to John Henry Wigmore, cross-examination - direct, face-to-face questioning of witnesses under oath by an advocate - "is beyond any doubt the greatest legal engine ever invented for the discovery of truth."⁹⁴ This is a task peculiar to the advocate: the interrogation of witnesses. The full text of this famous quotation is worth considering thoroughly.

Sec. 1367. Cross-examination as a distinctive and vital feature of our law. For two centuries past, the policy of the Anglo-American system of evidence has been to regard the necessity of testing by cross-examination as a vital feature of the law. The belief that no safeguard for testing the value of human statements is comparable to that furnished by cross-examining, and the conviction that no statement (unless by special exception) should be used as testimony until it has been probed and sublimated by that test, has found increasing strength in lengthening experience.

Not even the abuses, the mishandlings, and the puerilities which are so often found associated with cross-examination have availed to nullify its value. It may be that in more than one sense it takes the place in our system which torture occupied in the mediaeval system of the civilians. *Nevertheless, it is beyond any doubt the greatest legal engine ever invented for the discovery of truth.* However difficult it may be for the layman, the scientist, or the foreign jurist to appreciate this its wonderful power, there has probably never been a moment's doubt upon this point in the mind of a lawyer of experience.

Following logically upon the central position which Wigmore gives to cross-examination, he provides his own definition of hearsay.

The theory of the hearsay rule is that the many possible deficiencies, suppressions, sources of error and untrustworthiness, which lie underneath the bare untested assertion of a witness, may be best brought to light and exposed by the test of cross-examination. Of its workings and its value, more is to be seen in detail (sections 1367-1394, *supra*.) It is sufficient here to note that the hearsay rule, as accepted in our law, signifies *a rule rejecting assertions, offered testimonially, which have not been in some way subjected to the test of cross-examination.*⁹⁵ (emphasis in the original)

⁹⁴ John Henry Wigmore, *Evidence in Trials at Common Law*, Vol. V, section 1367, revised by James H. Chadbourn, Little, Brown and Co., Boston, 1974.

⁹⁵ *Id.*, section 1362.1.

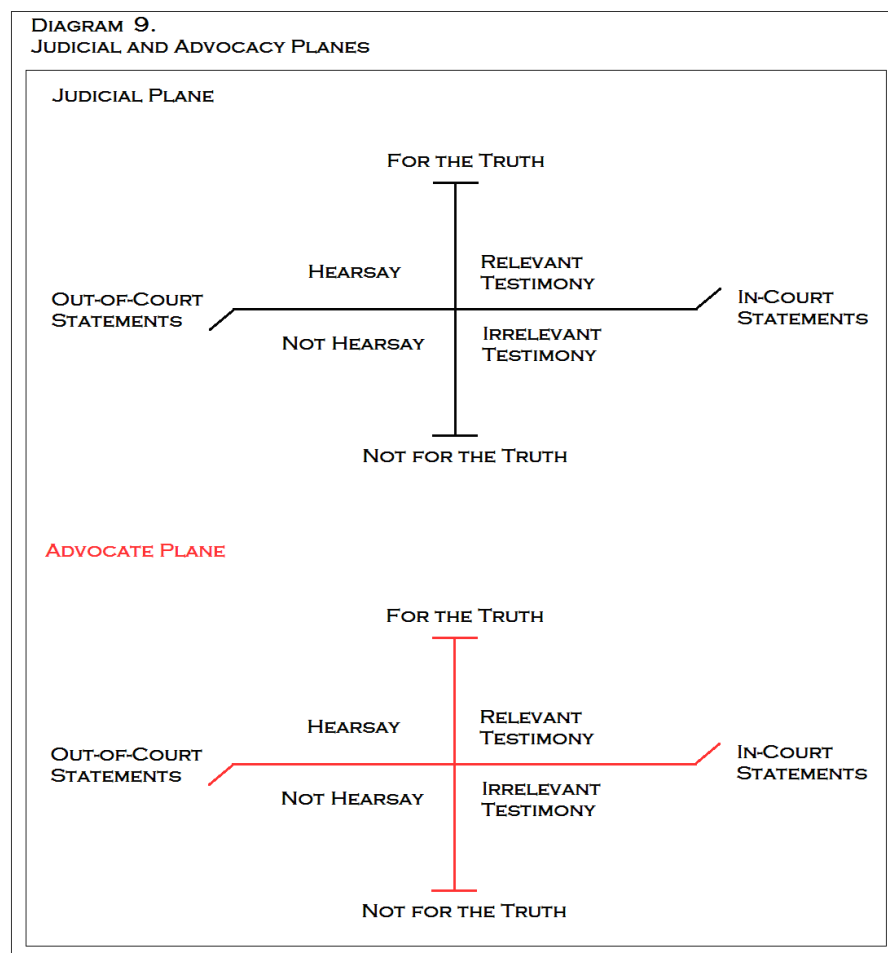
Wigmore's definition of hearsay is also available to an advocate in case the first fails to cover the matter. According to Wigmore, hearsay is:

- 2) A statement unable to be cross-examined.
Wigmore ("Lawyer's Point Of View")

The importance of an adversarial system is brought forward by Wigmore's definition of hearsay. Judges are not supposed to cross-examine witnesses; attorneys do that. Any implied condemnation or distrust suggested by a judge's interrogation of a witness strikes at the heart of judicial impartiality. The official favoritism frequently demonstrated by judicial examination of witnesses simply has no place in American law.

The admission of evidence unable to be cross-examined challenges the right to be represented in court by an advocate, to be heard in court and to challenge his or her opponent's evidence in court. In effect statements which are unable to be cross-examined deprive the party of the right to counsel and to a fair trial.

One might consider these points by noting that just as the court has a point of view of the evidence, so does the advocate have a point of view different from the court but based upon the same principles as the court. The manner in which these objections arise is one which assumes the reflective nature of each of these points of view on the evidence being presented.



It is important to keep in mind that the Rule Against Hearsay is an *objection* to testimony or evidence. It is a way of keeping evidence *away* from the jury's hearing that might hurt the attorney's case.

Consequently the Rule Against Hearsay comes into play only upon the *objection* of one side which seeks to exclude the evidence in question from consideration of the jury. Much of the trial preparation for both sides of any question is directed toward the discovery of the facts favorable for the other side and researching methods to exclude these facts from evidence. The arguments seeking to exclude this evidence are phrased in the following manner:

"Your honor, I object. This question calls for ..."

Here the advocate presents the arguments of hearsay, irrelevance, etc. If the court sustains the objection, the evidence is excluded. If the court overrules the objection, the evidence is presented for the jury's consideration of their verdict. The transcript dutifully records these objections and arguments, thus "preserving" them for later review by an appellate court. Failure to raise objections at trial waives any right to complain of judicial error on the matter on appeal.

Not every issue regarding evidence is preserved for appeal, sometimes for very important reasons. For example advocates frequently waive or give up objections to irrelevant evidence which is otherwise favorable to an advocate's position.

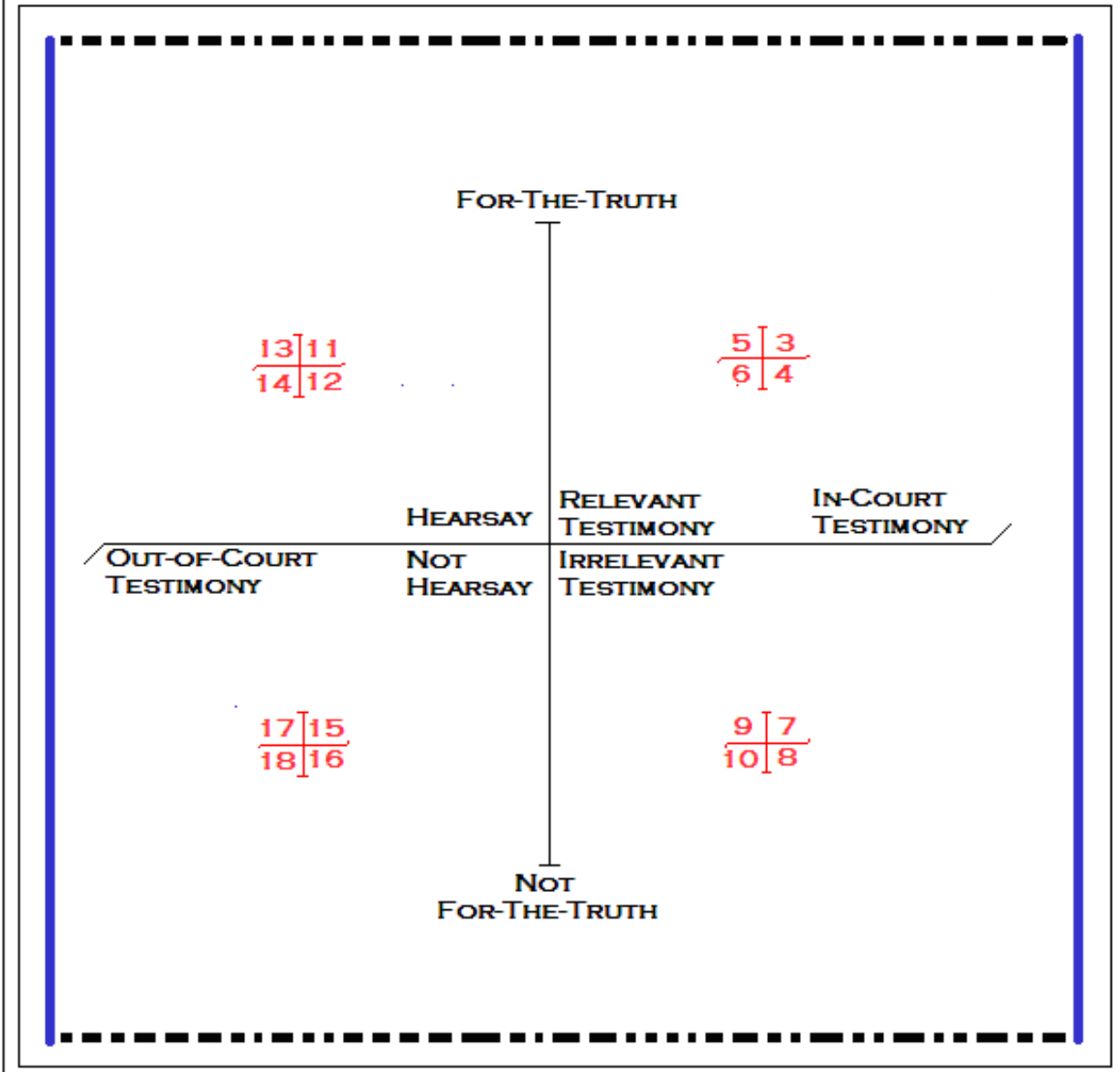
That is, as the advocate decides *whether or not* to offer an objection to evidence proposed as *relevant*, he or she must decide whether the fact truly is (3) relevant (4) or is rather irrelevant (5) is hearsay (6) or is not hearsay.

Similarly when *irrelevant* evidence is being introduced, each advocate must determine *whether or not* to offer an objection base upon whether such evidence is helpful and (7) relevant to the progress of his or her suit (8) or whether an objection should be made on grounds of relevance (9) might be subject to hearsay objections (10) or may qualify as not hearsay.

When considering information which is *hearsay*, the advocate must decide again *whether or not* to offer a hearsay objection based upon the consideration of whether such evidence is (11) relevant or helpful to his or her side, (12) or to raise an objection that the information is irrelevant, (13) to raise a hearsay objection, and (14) or to waive an objection as the information is not truly hearsay.

Finally, when information is brought forward as "*not hearsay*" the advocate must still consider *whether or not* to raise an objection based upon the perception of the (15) relevance of the testimony to the case, (16) or whether an objection as to "irrelevant" is proper. Moreover the information which is brought forward as (17) "not hearsay" may still be subject in part to hearsay objections if damaging, or (18) if not damaging may be allowed in without objection.

DIAGRAM 10.
JUDICIAL AND ADVOCACY PLANES MERGED



The superimposition of red quadrants upon the original standard cross in black is to demonstrate the role of advocacy in shaping the trial. Advocates frequently find themselves waiving good objections in hopes of obtaining stronger strategic advantages by allowing the evidence to come in. Conversely advocates frequently make numerous and highly technical objections to damaging evidence to preserve unfavorable rulings for appellate review.

As a result of the relationships which form between the various categories of testimony, advocates frequently stand at odds to one another, each attorney vying for opposing views which may be taken from the same testimony, or seeking to alter the jury's opinion by the introduction of material opposed by the other side of the law suit.

The prohibition against hearsay has been discussed from two points of view, these being:

The Court:

- 1) An out-of-court statement offered for the truth of the matter asserted.
Federal Rules of Evidence, Rule 110

The Advocate:

- 2) A statement unable to be cross-examined.
Wigmore

We have a third definition of the prohibition against hearsay yet to consider, this being taken from the point of view of the jury.

The Jury:

- 3) A statement in which the jury is forced to reason from the witness' belief of a statement or even to the truth of that event, via an understanding of the ambiguity, sincerity, perception or memory of the witness.
Morgan, Tribe, Hunvald, et al.

Before attempting to derive this definition from the analysis presented previously, it will be important to provide a model indicating the position and the importance of the jury itself.

4.3.0 The Importance of the Jury

The fascinating thing about trial work is that human beings are required to take on the essential aspects of social thought as the central purpose of their own professional standing. The Judge acts in the courtroom to ensure the proper and orderly pursuit of truth according to the basic rules of evidence. The Lawyer acts in the courtroom to present evidence, make objections, and aid the jury in seeing his or her client's point of view.

Quite distinct from the Judge and the Advocate, however, the American Jury acts in the courtroom to receive the impressions generated by the Lawyers and the Judge and to render some final judgment as to the facts of the case. The "defining" of the trial is a judicial role, the creation of "relationships" between the issues of the case is the role of an advocate, and both of these influence - but do not dictate - the jury's "conclusion" in the case, the verdict.

We have previously considered the Prohibition Against Hearsay from both a judicial point of view (hearsay is "an out-of-court statement offered for the truth of the matter asserted") and an advocate's point of view (hearsay is a "statement unable to be cross-examined").

The Jury in the American legal system, has its own, unique interest. While Wigmore has emphasized the role played by cross-examination and advocacy in shaping the American Law of Evidence, James Bradley Thayer emphasizes the role of the jury. According to Thayer, “One who would state the law of evidence truly must allow himself to grow intimately acquainted with the working of the jury system and its long history.”⁹⁶

At once, when a man raises his eyes from the common-law system of evidence, and looks at foreign methods, he is struck with the fact that our system is radically peculiar. Here, a great mass of evidential matter, logically important and probative, is shut out from the view of the judicial tribunals by an imperative rule, while the same matter is not thus excluded anywhere else. English-speaking countries have what we call a “Law of Evidence;” but no other country has it; we alone have generated and evolved this large, elaborate, and difficult doctrine. We have done it, not by direct legislation, but, almost wholly, by the slowly accumulated rulings of judges, made in the trying of causes during the last two or three centuries, - rulings which at first were not preserved in print but in the practice and tradition of the trial courts; and only during the last half or two-thirds of this period have they been revised, reasoned upon, and generalized by the courts in banc.

When one has come to perceive these striking facts, he is not long in finding the reason for them. ... *It is this institution of the jury which accounts for the common-law system of evidence*, - an institution which English-speaking people have had and used, in one or another department of their public affairs, ever since the Conquest. Other peoples have had it only in quite recent times, unless, indeed they may belong to those who began with it centuries ago, and then allowed it to become obsolete and forgotten. England alone kept it, and, in a strange fashion, has developed it.

Thayer points out that the purpose of the Prohibition Against Hearsay is long-standing and recurring, as it stands in opposition to the willingness of individuals to fabricate and deceive.

The true historical nature of (the Prohibition Against Hearsay) is hinted by the remark of an English court, two centuries ago and over, when they checked the attempt of a woman to testify what another woman had told her. “The court,” it was quietly remarked, “are of opinion that it will be proper for Wells to give her own evidence.”

⁹⁶ James Bradley Thayer, LL.D., *A Preliminary Treatise on Evidence at the Common Law*, Little, Brown and Company, Boston, 1898, p. 267, Footnote 1.

Other authors have emphasized the role of the jury in the development of the Prohibition Against Hearsay. McCormick provides the following summary.

In an oft-quoted passage, Wigmore calls the rule against hearsay “that most characteristic rule of the Anglo-American Law of Evidence – a rule which may be esteemed, next to jury trial, the greatest contribution of that eminently practical legal system to the world’s methods of procedure.” How did this rule come about?

The development of the jury was, no doubt, an important factor. In its earlier forms, the jury was in the nature of a committee or special commission of qualified persons in the neighborhood to report on facts or issues in dispute. So far as necessary, its members conducted its investigation informally among those who had special knowledge of the facts. Attesting witnesses to writings were summoned with the jurors and apparently participated in their deliberations, but the practice of calling witnesses to appear in court and testify publicly about the facts to the jury is a late development in jury trial. ... A consciousness of need for exclusionary rules of evidence did not begin to appear until this period of the emergence of witnesses testifying publicly in court. Admittedly, even early witnesses to writings were required to speak only of “what they say and heard,” and this requirement would naturally be applied to the new class of testifying witnesses.⁹⁷

4.3.0.0 The Plane of the Jury’s Conclusion

Two definitions of the prohibition against hearsay have been considered:

The Court:

- 1) An out-of-court statement offered for the truth of the matter asserted.
Federal Rules of Evidence, Rule 110

The Advocate:

- 2) A statement unable to be cross-examined.
Wigmore

We come now to the final definition of hearsay, one which relates specifically to the jury and its role in the trial.

The Jury:

- 3) A statement in which the jury is forced to reason from the witness' belief of a statement or even to the truth of that event, via an understanding of the ambiguity, sincerity, perception or memory of the witness.
Morgan, Tribe, Hunvald, et al.

⁹⁷ John W. Strong, *McCormick on Evidence*, Volume 2, Chapter 24, section 244, West Group Publishing, 1999.

As mentioned previously, trial work compels human beings to take on the essential aspects of social thought as an object of their own professional standing. The Judge exists in the courtroom to ensure the proper and orderly pursuit of truth according to the basic rules of evidence. The Lawyer exists in the courtroom to present evidence, make objections, and aid the jury in seeing his client's point of view. The Jury exists in order to receive the impressions thereby generated and to render some final judgment as to the facts of the case. Edmund Morgan has commented extensively on the Prohibition Against Hearsay. He writes:

The exclusion of hearsay evidence is not grounded upon its lack of probative value, for if inadmissible hearsay is received without objection, it is to be weighed by the trier of fact, and may be of sufficient value to support a finding or verdict. Hearsay is excluded because of potential infirmities with respect to the *observation, memory, narration* and *veracity* of him who utters the offered words when not under oath and subject to cross-examination.⁹⁸ (emphasis supplied)

As the embodiment of epistemologic understanding, juries do more than simply look at evidence and come to abstract conclusions. Juries evaluate and understand the evidence before them in a way which is both collective and personal. The four characteristics which every jury considers as to the witnesses before them are:

- 1) the witness' observation (sometimes referred to as "perception"),
- 2) the witness' memory,
- 3) the witness' narration and its possible meaning (sometimes referred to as "ambiguity"), and
- 4) the witness' veracity (sometimes referred to as "sincerity" or "truthfulness").

Trial lawyers understand that these evaluations are made by the jurors not only as to the witnesses who seek to relate evidence which might be hearsay. Jurors evaluate the entire proceeding in the light of their expectations and experience. The behavior of the lawyers, the parties, the judge, and the witnesses coming before the jury are not immune from the jury's wrath and censure if the occasion justifies it. The jury's evaluation of the fairness of the proceedings, the correctness or fairness of the rulings of the judge, the candor or lack thereof by the parties or their attorneys – all these actors and events move before the jury and are prone to influence the opinions of the jury as to the rights of the parties on every score.

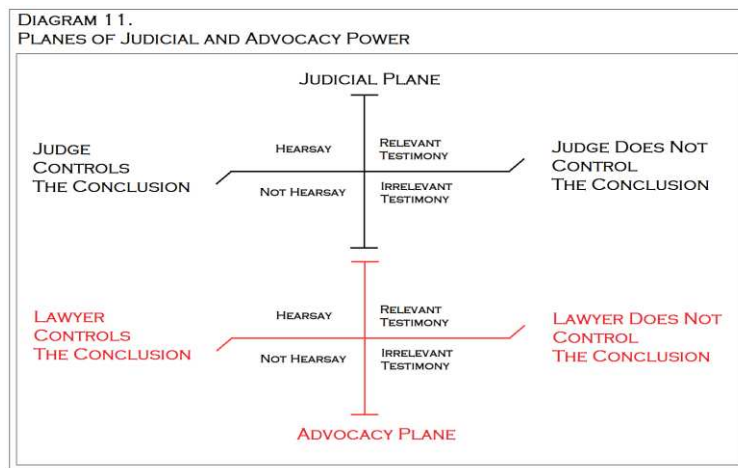
The above comments have been distilled by Professor Edward Hunvald, professor of evidence at the University of Missouri at Columbia School of Law, into a third definition of Hearsay, one which emphasizes the role of the jury. According to the above, hearsay is:

- 3) Hearsay is a statement in which the jury is forced to reason from the witness' belief of a statement or even to the truth of that event, via an understanding of the *ambiguity, sincerity, perception or memory* of the witness. Hunvald, Morgan, Tribe, et al. (Jury's Point Of View)

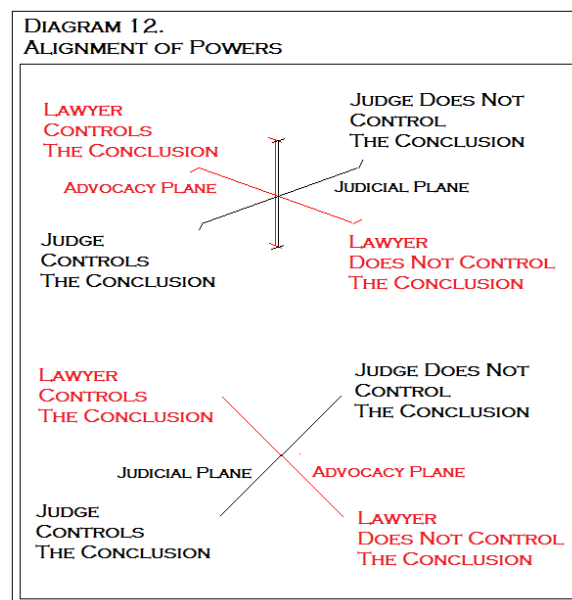
⁹⁸ Edmund M. Morgan, "The Law of Evidence, 1941-1945" *Harvard Law Review*, April, 1946, Vol. LIX, No. 4, p. 541.

The importance of the common judgment of the people, their understanding of the witnesses which come before them, is tightly controlled by the judicial system. However when dealing with hearsay and particularly with the realm of hearsay conduct, we deal with out-of-court statements which are offered for the truth of the matter asserted. This injects an inherent uncertainty into the picture. This uncertainty simply can not be eliminated from the trial, and it is one of the key elements of any trial.

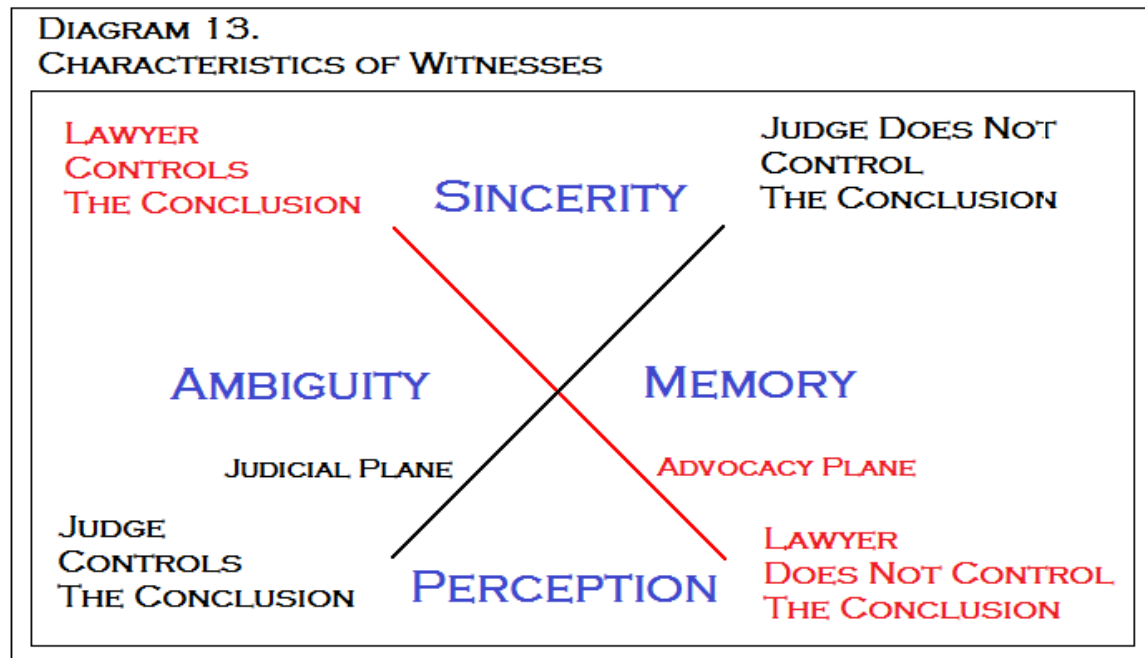
This uncertainty has profound effects on the Law of Evidence. To demonstrate this, we might treat the concept of "defining" the issues in law as a judicial role, that of establishing "relationships" between these issues as a uniquely "lawyer" role, both of these controlling - but not dictating - the jury's "conclusion" of the facts of the case and the verdict rendered.



The following pattern develops if we align the planes of judge and advocate. If we join these two viewpoints of the hearsay rule along a common axis - offered for the truth, not offered for the truth - we create a third plane, a plane of the jury's conclusion.



The process of a trial is designed to permit a tight control over the jury's consideration of any document or testimony, specifically as to (1) the perception of the witness as obtained through personal observation and experience, (2) the clarity of the witness' testimony, or its ambiguity, (3) the truthfulness of the witness, and (4) the witness' ability to remember the events in question.



This arrangement places within the court's power two essential questions: "Is the witness capable of giving testimony in court?" (perception) and "Is the witness clearly stating the facts known to them?" (ambiguity)

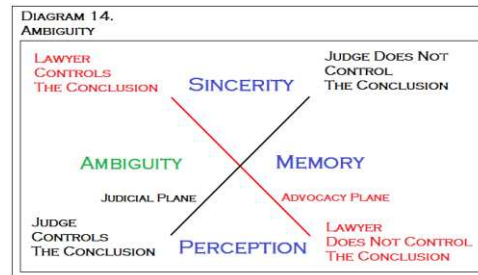
The advocate is also presented with two essential questions: "Is the witness clearly stating the information?" (ambiguity) and "Is the witness lying?" (sincerity)

Neither the court nor the advocate are capable of challenging the witness' statement "I can't remember."

A fundamental expectation of the law of evidence is that the judge and lawyers, working in conjunction, are sufficient to render to the jury a fair view of the evidence.

4.3.0.1 Narrative Ambiguity

It is important to keep in mind that the Judge and the Lawyers have different powers and roles in the trial of any case. The first, and most basic power that each possesses is a shared and common power: the right (and in the case of the Judge, the sometime obligation) to ask clarifying questions. These questions seek to eliminate the ambiguity of a witness' testimony on the stand. This narrative ambiguity of a witness sometimes confuses the jury with multiple meanings, unclear relationships, and strained interpretations and guesses. Since the jury is not permitted to ask questions of the witnesses, they must rely on others to do it for them.



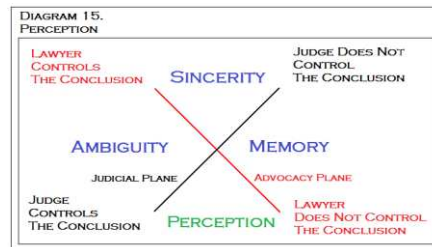
Mueller and Kirkpatrick describe the problems of Ambiguous Narrative as follows, in relation to the Prohibition Against Hearsay.

(Narrative ambiguity refers to) the risk that the declarant might misspeak or be misunderstood. There are three concerns: One is that he might say one thing but mean another (a slip of the tongue). The second is that even if he uses words well and chooses the best possible ones to convey his intended meaning, he might still be misinterpreted. Experience differs among people, so the images and meanings that words convey to most people might not be the ones that others take from them. The third is that the language, while rich in nuance and variety, may not capture the point in detail, or the qualification or limit, that lies at the heart of a litigated dispute. So even if the speaker chooses the best words and the trier understands them in the same way, the message may be misleading or incomplete.⁹⁹

⁹⁹ Christopher B. Mueller, Laird C. Kirkpatrick, *Modern Evidence: Doctrine and Practice*, Little, Brown and Company, Boston, pp. 1047-1051.

4.3.0.2 Perception

Perception here refers, not to an intellectual or moral point of view, but rather the physical fact of participating in - seeing, hearing, tasting, touching or smelling - the event in question. Although Attorneys in the United States are free to challenge the witness' perception of an event, the Court possesses the additional power of removing the witness from the stand when the Perception of the Witness of the events under discussion is so questionable as to be beneath the standard of credible evidence to be submitted to the jury.



The Judge's power to remove witnesses from the stand who do not contribute to the trial of the case through their personal perception of the events to be considered by the jury is absolute. An Attorney may ask for the power to be used at any time. But the Attorney must wait upon the Court's judgment on these matters. No witness may be removed from the stand without the Judge's command. Mueller and Kirkpatrick describe problems of Perception and Misperception as follows, in relation to the Prohibition Against Hearsay.

One risk is that the speaker may misperceive the condition or event in question. If Observer tells Listener that "nurse N was in the operating room during the surgery," it is possible that he mistook someone else for Nurse N. He might be nearsighted, or may only have caught fleeting or partial glimpse of the person he later described; he might not hear well or might have heard the voice of the person he identified as nurse N against a confusing jumble of background voices; he might be only slightly acquainted with nurse N, and her voice and appearance might not yet really have sunk in; he might have been distracted, paying little attention to what he saw or heard or might have erred because another nurse closely resembles N in voice or general appearance.

The focal point is the moment of observation, and there are really three concerns. One centers on the sensor capacities of the speaker, meaning mainly what we would call his physical abilities to see and hear (sometimes the other senses of touch, smell, and taste are involved in reported observations, but less often). Another centers on his mental capacity, which means mostly his judgment and ability to process and make sense of whatever he sees and hears. Both these concerns are affected by the attitudes, expectations and general psychological condition, and by the distractions and preoccupations that are part of his life at the moment. The third concern is the relevant physical circumstances, including lighting conditions, visual obstructions, noises, even weather conditions, that might bear on the opportunity to observe.¹⁰⁰

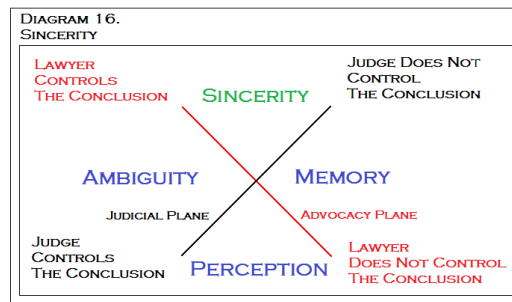
¹⁰⁰ Id., p. 1048.

4.3.0.3 Veracity, Truthfulness, Sincerity

Attorneys, like judges, have their own unique role in the trial. Most frequently these are associated with direct and indirect challenges to the veracity - that is, the honesty and truthfulness - of the witness.

No judge should feel comfortable, or encouraged, to disparage the honesty of witnesses coming before the jury in an off-handed or disrespectful fashion. Jurors are prone to view the fairness of the proceedings in direct relationship to the their perception of the integrity and impartiality of the judge. Judges undermine this appearance when their demeanor and questioning of witnesses is designed to uncover the dishonesty of a witness.

Attorneys, on the other hand, are well suited to challenge the veracity of witnesses in court. The jurors know that the attorney has a stake in the outcome and therefore are more likely to ignore the over-zealousness of Attorneys than that of Judges. The successful questioning of a witness by an Attorney does not undermine the juror's sense of justice: often it confirms it.



Mueller and Kirkpatrick discuss problems of witness sincerity in the following excerpt, detailing the special problems of disclosing dishonesty as cloaked by hearsay.

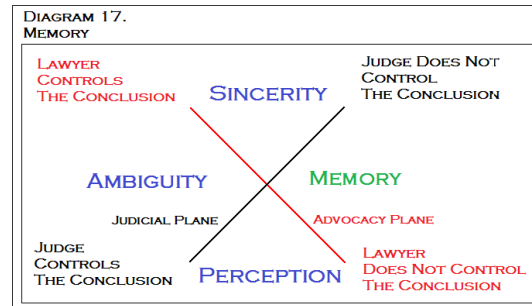
Another risk is that the speaker might shade the truth or blatantly falsify. In everyday experience, the former is more common than the latter, but both happen. And the gathering winds of litigation encourage observers to take sides, sensing the coming dispute and preferring one outcome or one side to the other, thus encouraging conscious, subconscious, or unconscious shadings of the truth.

In the example, Observer might think Nurse N was probably in surgery. Knowing he was less than certain, he might make a positive and unqualified statement anyway. Or he might know that she was there only for a few moments while the incision was closed, but he makes an unqualified statement, knowing it implies that she was present the whole time. He might even know that Nurse N was not in surgery at the time, but for reasons of his own he might say she was anyway – a blatant falsehood.¹⁰¹

¹⁰¹ Id., p. 1050.

4.3.0.4 Faulty Memory

No system of law can make a witness remember that which the witness cannot remember. The Watergate proceedings are replete with professional men “forgetting” significant dates, events, conversations, etc. The specter of so much forgotten fact might lead a jury to believe the witnesses are lying about their unexplained loss of memory. But neither the Judge nor the Attorney can do much to rectify the situation entirely. If a witness is unable to recall a fact crucial to the case, and if that fact cannot be supplied in any other manner to the jury, the case may fail for want of proof.



Mueller and Kirkpatrick discuss the problem of memory in the following comment, again as it relates to Hearsay.

Another risk is that the speaker at the very moment of utterance might err in calling to mind the events or conditions he observed. We commonly think of memory as fading over time. It is almost a commonplace to understand that memories of multiple similar events may become confused or conflated, and that memories are affected by the important things that preoccupy and concern us and absorb the bulk of our energies and attention.

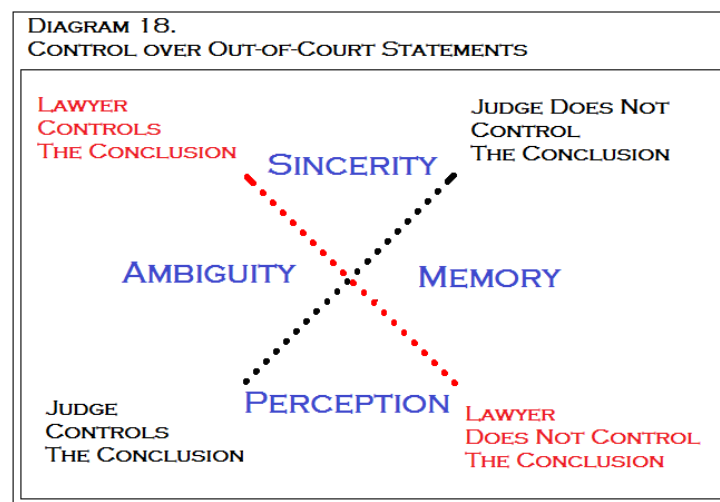
Psychologists report that human recollecting does not involve retrieving a datum stored in the mind in static condition (as it might rest in computer memory): It is better understood as creating a new mental image that is affected by – indeed partly comprised of – subsequent memories along with today’s impressions and ideas. The acuity of memory is affected by factors operating both at the time of observation such as the observer’s attentiveness, interest, emotional involvement, and nature of the experience (pleasant information is more easily recalled, and unpleasant or traumatic events are more readily repressed). It is also affected by factors that come into play when the event is later called to mind, including the type of information (visual perceptions are more easily recalled than verbal descriptions), the attitude of the observer (caution aids in recall), and the suggestively of the situation.

In our example, Observer may have paid little attention to what occurred and cared little about it. He might speak long after the event, with the intervening memory of many subsequent surgeries, perhaps under pressure to recall in a certain way. He might conflate similar occurrences (knowing he saw Nurse N at a surgery, he mistakenly thinks the occasion he recalls is the one he means to describe) or in other ways calls to mind a picture that differs significantly from the immediate impression he had of the event or condition in question.

The concern is the moment of recollecting, and the usual focus is on failed or faulty memory. But the real point is broader and less judgmental: The process of formulating ideas about the past introduces important changes and distortions, and while we speak of faults or failings (terms that are sometimes quite apt), we might just as well speak in more neutral terms of what it means to be human. Once again, being wary of this risk implies not so much skepticism as an attitude of caution and care.¹⁰²

4.3.1 Conclusions as to Hearsay

As the judicial system investigates material which is “hearsay” it is obvious that the control sought by the judicial system can not be absolute in this quadrant. Although the material may be offered for its truth, it is nevertheless made out-of-court, and the initial statement in question can not be controlled or confronted by either the lawyer of the judge. If we mark this relationship as one of inherent uncertainty, we have:



¹⁰² Id., pp. 1048-1050.

Together both the judge and the lawyer possess uncertain powers as they face this quadrant.

DIAGRAM 19.
NINE POSSIBILITIES OF HEARSAY

	JUDGE CONTROLS THE CONCLUSION	JUDGE IS UNCERTAIN IN CONTROLLING THE CONCLUSION	JUDGE DOES NOT CONTROL THE CONCLUSION
LAWYER CONTROLS THE CONCLUSION	<p>AMBIGUITY</p> <p>JUDGE AND LAWYER CONTROL THE CONCLUSION</p>	<p>LAWYER CONTROLS THE CONCLUSION AND JUDGE IS UNCERTAIN IN CONTROLLING THE CONCLUSION</p>	<p>SINCERITY</p> <p>LAWYER CONTROLS AND JUDGE DOES NOT CONTROL THE CONCLUSION</p>
LAWYER IS UNCERTAIN IN CONTROLLING THE CONCLUSION	<p>JUDGE CONTROLS AND LAWYER IS UNCERTAIN IN CONTROLLING THE CONCLUSION</p>	<p>BOTH JUDGE AND LAWYER ARE UNCERTAIN IN CONTROLLING THE CONCLUSION</p>	<p>JUDGE DOES NOT CONTROL THE CONCLUSION AND LAWYER IS UNCERTAIN IN CONTROLLING THE CONCLUSION</p>
LAWYER DOES NOT CONTROL THE CONCLUSION	<p>PERCEPTION</p> <p>JUDGE CONTROLS THE CONCLUSION, LAWYER DOES NOT CONTROL THE CONCLUSION</p>	<p>LAWYER DOES NOT CONTROL AND JUDGE IS UNCERTAIN IN CONTROLLING THE CONCLUSION</p>	<p>MEMORY</p> <p>NEITHER JUDGE NOR LAWYER CONTROL THE CONCLUSION</p>

These elements of inherent uncertainty are picked up in the third definition of Hearsay, i.e.:

Jury: Hearsay is a statement *in which the jury is forced to reason from the witness' belief* of a statement or even to the truth of that event, via an understanding of the ambiguity, sincerity, perception or memory *of the witness*.

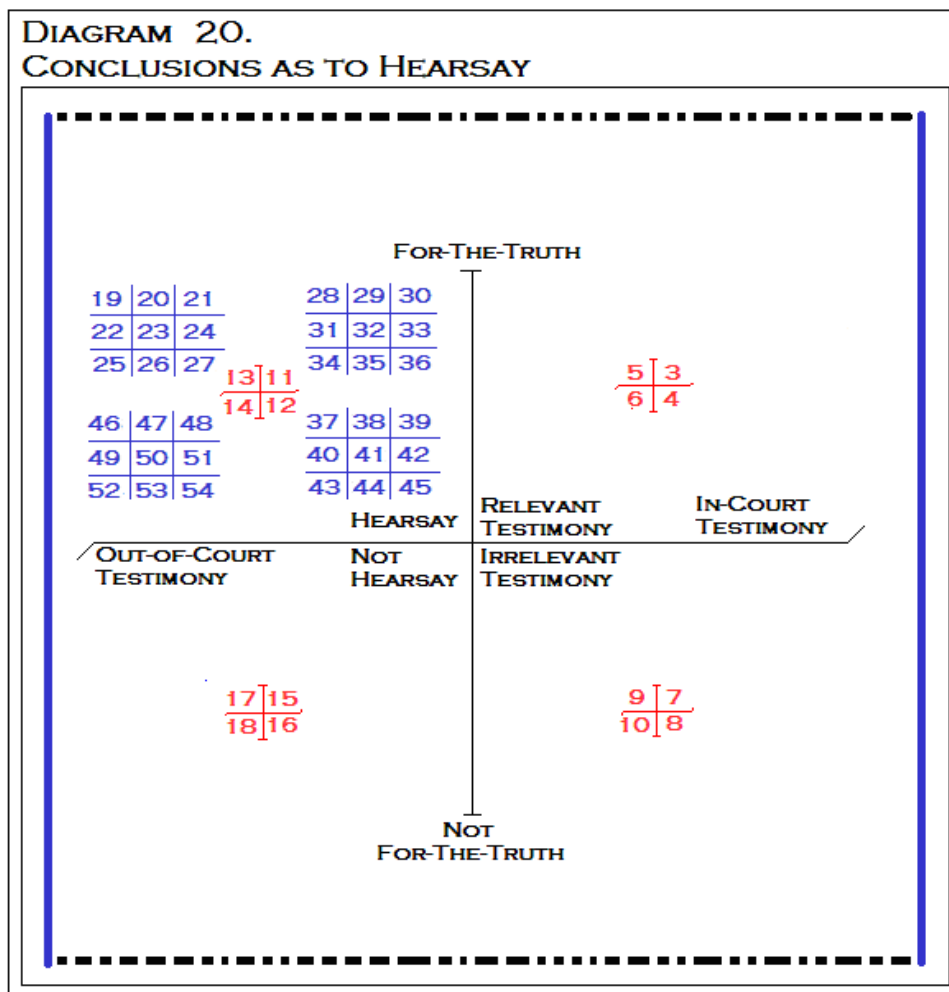
Because the jury is forced to reason about the evidence in ways which are beyond the power of the court or the advocate to cross-examine or control, hearsay in all its forms is excluded subject to exceptions which bring it within the purview and confidence of the judicial system under exceptions to the Rule Against Hearsay.

Referring to the diagram below, as the jury attempts to grasp the affect which a *hearsay* statement has to other *hearsay* statements which have been admitted into evidence under an exception, this inherent uncertainty may be written as given below in considerations 19-27. That is to say when dealing with hearsay, the power of the court or the advocate to control the evidence presented is uncertain because it involves statements made out-of-court which are being offered for their truth.

When dealing with *hearsay* and its affect upon *relevant and proper evidence* (28-36), the power of the court or the advocate to control the evidence presented is inherently uncertain because it involves statements made out-of-court which are being offered for their truth.

When dealing with *hearsay* and its affect upon *irrelevant evidence* which has come before the jury for some reason (37-45), the power of the court or the advocate to control the evidence or its effect upon the rights of the parties is inherently uncertain because it involves statements made out-of-court which are being offered for their truth.

Finally, when dealing with *hearsay* and its affect upon "*not hearsay*" which has been properly admitted (46-54), the power of the court or the advocate to control the evidence or its effect upon the rights of the parties is inherently uncertain because it involves statements made out-of-court which are being offered for their truth.



4.3.2 Conclusions as to In-Court Testimony

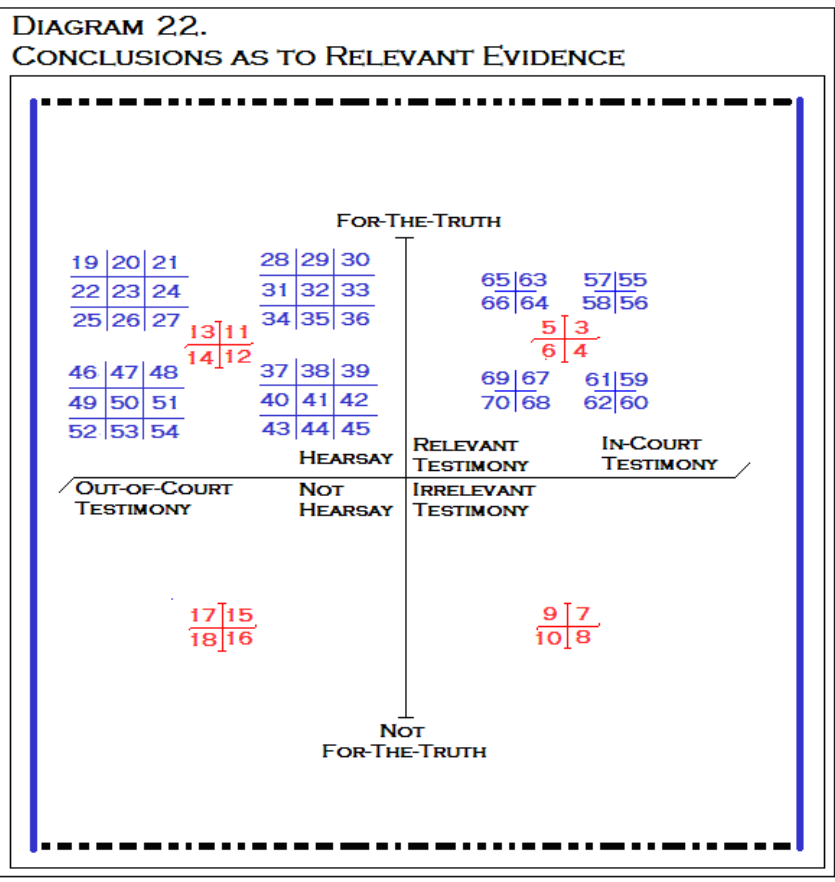
The uncertainty which typifies “hearsay” does not exist when the jury hears from the witness about something he/she *has actually and personally experienced*. In these circumstances, the jury is fully capable of evaluating the truthfulness, the sincerity, the clarity and the perception of the witness. Moreover the judge and the lawyers of the case are fully capable of making an inquiry of the actual experience by direct examination and cross-examination of the witness.

DIAGRAM 21.

FOUR POSSIBILITIES OF IN-COURT TESTIMONY

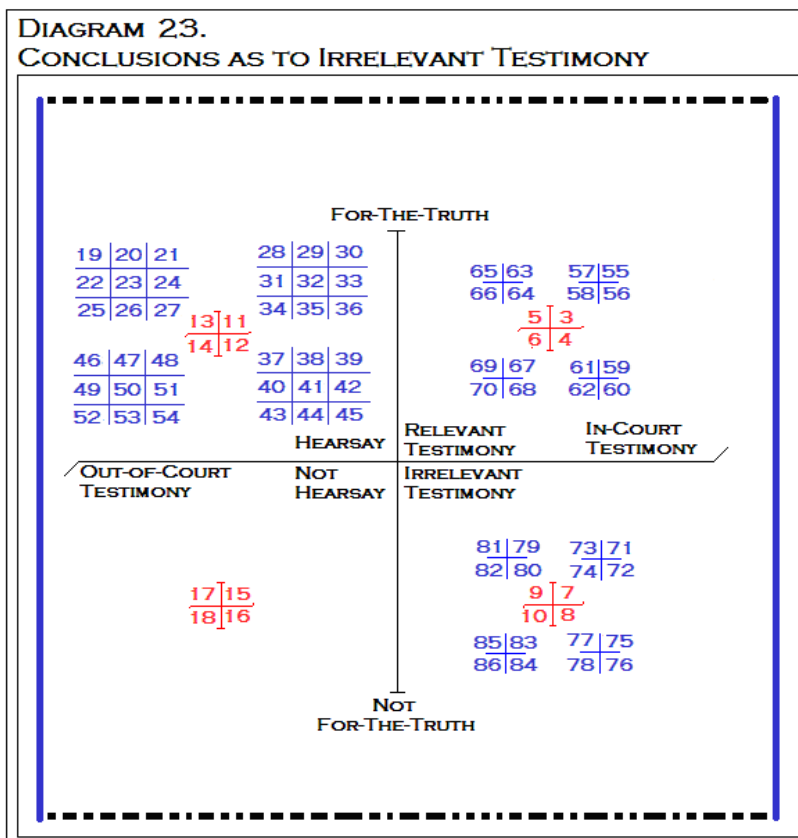
	JUDGE CONTROLS THE CONCLUSION	JUDGE DOES NOT CONTROL THE CONCLUSION
LAWYER CONTROLS THE CONCLUSION	AMBIGUITY JUDGE AND LAWYER CONTROL THE CONCLUSION	SINCERITY LAWYER CONTROLS AND JUDGE DOES NOT CONTROL THE CONCLUSION
LAWYER DOES NOT CONTROL THE CONCLUSION	PERCEPTION JUDGE CONTROLS THE CONCLUSION, LAWYER DOES NOT CONTROL THE CONCLUSION	MEMORY NEITHER JUDGE NOR LAWYER CONTROL THE CONCLUSION

Referring to the diagram below, the affect of in-court *relevant* testimony upon every other piece of *relevant* information (55-58) is the result of the jury's personal experience of the memory, sincerity, perception and clarity of the witness. Because this affect is created by the direct in-court observation of the witness by the jury, there is no *inherent* uncertainty as to this affect, although there may be strong disagreement amongst the jurors as to their conclusions regarding the witness. The same may be said for the affect of in-court *relevant* testimony to *irrelevant* testimony (59-62), the affect of in-court *relevant* testimony to *hearsay* statements which have come before the jury (63-66), and the affect of in-court *relevant* testimony to "*not hearsay*" (67-70). In each of these cases, the jury evaluates the memory, sincerity, perception and clarity of the witness directly before them as a matter of their own personal experience of the witness. There is no *inherent* uncertainty forced upon the situation due to the statements being made out-of-court and then related in-court by some other witness.



It happens occasionally that material which is indeed irrelevant – or at least arguably irrelevant – is brought before the jury. This material may help or hurt a party's suit. If necessary to preserve this point for appeal an objection as to relevance should be lodged and may be sustained by the court.

As in relevant testimony when we consider the affect of in-court *irrelevant* material to *relevant* material (71-74) the jury is in a position to evaluate the memory, sincerity, perception and clarity of the witness who has been allowed to present this testimony. Once again there is no *inherent* uncertainty forced upon the situation due to the statements being made out-of-court and then related in-court by some other witness. The same may be said again for the affect of in-court *irrelevant material* to other items of *irrelevant material* (75-78), or the affect of in-court *irrelevant* testimony to *hearsay* (79-82), or the affect of in-court *irrelevant* testimony and other information admitted as "*not hearsay*" (83-86). There is no *inherent* uncertainty because the in-court nature of the testimony permits the jury to evaluate the testimony as a matter of their own personal experience of the witness.



The certainty which arises from personal experience is distinguished legally from the inherent uncertainty of hearsay testimony which, by its nature, is obtained out-of-court, outside the direct experience of the jury, and then repeated by a witness testifying before them.

4.3.3 Conclusions as to “Not Hearsay”

When we come to the realm of "Not Hearsay," an interesting and important qualification of the pattern must be made.

As noted previously words of slander, or words denoting state of mind, or words providing notice to the hearer are the classic examples of Not Hearsay. Such words, originally given out-of-court, are then repeated in court because they are the gravamen of the action, or give light to the circumstances surrounding a particular action, or because they demonstrate an effect upon the hearer. In each of these cases the testimony is both “out-of-court” and “not for the truth of the matter asserted.”

In essence Not Hearsay takes on the aspect of any other matter seen out-of-court and then described to the jury. Testimony as to the verbal statements of the out-of-court actor are essentially like the witness describing any other fact of the case – the weather, the lighting, the time of day, etc.

Consequently Not Hearsay carries an unusual “Yes-No” quality about it. This is conveyed by the “Yes – No” statement in the lower-left corner. (87-88)

If the Court finds that the out-of-court testimony is offered for the truth of the statement, then it is hearsay and must be excluded.

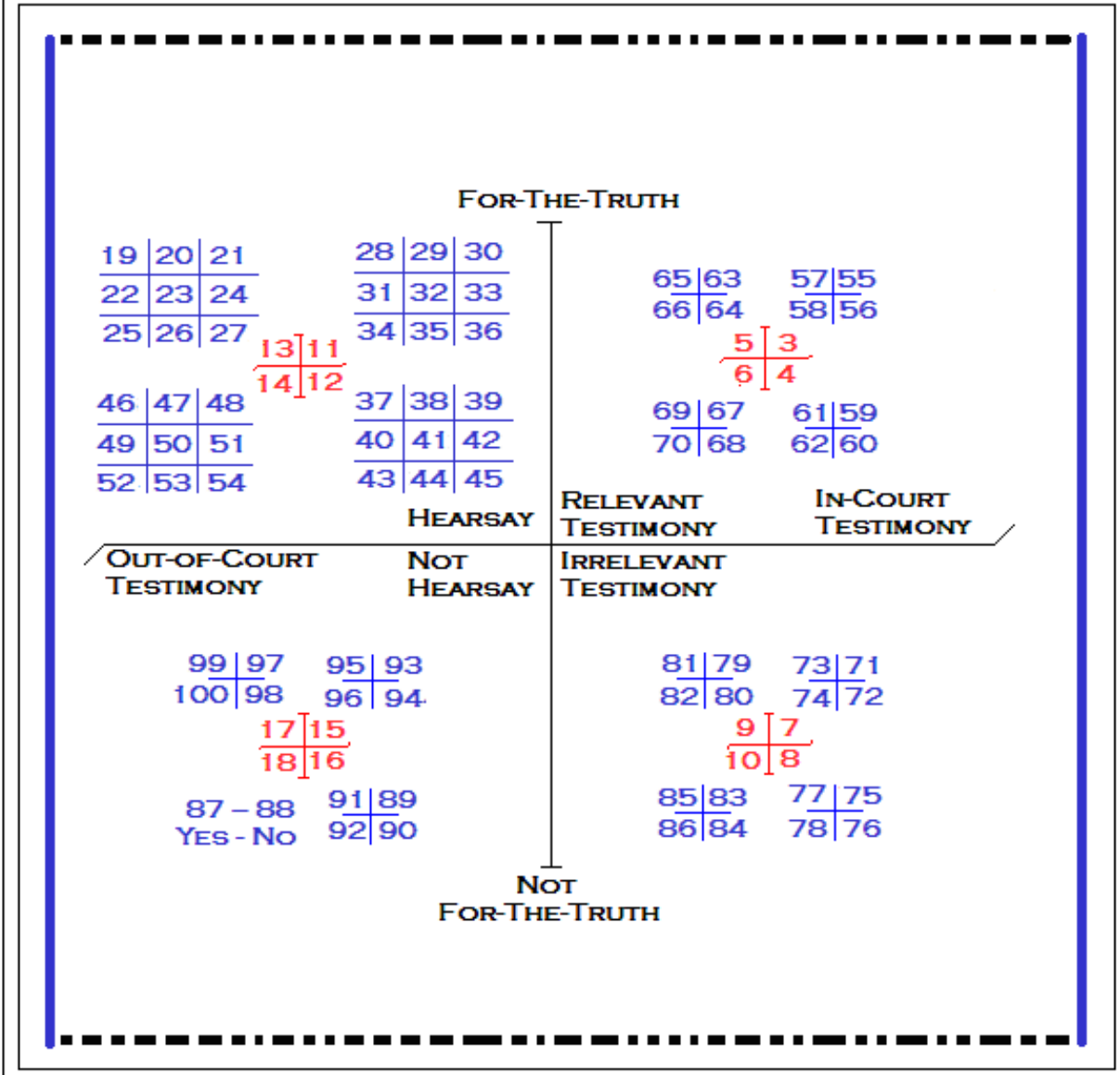
If the out-of-court testimony is “not offered for the truth” then it risks being irrelevant and must be excluded on this ground alone.

The entire premise of "Not Hearsay" is that because *both* objections which usually bar testimony are present and the double negative permits the material to be admissible if relevant to the proceedings.

Thus the perception and memory of the witness offering the testimony, and the sincerity or narration of the witness are initially unimportant. What is at stake is the proper characterization by the Court of the material itself.

Assuming that "Not Hearsay" testimony is presented in evidence, it will have an affect on the material deemed *irrelevant* (89-92), to the *relevant* testimony offered to the court (93-96) and to *hearsay* statements which have been permitted into evidence (97-100) in the same way that any other matter taking place out of court is described by the witness who personally experienced it. The jury can experience directly the testimony of the witness and consider the ambiguity, perception, sincerity and memory of the witness for Not Hearsay just as much as the witness describing the weather... once the judge first decides upon the proper characterization of the testimony itself (87-88).

DIAGRAM 24.
"SYSTEM OF MOVEMENT"



We have numbered as "1" and "2" above the original dichotomy of In-Court / Out-of-Court and For the Truth / Not For the Truth because this simple dichotomy lays the foundation for the entire scheme of evidence. We have not numbered as sets of opposites the original quadrants of possible testimony – Relevant Testimony, Irrelevant Testimony, Hearsay, Not Hearsay – because these quadrants are meaningless without a case to consider. The remaining numbers are given to add to a model of 100 parts whereby society "thinks" about the resolution of a particular case.

CONCLUSION

To summarize we have presented:

2 dichotomies

Primary Opposition:

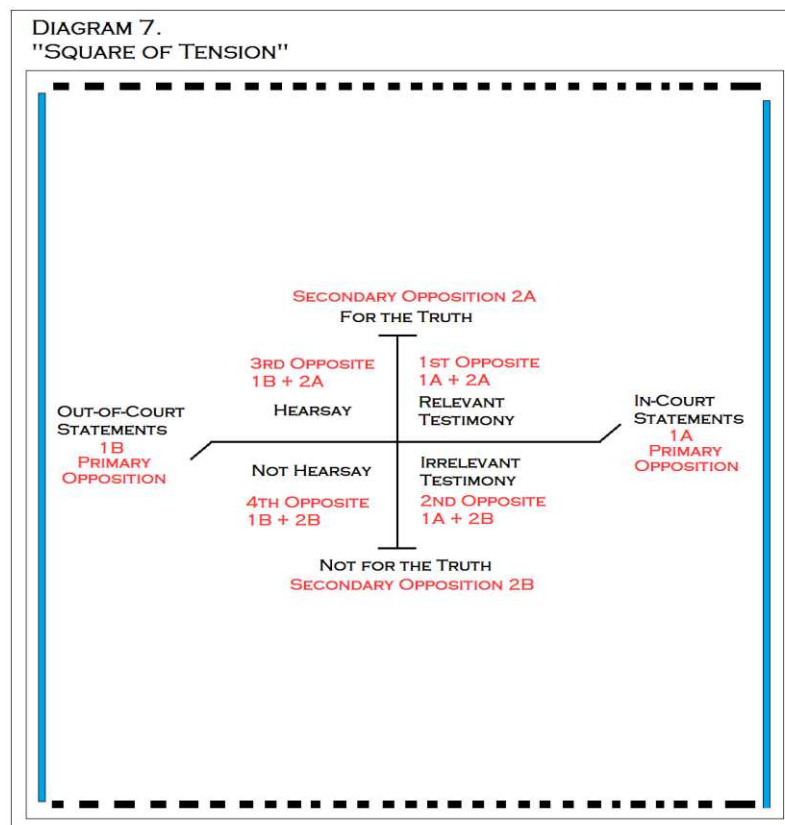
1A = In-Court

1B = Out-Of-Court,

Secondary Opposition:

2A = For-The-Truth

2B = Not-For-The-Truth,



4 quadrants

Relevant Evidence =

Irrelevant Evidence =

Hearsay =

Not Hearsay =

First Opposite

Second Opposite

Third Opposite

Fourth Opposite

1A + 2A

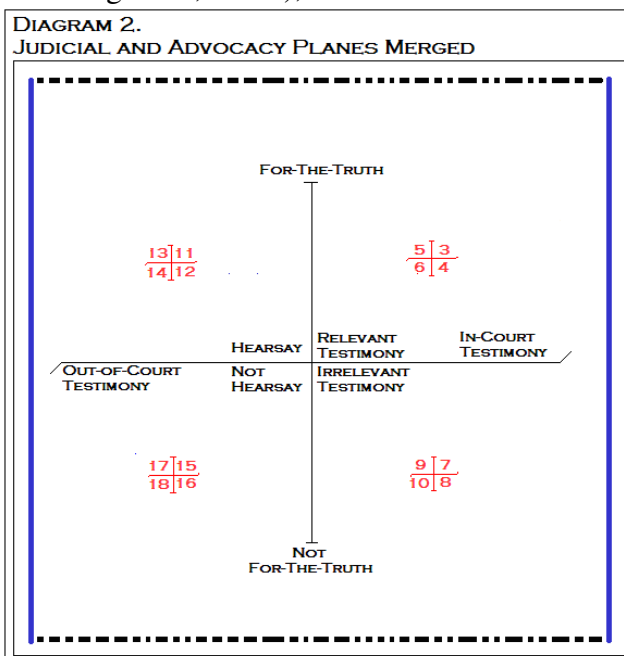
1A + 2B

1B + 2A

1B + 2B,

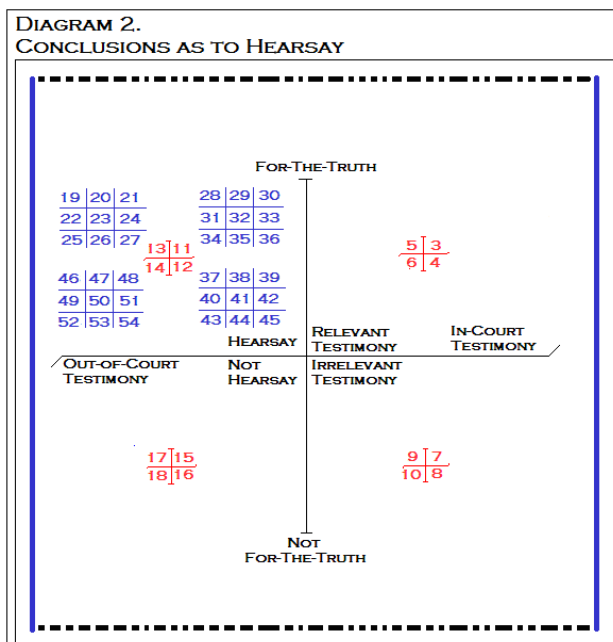
8 relationships inherent in Relevant and Irrelevant Evidence as brought forward by the advocates in the case (#3 through #10, in red),

8 relationships inherent in the Hearsay and Not Hearsay as brought forward by the advocates in the case (#11 through #18, in red),

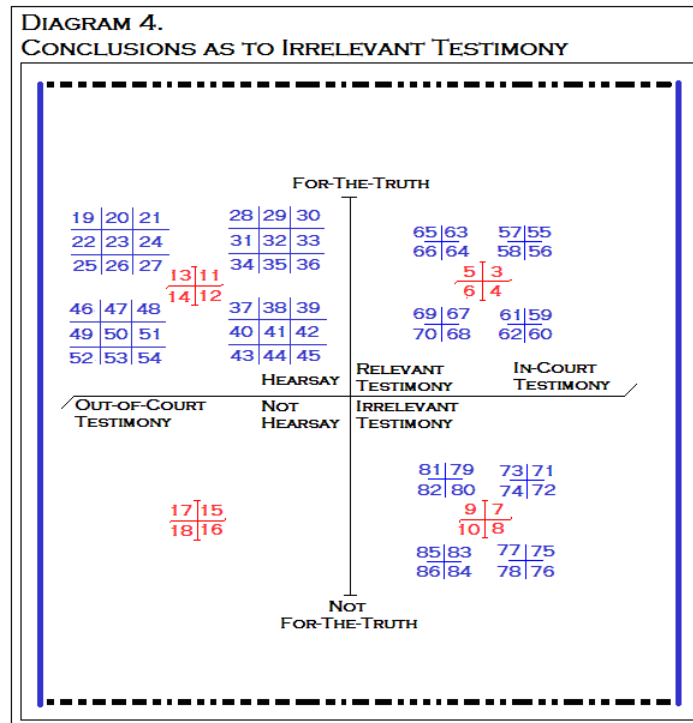


18 conclusions possible when hearsay evidence is considered in relation to other hearsay evidence and relevant evidence regarding a jury's evaluation of the ambiguity, sincerity, perception and memory of the witness (#19 through #36, in blue, top-left quadrant),

18 conclusions possible when hearsay evidence is considered in relation to other irrelevant evidence and non-hearsay uses of evidence regarding a jury's evaluation of the ambiguity, sincerity, perception and memory of the witness (#37 through #54, in blue, top-left quadrant),

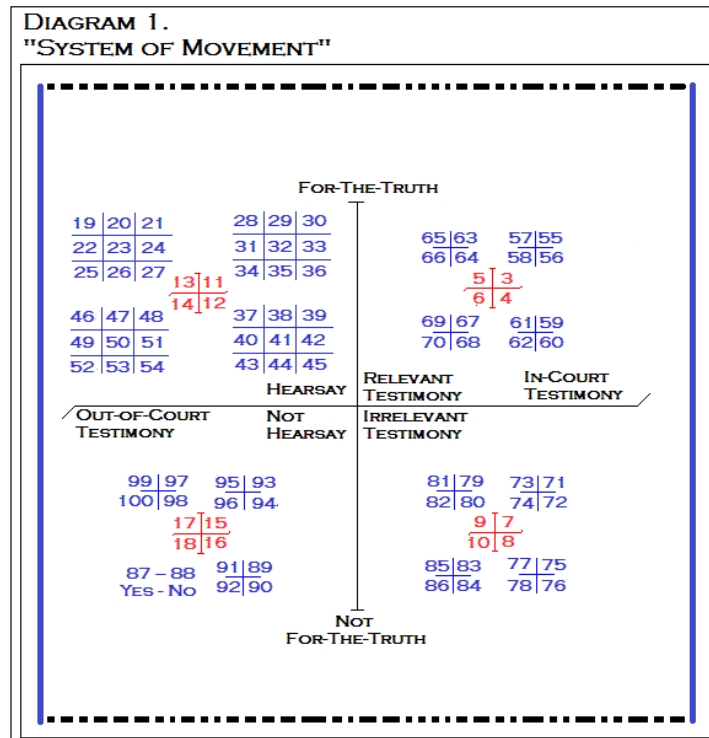


32 conclusions possible in considering the in-court testimony which comes before the jury, both relevant and irrelevant (#55-86, in blue, right hand quadrants),



2 conclusions possible in considering the initial categorization of Not Hearsay (#87, #88, in blue, lower-left quadrant),

12 conclusions possible regarding the relationships of any non-hearsay evidence to hearsay, irrelevant and relevant evidence (#89 through #100, in blue, lower-left quadrant).



Essay Three: How Many Chemical Elements Are There?

It is the function of science to discover the existence of a general reign of order in nature and to find the causes governing this order. And this refers in equal measure to the relations of man - social and political - and to the entire universe as a whole.

Dmitri Mendeleev

ABSTRACT

Aims: To use the “System of Movement” pattern to identify the Periodic Table of Chemical Elements as a level of reality subject to the interpretation of these essays.

Study design: Philosophic / Mathematic discussion of the Periodic Table of Chemical Elements and its association with the numbering system presented for Russell’s Paradox.

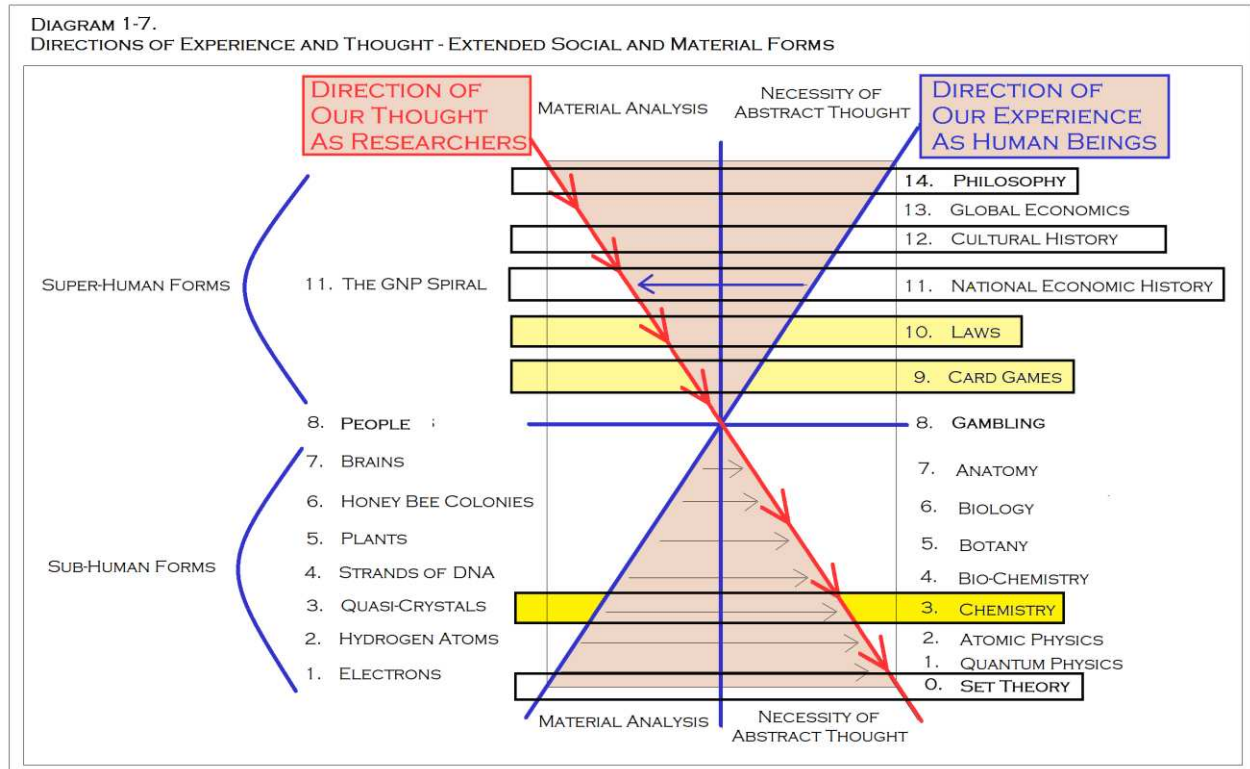
Place and Duration of Study: Library research.

Methodology: In this essay we discuss basic ideas underlying the Periodic Table of Chemical Elements. These ideas are presented in the form of a “System of Movement” which limits the development of naturally occurring chemical elements to 100.

Conclusions: The structure of consciousness which seems to govern the social realm has clear associations in the physical realm as well.

INTRODUCTION: WHAT IS “THE PERIODIC TABLE OF ELEMENTS”?

We turn to the level of chemistry in this essay, to investigate the possibility that the System of Movement pattern is found therein.



In his book *Six Easy Pieces*, Richard Feynman describes in very visual and simple terms the concept of atoms as they make up the world around us.

Matter is made of atoms.

If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generation of creatures, what statement would contain the most information in the fewest words? I believe it is the atomic hypothesis (or the atomic *fact*, or whatever you wish to call it) that *all things are made of atoms – little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another*. In that one sentence, you will see there is an *enormous* amount of information about the world, if just a little imagination and thinking are applied.¹⁰³

¹⁰³ Richard Feynman, *Six Easy Pieces: Essentials of Physics explained by its most brilliant teacher*, Helix Books, Reading Massachusetts, 1995, p. 4.

Professor Feynman goes on to describe in vivid detail the overall picture of the world of an atom, as follows.

To illustrate the power of the atomic idea, suppose that we have a drop of water a quarter of an inch on the side. If we look at it very closely we see nothing but water – smooth, continuous water. Even if we magnify it with the best optical microscope available – roughly two thousand times – then the water drop will be roughly forty feet across, about as big as a large room, and if we looked rather closely, we would still see relatively smooth water – but here and there small football-shaped things swimming back and forth. Very interesting. These are paramecia. You may stop at this point and get so curious about the paramecia with the wiggling cilia and twisting bodies that you go no further, except perhaps to magnify the paramecia still more and see inside. This, of course, is a subject for biology, but for the present we pass on and look still more closely at the water material itself, magnifying it two thousand times again. Now the drop of water extends about fifteen miles across, and if we look very closely at it we see the kind of teeming, something which no longer has a smooth appearance – it looks slightly like a crowd at a football game as seen from a very great distance. In order to see what this teeming is about, we will magnify it about two hundred and fifty times and we will see something similar to what is shown in Figure 1-1.

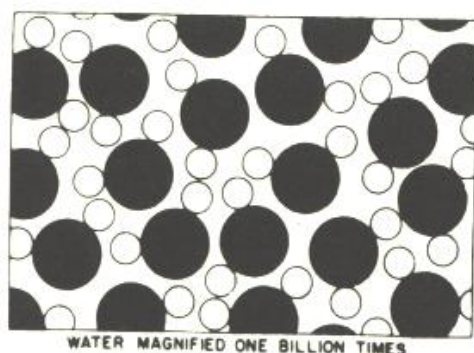


Figure 1-1.

This is a picture of water magnified a billion times, but idealized in several ways. In the first place, the particles are drawn in a simple manner with sharp edges, which is inaccurate. Secondly, for simplicity, they are sketched almost schematically in a two-dimensional arrangement, but of course they are moving around in three dimensions. Notice that there are two kinds of “blobs” or circles to represent the atoms of oxygen (black) and hydrogen (white), and that each oxygen has two hydrogens tied to it. (Each little group of an oxygen with its two hydrogens is called a molecule.) The picture is idealized further in that the real particles in nature are continually jiggling and bouncing, turning and twisting around one another. You will have to imagine this as a dynamic rather than a static picture. Another thing that cannot be illustrated in a drawing is the fact that the particles are “stuck together” – that they attract each other, this one pulled by that one, etc. The whole group is “glued together,” so to speak. On the other

hand particles do not squeeze through each other. If you try to squeeze two of them too close together, they repel.¹⁰⁴

The size of these atoms of Hydrogen and Oxygen is taken up with an example equally as vivid.

The atoms are 1 or 2×10^{-8} cm in radius. Now 10^{-8} cm is called an angstrom (just another name), so we say they are 1 or 2 angstroms (A) in radius. Another way to remember their size is this: if an apple is magnified to the size of the earth, then the atoms in the apple are approximately the size of the original apple.¹⁰⁵

The idea of atoms and the development of the Table of Atomic Elements is described briefly in the article "Elements" by Dr. O. Lewin Keller, published in *The Encyclopedia of Physics*. Dr. Keller writes:

In 1661 Robert Boyle, who had developed a chemical atomic theory based on the concepts of Democritus, gave the definition of chemical elements as "certain primitive and simple, or perfectly unmingling bodies, which, not being made of any other bodies or one another" are the constituents of chemical compounds." ...

Over one and one quarter centuries after Boyle had given his definition of an element, Antoine-Laurent Lavoisier was able to determine a list of elements based on an experimentally verifiable definition: "A chemical element is a substance that cannot be decomposed further into simpler substances by ordinary chemical means." ...

Work of the sort being carried out by Lavoisier soon led to the development of the law of definite proportions, which stated that in any given compound the elements always occur in the same proportions by weight no matter how the compound is synthesized. This law led to the definition of "equivalent weights" of elements as that weight which will combine with or replace a unit weight of some standard element such as hydrogen.

John Dalton, in 1808, was the first to postulate an atomic theory that incorporated atomic weight as distinguished from equivalent weight and was capable of explaining the empirically derived laws of chemical combination.¹⁰⁶

¹⁰⁴ Id., pp. 4-5.

¹⁰⁵ Id., p. 5.

¹⁰⁶ ¹⁰⁶Editors Lerner and Trigg, Second Edition, VCH Publishing, New York, 1991, pp. 348-351.

The creator of the first successful periodic law was Mendeleev. This Russian scientist based his entire scheme upon the relationship between atomic weight and chemical behavior.

“I began to look about and write down the elements with their atomic weights and typical properties, analogous elements and like atomic weights on separate cards, and this soon convinced me that the properties of elements are in periodic dependence upon their atomic weights.”

--Mendeleev, *Principles of Chemistry*, 1905, Vol. II

Dr. Keller's article continues:

These efforts culminated in the work in 1869 of Dimitri Mendeleev, author of the periodic law.

The availability of fairly reliable atomic weights for a number of elements allowed chemists to seek relationships among them on a weight basis. In 1869, Dimitri Mendeleev knew of 65 elements with their atomic weights. While looking for relationships among these elements he made one of the most important discoveries in the history of chemistry: The properties of the elements are periodic functions of their atomic weights.

This periodic law allowed the arrangement of the elements in a table in order of increasing atomic weight such that the table contains columns and rows of elements. Elements with similar chemical properties, such as silicon, tin, and lead, were found to fall in the same column. Thus there appeared a regular recurrence of chemical and physical properties of the elements from the top to the bottom of the column even though the elements were widely separated in atomic weight. For the first time in history it was shown that the chemical elements form an entity in their interrelationships, and undiscovered elements with predictable properties could be sought to fill up the holes in the table. The periodic law proposed by Mendeleev was a daring break with the thought of the scientific community in 1869. In fact, Mendeleev's bold predictions of the chemical and physical properties of still undiscovered elements undoubtedly furnished the touch of drama needed to gain acceptance of his system. ... The three most famous predictions by Mendeleev concerned eka-aluminum (gallium), eka-boron (scandium), and eka-silicon (germanium). When the elements themselves were discovered, Mendeleev's detailed predictions were found to be amazingly accurate.¹⁰⁷

¹⁰⁷ Id., pp. 348-351.

At the present time, the following chart is given as the order of the atoms which make up the physical reality around us.¹⁰⁸

1 1 H 1.0079																	18 2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uuu (272)	112 Uub (285)		114 Uuq (289)				
* Lanthanide series			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
# Actinide series			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

¹⁰⁸ Taken from the Internet, University of Leeds, England.

Introduction 1.1 The 100 Elements of Nature

Dr. Richard Hahn describes the sharp break which occurs in nature at element 100, Fermium, as follows:

The transuranium elements have been synthesized in a variety of ways. ... At present, their production methods can be divided into two groupings:

(1) *The elements up to and including Fm (Fermium, element 100) can be produced in weighable amounts that vary from many grams down to about 10^{-12} g (or 10^9) atoms (1,000,000,000 atoms).* To produce these elements, targets such as uranium are irradiated in a high-flux reactor, where they undergo a series of multiple neutron captures and (negative) beta-particle radioactive decays to form elements with higher masses and atomic numbers than the targets. Chemical processing of the irradiated targets separates the different elements formed by this process.

(2) Elements with Z (atomic number) of 101 and above can only be obtained in trace amounts, from accelerator bombardment of targets with charged particles. To form the heaviest elements, beams of nuclei, which are called heavy ions because they have atomic masses greater than that of helium-4, must be used to introduce several protons into the target nucleus at one time, reactions such as $^{16}\text{O} + ^{249}\text{Bk} \rightarrow ^{262}\text{105} + 5\text{n}$ (neutrons) or $^{12}\text{C} + ^{249}\text{Cf} \rightarrow ^{257}\text{104} + 4\text{n}$ have often been used, in which the excess energy that is available in the reaction is released by the emission of several neutrons. Because the chance of forming a desired nucleus increases, a new approach has been used to form the elements above 105. Called "cold nuclear fusion," the process involves bombarding especially stable target nuclei, such as ^{208}Pb or ^{209}Bi , with beams such as ^{54}Cr or ^{58}Fe to form products with low excess energy, as indicated by the fact that only one or two neutrons are emitted in the reaction. ...¹⁰⁹

Dr. Hahn describes the transuranium elements and the scientific problems associated with them as follows.

(3) Added to these problems are the special difficulties encountered in trying to study the behavior of elements that exist only for seconds or minutes. For example, to study the chemical properties of elements 103 or 104, one has to work at an accelerator, produce a few hundred atoms (at most) in an irradiation, purify the desired element, perform a chemical measurement, and then begin the procedure over with a new irradiation prior to making another chemical measurement. Such methodology has been dubbed "one-atom-at-a-time" chemistry."¹¹⁰

¹⁰⁹ Richard Hahn, "Transuranium Elements" as published in The Encyclopedia of Physics, 2nd Edition, VCH Publishers, New York, 1991, Pages 1303-1304.

¹¹⁰ Id, p. 1304.

Regarding the list below, it is important to note that at the present time scientists are unable to obtain more than trace amounts ("a few hundred atoms (at most)"*) of any element over 100. Elements over 100 are brought about only through a process dubbed "one-atom-at-a-time chemistry" measuring the rate of the atom's "decay chain." Thus science is unable to measure the atomic weight of these elements. In this way they differ significantly from the preceding 100.¹¹¹

Number	Element:	Half-life:	Discovery Date:	Quantity:
92	Uranium (238)	4.5 billion years	(1841)*	Weighable
93	Neptunium	2 million years	1940	Weighable
94	Plutonium	80 million years	1940	Weighable
95	Americium	7,000 years	1944	Weighable
96	Curium	300,000 years	1944	Weighable
97	Berkelium	1,400 years	1949	Weighable
98	Californium	800 years	1950	Weighable
99	Einsteinium	276 days	1952	Weighable
100	Fermium	80 days	1953	Weighable
101	Mendelevium	54 days	1955	Unweighable
102	Nobelium	1 hour	1958	Unweighable
103	Lawrencium	3 min	1961	Unweighable
104	Kurchatovium	70 seconds	1964	Unweighable
104	Rutherfordium		1969	Unweighable
105	Nielsbohrium	40 seconds	1970	Unweighable
105	Hahnium		1970	Unweighable
106	(mass 259)	7 milli-seconds	1974	Unweighable
	(mass 260)	20 milli-seconds	1974	Unweighable
	(mass 263)	.9 seconds		Unweighable
107	(mass 261)	1 milli-second	1981	Unweighable
	(mass 262)	5 milli-seconds		Unweighable
	(mass 267)	1 second		Unweighable
108	(mass 265)	2 milli-seconds	1984	Unweighable
109	(mass 266)	4 milli-seconds	1982	Unweighable

¹¹¹ Taken from the *Handbook of Chemistry and Physics*, 54th ed., CRC Press, 1973-1974, Editor Robert Weast, Ph.D., p. B-35.

Dr. Hahn concludes his article with a comment on the end-point of the series, and on the search for additional elements.

The fact that very short half-lives are encountered in the heaviest elements has led many scientists to conclude that element 109 may be at or near the limit of nuclear stability, and that it may be very difficult, or even impossible, to produce elements with even higher atomic numbers. However, several years ago, an idea was developed about a possible new region of nuclear stability (called the "island of stability") that might exist far from the elements known today. Based on our knowledge of nuclear structure and stability, this new region of "superheavy elements" was predicted to occur around atomic numbers 114 or 126.

The prospect of finding such new, relatively stable, elements was especially exciting to many scientists, because it would allow them to test and to extend their ideas, not only about nuclear properties, but about chemical behaviour as well. Many ingenious experiments were carried out, to try to produce isotopes of these elements in nuclear bombardments, or to detect extremely long-lived varieties of the "SHE's" in nature (by taking advantage of the fact that elements that are members of a particular chemical "family" all have similar chemical properties, and tend to be found together in ore deposits, purified metals, etc.).

Although several optimistic claims have been made for the discovery of superheavy elements, none of them unfortunately has survived the scrutiny of the scientific community. Because of this lack of success, interest in this research area has waned in recent years. Many scientists have concluded that either the SHE's are much less stable than originally thought, or that the conditions that have been available in nuclear bombardments were simply not optimum for reaching the sought-after island of stability.¹¹²

¹¹² Id, p. 1304.

METHODOLOGY

1. Hypothesis

I propose that there is good reason to believe that the structure of the Periodic Table of Chemical Elements must end at Element 100, Fermium, and that the remainder of the elements should be regarded as suspect due to “one-atom-at-a-time” chemistry used to create them.

2. Methods

We use the map developed in the previous essay to evaluate the structure of the Periodic Table of Chemical Elements.

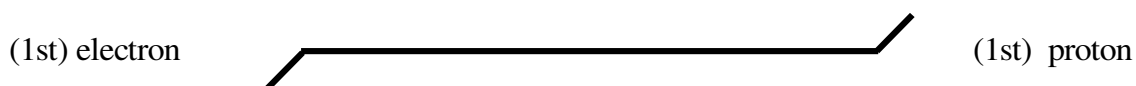
3. Data

We present here the standard notation of the Periodic Table of Chemical Elements and use it in a new form.

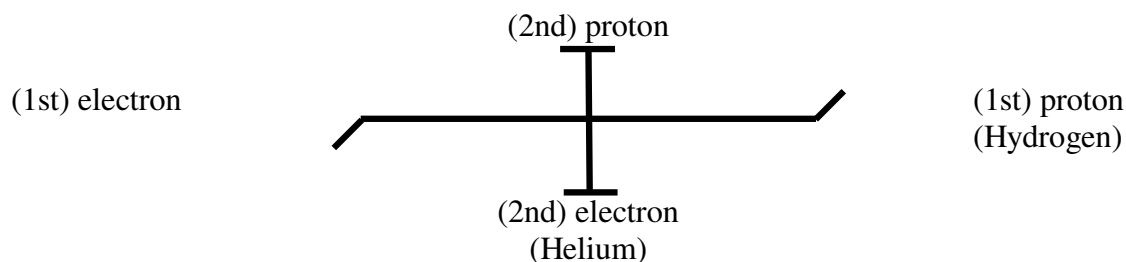
4. Procedure

4.1 Building the Periodic Table

The essential building block of the elements is the proton-electron pair, the proton bearing a positive charge, the electron carrying a negative charge. In Hydrogen this pair negate one another, permitting the element to bind with virtually any other element.



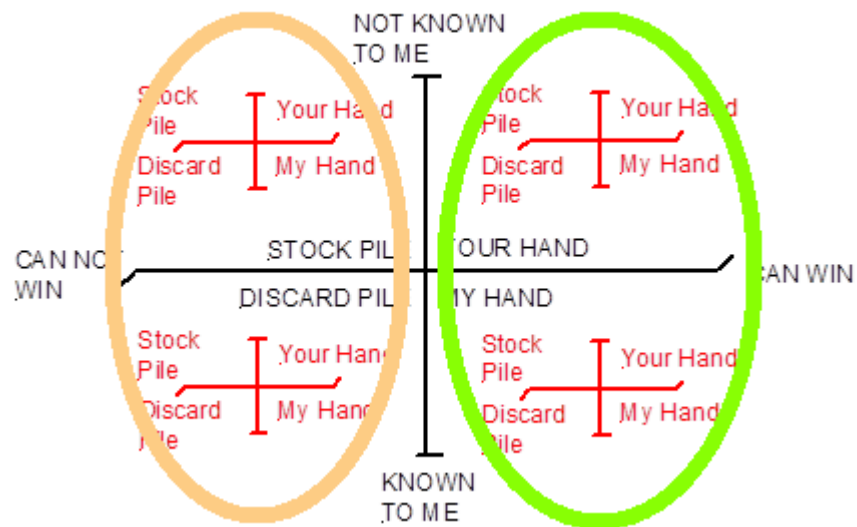
In Helium, a second proton/electron pair join the first pair, and the quadrant system is complete and stable. As a result Helium does not merge readily with any other element.



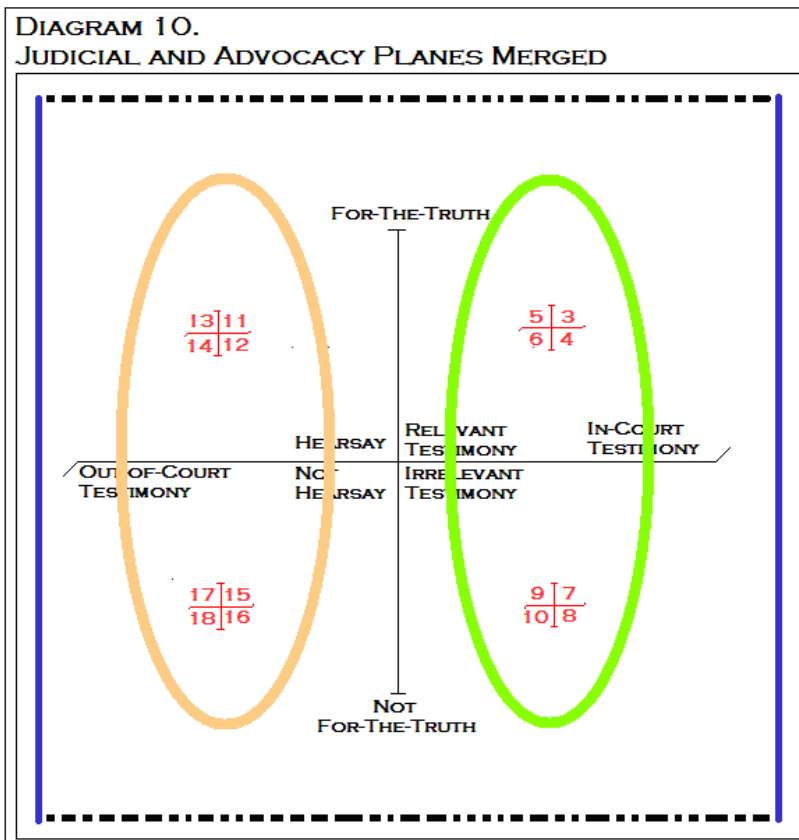
Taking these two dichotomies as personified by two separate elements, these are found in the periodic table of chemical elements as:

1																		18	
1 H 1.0079	2																	2 He 4.0026	
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180		
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948		
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798		
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29		
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)		
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uuh (272)	112 Uub (285)	114 Uuq (289)							
* Lanthanide series			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97		
# Actinide series			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)		

Two sets of eight were explored in both the psychology of Gin Rummy ...



... as well as the law of evidence.



These are found in the Periodic Table as the next sixteen elements, as follows.

1 1 H 1.0079																	18 2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uun (272)	112 Uub (285)		114 Uuq (289)				
* Lanthanide series																	
		57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97	
# Actinide series																	
		89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)	

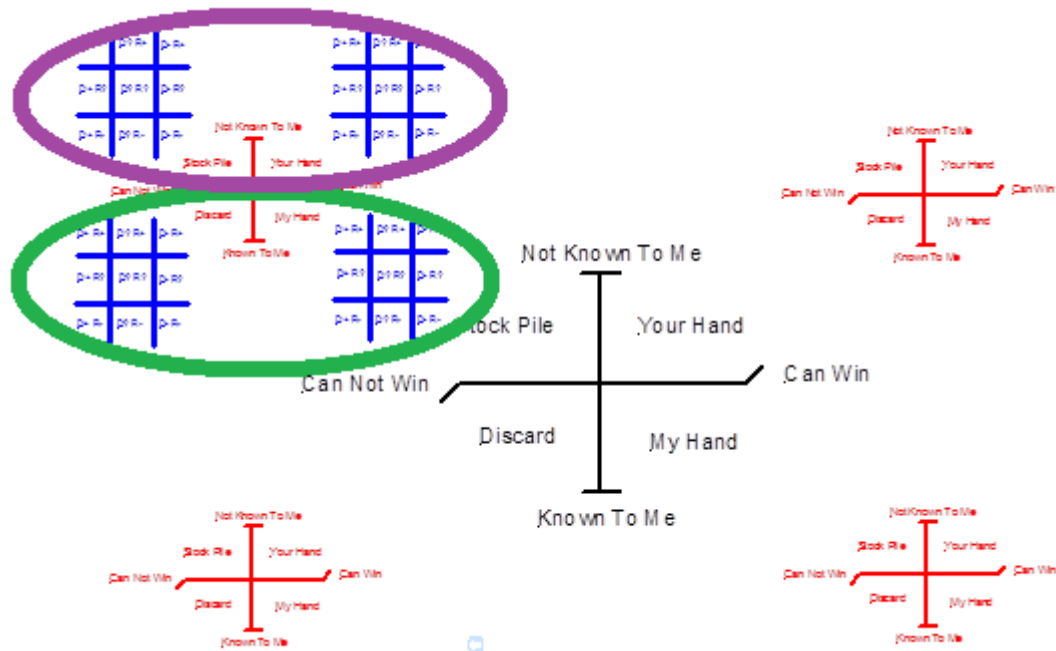
The first group of eight consist of the following elements:

Lithium (Li, #3), Beryllium (Be, #4), Boron (b, #5), Carbon (C, #6), Nitrogen (N, #7), Oxygen (O, #8), Fluorine (F, #9) and Neon (Ne, #10).

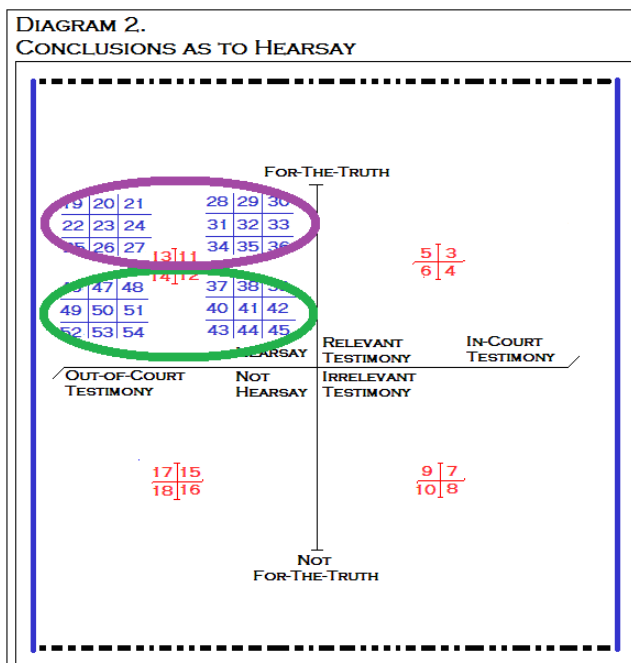
The second group of eight consist of the following elements.

Sodium (Na, #11), Magnesium (Mg, #12), Aluminum (Al, #13), Silicon (Si, #14), Phosphorus (P, #15), Sulfur (S, #16), Chlorine (Cl, #17), and Argon (Ar, #18).

Let us compare the remainder of our quadrant system with the table of periodic elements. In the upper left quadrants we would expect a first set of 18 elements. In the game of Gin Rummy this was pictured as conclusions as to the relationship of the Stock Pile towards sets of cards which could win or could not win the game.



In our study of the law of evidence a similar dichotomy of two sets of eighteen is displayed in the jury's conclusion as to the effect of Hearsay testimony upon In Court and Out Of Court testimony.



These are found in the periodic table as the Potassium series. This series includes Potassium (K, #19), Calcium (Ca, #20), Scandium (Sc, #21), Titanium (Ti, #22), Vanadium (V, #23), Chromium (Cr, #24), Manganese (Mn, #25), Iron (Fe, #26), Cobalt (Co, #27), Nickel (Ni, #28), Copper (Cu, #29), Zinc (Zn, #30), Gallium (Ga, #31), Germanium (Ge, #32), Arsenic (As, #33), Selenium (Se, #34), Bromine (Br, #35), and Krypton (Kr, #39.)

1 H 1.0079																	18 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.921	34 Se 78.96	35 Br 79.904	36 Kr 83.796
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 * #	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 * #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uuu (272)	112 Uub (285)	114 Uuq (289)					
* Lanthanide series			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
# Actinide series			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

We would next expect a second set of 18 elements. This has previously been pictured as:

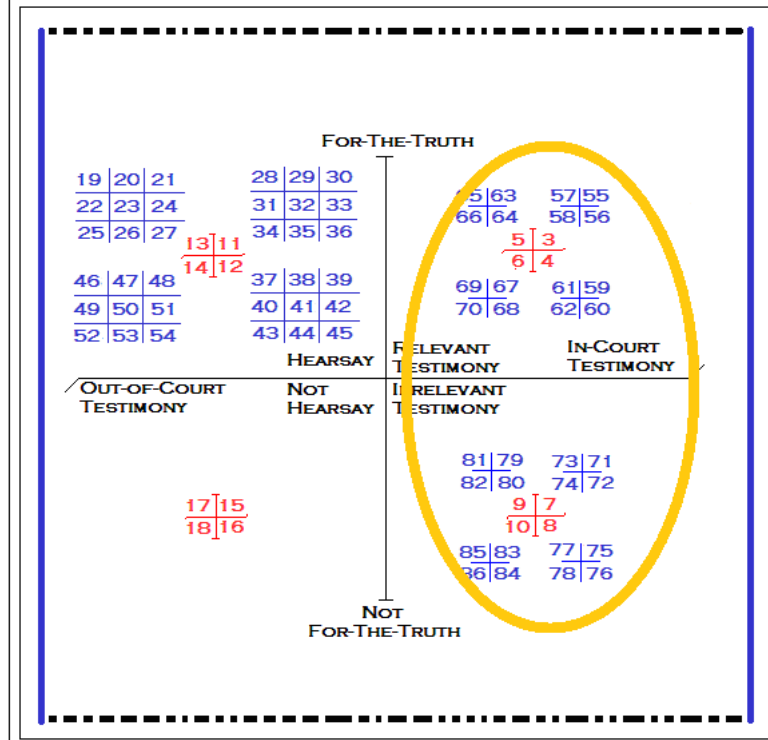
This is given in the periodic table as the Rubidium series. This series includes Rubidium (Rb, #37), Strontium (Sr, #38), Yttrium (Yb, #39), Zirconium (Zr, #40), Niobium (Nb, #41), Molybdenum (Mo, #42), Technetium (Tc, #43), Ruthenium (Ru, #44), Palladium (Pd, #46), Silver (Ag, # 47), Cadmium (Cd, #48), Indium (In, #49), Tin (Sn, #50), Antimony (Sb, #51), Tellurium (Te, #52), Iodine (I, #53), and Xenon (Xe, #54). They are found in the periodic table as:

1 H 1.0079																	18 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.921	34 Se 78.96	35 Br 79.904	36 Kr 83.796
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 * #	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 * #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uuu (272)	112 Uub (285)	114 Uuq (289)					
* Lanthanide series			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
# Actinide series			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

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DIAGRAM 23.
CONCLUSIONS AS TO IRRELEVANT TESTIMONY

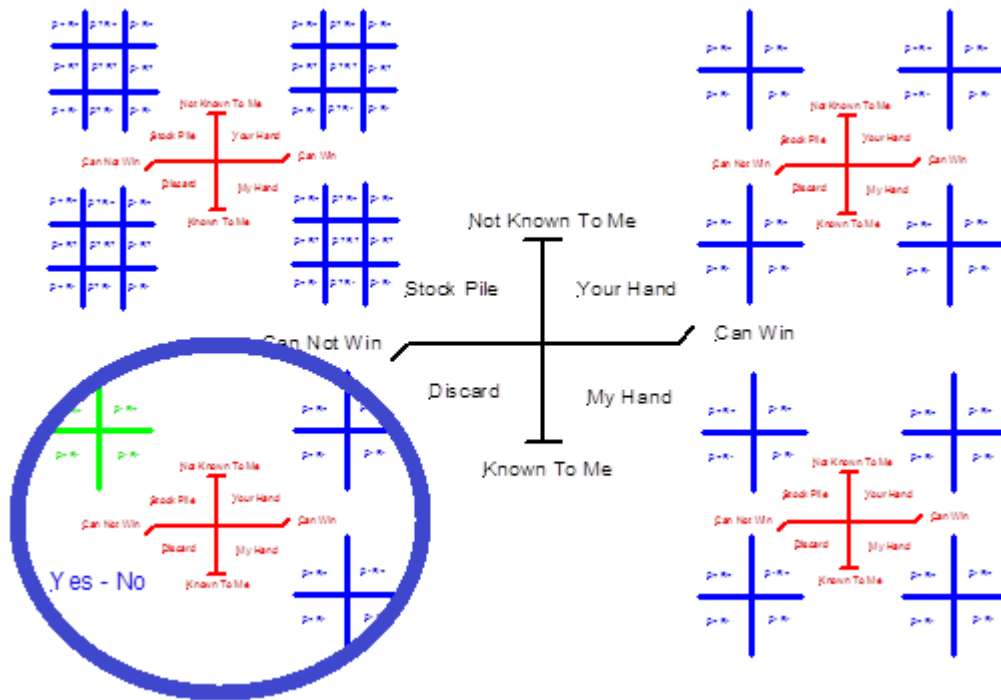


This is found in the periodic table as the Cesium series. Please note that with Element 57, Lanthanum, a break occurs. With this element begins the Lanthanide series, a repetition of qualities found within the families as marked, and including within it elements 57 through 71.

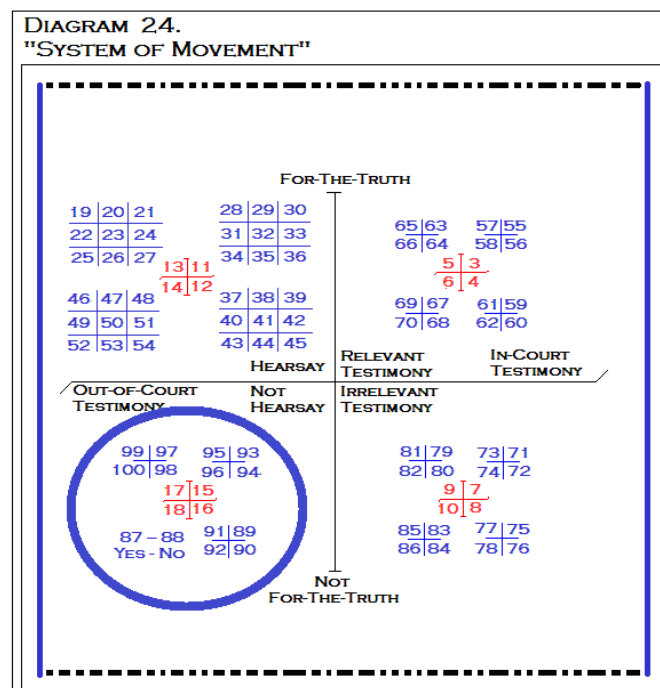
The total of 32 elements begins with Cesium (Cs, #55), Barium (Ba, #56), Lanthanum (La, #57), Cerium (Ce, #58), Praseodymium (Pr, #59), Neodymium (Nd, #60), Promethium (Pm, #61), Samarium (Sm, #62), Europium (Eu, #63), Gadolinium (Gd, #64), Terbium (Tb, #65), Dysprosium (Dy, #66), Holmium (Ho, #67), Erbium (Er, #68), Thulium (Tm, #69), Ytterbium (Yb, #70), Lutetium (Lu, #71), Hafnium (Hf, #72), Tantalum (Ta, #73), Tungsten (W, #74), Rhenium (Re, #75), Osmium (Os, #76), Iridium (Ir, #77), Platinum (Pt, #78), Gold (Au, #79), Mercury (Hg, #80), Thallium (Tl, #81), Lead (Pb, #82), Bismuth (Bi, #83), Polonium (Po, #84), Astatine (As, #85), Radon (Rn, #86).

1 H 1.0079	2 He 4.0026																
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948										
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uuh (272)	112 Uub (285)	114 Uuq (289)					
* Lanthanide series			57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
# Actinide series			89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Finally we would expect a set of 14 elements, these being in the lower left quadrant. For Gin Rummy this has been portrayed as the conclusion which one must make in choosing a card from the Draw Pile. This has previously been pictured as:



In law, this has been portrayed as the relationship which Not Hearsay has to the rest of the case.



These are given in the periodic table as the Francium series, the seventh and last series of periodic chemical elements. These are Francium (Fr, #87), Radium (Ra, #88), Actinium (Ac, #89), Thorium (Th, #90), Protoactinium (Pr, #91), Uranium (U, #92), Neptunium (Np, #93), Plutonium (Pu, #94), Americium (Am, #95), Curium (Cm, #96), Berkelium (Bk, #97), Californium (Cf, #98), Einsteinium (Es, #99), and Fermium (Fm, #100).

1 H 1.0079																	18 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.409	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 *	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Uun (281)	111 Uuh (272)	112 Uub (285)	114 Uuq (289)					

* Lanthanide series	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
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# Actinide series	89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)
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CONCLUSION

The previous break falling between Element 100 and 101 is explained by the map of Russell's Paradox as presented herein. The use of "one-atom-at-a-time" chemistry has proven to be unproductive and the classification of "elements" of nature via a chain of decay which as much represents the material conglomeration imploding as existing can not be taken as proof of the existence of an atomic element of universe construction or that it will be discovered outside the presence of laboratory conditions.

Essay Four: A Map of Russell's Paradox

All movements go too far.

Bertrand Russell

ABSTRACT

Aims: To apply the System of Movement pattern to logic, specifically that of set theory and its famous Russell's Paradox. Further, to apply this logic to the Chooser – Available Choice model as presented previously in Essay Five of American political and economic development.

Study design: Philosophic / Mathematic discussion of Russell's Paradox and its correlation to the economic model described in the five previous essays.

Place and Duration of Study: Library research.

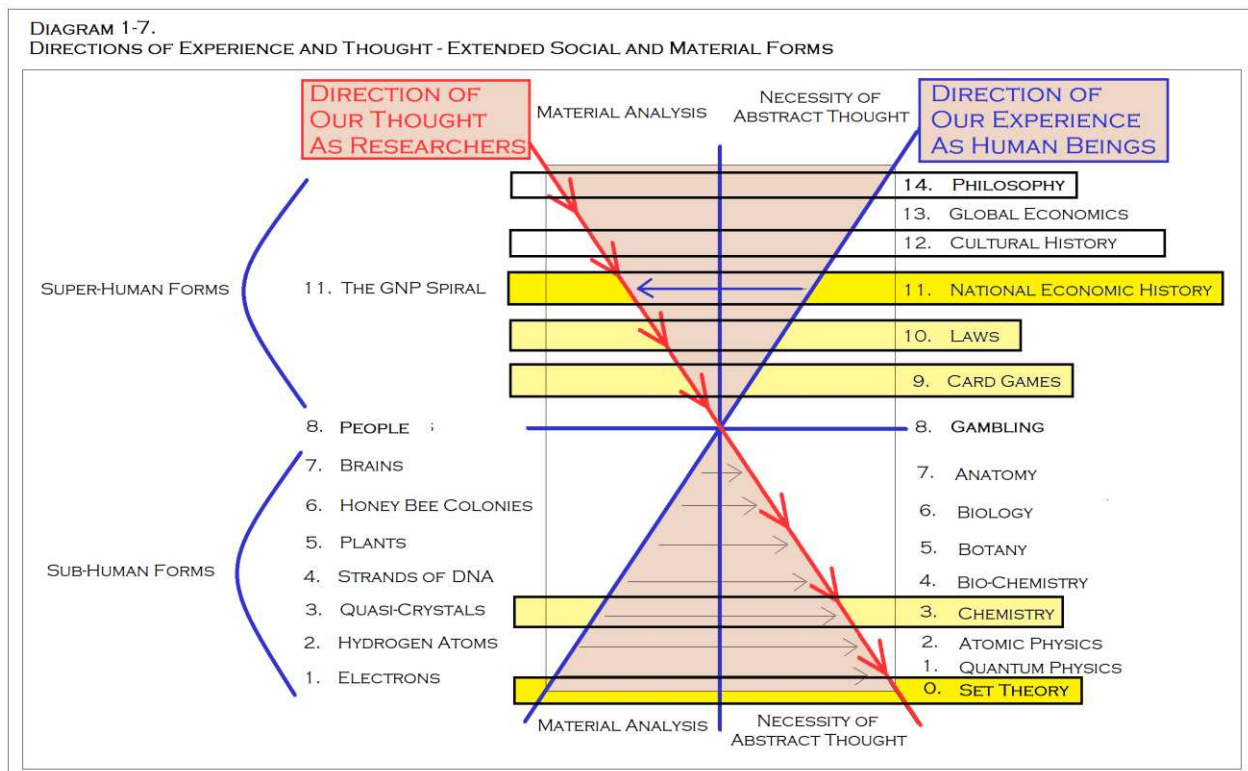
Methodology: In this essay we dissect the basic parts of one of the most famous mathematic puzzles of the twentieth century, Russell's Paradox. We chart correlations between the map thereby developed and the pattern of economic development within the United States.

Conclusions: If Russell's Paradox is an example of the structure of consciousness, it may be the key to understanding the organization of all levels of reality.

INTRODUCTION: SET THEORY AS LOGIC

We have followed the System of Movement pattern through three levels of reality. These are: (1) game theory, (2) law and (3) chemistry. We now set forth the basic terms of Russell's Paradox, a fundamental beginning point for set theory. Using the structure of a "map" of Russell's Paradox, we consider the national economic development of the United States as presented via the GNP Spiral developed in the first five essays.

The previous discussions of the System of Movement pattern are presented in beige below. The levels of reality which will be discussed in this essay – set theory / mathematics and national economic history – are highlighted in yellow.



Introduction 1.1 What is Russell's Paradox?

The mathematics which describes for us the economics of a planet and the motion of an electron is premised upon a set theory which, in Frege's words, forms "not only the foundations of my arithmetic, but also the sole possible foundations of arithmetic."¹¹³ It may be difficult to appreciate the importance of Russell's Paradox without first understanding of the centrality of set theory in mathematics. A standard textbook notes:

Set theory is the foundation stone of the edifice of modern mathematics. The precise definitions of all mathematical concepts are based on set theory. Furthermore, the methods of mathematical deduction are characterized by a combination of logical and set-theoretical arguments. To put it briefly, the language of set theory is the common idiom spoken and understood by mathematicians the world over. From all this it follows that if one is to make any progress in higher mathematics itself or in its practical applications, one has to become familiar with the basic concepts and results of set theory and with the language in which they are expressed.¹¹⁴

"Russell's Paradox" asks the following question:

Is the "set of all individual sets which are NOT members of themselves" a member of itself?

The paradox arises in the following manner.

First let us name the "set of all individual sets which are NOT members of themselves" the "super-normal set," (traditionally named elsewhere as the "Russell Set").

Second, if we say that the super-normal set IS a member of itself, we say that it is included in the set defined as "the set of all sets which ARE NOT members of themselves." However this is a blatant contradiction of the definition of the set proposed, because only sets which ARE NOT members of themselves are to be permitted entrance into the set as defined.

Third, and on the other hand, if we say that the super-normal set IS NOT a member of itself then we MUST include it within itself in order to satisfy the terms of the set proposed, i.e. "the set of ALL sets which ARE NOT members of themselves." If we leave this set out of itself under these circumstances we have left out one set from the category SUPER-NORMAL sets, to wit: itself. In this event we cannot say that ALL sets have been included therein and again we contradict ourselves.

The paradox arises because there is an inherent uncertainty as to which of these arguments should prevail by way of arriving at a conclusion to the question posed.

¹¹³ Letter to Russell, quoted in footnote 7 at page 349 of *Infinity and the Mind*, Bantam Books, Toronto, 1982 by Rudy Rucker, quoting Jean Van Heijenoort *From Frege to Godel* at page 114.

¹¹⁴ W. Gellert, et al., *The VNR Concise Encyclopedia of Mathematics*, Van Nostrand Reinhold Company, New York, 1975, p. 320.

William Dunham describes the significance of this contradiction.¹¹⁵

(R)ecall that the object of Russell's work was to build all of mathematics upon the unshakable foundation of logic. His paradox jeopardized such a program. Just as the occupant of the penthouse suite should feel uneasy upon learning of a crack in the basement, so should mathematicians feel uneasy knowing that, at the very foundation of their subject, there lies a crack in the logic. It suggests that the whole mathematical enterprise, like the apartment tower, could come tumbling down at any time.

Needless to say, Russell was shaken by the existence of his paradox. "I felt about the contradictions," he wrote, "much as an earnest Catholic must feel about wicked Popes." Others were similarly dismayed, as is evident in the famous exchange between Russell and the logician Gottlob Frege (1848-1925). The latter had published *Grundgesetze der Arithmetik*, a huge work aimed at exploring the foundations of arithmetic. In it Frege had worked with sets in the same naive and cavalier manner that had led Russell to his paradox. Russell communicated his example to Frege, who immediately recognized it as dealing a deathblow to his enterprise. In the second volume of his *Grundgesetze*, which was going to press at the time of Russell's letter, Frege had to face every scholar's greatest nightmare: that his or her work, at the last minute, has been rendered incorrect. With a poignancy matched only by his integrity, Frege wrote:

"A scientist can hardly meet with anything more undesirable than to have the foundations give way just as the work is finished. I was put in this position by a letter from Mr. Bertrand Russell when the work was nearly through the press."

Frege's response to Russell was the following.

Your discovery of the contradiction caused me the greatest surprise and, I would almost say, consternation, since it has shaken the basis on which I intended to build arithmetic...

It is all the more serious since not only the foundations of my arithmetic, but also the sole possible foundations of arithmetic, seem to vanish. ... In any case, your discovery is very remarkable and will perhaps result in a great advance in logic, unwelcome as it may seem at first glance... The second volume of my *Grundgesetze* is to appear shortly. I shall no doubt have to add an appendix in which your discovery is taken into account. If only I already had the right point of view for that!¹¹⁶

¹¹⁵William Dunham, *The Mathematical Universe*, John Wiley and Sons, Inc. New York, New York, 1994 p. 221.

¹¹⁶ Taken from Rudy Rucker, *Infinity and the Mind*, footnote number 7 at page 349, Bantam Books, Toronto, New York, 1982. He quotes from the Jean van Heijenoort anthology "*From Frege to Godel*," at p. 11.

The present mathematic approach to Russell's Paradox, and in particular to the "Super-normal set" and the ambiguities inherent in conclusions regarding it, has been to exclude the set entirely from the analysis. William Dunham notes:

After years of unsuccessful attempts (to understand the paradox), logicians eventually tried to legislate it away by stipulating that a set that contained itself as a member is really not a set. By means of such logical tactics, and some carefully crafted definitions, such classes were proclaimed to be illegitimate. ... (Russell) wrote that "whatever involves all members of a collection must not itself be a member of the collection." Consequently, the self-referential nature of membership in the Russell set ("the set of all individual sets which ARE NOT members of themselves," usually named "The Russell set") was illegitimate. The Russell set is not a set at all.

This solution, which required some excruciating convolutions of thought, seemed cumbersome and artificial. Russell spoke of it as "theories which might be true but were not beautiful." If nothing else, it transferred the study of sets from the naive, pre-Russellian domain into a less intuitive realm.¹¹⁷

Roger Penrose mentions Russell's Paradox in the following quote:

Russell was merely using, in a rather extreme form, the same type of very general mathematical set theoretic reasoning that the mathematicians were beginning to employ in their proofs. Clearly things had got out of hand, and it became appropriate to be much more precise about what kind of reasoning was to be allowed and what was not. It was obviously necessary that the allowed reasoning must be free from contradiction and that it should permit only true statements to be derived from statement previously known to be true. Russell himself, together with his colleague Alfred North Whitehead, set about developing a highly formalized mathematical system of axioms and rules of procedure, the aim being that it should be possible to translate all types of correct mathematical reasoning into their scheme. The rules were carefully selected so as to prevent the paradoxical types of reasoning that led to Russell's own paradox. The specific scheme that Russell and Whitehead produced was a monumental piece of work. However, it was very cumbersome and it turned out to be rather limited in the types of mathematical reasoning that it actually incorporated.¹¹⁸

The foundational elements of the problem are intriguing. If Frege is correct in proposing that set theory forms "not only the foundations of my arithmetic, but also the sole possible foundations of arithmetic," then how are we to arrive at a clear conclusion of anything in the realm of mathematics without an approach to this dilemma?

¹¹⁷ William Dunham, *The Mathematical Universe*, p. 221.

¹¹⁸ Roger Penrose, *The Emperor's New Mind*, Penguin Books, New York, New York, 1991, p. 101.

METHODOLOGY

1. Hypothesis

We propose that Russell's Paradox, as mapped in the fashion which is proposed herein, is a key part of any social or physical organization.

2. Methods

We introduce a simple set of dichotomies to identify the key elements in Russell's Paradox. We then number the resulting quadrants, specifying that this numbering system will be used throughout these essays to track congruent "fractal" organization at higher levels.

3. Data

We present here a strictly philosophic argument underlying the rest of the essays.

4. Procedure

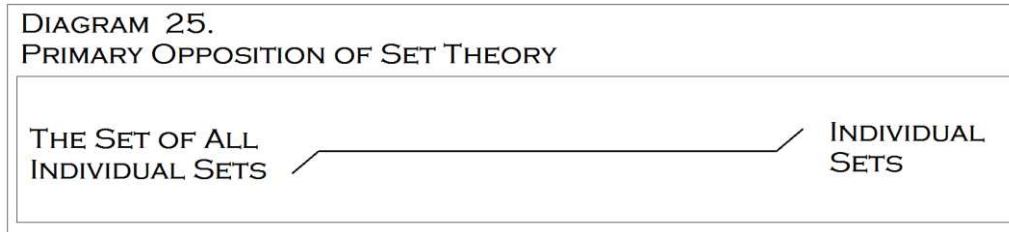
Let us begin then by proposing that the job of the mathematician or logician is to:

- (1) define the categories under investigation,
- (2) describe the relationships which these categories have to one another, and
- (3) come to conclusions as to the interaction between the categories described and the relationships inherent in these descriptions.

Consequently the three "planes of thought" forming the basis of an analysis of Russell's Paradox are the "plane of definition," the "plane of relationship," and the "plane of conclusion." These "planes of thought" represent the definitions, potential relationships, and conclusions every mathematician must consider in coming to any mathematical opinion. The interaction of these three planes of thought creates the pattern which underlies Russell's Paradox, as follows.

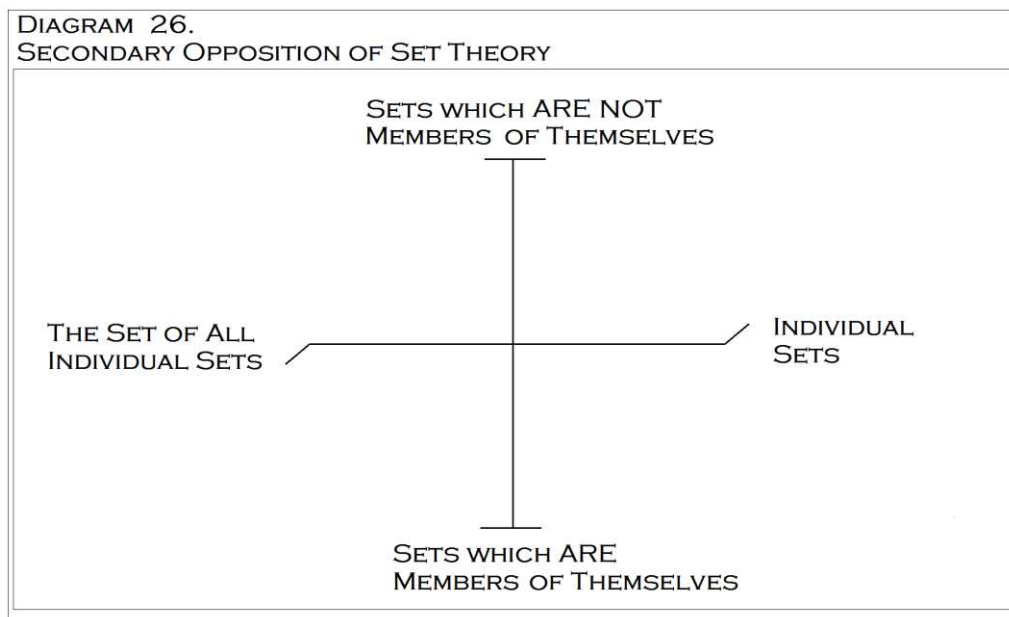
4.1 The Plane of Definition

Russell's Paradox begins by defining the following dichotomy:



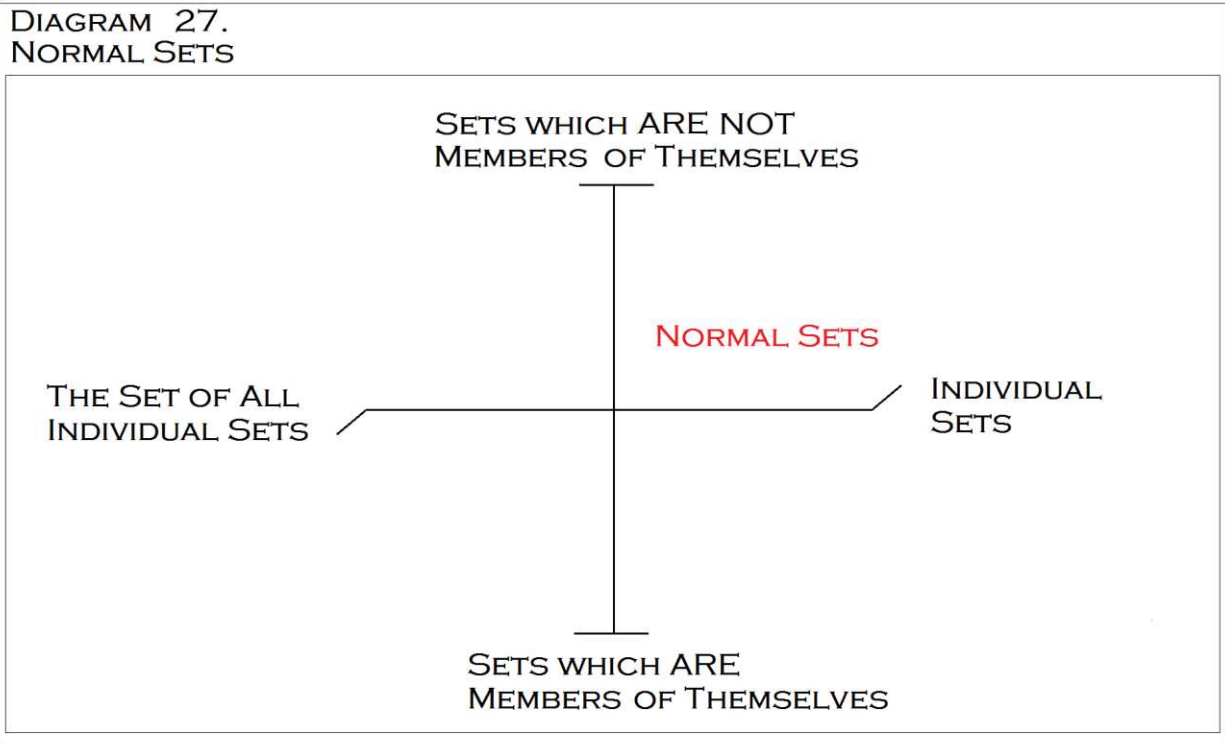
The horizontal symbol between this dichotomy is taken to be a gulf between opposites, the "Primary Opposition" of set theory. On the right hand side we might place "the set of odd numbers," or "the set of even numbers." On the left we have an enormous set, the set of ALL individual sets. The Primary Opposition represents a *difference in kind*, a difference in the basic nature of two things, as opposed to oppositions arising from a struggle between similar elements or a difference in gradation between similar elements.

Russell's Paradox then adds an additional opposition to the scheme, i.e. the distinction between sets which ARE or ARE NOT members of themselves.



The vertical symbol is intended to represent a Secondary Opposition, a different type of gulf between the ideas organized by the diagram. The Secondary Opposition represents an opposition based upon like natures in conflict or in some competition with one another as *gradations of the same basic nature*. A Secondary Opposition is one which, unlike the Primary Opposition, is not absolute or complete, because it deals with a form of opposition which is based upon difference with like categories, not differences in kind between the categories themselves. This leads to a clear division of four separate categories of sets. The terminology which is adopted for the purpose of this essay only is as follows.

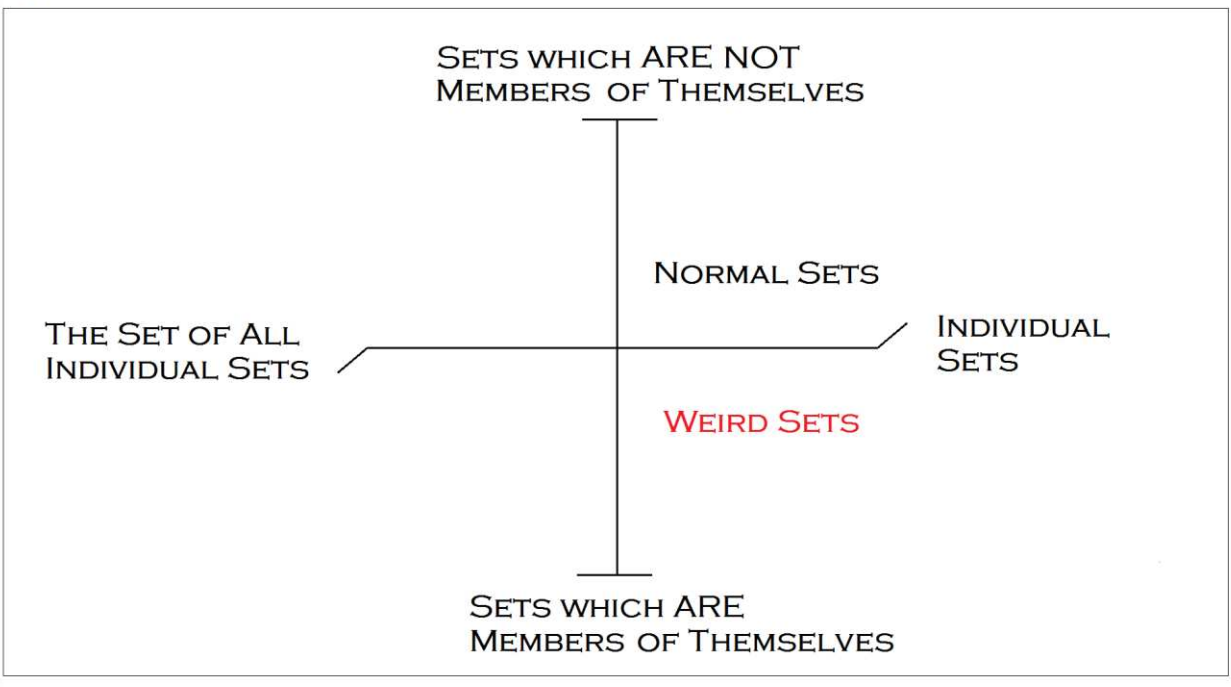
4.1.1. Individual sets which are NOT members of themselves. (top right)
“NORMAL” SETS



"Normal sets." A "Normal set" is "an individual set which is NOT a member of itself." The "set of all buffaloes" would be in the top right hand quadrant as a "normal" set. The "set of all buffaloes" is not a buffalo. The "set of all buffaloes" does not walk around North America, it does not eat grass, it is not covered with hair. Like most other sets this set is NOT a member of itself and would go in the top right hand corner. Obviously the "set of all buffaloes" is not a category including ALL individual sets - the set of prime numbers for example is not found within it. Therefore it can not be placed in either of the left hand quadrants. These sets are denominated "normal" sets because they describe categories typically thought of as "sets": the set of all real numbers, the set of all pigeons, the set of all red buffaloes, etc. It is true that each "normal" set might contain within it a potentially infinite number of sets (the set of buffaloes, the set of all red buffaloes, the set of all red buffaloes living in the 20th century, etc.) Our ability to describe in infinite detail the characteristics of any set however does not create therein a category of "ALL individual sets" whatsoever. The infinite amount of detail which might go into the description, still refers to a solitary set, i.e. "the set of all buffaloes." In any normal set, we deal still with some subset of the category "ALL individual sets."

4.1.2 Individual sets which ARE members of themselves (bottom right) “WEIRD” SETS

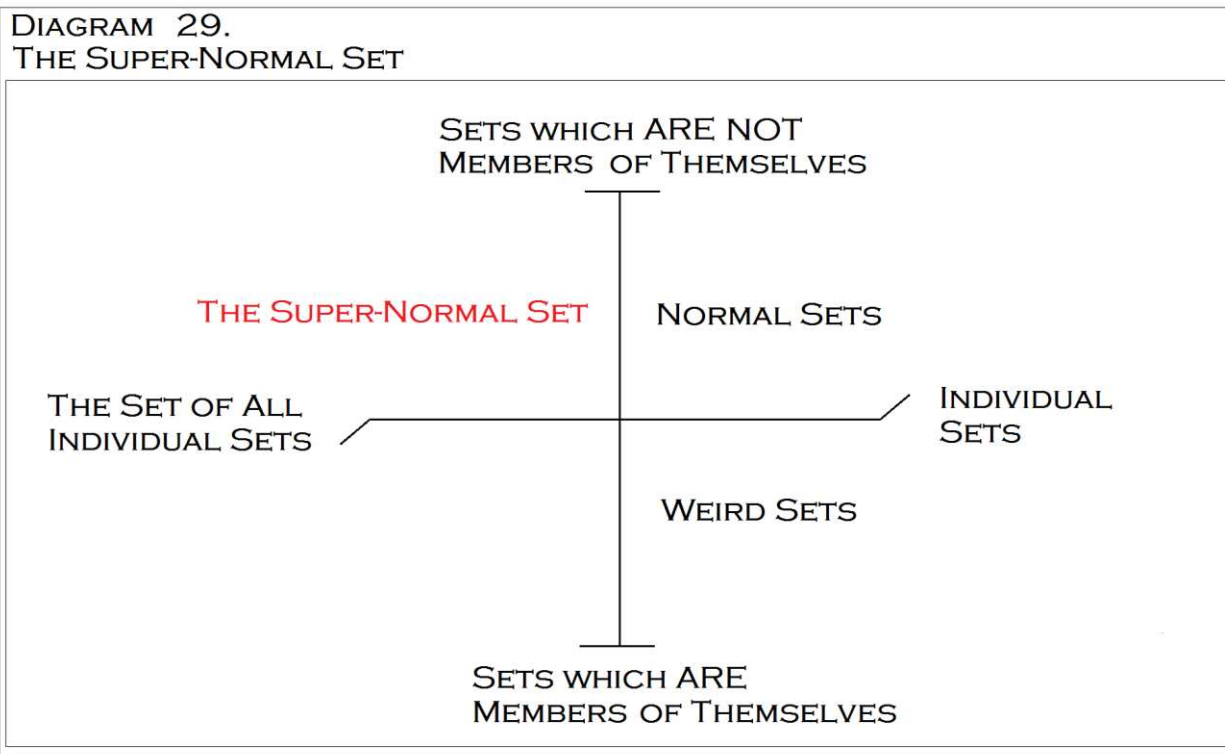
DIAGRAM 28.
WEIRD SETS



"Weird sets." A "Weird set" is defined as "An individual set which IS a member of itself." If we imagine "the set of all sets describable in twelve words or less" we see that we have created a "set" that is a part of itself. The set mentioned is described in eleven words and therefore falls within the parameters of the set described. (Eleven-word sets are a sub-set of the twelve-words-or-less set described.) This set is a member of itself and therefore must fall in the bottom right hand quadrant. Because the set is one which is contained within itself it must be excluded from the top quadrants. Because there are many sets which are not describable in twelve words or less and which are yet members of themselves ("the set of all sets describable in twenty ancient Arabic words or less") this set does not include ALL sets which might be members of themselves and is therefore not found within the left-hand quadrants.

We must see that for any "set" to be a member of itself, we must deal with "sets" within "sets." This convolution of language creates a very weird form of set, and the term "weird" is used to characterize the bottom right-hand quadrant.

4.1.3 The set of ALL individual sets which are NOT members of themselves (top left) **“THE SUPER-NORMAL” SET** (also known as “The Russell Set”)



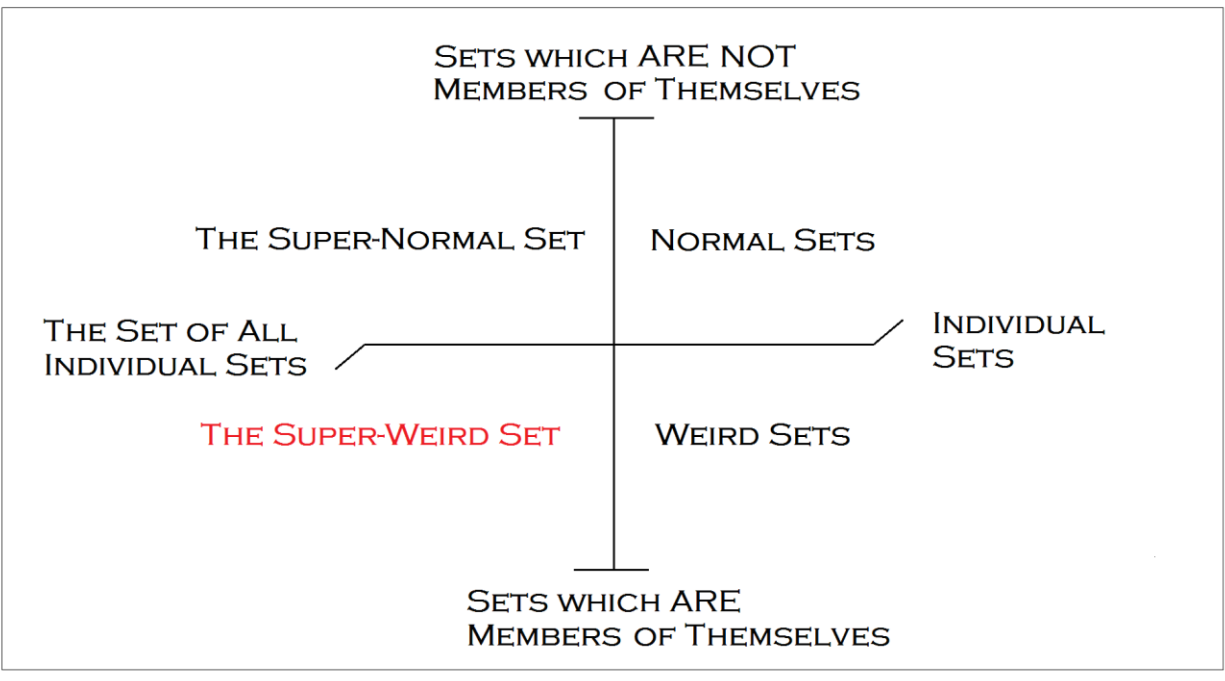
"The Super-normal Set." Let us suppose that we attempt to draw a connection between the "collections of ALL individual sets" with both "normal" and "weird" sets. Looking at our above diagram we would expect that the "Super-normal set" would be simply an enormously large collection of ALL normal sets. Conversely we would expect that the "Super-weird set" would be an enormous collection of all "weird sets."

For purposes of drawing a relationship between the word "individual sets" and "the set of ALL individual sets" let us mark the top left hand quadrant as the "Super-normal" set. "Normal sets" are then defined as "Individual sets which are NOT members of themselves." The Super-normal set is defined as "The set of ALL individual sets which are NOT members of themselves."

The "Super-normal" set is generally referred to as "The Russell Set" because it leads to an investigation of Russell's Paradox. The term "Super-normal" is used here simply to emphasize graphically a tremendously large collection of "ALL" "Normal" sets.

4.1.4 The set of ALL individual sets which ARE members of themselves (bottom left) “SUPER-WEIRD” SET

DIAGRAM 30.
THE SUPER-WEIRD SET

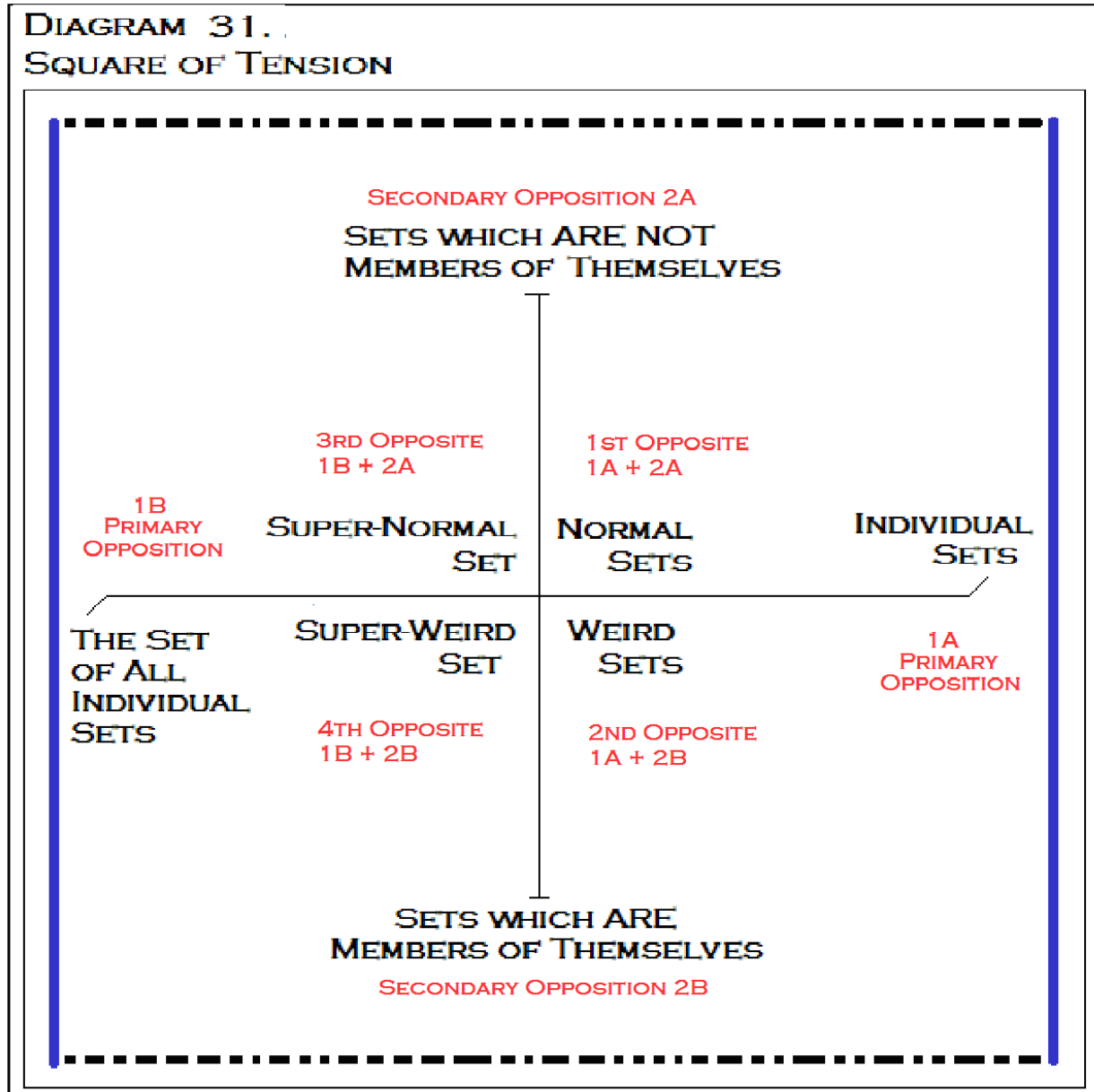


"The Super-weird set." Conversely we might draw a similar relationship between the individual "weird" set and the collection of ALL weird sets. This quadrant will be referred to as the "Super-weird" set. "Weird sets" are defined as "individual sets which ARE members of themselves." The "Super-weird set" is defined as "The set of ALL individual sets which ARE members of themselves."

This first set of four quadrants is referred to herein as simply "the definitional plane." Mathematicians must first begin their work by defining certain ideas. No attempt has yet been made to study the relationships between these defined "normal sets," "weird sets," the "super-normal set," or the "super-weird set," or to draw conclusions from these definitions and/or relationships.

These four vectors, or logical outcomes, are the four corners of this "map" of set theory, represented by the terms "Normal Sets," "Weird Sets," "The Super-Normal Set," and "The Super-Weird Set."

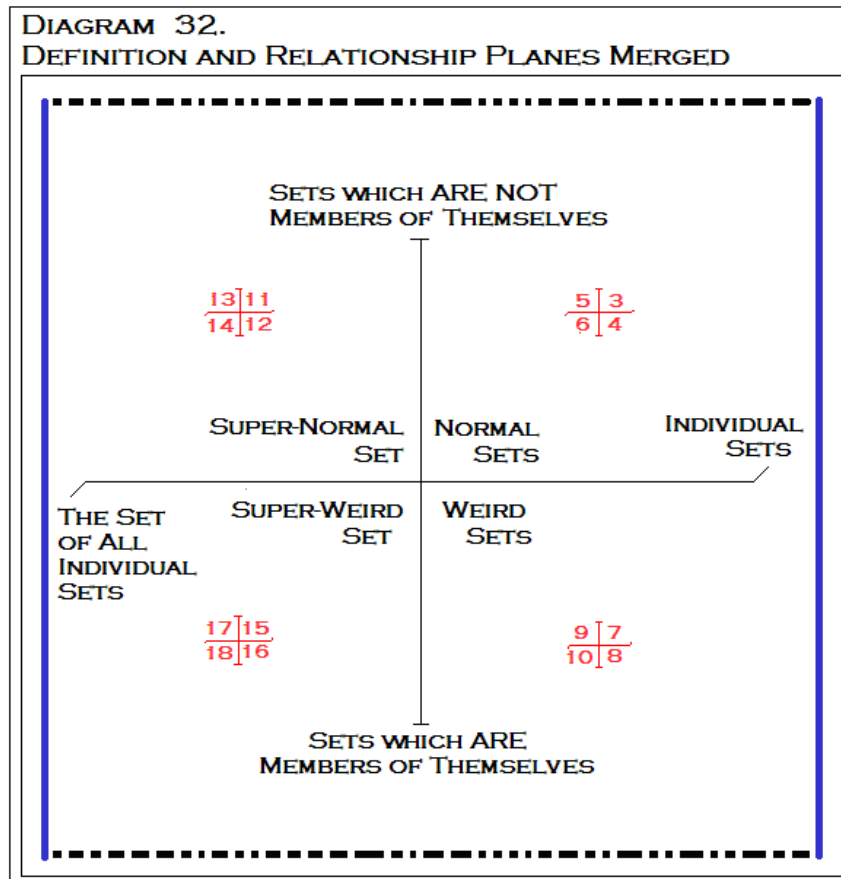
The following square of tension is at the root of set theory. The dotted horizontal lines represent a gulf, created by the Primary Opposition, which occurs between the notions of “Individual Sets” and “The Set of ALL Individual Sets.” The blue vertical lines represent the Secondary Opposition created by the distinction between sets which “ARE NOT members of themselves” and sets which “ARE Members of Themselves.”



4.2 The Plane of Relationship

In order to study the relationships between these defined categories to each other, we would see that "normal sets" have some sort of relationship to themselves, to weird sets, to the super-normal set and to the super-weird set (3-6). Similarly weird sets have some sort of relationship to themselves, to normal sets, to the super-normal set and to the super-weird set. (7-10) The supernormal set has a relationship to itself, to normal sets, to weird sets and to the super-weird set. (11-14) Finally the super-weird set has a relationship to itself, to normal sets, to weird sets, and to the super-normal set. (15-18)

This could be pictured as the following, where the red cross represents the importance of the Relationships between these four categories and the category of the "Super-weird set."



The vertical blue lines represent the tensions generated between types of sets which have something in common (on the right, both are individual sets; on the left, both are enormous collections of ALL sets) yet nevertheless are in direct conflict with each other as to the issue of membership in the set. The horizontal dotted lines represent a gulf, an impossibility, an absolute logical exclusion. As viewed herein the concepts of a single, simple "individual set" versus an enormous and potentially infinite collection of "ALL individual sets" are mutually exclusive.

This has occurred by squaring the number four, i.e. multiplying the four initial *definitions* of "types of sets" by the four *relationships* inherent in these defined types of sets. This might be imagined as setting up a second "plane of relationship."

4.3 The Plane of Conclusion

We may treat the concept of "defining" in mathematics, and of interpreting "relationships" between defined entities, as two separate aspects which "control" our "conclusion" to any question.

Taking Euclid's geometry, for example, we find the word "point" defined as "that having no part." If we ask how many parts the point has, we must conclude the answer to be "none" upon the strength of the *definition* of "point" itself. The definition of "point" controls the answer "none." Other relationships within Euclid's geometry are unnecessary in order to resolve the question.

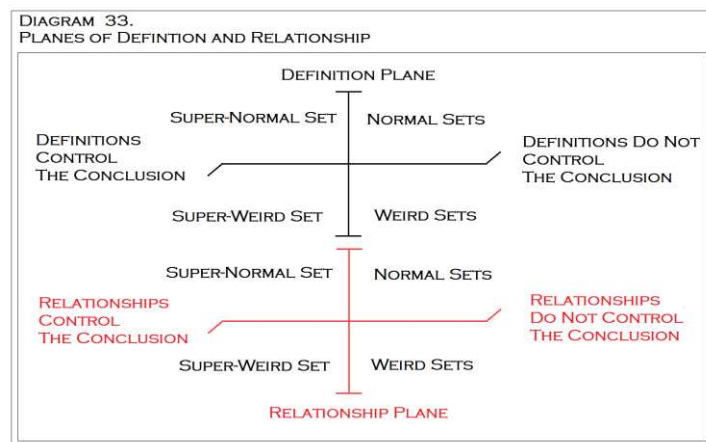
If we ask if two lines which intersect define but one point, we must seek to understand *both the definition of the point as well as the relationships contemplated* within Euclid's geometry between points, lines, planes, angles, etc. In this instance both the definition of point as well as its relationship to the concepts of lines in space control the answer "one."

We might ask how many points lie between any two points? In this case the definition of point is uncertain in providing an answer. Nevertheless the *relationships* contemplated between points on a line give us the answer of "infinity." Here the relationships contemplated control the answer given of "infinity." If we see in these definitions and relationships between concepts a continual overlap we understand the nature of mathematics and its approach to reality.

Finally we might ask, "What color is a point?" To this we must answer that *neither the definitions nor relationships contemplated* control the answer, any more than one may answer questions pertaining to the size, smell or marital status of geometric constructs. Within the framework of definitions contemplated and relationships assigned in Euclidean Geometry, such questions are not contradictory or ambiguous but are rather void of controlling answer.

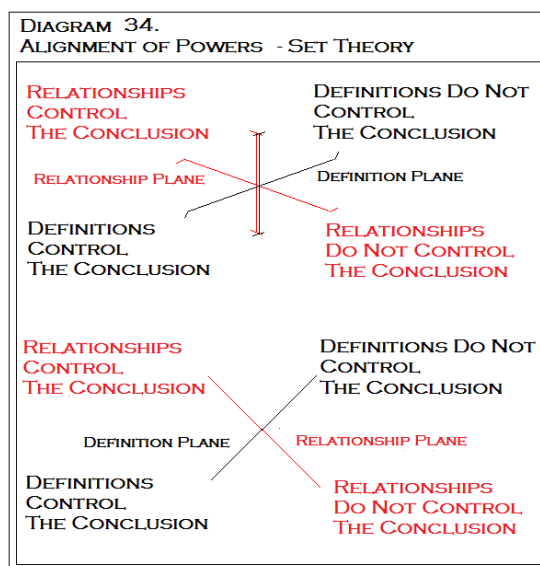
Let us begin by seeing in the Plane of Definition and the Plane of Relationship two fundamental forces controlling the development of mathematics. These planes are the underlying basis upon which the previous dichotomies of "Individual Sets" and "The Set of ALL Individual Sets" are written, and they have their own oppositions. These oppositions concern the extent to which either "Definition" or "Relationship" control the final conclusion to any answer given.

To imagine the development of a “Plane Of Conclusion” we might state the "Plane of Definition" with the "Plane of Relationship" separately, and then align them along a common axis, in the case of Russell’s Paradox, a common axis of set membership (i.e. sets which are/are not members of themselves).



To answer any question in mathematics either the definitions proposed, or the interrelationships specified, must control the answer. The mathematician must reach any specified conclusion based upon the adequacy of the definition of a given set, or upon the relationships mandated by the definitions adopted.

The mathematician now is expected to come to conclusions regarding the interplay between the definitions proposed and the interrelationships inherent in the definitions proposed. We should treat the concept of "defining" in mathematics, and of interpreting "relationships" between defined entities, as two separate aspects which "control" our answer to any question. As this pertains to any branch of mathematics, we would then have the following "conclusion" plane:



A fundamental expectation of every form of mathematics is that one of these quadrants will render an appropriate answer.

4.3.1 Conclusions Regarding The Super-Normal Set (a.k.a. The Russell Set)

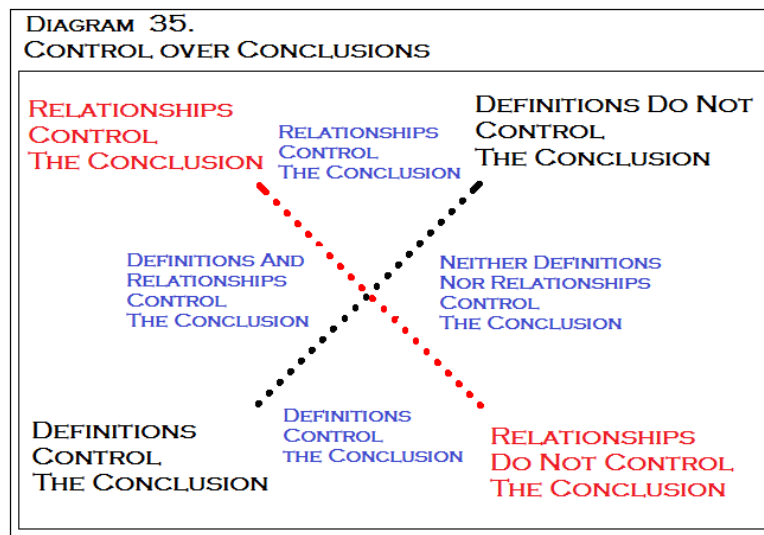
As stated at the outset of this discussion, “Russell's Paradox” asks the following question:

Is the "set of all individual sets which are NOT members of themselves" a member of itself?

Referring to the “super-normal set” as the “set of all individual sets which are NOT members of themselves” (traditionally named elsewhere as the “Russell Set”), we have noted that if we say that the super-normal set IS a member of itself, we say that it is included in the set defined as "the set of all sets which ARE NOT members of themselves." However this is a blatant contradiction of the definition of the set proposed, because only sets which ARE NOT members of themselves are to be permitted entrance into the set as defined.

On the other hand, if we say that the super-normal set IS NOT a member of itself then we MUST include it within itself in order to satisfy the terms of the set proposed, i.e. "the set of ALL sets which ARE NOT members of themselves." If we leave this set out of itself under these circumstances we have left out one set from the category SUPER-NORMAL sets, to wit: itself. In this event we cannot say that ALL sets have been included therein and again we contradict ourselves.

In the case of “Russell's Paradox” and the Super-normal set we are uncertain about the Definitions, and the Relationships, which control the answer to the Paradox.



The uncertainty created by the Paradox creates a new and unavoidable variable in the matter. This variable is the extent to which the “Definitions Are Uncertain In Controlling The Conclusion,” and the extent to which “Relationships Are Uncertain In Controlling The Conclusion.”

When we deal with the Supernormal Set, the uncertainty we face regarding our *Definitions*, renders the following two new possibilities.

Similarly, when we deal with the Super-normal Set, the uncertainty we face regarding the *Relationships* renders two more possibilities.

The checkerboard of possibilities below represents the uncertainty inherent in the contradictions found in Russell's Paradox. To determine whether the Super-normal set is a member of itself we face nine separate possibilities: That is to say, in attempting to align the concepts of definition and relationship in answering whether the super-normal set is a member of itself, we have nine possible answers, none of which takes precedence over the others.

DIAGRAM 36.
NINE POSSIBILITIES FOR RESOLVING RUSSELL'S PARADOX

	DEFINITIONS CONTROL THE CONCLUSION	DEFINITIONS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	DEFINITIONS DO NOT CONTROL THE CONCLUSION
 DEFINITION PLANE		
RELATIONSHIPS CONTROL THE CONCLUSION	BOTH DEFINITIONS AND THE RELATIONSHIPS BETWEEN THEM CONTROL THE CONCLUSION	RELATIONSHIPS CONTROL THE CONCLUSION AND DEFINITIONS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	RELATIONSHIPS CONTROL THE CONCLUSION AND DEFINITIONS DO NOT CONTROL THE CONCLUSION
RELATIONSHIPS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	DEFINITIONS CONTROL THE CONCLUSIONS AND RELATIONSHIPS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	BOTH DEFINITIONS AND RELATIONSHIPS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	DEFINITIONS DO NOT CONTROL THE CONCLUSION AND RELATIONSHIPS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION
RELATIONSHIPS DO NOT CONTROL THE CONCLUSION	DEFINITIONS CONTROL THE CONCLUSION AND RELATIONSHIPS DO NOT CONTROL THE CONCLUSION	RELATIONSHIPS DO NOT CONTROL THE CONCLUSION AND DEFINITIONS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	NEITHER DEFINITIONS NOR RELATIONSHIPS CONTROL THE CONCLUSION

... or in simplified notation:

DIAGRAM 36.
NINE POSSIBILITIES FOR RESOLVING RUSSELL'S PARADOX

	DEFINITIONS CONTROL THE CONCLUSION	DEFINITIONS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	DEFINITIONS DO NOT CONTROL THE CONCLUSION
 DEFINITION PLANE		
RELATIONSHIPS CONTROL THE CONCLUSION	D+ R+	D? R+	D- R+
RELATIONSHIPS ARE UNCERTAIN IN CONTROLLING THE CONCLUSION	D+ R?	D? R?	D- R?
RELATIONSHIPS DO NOT CONTROL THE CONCLUSION	D+ R-	D? R-	D- R-

If we place this in the “Conclusion Plane” within the Relationships of the Super-normal set to itself, we have (19-27), below.

Is the super-normal set a member of the category of sets known as “normal sets”? (28-36) Only sets which are not members of themselves are permitted into this category. The previous discussion makes clear that the decision to include the super-normal set as a member - or a non-member - of itself results in nine possible conclusions symbolized by the checkerboard pattern, this time located in the relationship which the super-normal set has to normal sets. Thus we are forced to repeat the nine-part answer as before.

The intense sense of uncertainty as faced at these two portions of the upper-left quadrant are correlated to the intense uncertainty which typifies the comparable period of American Economic History, as presented in the preceding set of five essays on the mathematic prediction of social and economic crises.

DIAGRAM 37.
POSSIBILITIES REGARDING RUSSELL'S PARADOX

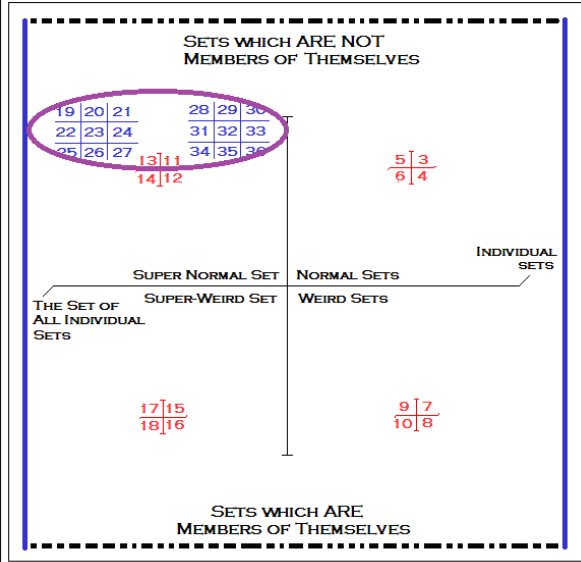
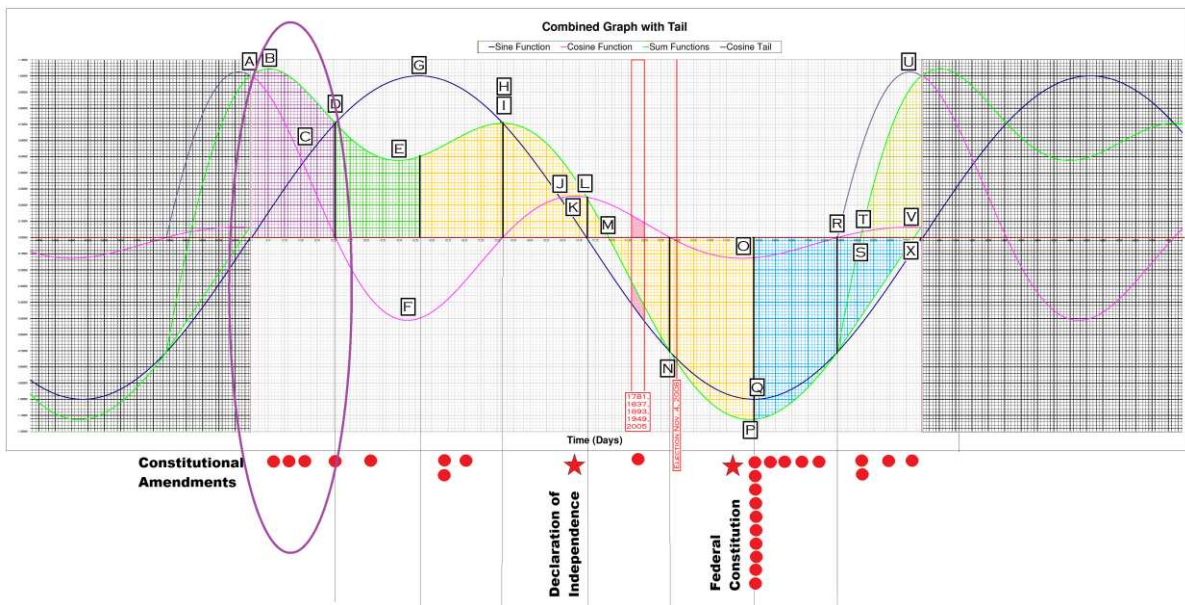
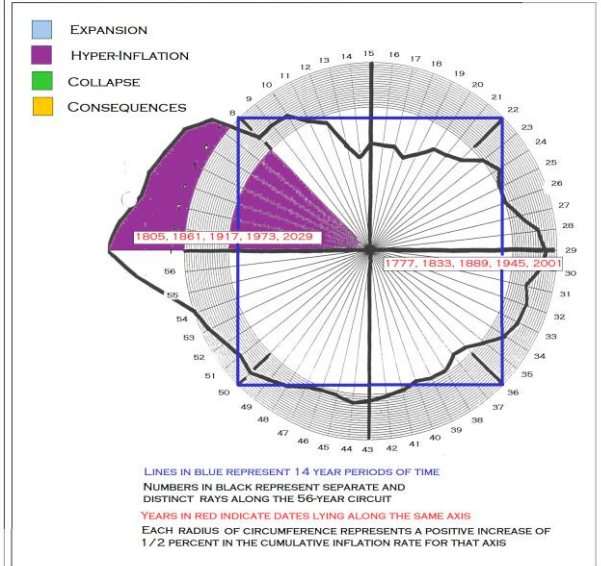


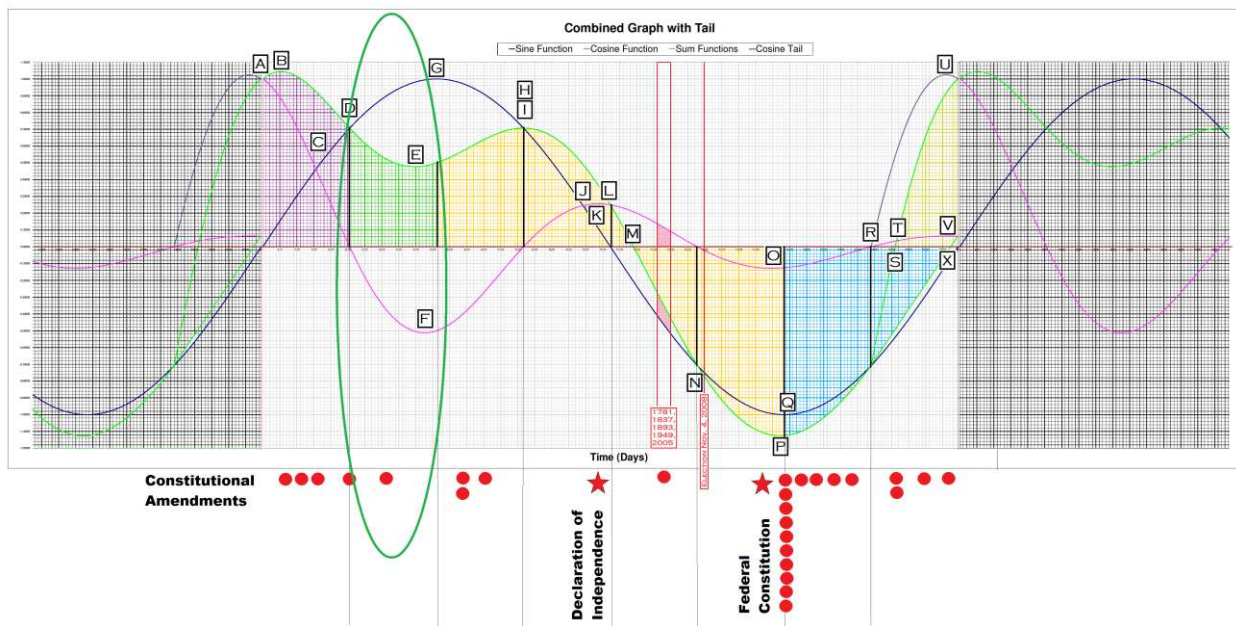
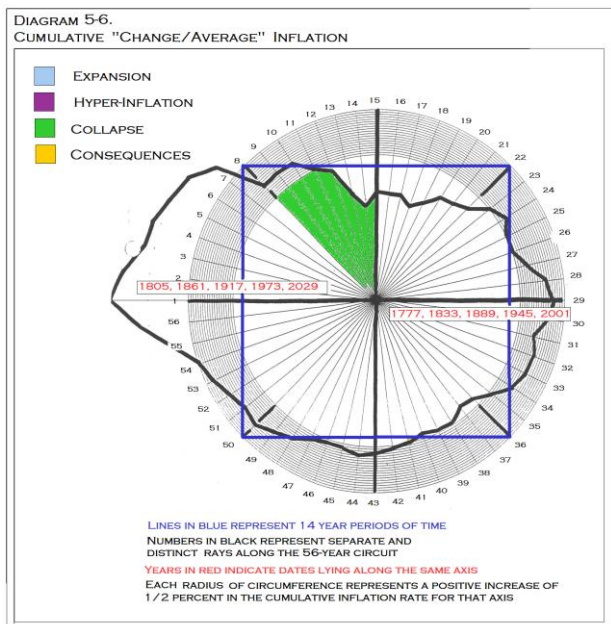
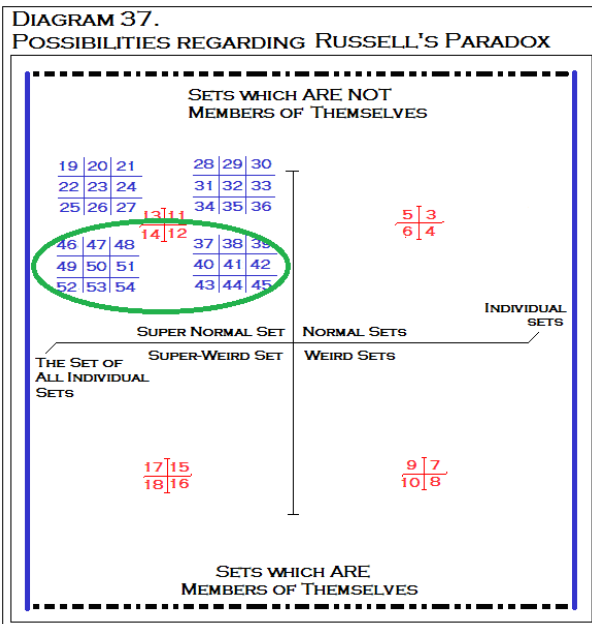
DIAGRAM 5-6.
CUMULATIVE "CHANGE/AVERAGE" INFLATION



Is the super-normal set a member of the category of sets known as "weird sets?" (37-45) Only sets which are members of themselves are permitted into this category. Again the previous discussion makes clear that the decision to include the super-normal set as a member - or a non-member - of itself results in nine possible conclusions symbolized by the checkerboard pattern, this time located in the relationship which the super-normal set has to weird sets. Thus we are forced to repeat the nine-part answer as before.

Is the super-normal set a member of the category of sets known as "the super-weird set?" (46-54) Only sets which are members of themselves are permitted into this category. Again the previous discussion makes clear that the decision to include the super-normal set as a member - or a non-member - of itself results in nine possible conclusions symbolized by the checkerboard pattern, this time located in the relationship which the super-normal set has to the super-weird sets.

The uncertainty of the first section of this quadrant (correlating with hyper-inflation) now leads to an imploding uncertainty (correlating with collapse). This is compared to American Economic History, as follows.



The essential ambiguity of the super-normal set to itself places the relationships of this category with all other sets in doubt. We are unable to establish clear conclusions for the "Super-normal set" with itself, with normal sets, with weird sets and with the Super-weird set.

This pattern is one of necessity. The logical impossibility present when the super-normal set attempts to clarify a definition of or relationship with itself renders impossible a further description of its relationship with other defined types of sets, including its position as a "normal set." Unable to discuss "normal" sets in the context of the super-normal set we are unprepared to discuss or decide relationships with the weird, and the super-weird set. The contradictions of Russell's Paradox force this effect only upon the super-normal set and conclusions regarding it.

4.3.2 Conclusions Regarding Individual Sets (Normal and Weird)

We might expect that this same uncertainty would ruin any chance of a coherent set theory. If this was the case we might expect that these same nine possibilities would “infect” every other quadrant anticipated under the Definitions and Relationships envisioned.

Plainly, this is not the case. If we ask the question "Is a normal set a member of itself?" we ask: "Is an individual set which is NOT a member of itself a member of itself?" The answer is no, based upon the clear definition of terms. Moreover the relationships envisioned in set theory do not permit us to answer the question other than "no." Because we have no *inherent* uncertainty or contradiction, no unavoidable and relentless ambiguity, we may return to a simple and straightforward placement of planes.

That is to say, when dealing with normal sets, set theory is capable of reaching clear and consistent conclusions without paradox or contradiction. (55-58)

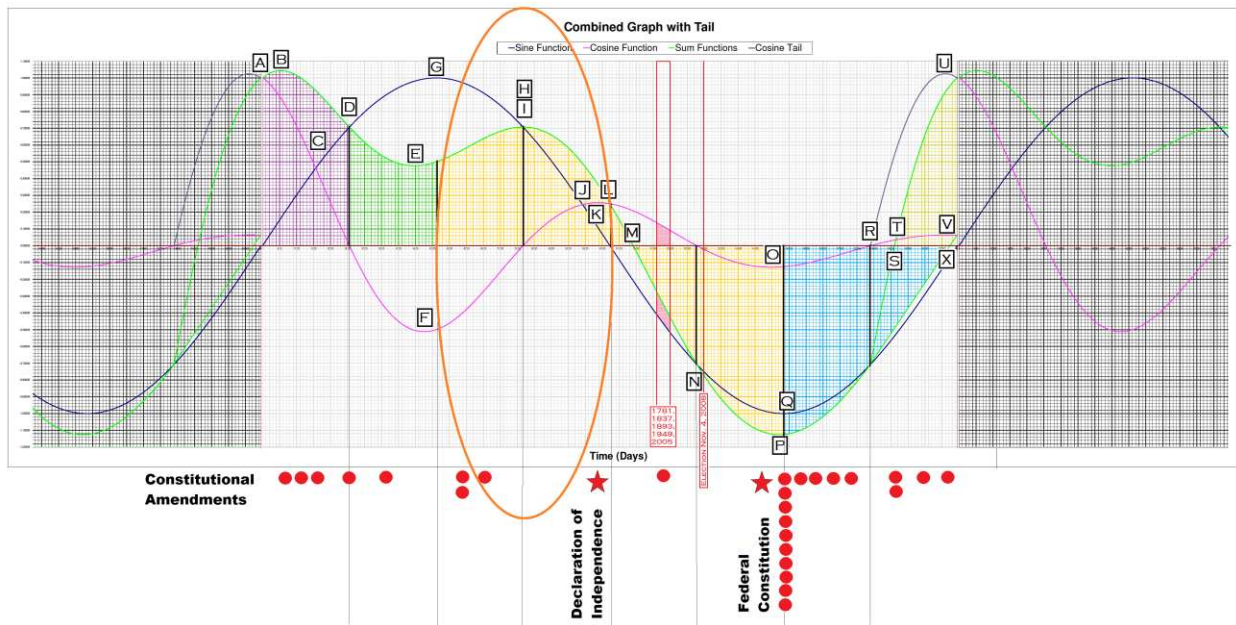
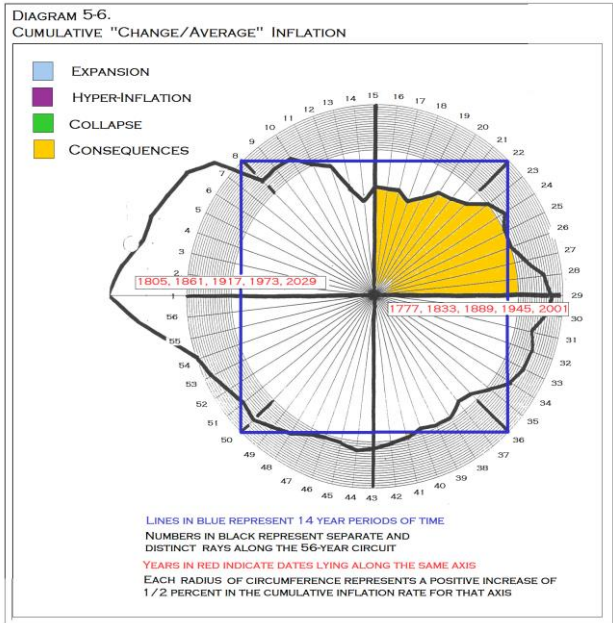
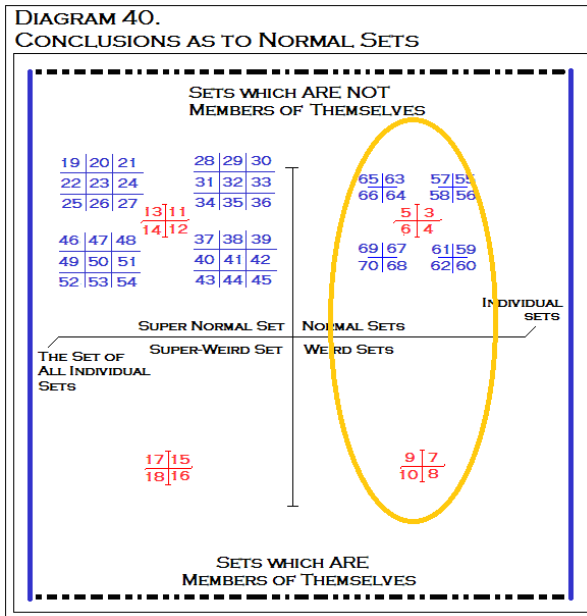
If we ask whether a normal set may be a member of the category known as "weird sets," we ask again whether an individual set which is NOT a member of itself IS a member of itself. Again the answer is "no" based upon the definitions proposed and the relationships understood. Unlike the Super-Normal Set, there is no *inherent* ambiguity or uncertainty. (59-62)

If we ask whether the normal set is a member of the category known as the super-normal set- the set of ALL individual sets which are NOT members of themselves- the answer must be yes, since any normal set is defined as an individual set which is NOT a member of itself. Again we face no *inherent* uncertainty. (63-66)

Regarding our previous discussion of Russell's Paradox, this position is something akin to noting that this view of set theory is non-commutative; that is, the statement " $A + B = B + A$ " is not necessarily a true statement. From the point of view of normal sets, there is no particular problem in seeing that they are part of a broad conceptual framework "all sets which are not members of themselves," i.e. the super-normal set. From the standpoint of the super-normal set, however, membership of ALL normal sets within it - at least in regards to itself - renders considerable *and inherent* ambiguity of result.

If we ask whether a normal set is a member of the category known as the super-weird set- the set of all individual sets which ARE members of themselves- the answer must be no, because a normal set is defined as an individual set which is NOT a member of itself. It may not be included in such a set. Again there is no *inherent* uncertainty. (67-70)

The correlation here is to a more stable, less uncertain portion of economic history.



If we ask whether a weird set is a member of the category known as "normal sets," we ask "Is an individual set which IS a member of itself NOT a member of itself?" The question contradicts itself on its own terms and must be answered "no." There is no ambiguity or contradiction *inherent* in the question. (71-74)

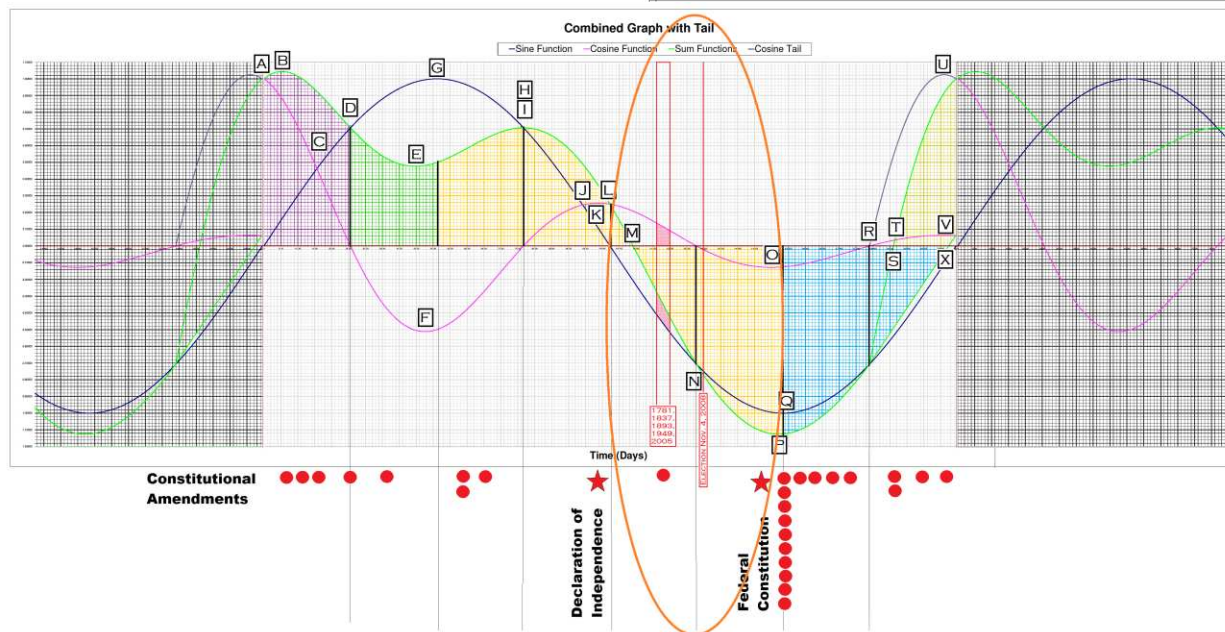
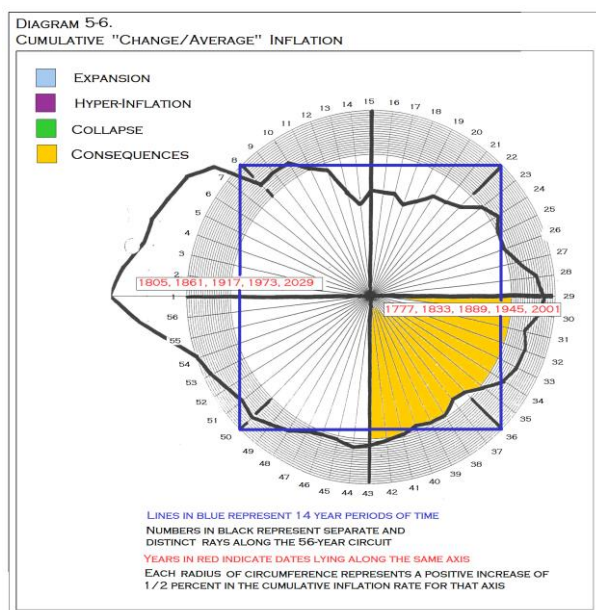
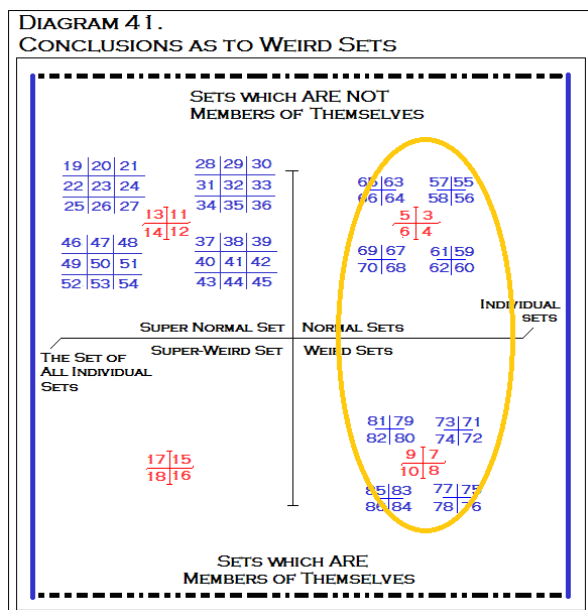
If we ask whether a weird set is a member of itself, we ask, "Is an individual set which IS a member of itself a member of itself?" Based upon our definitions proposed we must say "yes." There is no *inherent* uncertainty in the answer. Again set theory seems consistent when dealing with this category of set. (75-78)

If we ask whether a weird set is a member of the category known as the super-normal set we ask "Is an individual set which IS a member of itself a member of the set of ALL individual sets which are NOT members of themselves."

The conclusion reached must be "no". There can be no uncertainty or ambiguity in the answer under the definitions or relationships defined. Unlike the Super-Normal set, we do not face here *inherent* uncertainty. (79-82)

If we ask whether a weird set is a member of the category known as the super-weird set, we ask "Is an individual set which IS a member of itself a member of the set of ALL individual sets which ARE members of themselves?" The answer must be yes. In so far as it is one set which is a member of itself, it must be considered a member of the set of ALL sets which ARE members of themselves. Again, there is no *inherent* paradox or uncertainty in the answer. (83-86)

This completes the right hand side of economic history, that part dedicated to stability and consolidation.



The definitions and relationships specified for both quadrants of the right hand side ("Individual sets") are clear. In order to determine whether a set is either "normal" or "weird" we need only refer to the set as defined. There is no inherent contradiction in dealing with these sets as presented. There is no ambiguity here because of the limited and individual nature of the sets themselves. As a result the concepts inherent in large collections of these sets ("ALL" sets which are/are not members of themselves) are not difficult to define or to understand relationships between individual defined types of sets.

For example, "the set of all sets describable in five words or less" includes within it "the set of prime numbers" but does not include itself. Both of these sets are normal sets because neither includes itself.

"The set of all sets describable in twelve words or less" is a member of itself and therefore a weird set because it is described in eleven words. "The set of all sets describable in fifteen syllables or less" does not include itself and is therefore a normal set because it uses 17 syllables to describe itself. None the less this normal set includes within it the previous set mentioned ("twelve words or less"), a weird set. "The set of prime numbers," on the other hand, is a normal set contained in the weird set described.

Thus weird sets may contain normal sets and normal sets may contain weird sets. The definition of whether these sets may contain themselves does not affect the clarity with which the categories of sets may function.

4.3.3 Conclusions regarding The Super-Weird Set

Regarding the Super-Weird set, let us ask: "Is the set of ALL individual sets which ARE members of themselves a member of itself?"

Note: The terms proposed do not suggest an answer.

If we say – arbitrarily - that the super-weird set IS a member of itself, we include it as a member of "the set of all individual sets which are members of themselves."

On the other hand, if we say – equally arbitrarily – that the super-weird set IS NOT a member of itself, we exclude it from "the set of all individual sets which are members of themselves."

In this case, unlike the Super-Normal set, we do not contradict the definition or relationships of the Super-Weird set by either excluding or including the set as a member of itself. Here the answer must be a Yes-or-No without any hint of logical preference toward the outcome of the question. Because this result is not in accord with the clearly defined "conclusion" plane used elsewhere, let us simply mark it as a Yes-No choice. (87-88)

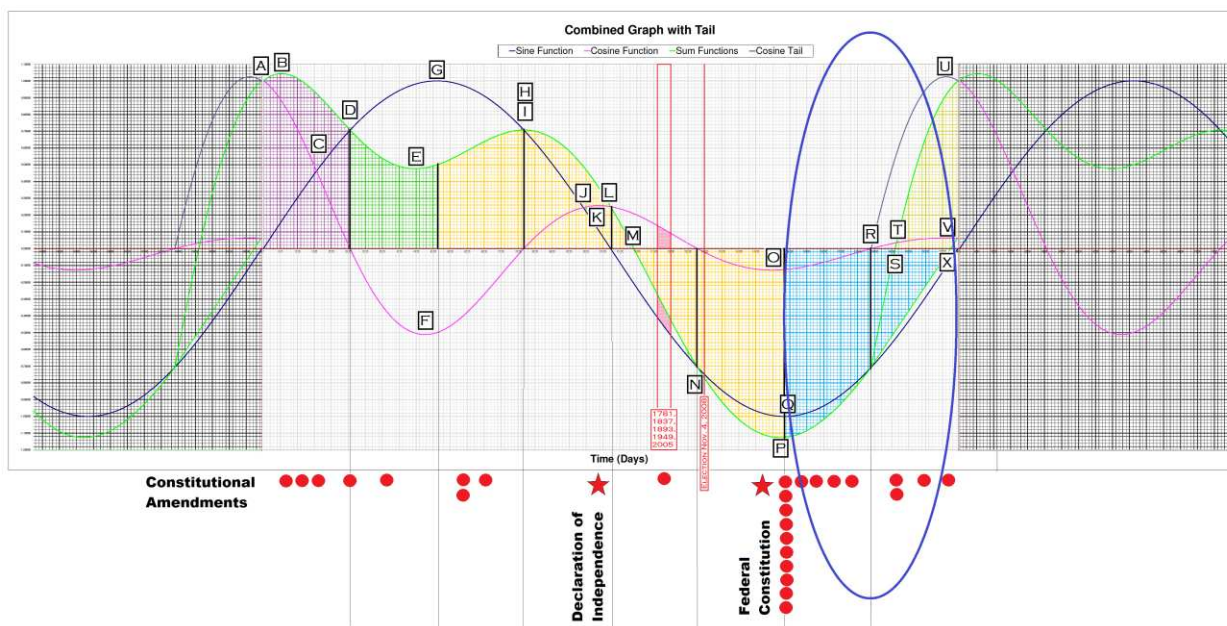
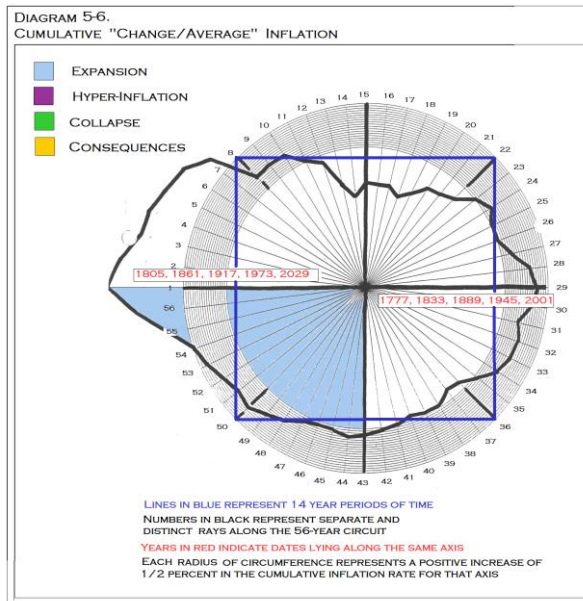
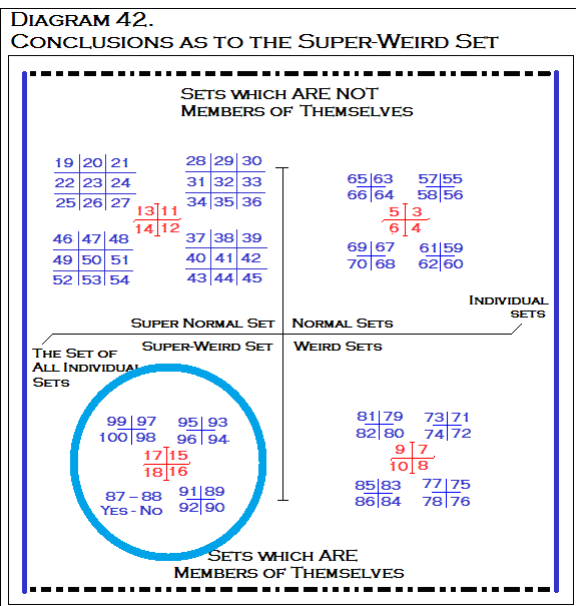
If we now ask whether the Super-Weird set is a member of the category known as "weird sets" we ask "Is the set of ALL sets which ARE members of themselves a member of itself?" If we have given a "Yes" to the first question ("Is it a member of itself?") we may give a "Yes" to this one as well. On the other hand, if we have given a "No" to the first question we must give a "No" to this one as well. The only uncertainty to the question lies in the nature of the initial question. Once the answer is determined, the conclusion reached in this question is not subject to any inherent uncertainty or contradiction. The simple blue cross is in tact, although the specific answer given relies entirely on the issue presented in the first question. (89-92)

If we ask if the super-weird set is a member of the category known as "normal sets" we ask "Is the set of ALL individual sets which ARE members of themselves a set which is NOT a member of itself" Once again our answer is premised upon the choice we have made at the outset. If we have said "No" to the first question, we have said that the Super-Weird set is NOT a member of itself. In this case, we must answer "yes" to the present question, i.e. that it IS a set which is NOT a member of itself- i.e. a normal set.

On the other hand, if we have said that the super-weird set IS a member of itself, then we must say No, it is NOT a normal set. Again the terms of the relationships and definitions are not contradictory, although they do not suggest a preferred resolution and they rely entirely upon the answer given in the first question. (93-96)

Finally, if we ask whether the super-weird set is a member of the category known as "the super-normal set," we ask "Is the set of all individual sets which ARE members of themselves a member of the set of ALL individual sets which are NOT members of themselves?" Again our answer lies in the choice made initially. Once made- "Yes-or-No" -there is no contradiction to including or excluding it from membership in the super-normal set, and in fact, must be included/excluded under the definition of the super-normal set. (97-100)

This "Yes-No" characteristic is completely different than any of the other quadrants. Consequently an expansion of ideas, mind-sets, "consciousness" results when society travels through this period of economic history. As seen previously, this period is clearly connected with the development of constitutional amendments whereby people say "Yes" and "No" to their circumstances with great determination.



This is the final design which is proposed herein for the foundation of set theory and Russell's Paradox within it. At present only the top-right quadrant ("normal sets") are considered clear enough to warrant approval. By virtue of the definition of a set, the three remaining categories of sets - super-normal, weird and super-weird - are ignored.

CONCLUSION

Alan Weir, in his essay entitled *Naïve Set Theory Is Innocent!*, makes the following comments regarding the present state of affairs.

The philosophic community is notorious for rarely reaching a consensus, even after thousands of years of discussion of a topic. This ought to be seen as evidence of the depth of the subject. Even so, it is natural to want to point to some philosophical problems which have been conclusively resolved in order to counter any suggestion that the subject is entirely empty or lacking in content; and so natural, in turn, to dismiss as mischief-makers those iconoclasts who seek to overturn even such limited consensus as exists. Though in general (I feel) sympathy with this reaction, I feel the need to demur from the consensus at, perhaps, one of its most firmly held points. This is the almost universal belief that naive set theory, a theory which had seemed well-nigh self-evident, has been shown to be false by the set theoretic antinomies.

...

(L)ike most of our fundamental concepts – cause, substance, person, etc. – the naïve notion of set and the naïve notion of class ... evolved undesigned. Consider seventeenth century cases such as Locke's 'which Operation ... do furnish the Understanding with another set of *Ideas*'; or Evelyn's 'Anemomies and Flowers and that Class should be discretely pruned.' These examples make it plausible that 'set' and 'class' have long had a usage in which they mean something like 'natural kind.'

But even if I am wrong on the history and the naïve notion of class or set did not evolve but was invented, I want to maintain that that invention was borne out of necessity and we cannot now disinvent the naïve notion any more than we can disinvent nuclear weapons. But if that is the case, will not disaster ensue at least in the set-theoretic case?¹¹⁹

We argue herein that disaster is not born from the map proposed. It is hoped that if mathematicians and logicians accept the above design as accurate and descriptive of the present situation *visa vi* the foundation of mathematics, i.e. as to Russell Set and its place in set theory, then the map itself may prove useful in areas wherein asymmetry and inherent uncertainty abound.

¹¹⁹ Alan Weir, "Naïve Set Theory is Innocent!" *Mind* 107, (1998), pp. 763-798; taken from pages 1-4 in the original text.

Essay Five: The Coming Revolution in Europe

Revolutions are born of hope.

Crane Brinton

ABSTRACT

Aims: To analyze the development of European culture from the point of view of the models introduced.

Study design: Philosophic / Mathematic discussion of European History.

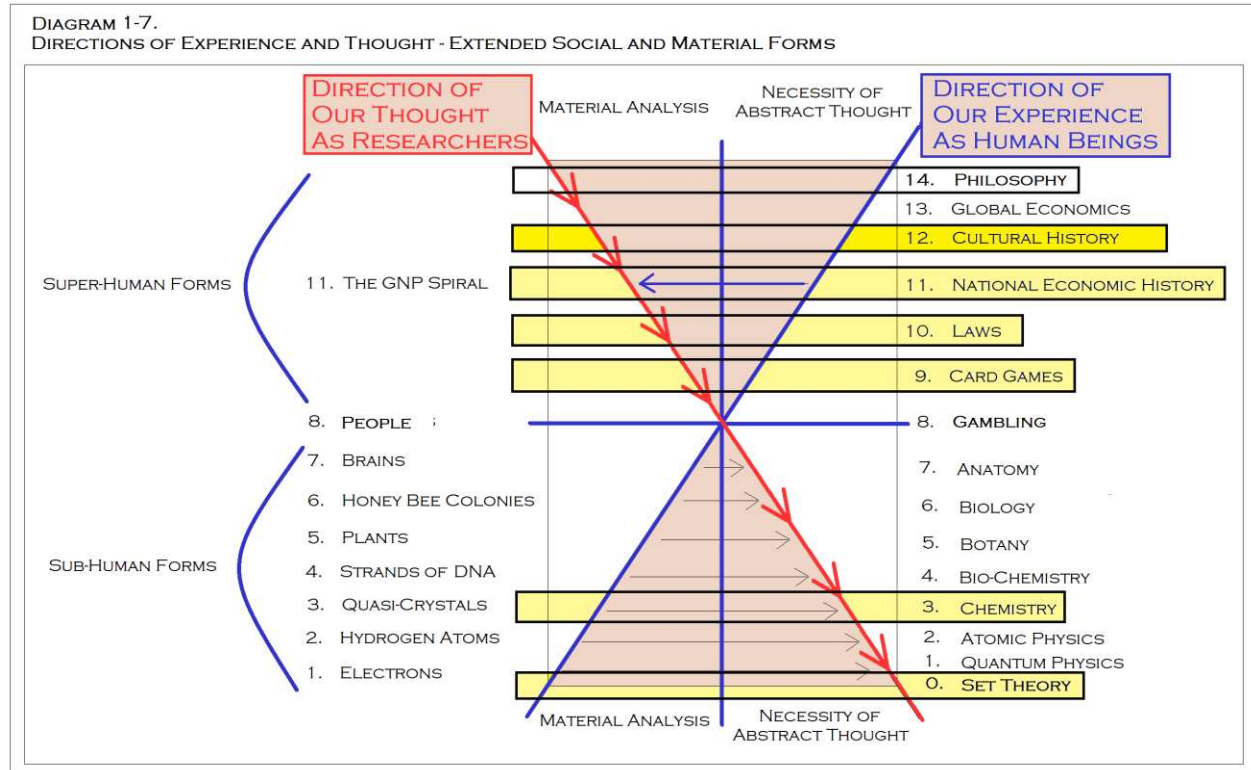
Place and Duration of Study: Library research.

Methodology: In this essay we consider the development of European history from the point of view of a system of movement, superior to, but interacting with, that of the United States.

Conclusions: If the structure of consciousness is understood correctly, the present implosion of European economic certainty is a central part of the present pattern.

INTRODUCTION

In this essay I bring the insights of the previous essays to bear on a discussion of European and the present on-going crisis of debt.



It is possible through the use of a European System of Movement to consider the likely timeline of future economic development in Europe and its association with the GNP Spiral. I suggest that the period 2028-2029 may bring a “perfect storm” of social change, one which is both rapid and world wide.

METHODOLOGY

1. Hypothesis

We suggest that the present state of affairs in Europe demonstrates that a system of Movement is operating to effect the implosion of culture and economics presently being experienced.

2. Methods

We use the dichotomies introduced previously to explain the basis for social patterns IN European History.

3. Data

We use the system of movement pattern to understand the present “melt-down” of European history.

4. Procedure

4.1 A Brief Summation of the Cultural Development of Europe

To the modern historian viewing very small increments of time - The French Revolution, the Second World War, the Renaissance, the religious revolution of the 1500s - it might seem odd to attempt the quantification of social evolution. Looking simply at a textbook outline of the past 400 years of French history we find the following.

The Bourbon dynasty	1589-1792.	This period includes
Henry IV	1589-1610,	
Louis XIII	1610-1643,	
Louis XIV	1643-1715,	
Louis XV	1715-1774,	and
Louis XVI	1774-1792.	This is followed by
The First Republic	1792-1804,	in which we find
a Convention	1792-1795,	
a Directory	1795-1799	and
a Consulate	1799-1804.	This is followed by
The First Empire	1804-1814	(Napoleon I) and
Restored Bourbon dynasty	1814-1830.	In this "Restoration" we find
Louis XVIII	1815-1824	and
Charles X	1824-1830.	Next we have a new king
The Orleans dynasty	1830-1848	(Louis-Phillippe) followed by
The Second Republic	1848-1852,	and
The Second Empire	1852-1870	(Napoleon III). Next we find
The Third Republic	1870-1940,	followed by
The Vichy Regime	1940-1944	and a
Provisional Government	1944-1946.	Succeeding this we find
The Fourth Republic	1946-1958	and currently
The Fifth Republic	1958-present.	

Counting the above we have five republics (one of which falls into three revolutionary stages), two empires, two lines of kings (one of which was both original and restored), a provisional government, and a government of occupation.

The relevance of the quest for order in this series of French governmental institutions lies in the importance of France. France lies at the heart of Western Europe. The geography of France has protected it from Huns, Vandals, Mongols, Moors and Turks. It has exposed it to Romans, Vikings, Germans and (to a lesser extent) Greeks. Even the English common law dates from the reign of William I, vassal of Henry I of France, crowned King of England Christmas 1066.

Historically the French have led Europe in fashion, politics, architecture, literature and the evolution of national unity. To find a pattern or logical order in the above series of events may lead to an understanding of the Western consciousness, the European "Mind" and its historic development. Upon this understanding we might frame a larger understanding of all evolution.

The "system of movement" presented here is a logical order, a pattern which makes a partial appearance in the European cultural development. To demonstrate this pattern and its current state of evolution we must summarize very briefly a description of the French class system.

4.2.0 The French Class System

The origins of the French class system stem from the division of France by the Romans at the time of Julius Caesar into two competing groups. These are (1) the Gauls and the Franks, the natives of France, and (2) the Romanized leadership. Throughout the Middle Ages, when serfdom and knighthood separated individuals by more than linguistic differences, these two groups evolved into four classes. Thus today in France we find four distinct groups of people. These are the descendents of the Romanized leadership, the kings and the nobles, as well as the descendents of the natives of France who do not claim this royal or noble heritage, the bourgeoisie and the peasants.

This class system was molded and contained throughout the Dark and Middle ages by the doctrines of Christianity. To this day Christianity is perhaps the single most powerful influence upon the day-to-day conduct of the French citizen, regardless of philosophic affiliation or scientific predisposition. One can appreciate the completeness of this association by opening a *Plan de Paris*, a city map of Paris, and counting the numbers of streets (rues, avenues, boulevards, etc.) named after a Christian saint, denominated St. (masculine) or Ste. (feminine). One counts 121 in the City of Paris alone in one edition.

The integrity of this catholic and medieval system of religious faith was seriously interrupted at the time of the discovery of America, 1492. The opening of large possibilities of trade and commerce with this new land was delayed by a Spanish monopoly (with the exception of Portuguese Brazil) for 100 years. During this time northern Europe experienced perhaps its most devastating period, the Wars of Religion.

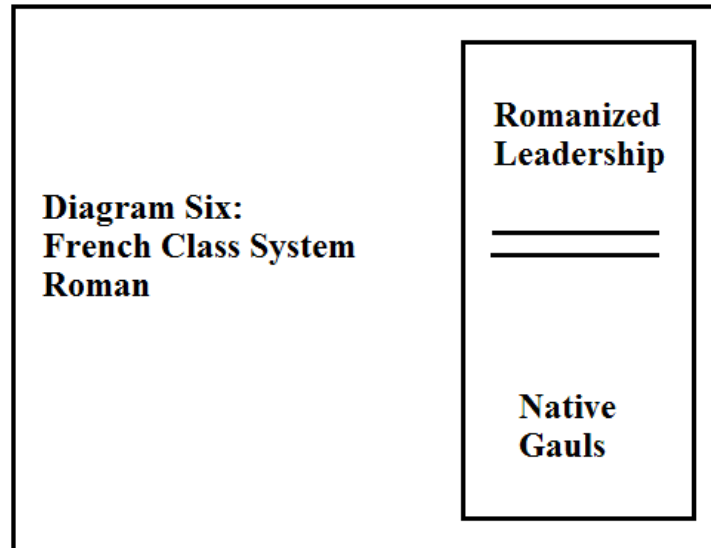
In France the answer to the question "Catholic or Protestant?" was given by a king of the Protestant area of Navarre. After years of religious unrest Henry of Navarre was at the point of capturing the city of Paris in what promised to be a bloody battle for control of France itself. When offered the city of Paris without a fight but on condition that he surrender the Protestant faith his decision was straightforward and simple.

"Paris is well worth a mass." (1593)

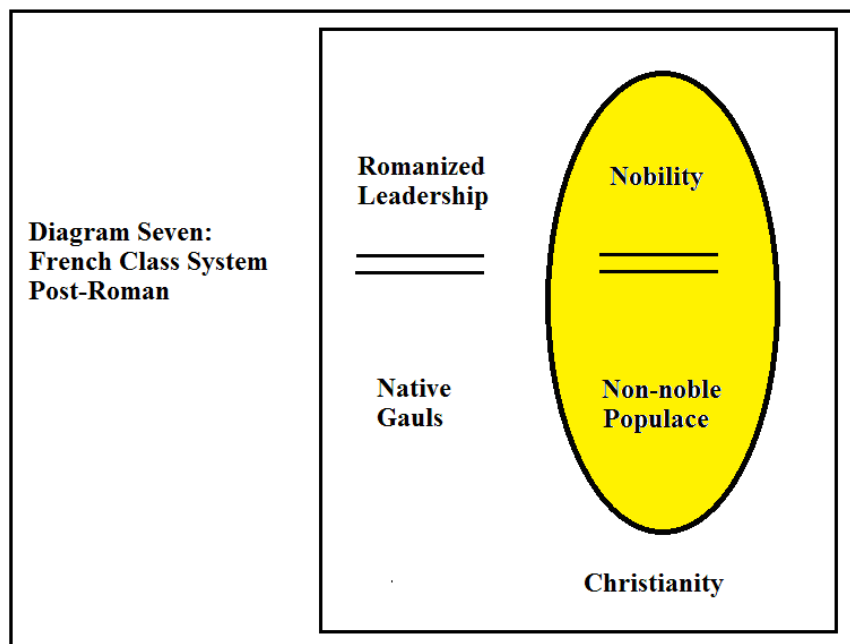
Henry of Navarre thus became Henry IV, founder of the Bourbon dynasty. Followed by his son Louis XIII and his advisors - notably Cardinals Richelieu and Mazarin - these two rulers serve as a transition, one paving the way for the modern evolution of France via the Bourbon dynasty.

4.2.1 A Simple Diagram of French Cultural Development

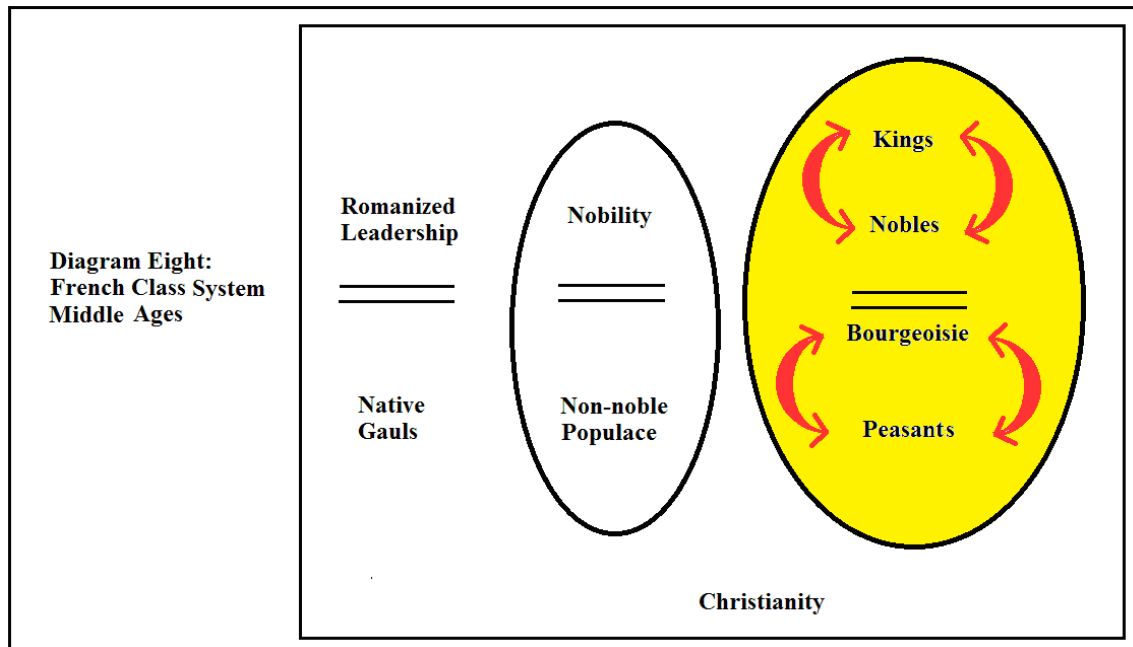
We might draw a simple cartoon of this process by noting the initial division of France by the Romans into Native and Romanized Gauls ...



... which evolved under Christianity into culturally separate groups of people, a nobility and a non-noble populace.

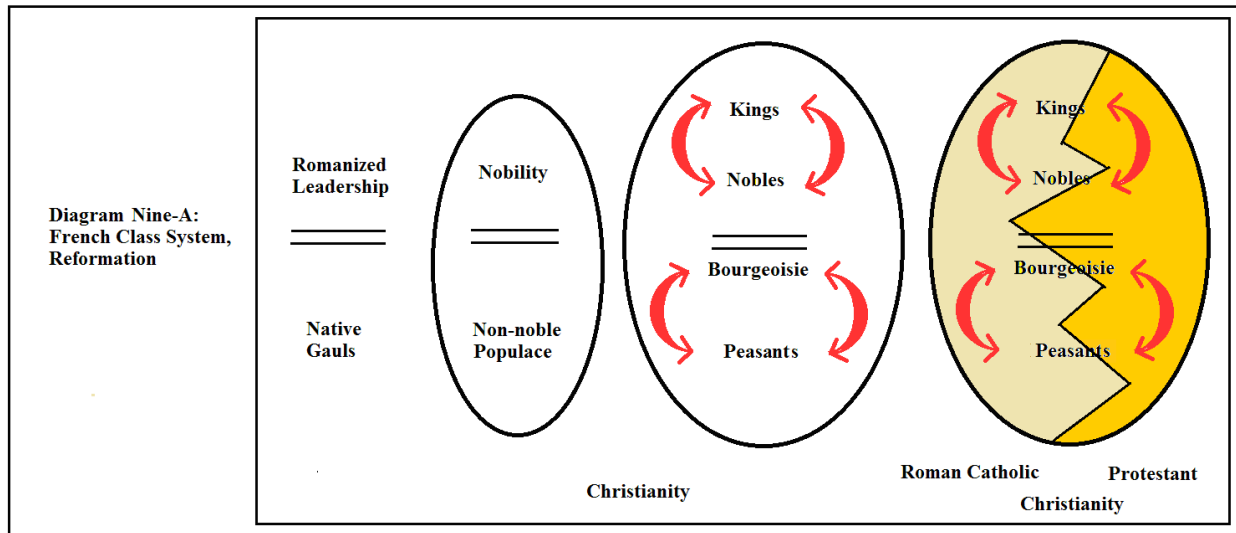


Throughout the Middle Ages these two separate groups developed internal rivalries resulting in a centralized noble court, or king, as well as a landed and more financially powerful segment of the populace, the bourgeoisie.

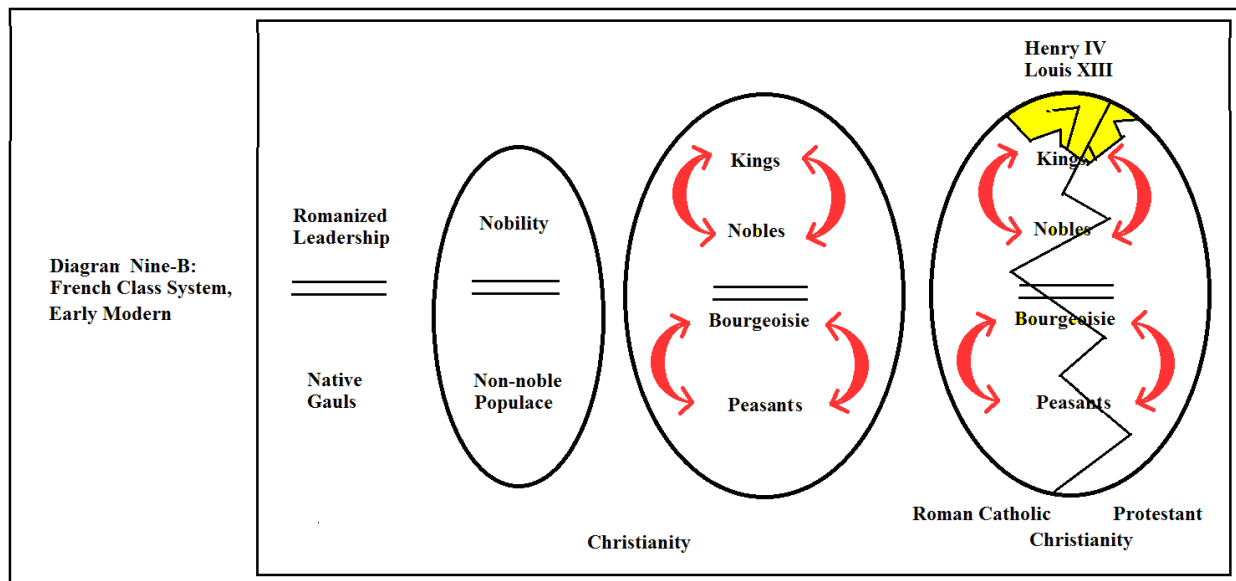


It is important to see that the origins of the classes in France are in competition, i.e. Roman and non-Roman. It is also important to see that the classes themselves are the results of serious oppositions between internal segments within the larger groups.

The glue sustaining cultural evolution in France throughout the Middle Ages was the Holy Christian Church. Against this backdrop the crisis of faith experienced by Europeans throughout the 1500's can perhaps be appreciated. The Protestant Reformation was not simply a new and worthwhile reform of religious practices. Rather it resulted in the dismemberment of life as it was known in the Middle Ages. Kings, Nobles, Bourgeoisie and Peasants each divided along religious grounds. For the first time in history the king might not be obeyed - not because of internal economic or social conditions - but rather because the king himself was "of Satan." The rebellions caused by these concerns left Europe devastated.



The transition of Henry IV and Louis XIII might be written then as a "hinge" uniting this time of Roman and medieval France to modern France.



4.2.2 France in Modern Times

The abandonment of religious rights for Protestants throughout the tenure of Louis XIII led to the ability of the next king, Louis XIV, to establish himself as sole ruler of France. His doctrine of government – and as applicable to modern times as well – is quite famous.

L'etat, c'est moi. (I AM the state.)

If we look for patterns over the past 400 years of historic development in France, we must first notice that four centralizing periods stand out. These are the governments of Louis XIV, Napoleon Bonaparte, Napoleon III and de Gaulle. These four individuals represent the tendency of history to hand governmental control to a semi- or real dictator when the disastrous chaos of an earlier period threatens the further development of the French nation-state.

If we place these four persons below one another historically under the heading "centralizing" we have:

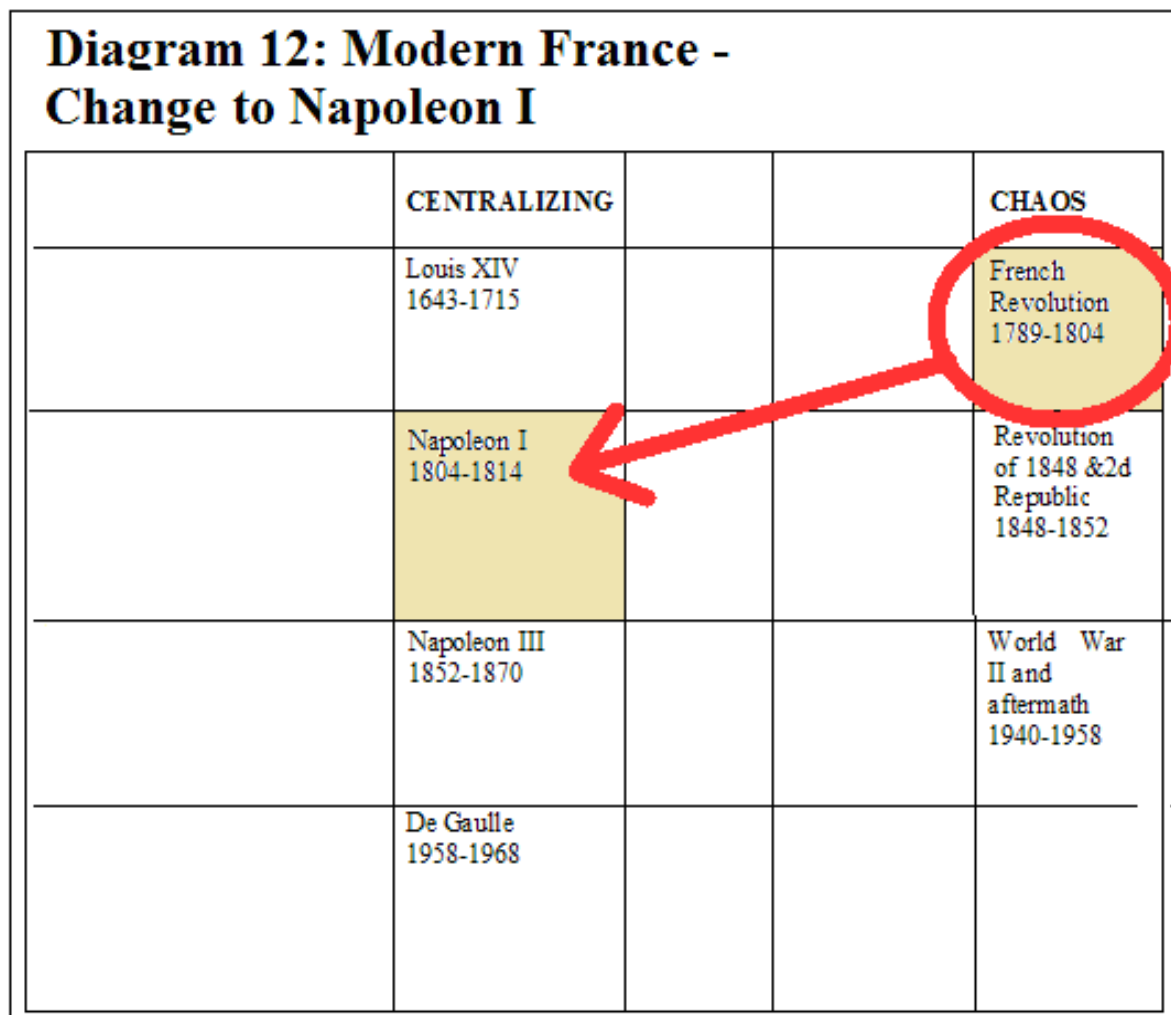
Diagram 10: Modern France - Centralizing Forces				
	CENTRALIZING			
	Louis XIV 1643-1715			
	Napoleon I 1804-1814			
	Napoleon III 1852-1870			
	De Gaulle 1958-1968			

If we place slightly opposite these men the chaotic period which led to their position as head of state, we have:

Diagram 11: Modern France - Chaotic Forces

	CENTRALIZING			CHAOS
	Louis XIV 1643-1715			French Revolution 1789-1804
	Napoleon I 1804-1814			Revolution of 1848 & 2d Republic
	Napoleon III 1852-1870			World War II and aftermath 1940-1958
	De Gaulle 1958-1968			

This is to say: (1) The French Revolution brought Napoleon Bonaparte to political office as First Consul of the First Republic in 1799, after which he became Consul For Life (1802), after which he crowned himself Emperor Napoleon I on December 2, 1804;

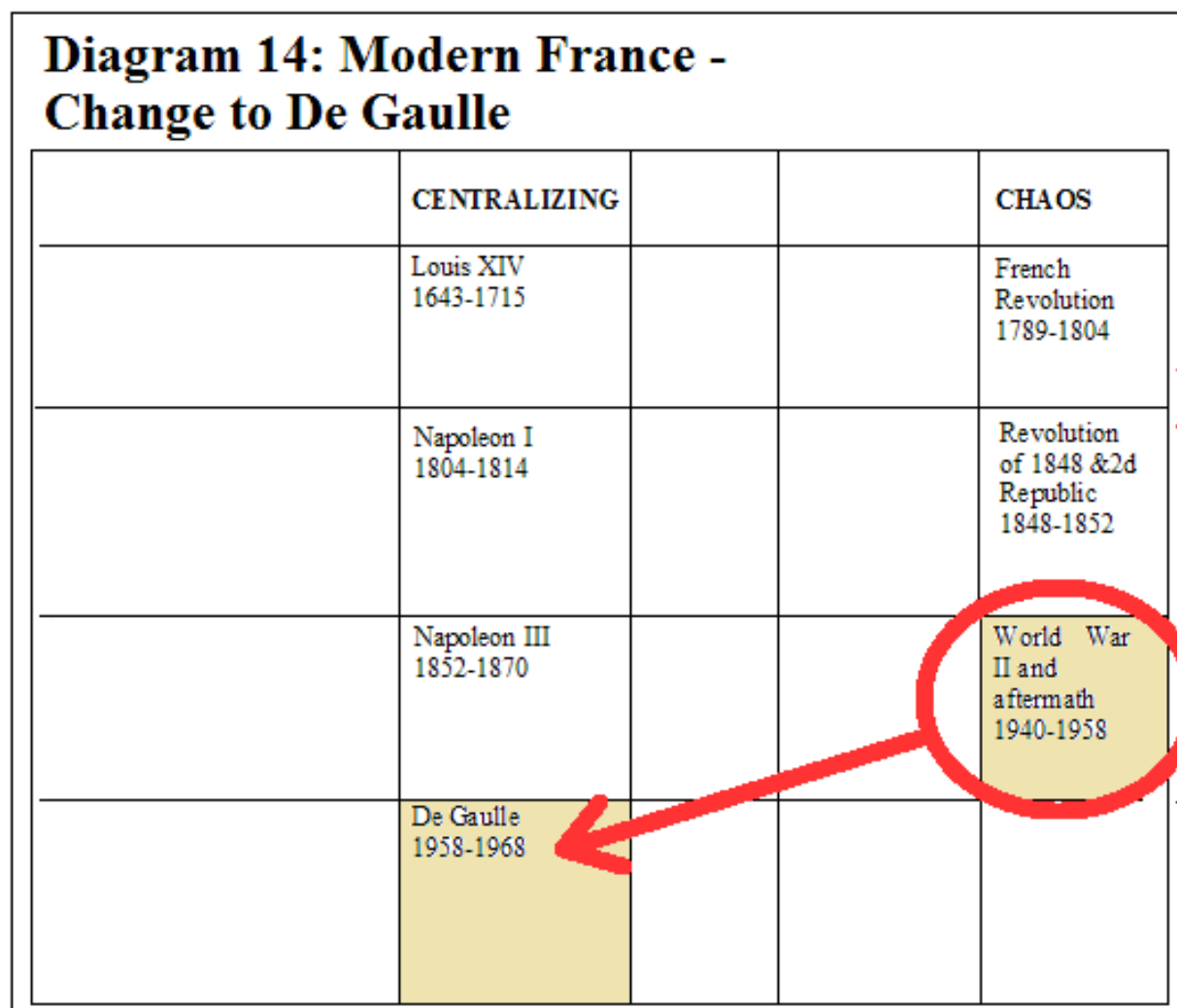


... (2) The Revolution of 1848 brought Napoleon III to political office first as president of the Second Republic in December 1848 after which, through coup d'état, he established himself as Emperor Napoleon III on December 2, 1852;

Diagram 13: Modern France - Change to Napoleon III

	CENTRALIZING			CHAOS
	Louis XIV 1643-1715			French Revolution 1789-1804
	Napoleon I 1804-1814			Revolution of 1848 & 2d Republic 1848-1852
	Napoleon III 1852-1870			World War II and aftermath 1940-1958
	De Gaulle 1958-1968			

... and (3) World War II (1940-44) and its chaotic aftermath of Provisional Government (1944-46) and Fourth Republic (1946-58) brought de Gaulle to power as the first president of the Fifth Republic, December, 1958.



The remaining periods of history might be introduced by differentiating the styles of government subsequent to Louis XIV. These would be the cabinet government of Louis XV and the more chaotic and ultimately parliamentary rule of Louis XVI. (Louis XVI was beheaded in 1793, approximately 4 years after the fall of the Bastille to revolutionary mobs, July 14, 1789.)

**Diagram 15: Modern France -
Cabinet and Parliament Periods - 1700's**

	CENTRALIZING	CABINET	PARLIAMENT	CHAOS
	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804
	Napoleon I 1804-1814			Revolution of 1848 & 2d Republic 1848-1852
	Napoleon III 1852-1870			World War II and aftermath 1940-1958
	De Gaulle 1958-1968			

This evolution of French politics from a centralized, to a cabinet, to a parliamentary, to a chaotic position has held true through four separate stages of development. Thus we see in the Bourbon Restoration of Louis XVIII and Charles X a cabinet government, succeeded by "The Bourgeois King," Louis-Phillippe, and a parliamentary reign.

**Diagram 16: Modern France -
Cabinet and Parliament Periods - 1800's**

	CENTRALIZING	CABINET	PARLIAMENT	CHAOS
	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804
	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & 2d Republic 1848-1852
	Napoleon III 1852-1870			World War II and aftermath 1940-1958
	De Gaulle 1958-1968			

The Third Republic likewise underwent a division of its long tenure in power. The period from 1870 through the First World War was governed under principles of cabinet rule. This was replaced by a parliamentary rule after the First World War.

Diagram 17: Modern France - Cabinet and Parliament Periods - Early 1900's

	CENTRALIZING	CABINET	PARLIAMENT	CHAOS
	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804
	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & 2d Republic 1848-1852
	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958
	De Gaulle 1958-1968			

As of 1977, mid-way through the final stage of this system and the date wherein the chart above was first devised, the chaos of World War II and its aftermath had been replaced by the centralizing government of de Gaulle (1958-68). In turn de Gaulle had been replaced by the cabinet or “technocrat” tenure of Pompidou and d’Estaing.

But what of the date of the final chaotic period?

Diagram 18: Modern France - Cabinet and Parliament Periods - Late 1900's				
	CENTRALIZING	CABINET	PARLIAMENT	CHAOS
	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804
	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & 2d Republic 1848-1852
	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958
	De Gaulle 1958-1968	Pompidou, d’Estaing 1968-?	?	?

4.3. A Theory of Cultural Development

One may estimate the timing of the final stage of French - or more broadly European cultural - “evolution” by considering the significance of the class system as reflected in the right to vote. As in the United States, the French have not eagerly granted the franchise, the right to vote, to as many people as possible without a struggle.

If we imagine the ability to vote as co-equal with the right to control, we find the control of the kings giving way after the French Revolution to a broader group of persons: men of substantial wealth and property. This ability to control is broadened as the result of the

Revolution of 1848 to a still larger group: men of some property, the bourgeoisie. As a result of the national trauma of World War II the ability to control is opened yet again during the tenure of de Gaulle to a still broader group: all men and women over age 21 who are citizens of France.

Note that we begin with a separation of French politics into two sections, Romanized Gaul and Native Gaul, operating still as a modern division of times. We see in the last four hundred years an extension of the franchise, the right to vote, in four different periods, each corresponding to a class of the French body politic. We begin with the control of government in the hands of kings, moving next a high nobility or those possessing significant property, next a bourgeoisie, and finally all citizens equally. Continuing the division of Romanized and Native Gaul, we have:

**Diagram 19: Modern France -
Class Divisions - Roman, Native**

	CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized KINGS	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804
Romanized NOBLES	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & 2d Republic 1848-1852
Native BOURGEOISE	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958
Native PEASANTS	De Gaulle 1958-1968	Pompidou, d'Estaing 1968-?	?	?

Next note that the groups which have “emerged” or evolved (Kings, Bourgeoisie) from more ancient divisions (Nobles, Peasants) enjoy a period of governance approximately three times that of the group from which they emerge. (See Diagram Eight) Measuring the length of time during which kings hold governmental authority we have Louis XIV to the coming of Napoleon Bonaparte as emperor, 1643 to 1804 = 161 years. Following this we have a period wherein nobility or “high bourgeoisie” hold governmental authority, to wit: Napoleon I through the Revolution of 1848 and the end of the Second Republic in the crowning of Napoleon III as a second emperor, 1804 to 1852 = 48 years. The exact ratio is 161 years divided by 48 = 3.354.

Measuring the tenure of the bourgeoisie we have Napoleon III through the end of the Fourth Republic, 1852 through 1958, 106 years. 106 divided by 3.354 = 31.60. Adding 31 years to the date on which de Gaulle assumed power yields 1958 + 31 = 1989. Under this calculation one would anticipate that the end of the Reign of the Peasantry would see a “year of chaos” in 1958 + 31 = 1989.

Diagram 20: Modern France - Original vs. Emerging Classes

		CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized	KINGS 1643-1804 161 years	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804
	NOBLES 1804-1852 48 years	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848, 2 nd Repub. 1848-1852
Native	BOURGEOISIE 1852-1958 106 years	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958
-	PEASANTS 1958 - 1989? + 31 years?	De Gaulle 1958-1968	Pompidou, d'Estaing 1968-?	?	Year of Chaos 1989?

The above figures date the “end of chaos” with the creation of “empire.” In “empire” we find a formal and drastic departure from the preceding “revolutionary” governments (Consulate of the First Republic, Presidency of the Second Republic). These chaotic governments are replaced by an irresistible “imperial” centralization (Napoleon “I”, Napoleon “III”).

On the other hand, we might consider chaos “ended” and centralization begun in the year Bonaparte or his nephew first assume political office. Under this interpretation the French Revolution and First Republic end in 1799, the year Bonaparte became First Consul of the First Republic. Similarly the Revolution of 1848 might be considered to end in December 1848 when the future Napoleon III assumed the presidency of the Second Republic. The ratios thus shift slightly.

1643 through 1799 = 156 years.
 1799 through 1848 = 49 years.
 156/49 = 3.18.
 1848 through 1958 = 110 years.
 110/3.18 = 34.59 years.
 1958 + 34 years = 1992 as the anticipated “date of chaos.”

Diagram 21: Modern France - Personalities vs. Governments

		CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized	KINGS 1643-1804 156 years?	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	<i>French Revolution 1790- 1799?</i>
Romanized	NOBLES 1799-1848? 49 years?	<i>Napoleon I 1799-1814</i>	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	<i>Revolution of 1848?</i>
Native	BOURGEOISIE 1848-1958 110 years?	<i>Napoleon III 1848-1870</i>	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958
Native	PEASANTS 1958 - 1992? + 34 years?	De Gaulle 1958-1968	Pompidou, d'E staing 1968-?	?	Year of Chaos 1992?

Thus two dates - 1989, 1992 - might be considered potential “years of chaos” depending upon whether this model describes the evolutions of governments or personalities.

Figuring the period of rule of the “ancient” class *roughly* at one-third of the period of the “emerged” class, using our first scheme we divide 106 by 3 = 35.33. 1958 + 35 = 1993. 1993 might be considered a candidate for the “year of chaos” using governments as the focus of the model and the approximate ratio of one-third.

Again, using one-third as a *rough* or averaged ratio between emerged/ancient periods of rule, under our second scheme we divide 110 by 3 = 36.67. 1958 + 36 = 1994. 1994 must be considered a candidate for the “year of chaos” using personalities as the focus of the model and the rough or approximate ratio of one-third.

Diagram 22: Modern France - Exact Ratios vs. Average Ratios

		CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized	KINGS 1643 - 1804? 1643 - 1799? 161 years? 156 years?	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804? 1789-1799?
Romanized	NOBLES 1804 - 1852? 1799 - 1848? 48 years? 49 years?	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & 2d Republic? 1848-1852? 1848?
Native	BOURGEOISE 1852 - 1958? 1848 - 1958? 106 years? 110 years?	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958 18 years
Native	PEASANTS 1958 - ? + 31 years? + 34 years? + 35 years + 36 years	De Gaulle 1958-1968	Pompidou, d'Estaing 1968-?	?	Year of Chaos 1989? 1992? 1993? 1994?

The question arises, is this model one of people or governments? and does it use “specific” ratios (dividing periods by 3.354 or 3.18) or “averaged” (dividing periods by 3)?

Note as well that the duration of periods of chaos during each of these reigns is quite different. We have during the Reign of Kings a French Revolution which lasts approximately ten to fifteen years (1789 to 1799, or to 1804). During the Reign of Nobles a new chaotic period, the Revolution of 1848, brings about sudden changes in governments throughout Europe in approximately six months. This revolutionary movement results in the Second Republic of four years, 1848 to 1852. This second period of chaos is much shorter, but by what ratio?

During the Reign of the Bourgeoisie we have a period of chaos - World War II and aftermath - of 18 years (1940-1958). Simply following the pattern one would anticipate a rapid - not a prolonged - change of governments throughout Europe akin to the Revolution of 1848 somewhere between the dates 1989 to 1994.

Diagram 23: Modern France - Comparative Lengths of Chaotic Periods					
		CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized	KINGS 1643 - 1804? 1643 - 1799? 161 years? 156 years?	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804 1789-1799 15 years? 10 years?
Romanized	NOBLES 1804 - 1852? 1799 - 1848? 48 years? 49 years?	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & Second Republic? Rev. of 1848 4 years? 6 months?
Native	BOURGEOISIE 1852 - 1958? 1848 - 1958? 106 years? 110 years?	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958 18 years
Native	PEASANTS 1958 - ? + 31 years? + 34 years? + 35 years + 36 years	De Gaulle 1958-1968	Pompidou, d'Estaing 1968-?	?	Year of Chaos 1989? 1992? 1993? 1994? Months?

Thus as of 1977, a sudden, revolutionary change, analogous to the Revolution of 1848, sweeping suddenly across Europe in 1989 or the early 1990s, could be predicted. Preceding this change one would expect the cabinet government of d'Estaing to be replaced by parliamentary rule.

On May 10, 1981 Francois Mitterand, head of the French Socialist Party, became president of France, defeating Valerie Giscard d'Estaing with 52% / 48% of the vote. Parliamentary elections on June 14 and 21, 1981 gave the Socialists control of the National Assembly. These events ended 23 years of right wing and right-centrist rule.

Diagram 24: Modern France - Socialists Elected

		CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized	KINGS 1643 - 1804? 1643 - 1799? 161 years? 156 years?	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804 1789-1799 15 years? 10 years?
Romanized	NOBLES 1804 - 1852? 1799 - 1848? 48 years? 49 years?	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & Second Republic? Rev. of 1848 4 years? 6 months?
Native	BOURGEOISE 1852 - 1958? 1848 - 1958? 106 years? 110 years?	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958 18 years
Native	PEASANTS 1958 - ? + 31 years? + 34 years? + 35 years + 36 years	De Gaulle 1958-1968	Pompidou, d'Estaing 1968-1981	Mitterand 1981 -	Year of Chaos 1989? 1992? 1993? 1994? Months?

On November 9, 1989 the Berlin Wall crumbled. With this event began the rapid disintegration of the Soviet Union as a European Power and finally as a World Power. By Christmas Day, December 25, 1991, the Soviet Union had imploded as a political force; it did not exist. As summed up by the magazine, *The Economist*:

In 1989 one East European communist regime after another loosened its grip on one-party power: Hungary (February), Poland (June), Bulgaria, East Germany and Czechoslovakia (November), Romania (December). By January 1992 every East European country had freely and fairly elected governments. All were non-communist, though in Romania and Albania ex-communists kept much power.

Diagram 25: Modern France- The Soviet Implosion

		CENTRALIZING	CABINET	PARLIAMENT	CHAOS
Romanized	KINGS 1643 - 1804? 1643 - 1799? 161 years? 156 years?	Louis XIV 1643-1715	Louis XV 1715-1774	Louis XVI 1774-1793	French Revolution 1789-1804 1789-1799 15 years? 10 years?
Romanized	NOBLES 1804 - 1852? 1799 - 1848? 48 years? 49 years?	Napoleon I 1804-1814	Bourbon Restoration 1814-1830	Louis-Phillippe 1830-1848	Revolution of 1848 & Second Republic? Rev. of 1848 4 years? 6 months?
Native	BOURGEOISE 1852 - 1958? 1848 - 1958? 106 years? 110 years?	Napoleon III 1852-1870	Third Republic First Half 1870-1919	Third Republic Second Half 1919-1940	World War II and aftermath 1940-1958 18 years
Native	PEASANTS 1958- 1989/1991 +31 to 33 years	De Gaulle 1958-1968	Pompidou, d'Estaing 1968-1981	Mitterand 1981 -	Soviet Implosion 1989-1991 26 Months

One might describe the “image” of these periods in French history – an “image axis” so to speak - by identifying key phrases or slogans for each of our sixteen divisions of modern French history. Our purpose is to provide a feel for the period and thereby provide an idea or understanding of the importance and place of the period itself. The following may be proposed:

Louis XIV	“L’etat, c’est moi.” (“I AM the state.” Referring to the establishment of all government under Louis’ personal and relentless control.)
Louis XV	“Après nous, le deluge.” (“After us, the flood.” Statement attributed to the mistress of Louis XV predicting the loss of royal privileges after the death of Louis XV in a flood of popular resentment.)
Louis XVI	“Laissez-les manger les gâteaux.” (“Let them eat cake.” Statement attributed to Marie-Antoinette, Queen of Louis XVI, who proposed this as the solution to peasant rioting due to the absence of bread, a poor harvest and famine.)
French Revolution	“Liberte, Egalite, Fraternite” (“Liberty, Equality, Brotherhood,” idealistic goals of the French Revolution.)
Napoleon	“Ma femme.” (“My wife.” Napoleon’s response to the question of a sophisticated courtesan of Paris who asked him which woman met in his travels across Europe, Africa and Asia was the most beautiful. The reign of Napoleon saw a no-nonsense return to values which might support a national military effort, the most lasting of which is the modern Code Napoleon, the French civil and criminal law.)
Louis XVIII, Charles X	“They have learnt nothing and they have forgotten nothing.” (Phrase attributed to Talleyrand as to the impossibility of establishing a true constitutional monarchy in France under the Bourbons.)
Louis-Phillippe	“The Bourgeois-King.” (Popular description of Louis-Phillippe and his necessary constituency, an unusual contradiction in terms.)
Revolution of 1848	“Workers Unite! You have nothing to lose but your chains!” (Final and most famous phrase of Marx’ <i>Communist Manifesto</i> of the same year.)
Napoleon III	“The Bourgeois Emperor.” (Another contradiction in terms.)
3rd Republic First Part	“To The Day!” (Toast between French and German military officers who looked forward to the inevitable war between Germany and France as the French endeavored to retrieve the surrendered territories of Alsace and Lorraine lost during the Franco-Prussian war of 1870. Harbinger of the disastrous World War I.)

3rd Republic Second Part “Better Hitler than Blum.” (Popular French political slogan opposing increased (socialist) involvement of the peasantry in French government. Symbol of a divisive French political life and harbinger of the chaotic and disastrous World War II and post-War period.)

W. W. II and aftermath “Blood, toil, tears and sweat.” (Churchill’s summary of the English effort in the War to liberate France from the Germans and thereby save itself.)

DeGaulle “Vive la France!” (“Long Live France!” First time this political slogan entered into the popular political life of France. Previously slogans such as “Vive la Republic!” or “Vive le Roi!” had been common.)

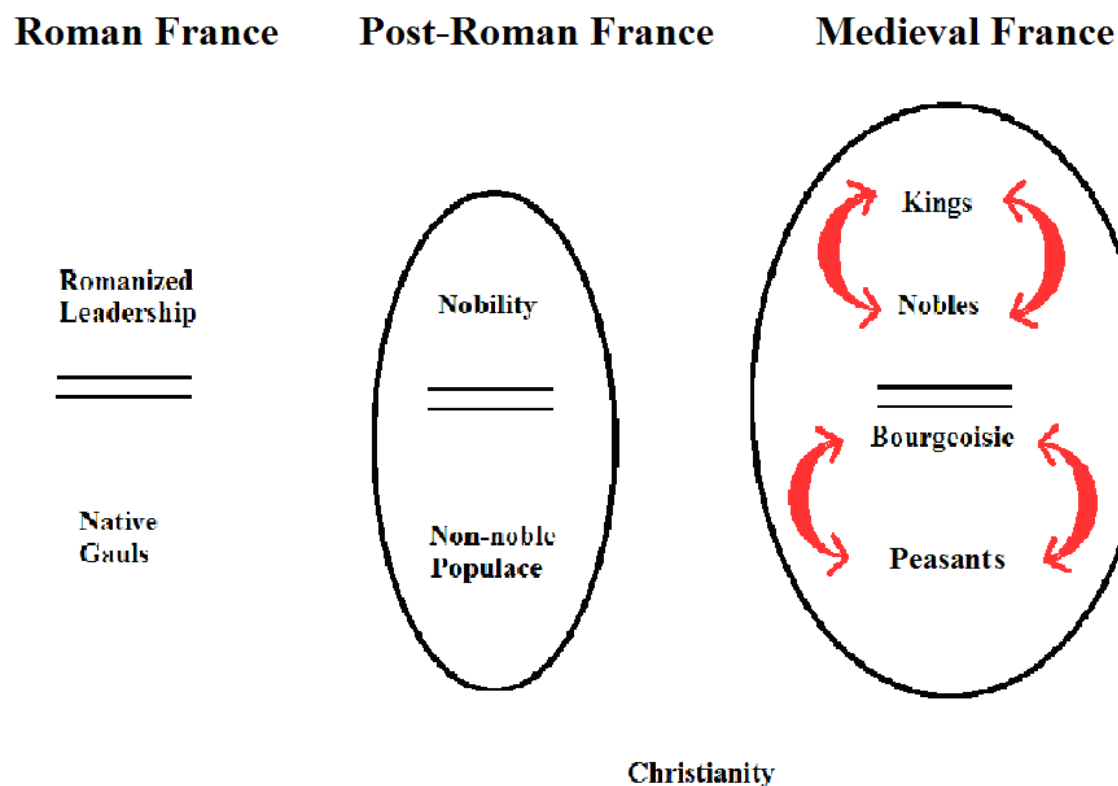
Pompidou, d’Estaing “The technocrats.” (Word invented to describe the highly educated professional elite leading France into a modern world of nuclear power and declining French influence.)

Placing these in the previously assembled 16-part plan, we have:

Diagram 26: Modern France - Historic Catch Phrases, Slogans				
	CENTRAL.	CABINET	PARLIAMENT	CHAOS
KINGS 1643-1804 161 years	Louis XIV 1643-1715 “L’etat, c’est moi.”	Louis XV 1715-1774 “Après nous, le deluge.”	Louis XVI 1774-1793 “Laissez-les manger les gateaux.”	French Revolution 1789-1804 15 years “Liberte, Egalite, Fraternite!”
NOBLES 1804-1852 48 years	Napoleon I 1804-1814 “Ma femme.”	Bourbon Restoration 1814-1830 “They have learnt nothing, and they have forgotten nothing.”	Louis-Phillippe 1830-1848 “The Bourgeois King”	Revolution of 1848, Second Republic 1848-1852 4 years “Workers of the World Unite! You have nothing to lose but your chains!”
BOURG. 1852-1958 106 years	Napoleon III 1852-1870 “The Bourgeois Emperor.”	Third Republic First Half 1870-1919 “To The Day!”	Third Republic Second Half 1919-1940 “Better Hitler than Blum.”	World War II and aftermath 1940-1958 18 years “Blood, Toil, Tears, and Sweat.”
PEASANTS 1958-1989 +31 years	De Gaulle 1958-1968 “Vive la France!”	Pompidou, d’Estaing 1968-1981 “The Technocrats.”	Mitterand 1981-	Soviet Implosion 1989-1991 26 months

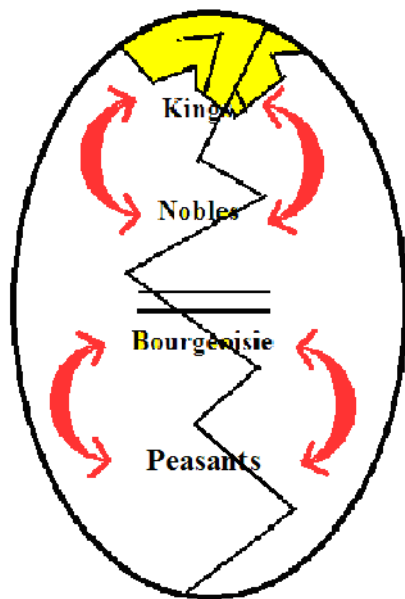
Placing side by side the above slogans in the organization previously described, we have:

**Diagram 27: French Evolution
Roman to Modern**



Reformation France

Henry IV
Louis XIII



Roman Catholic Protestant
Christianity

Modern France

Modern France - Historic Catch Phrases, Slogans

	CENTRAL.	CABINET	PARLIAMENT	CHAOS
KINGS 1643-1804 161 years	Louis XIV 1643-1715 "L'etat, c'est moi."	Louis XV 1715-1774 "Après nous, le deluge."	Louis XVI 1774-1793 "Laissez-les manger gateaux." les	French Revolution 1789-1804 15 years "Liberte, Egalite, Fraternite!"
NOBLES 1804-1852 48 years	Napoleon I 1804-1814 "Ma femme."	Bourbon Restoration 1814-1830 "They have learnt nothing, and they have forgotten nothing."	Louis-Philippe 1830-1848 "The Bourgeois King"	Revolution of 1848, Second Republic 1848-1852 4 years "Workers of the World Unite! You have nothing to lose but your chains!"
BOURG. 1852-1958 106 years	Napoleon III 1852-1870 "The Bourgeois Emperor."	Third Republic First Half 1870-1919 "To The Day!"	Third Republic Second Half 1919-1940 "Better Hitler the Blum."	World War II and aftermath 1940-1958 18 years "Blood, Toil, Tears, and Sweat."
PEASANTS 1958-1989 + 31 years	De Gaulle 1958-1968 "Vive la France!"	Pompidou, d'E staing 1968-1981 "The Technocrats."	Mitterand 1981-	Soviet Implosion 1989-1991 26 months

The implosion of the Soviet Union between 1989 and 1991 coincides entirely with the estimate that 1989 should see rapid, revolutionary change in Europe in a change of governments similar to that of the Revolution of 1848. Note also that the scope of violence between these two revolutions is very similar. To the astonishment of the world the Soviet Union, like the European monarchies of 1848, imploded almost without a shot. It must also be understood that our use of “averaged ratios” (dividing periods by 3) and “personalities” led to incorrect dates. We must consider governments as the subject of this model and use exact, not approximate, ratios (dividing periods by 3.354).

This model describes the cultural development of Western Europe from Julius Caesar to the present in but two pages. It portrays France as a kind of heart, a central barometer around which all other nations of Europe gather. It demonstrates that in France political events - kings, governments, revolutions, sudden changes of policy - are themselves players in a larger game, a larger and underlying logic. In 1977 this model predicted a revolutionary period of chaos in Europe falling between 1989 and 1994. The outcome of change was unknown.

Regarding the end of communist rule in Eastern Europe in 1989 and the sudden implosion of the USSR in 1991, it is interesting to consider the international scene as described by former President Richard Nixon nine years earlier in his book *The Real War*. The elimination of Eastern European tyranny was not believed possible in the 1970s and 80's.

This book is a *cri du coeur*, addressed not only to our political leaders but to leaders in all walks of life - to take hold before it is too late, and to marshal America's strengths so as to ensure its survival.

The Soviet Union today is the most powerfully armed expansionist nation the world has ever known, and its arms build-up continues at a pace nearly twice that of the United States. There is no mystery about Soviet intentions. The Kremlin leaders do not want war, but they do want the world. And they are rapidly moving into position to get what they want.

In the 1980s America for the first time in modern history will confront two cold realities. The first of these is that if war were to come, we might lose. The second is that we might be defeated without war. The second prospect is more likely than the first, and almost as grim. The danger facing the West during the balance of this century is less that of a nuclear holocaust than it is of drifting into a situation in which we find ourselves confronted with a choice between surrender and suicide - red or dead. That danger can still be averted, but the time in which we can avert it is rapidly running out.

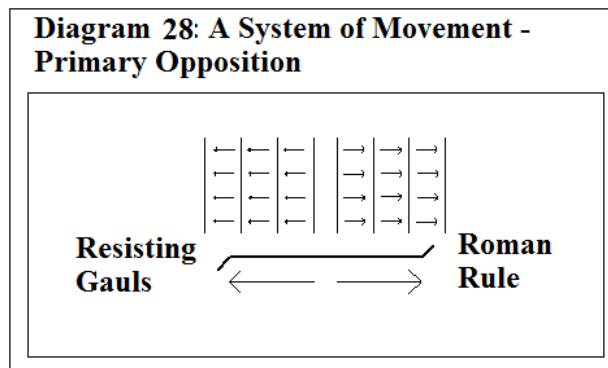
The next two decades represent a time of maximum crisis for America and for the West, during which the fate of the world for generations to come may well be determined.

Other nations have much longer experience than we have in the use of power to maintain the peace. But they no longer have the power. So, by default, the world looks to the United States. It looks today with nervous apprehension, as the bulwarks against Soviet expansion crumble in one nation after another, and as the United States appears so lost in uncertainty or paralyzed by propriety that it is either unable or unwilling to act.

4.5 General Theory: A Partial “System of Movement”

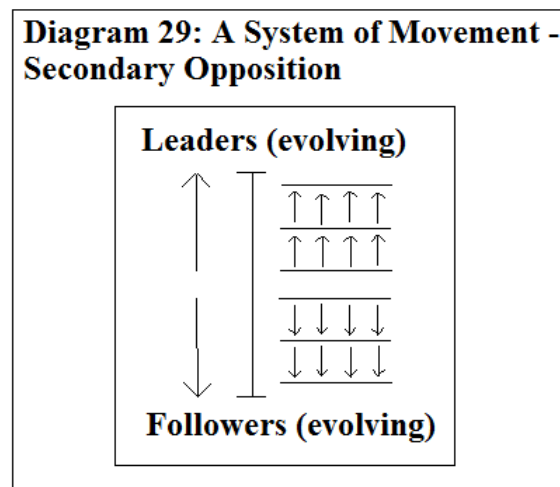
The set of facts and/or ideas set forth in Part 2 may be organized according to the architecture of a “system of movement” using the following basic principles.

At the ground level of all French cultural and economic development one finds an opposition between the organization which Rome imposed upon the Gauls, and the Franks and Gauls who struggled to resist.



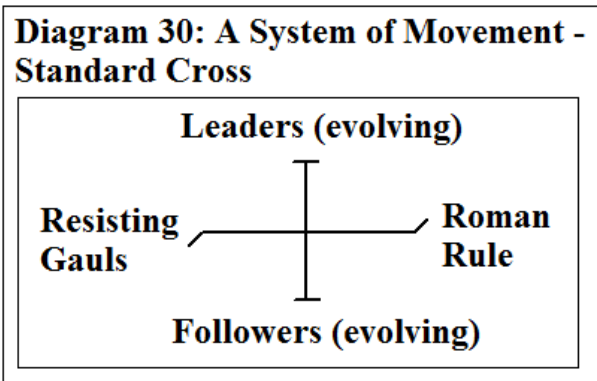
The symbol above represents a “Primary Opposition.” As used in this analysis, a Primary Opposition represents a *difference in kind*, a difference in the basic nature of two things, as opposed to oppositions arising from a struggle between similar elements or a difference in gradation between similar elements.

Further note the opposition occasioned between followers and leaders of any given group.

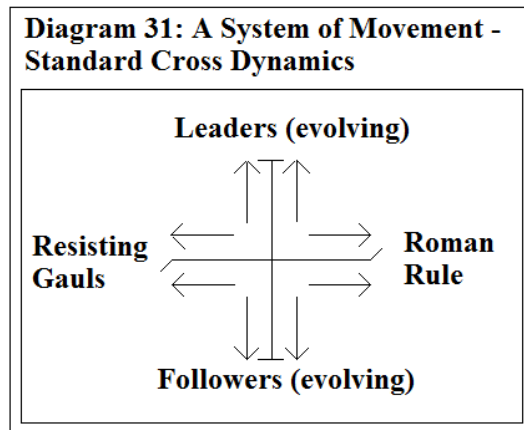


The symbol above represents a “Secondary Opposition.” As used in this analysis a Secondary Opposition represents an opposition based upon like natures in conflict or in some competition with one another as *gradations of the same basic nature*. A Secondary Opposition is one which, unlike the Primary Opposition, is not absolute or complete because it deals with a form of opposition which is based upon difference with like categories, not differences in kind between the categories themselves.

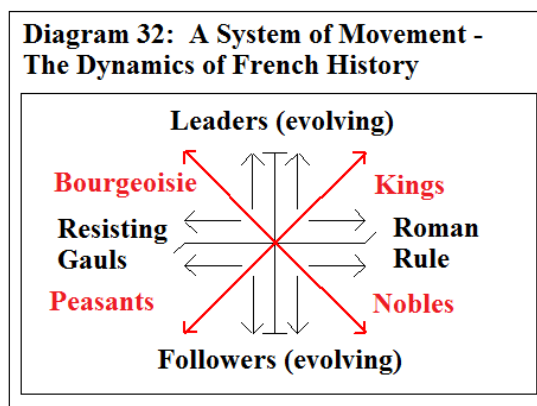
As these two oppositions contrast with each other, we may propose a joining of them in the following symbol, a Standard Cross.



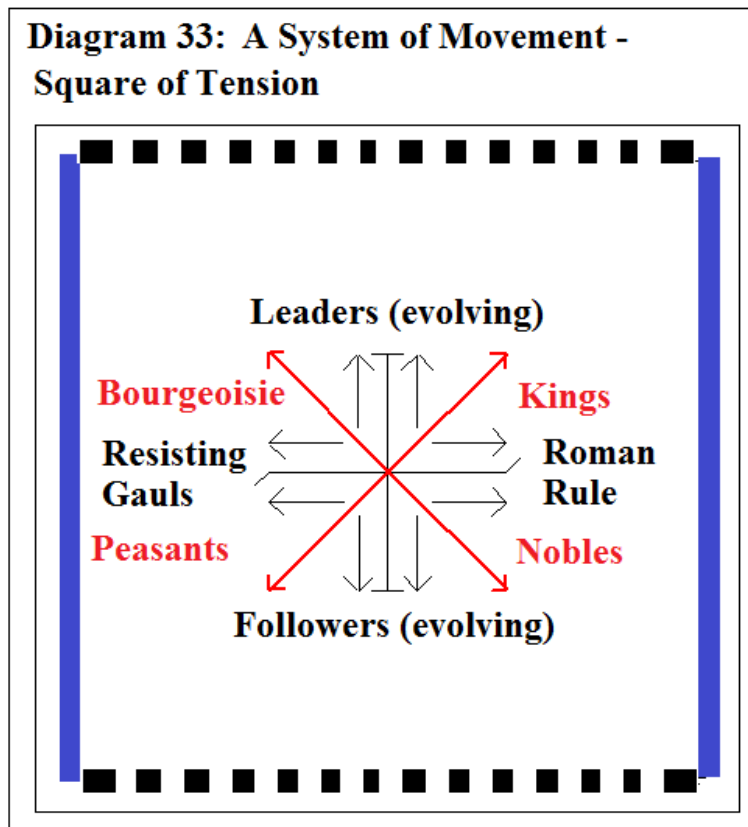
These two Oppositions operate to divide culture into four competing classes or groups.



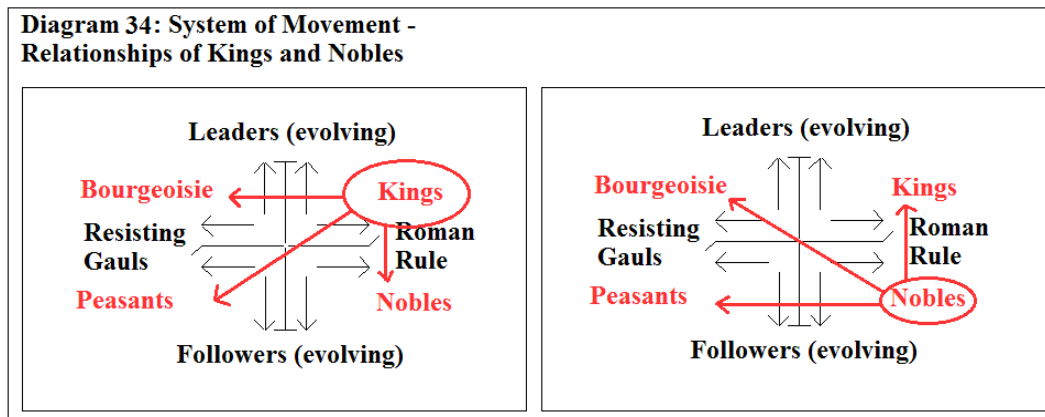
As this system is displayed in the foregoing history, we see that the "leaders" of the Romanized Gauls evolved a form of kingship surrounded by a noble court. On the other hand resisting Gauls throughout Roman times and into the Middle Ages succumbed to servant hood and eventually serfdom. From this basis arose the bourgeoisie.



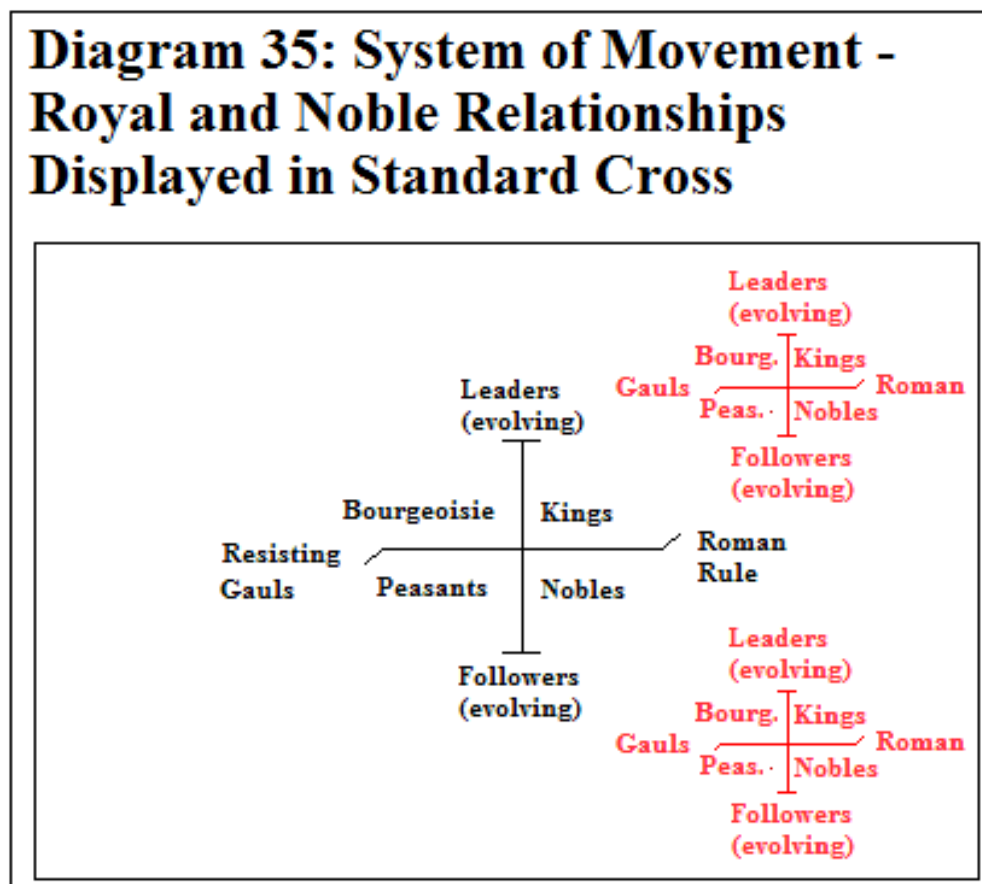
If we see these vectors as “forces” which operate on French culture with equal and necessary effect, we might draw a square delineating the extent to which this force plays upon the fabric of national life. The vertical blue lines represent the “secondary oppositions” or tensions between members of a common historic origin (Kings to Nobles, Bourgeoisie to Peasants) and the horizontal dotted lines represent a “primary opposition” which exists in France to this day (Romans to Gauls). These separate classes of people have developed relationships with each other over time.



If we consider the development of French history, we must notice that the kings of France have historic relationships between each other, with the nobility, with the bourgeoisie and with the peasantry of France. Similarly the nobility has developed over time an historic relationship with the kings of France, between the nobles of their group, with the bourgeoisie and with the peasantry.

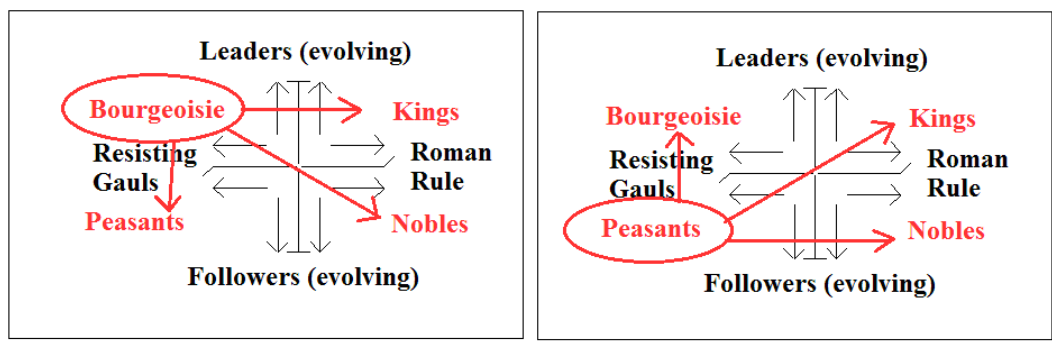


These two sets of logical relationships which are implied by the terms created may be written as:



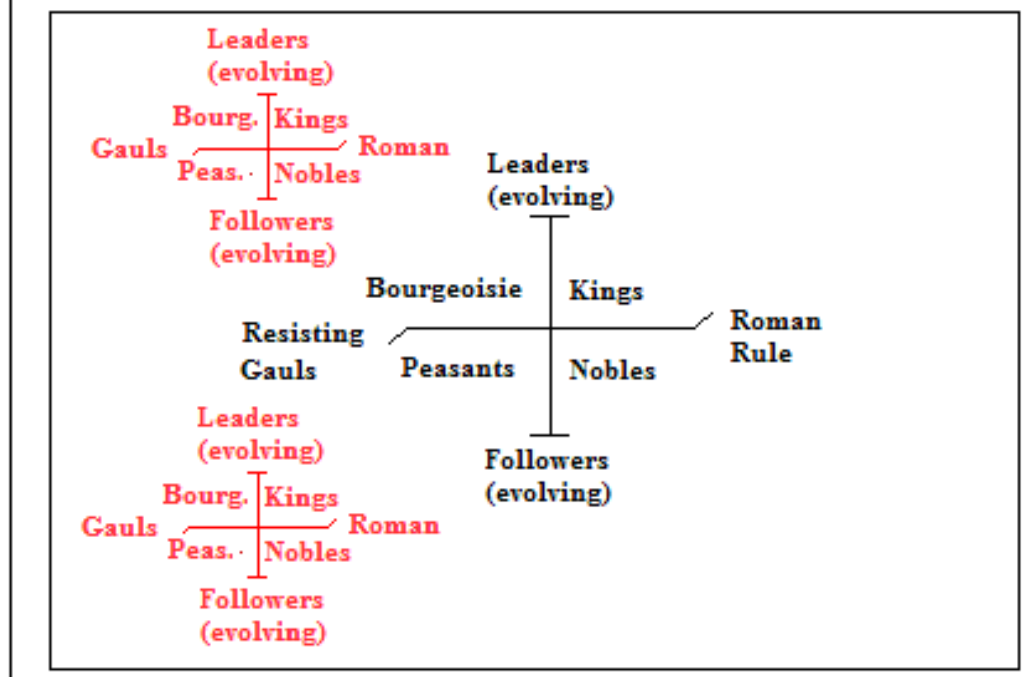
The bourgeoisie has also developed historic relationships between members of that class, with the kings of France, with the nobility and with the peasantry. Finally over time the peasantry has developed relationships between members of the peasantry, with the kings of France, with the nobility and with the bourgeoisie.

Diagram 36: System of Movement - Relationships of Bourgeoisie and Peasants

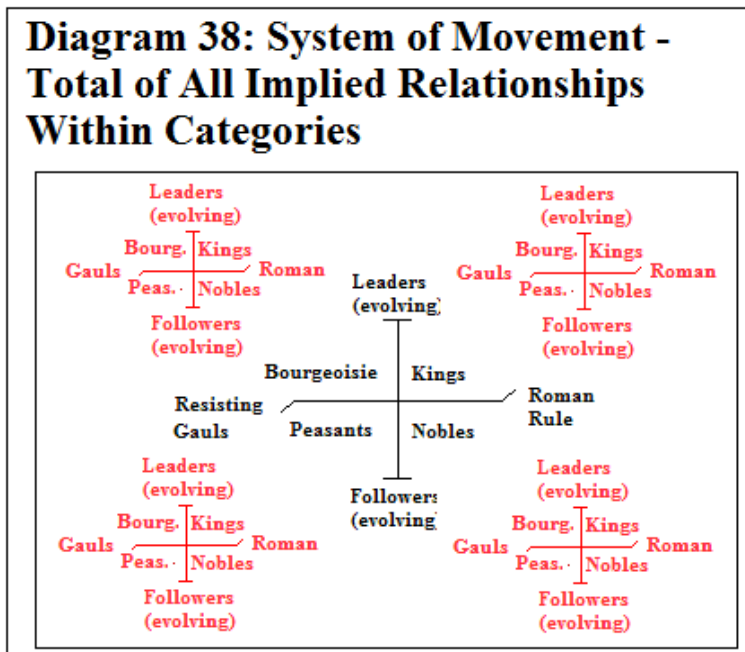


These may be written as:

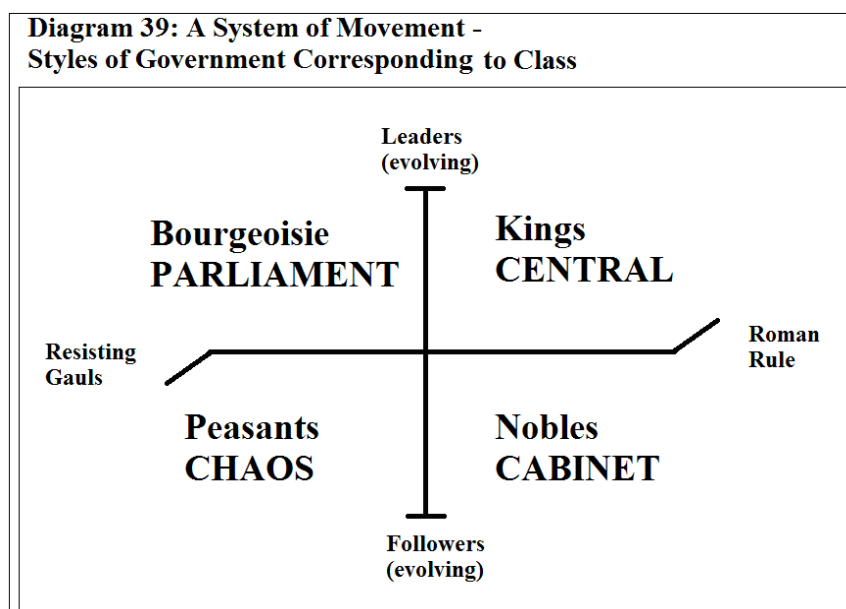
Diagram 37: System of Movement - Bourgeoisie and Peasants Relationships Displayed in Standard Cross



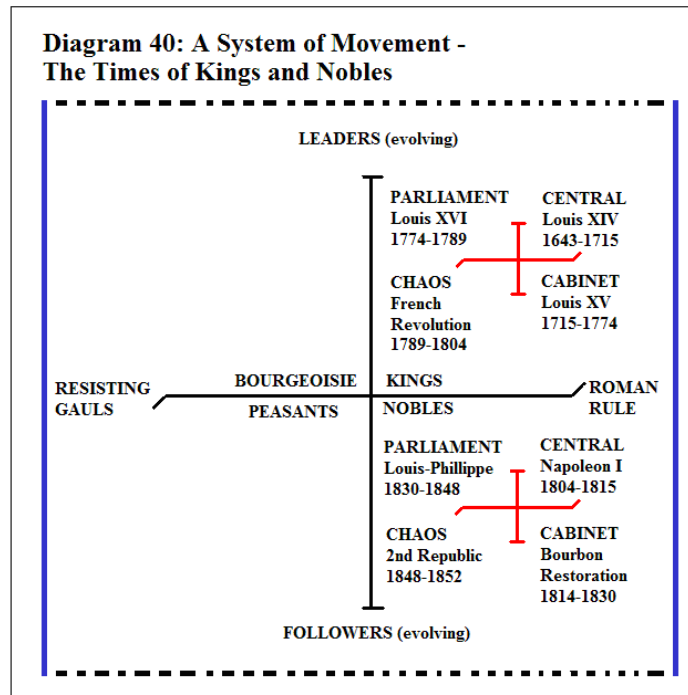
Collectively, each of these relationships can be placed around the initial classes as follows:



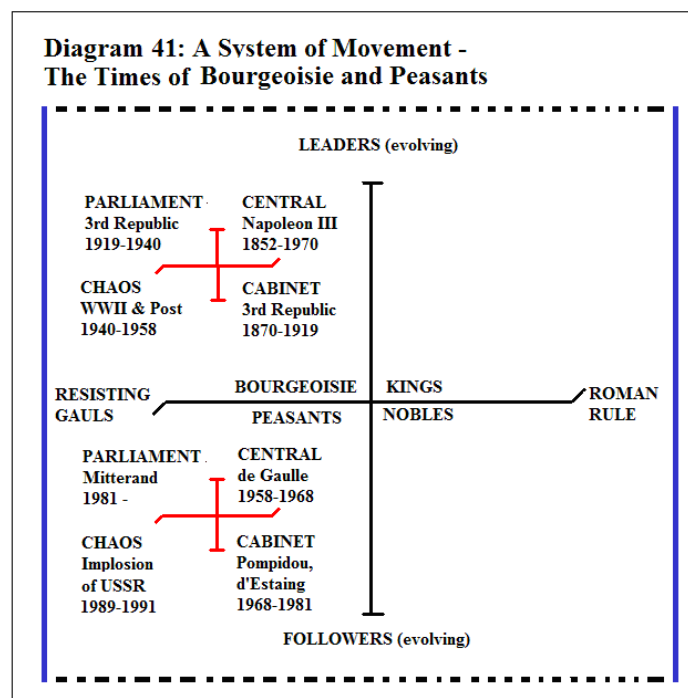
As these relationships have expressed themselves in modern post-Reformation government, we see embodied in the history of France each of four different points of view, representative of the tendencies and outlook of each class. To demonstrate the evolution of French governance, let us equate "kingship" with a centralized form of government; equate the "aristocracy" with a "cabinet" or "oligarchy" or "elitist" form of government; equate "bourgeoisie" with some form of parliamentary government; and equate "peasantry" with governmental chaos. We might delineate these four groups as political styles of leadership:



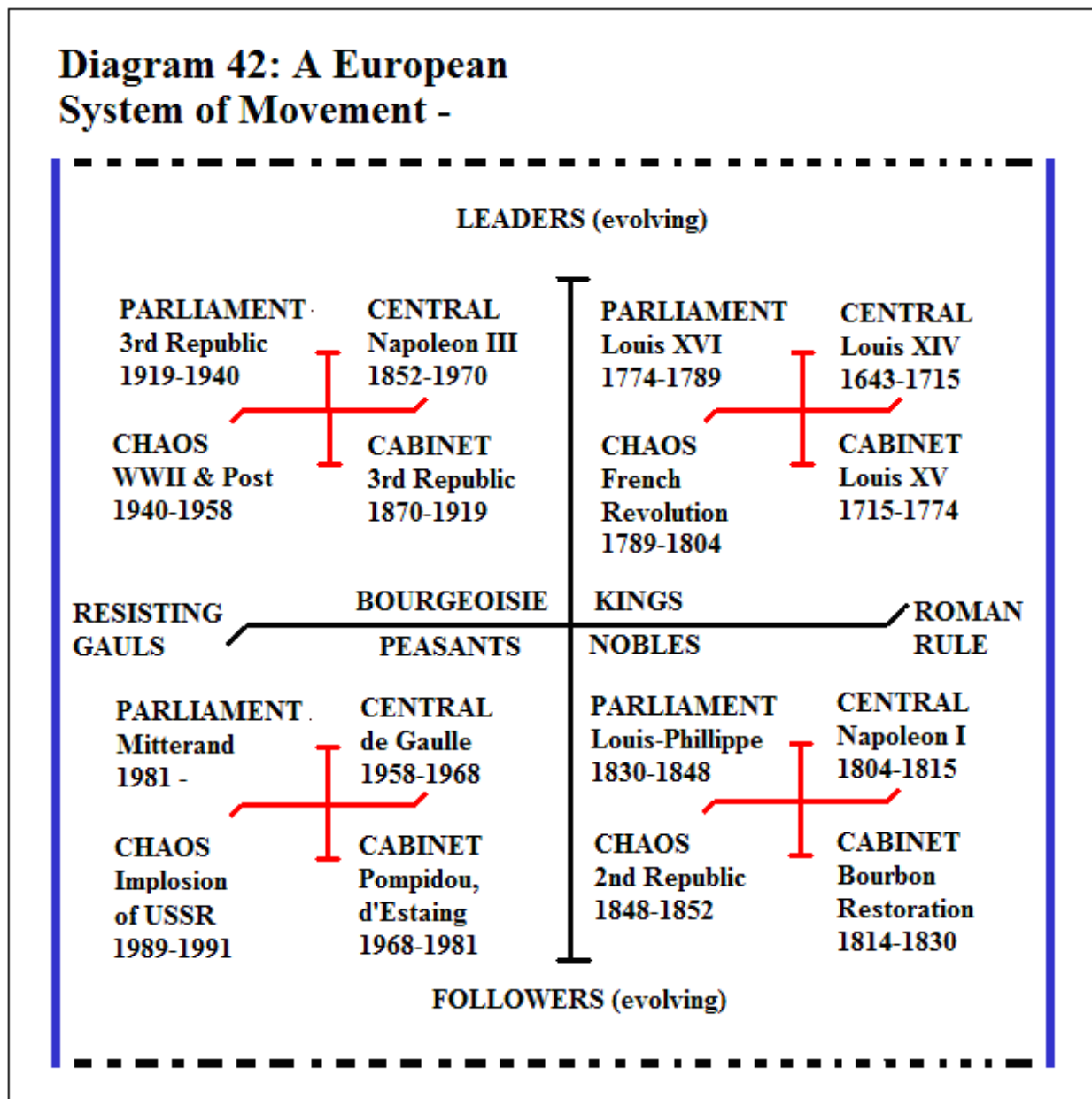
As demonstrated previously (see Diagram 25) this four-part division of style of governing has superimposed itself historically upon the original class system of medieval France, to wit the Romanized governing class, kings and nobles:



This in turn has been followed by the movement found within non-Romanized segments of the populace, the bourgeoisie and the peasantry of France.



To add consideration of the early dichotomies more specifically, we can state the entire system as follows:

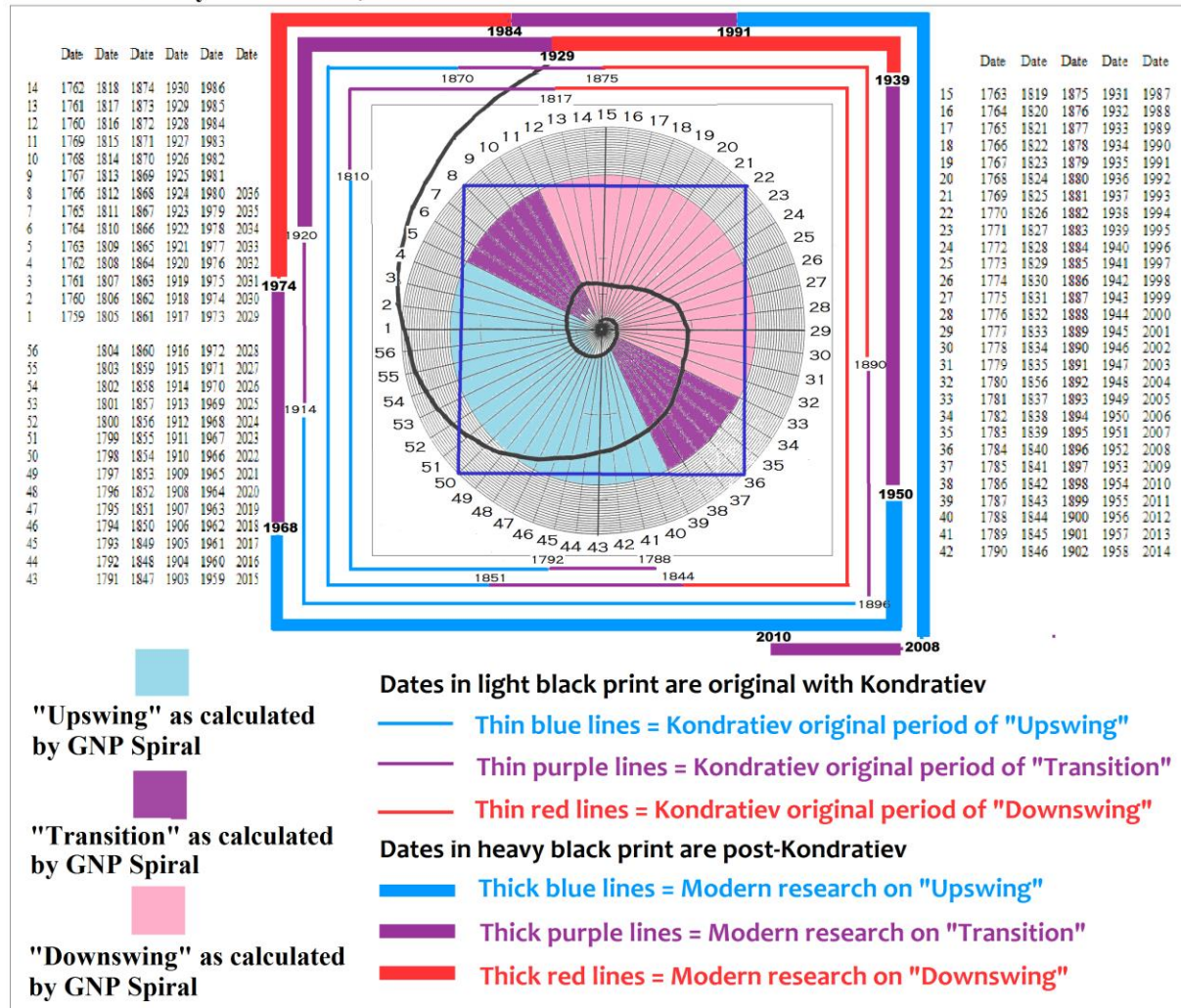


4.6 Comparison to Kondratiev Waves

The “system of movement” proposes a form of logic governing social development. In comparison, a chief difficulty facing Kondratiev Wave researchers is the consistency of dates for the cycle itself. The chart below aligns the GNP Spiral and the classic Kondratiev waves, with dates given by both Kondratiev and modern research.

Diagram 43: GNP Spiral as aligned with the Classic and Modern Kondratiev Wave

Source: Korotayev and Tsirel, 2010



If we juxtapose the aligned GNP Spiral / Kondratiev wave model with the European “system of movement” we may analyze three separate models simultaneously and potentially answer questions posed by each.

For example, let us consider the “periods of chaos” previously described in the European “system of movement” as periods of time during which European development:

- (1) releases a great deal of money into the general stream of world commerce, simply because the controls necessary to keep it locked in Europe are lacking during this period, and
- (2) finds more equitable, less restrictive ways of people living together, thereby consuming less energy with more efficiency and less waste.

Through the simultaneous juxtaposition of these three models we can see that the chaos of the French Revolution coincided with the general upswing of the period itself as noticed by Kondratiev. Referring to the diagram below:

1. The shaded yellow area within the European system of movement indicates the dates under discussion for events taking place in Europe and the model wherein they are found.
2. The shaded period within the GNP Spiral recalls the Phase A, Phase B and transition periods given previously for the period under discussion.
3. The increased heaviness of color in the square-based timeline connects the time period under discussion with the dates given by Kondratiev and their significance.

Considering the chart below, the rigid order imposed upon Europe by the royal prerogatives of the Bourbons ended in a “period of chaos” lasting from 1789-1804. During this period the energy liberated went directly into the “upswing” phase of the Kondratiev wave (see Kondratiev timeline) and the “revolutionary” outlook of the United States (see shaded portion in blue of the GNP Spiral). In particular, the United States benefited directly from the French chaos of this period in that the Louisiana Purchase of 1803 gave the United States uncontested French, Spanish and English claims to an enormous section of North America.

Diagram 44: Alignment of GNP Spiral, Kondratiev Wave and System of Movement - The French Revolution

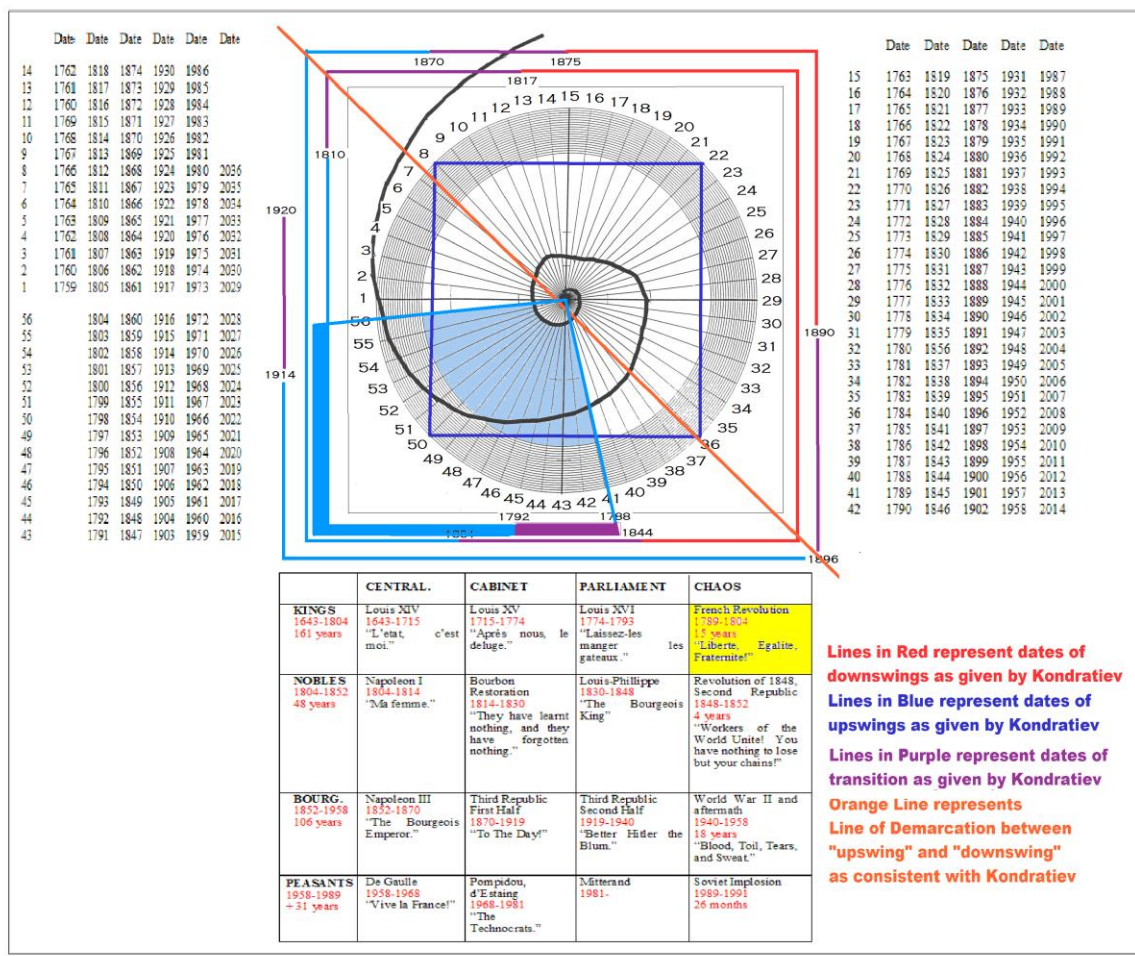


Diagram 42: A European System of Movement -

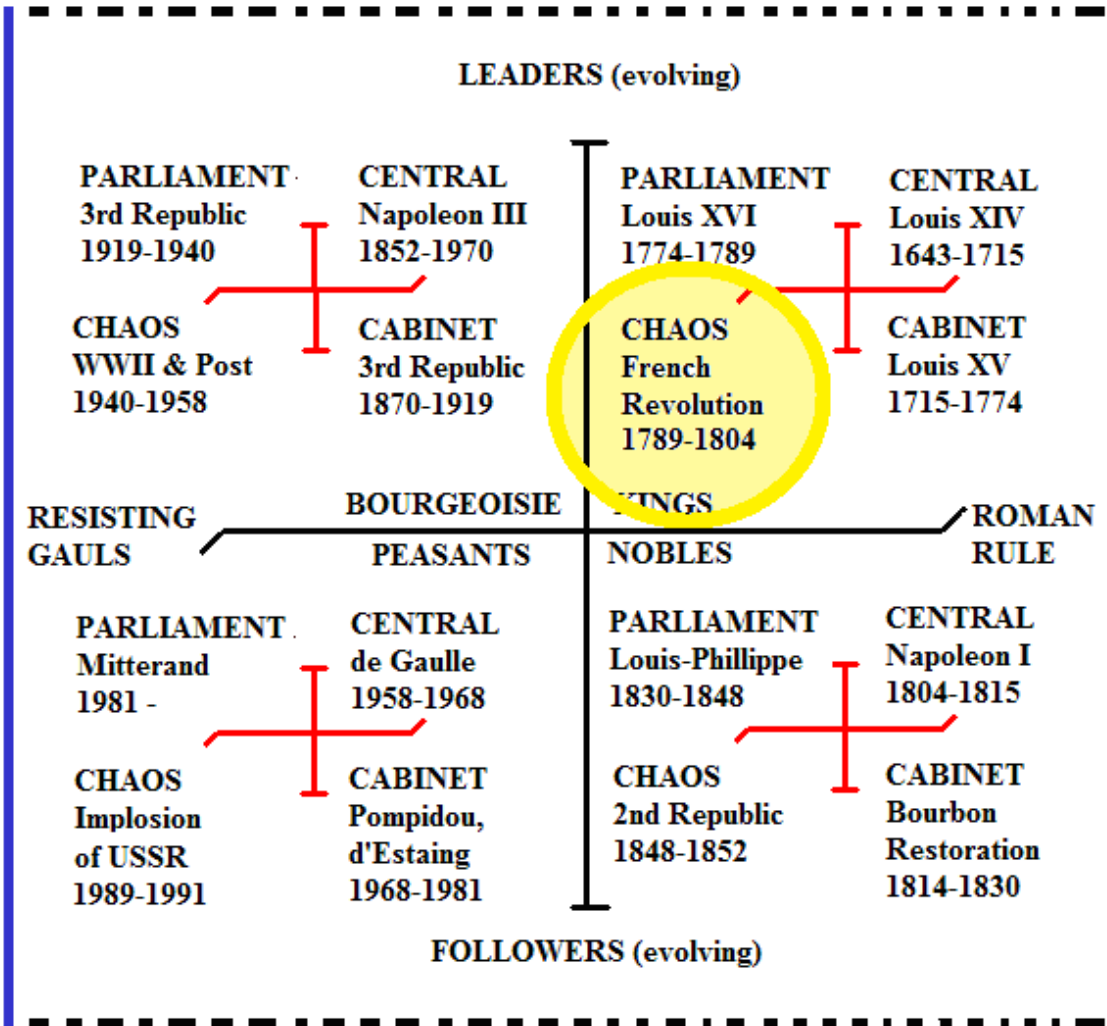
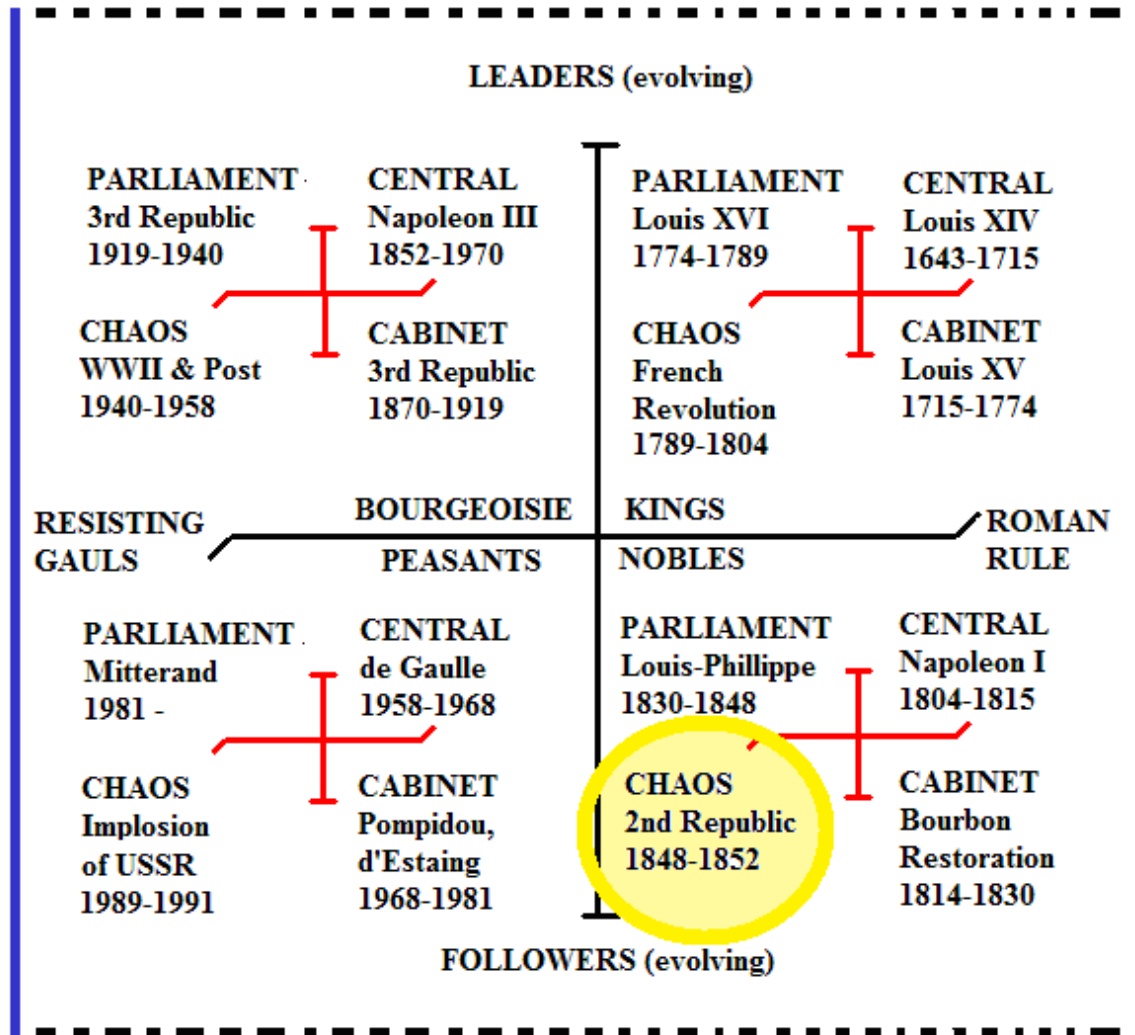


Diagram 45: Alignment of GNP Spiral, Kondratiev Wave and System of Movement - The Revolution of 1848



Diagram 42: A European System of Movement -



The situation is similar in the case of the Second World War and its aftermath. Modern research on Kondratiev Waves begins with a “transition period” at 1939, moving to an “upswing” at 1950. This “transition” period is quite contrary to the typical “downswing” under the classic Kondratiev thesis, as shown by the shaded red area within the GNP Spiral. Modern scholarship on Kondratiev waves brings the post-World War II period into an extended upswing period, as would be typical of the upswing period predicted by Kondratiev.

Diagram 46: Alignment of GNP Spiral, Kondratiev Wave and System of Movement - World War II and Aftermath - Source for Modern Kondratiev dates: Korotayev and Tsirel, 2010

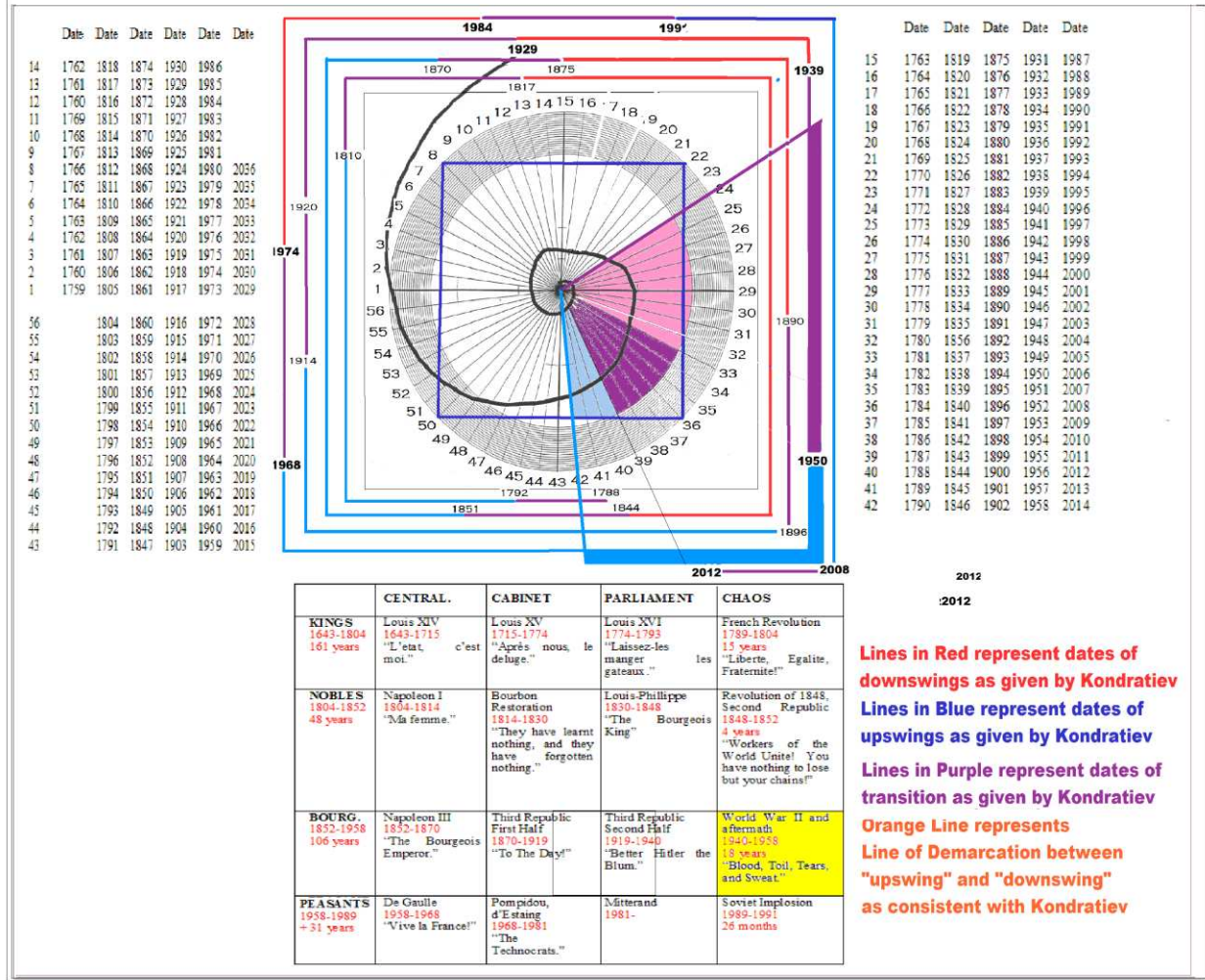
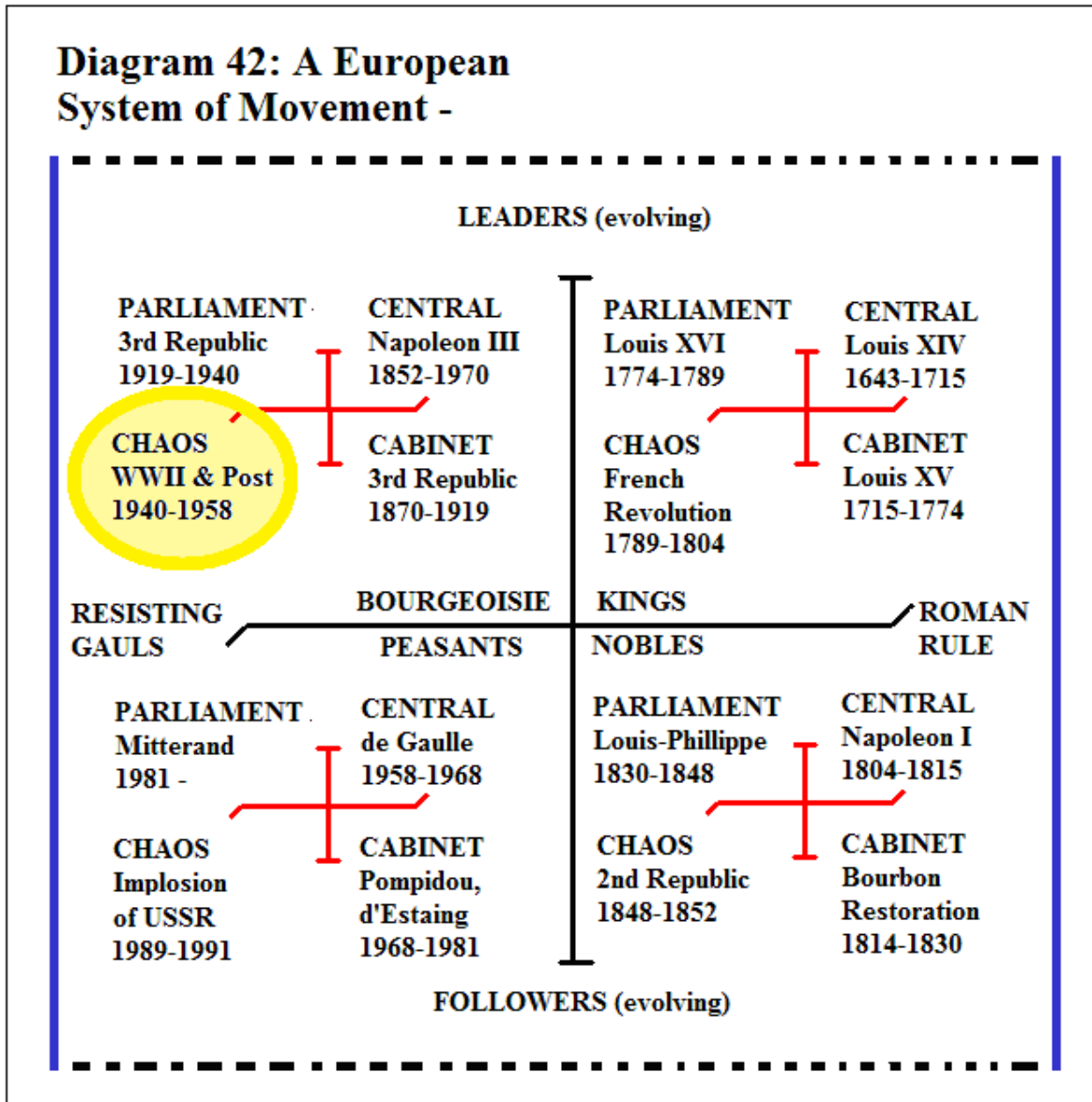


Diagram 42: A European System of Movement -



Viewing the matter from the point of view of the GNP Spiral, the European – and even global chaos – which engulfed the world during the Second World War and its aftermath brought about the collapse of much of the European imperial / colonial system. The monetary energy released into the global system during this period led to a wide variety of American alliances (NATO, SEATO, CENTO, etc.) to fill this void in counterbalance to Stalin and the Soviet Union. Not unlike previous periods of chaos, the disruption of the European global system contributed enormously to American power. And once again, the end of European chaos in 1950 coincided with a general upswing with a timing of dates in accordance with the classic Kondratiev wave.

In the previous three examples (Diagrams 44, 45, and 46) we have looked first to the European system of movement (highlighted in yellow), followed by secondary consideration of the relationships within the GNP Spiral (shaded areas of blue, pink and purple) and the classic understanding of the Kondratiev wave which may be affected by periods of European chaos (square surrounding timeline).

This approach may be reversed. In other words we may first investigate the dates given by modern Kondratiev scholars (the surrounding square-shaped timeline using thick lines) and look secondarily to the GNP Spiral (blue, pink and purple shading) and the European system of movement (in yellow) to obtain a more cogent insight with the use of these other models.

For example, the failure to recognize that two separate models are at work leads some modern research on Kondratiev Waves (Korotayev, Tsirel 2010) to hold that a very long period of “transition” runs between the period 1914-1929 wherein we move from “upswing” to “downswing.” This is a “transition period” of 15 years, more than one quarter of a 56-year cycle.

As this would be explored through the GNP Spiral and the system of movement model, this period coincides in Europe with the increasing decline of the bourgeoisie as it stumbles from World War I into chaos, while the United States lived out the end of an extremely revolutionary period. The denomination of this period as a “transition,” although accurate, is in reality an increasingly volatile situation wherein the three models are not in harmony with one another.

Diagram 47: Alignment of GNP Spiral, Kondratiev Wave and System of Movement -

Post-World War I and Roaring 20's - Source for Modern Kondratiev dates: Korotayev and Tsirel, 2010

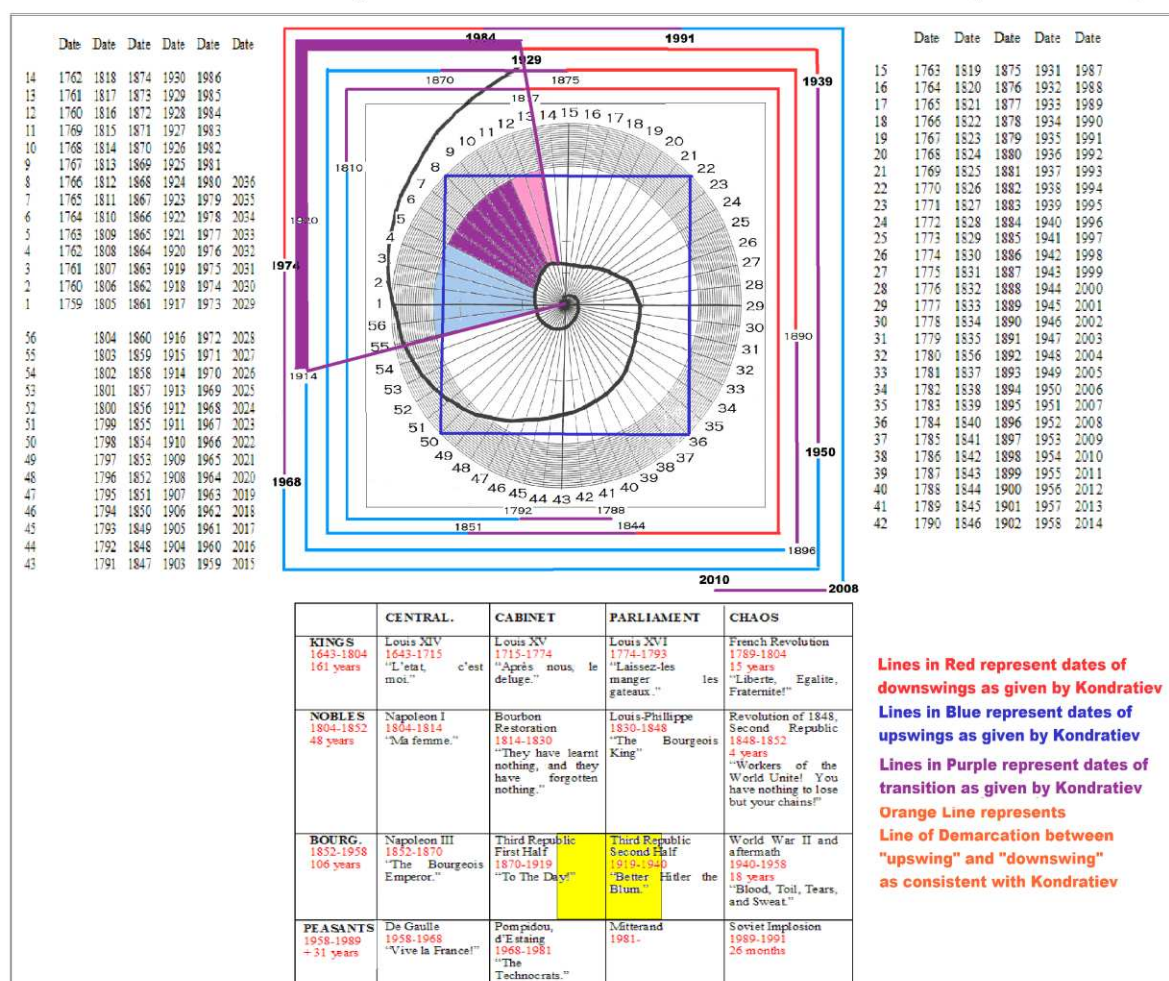
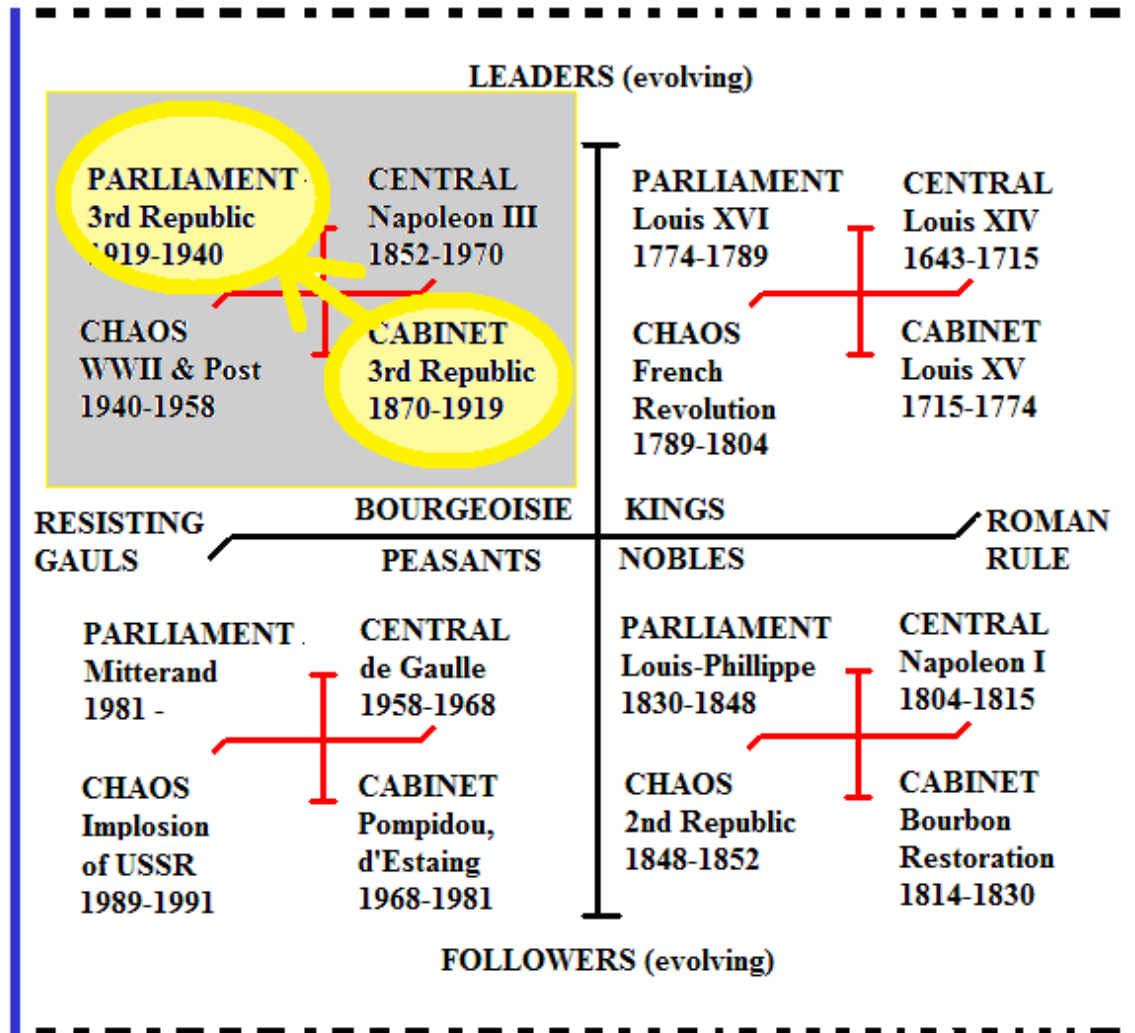


Diagram 42: A European System of Movement -



Referring to the 1970's, many Kondratiev theorists have dated a new downturn, this time beginning in 1974 and extending to 1984 (heavy red period of the square-shaped time line below). This is contrary to what one would expect during this period under the classic Kondratiev thesis (shaded area of blue, purple and red). As this might be considered in light of the GNP Spiral and the European system of movement, the revolutionary tendencies of this period in the United States given by the GNP Spiral (see supra, Introduction 1.B), coupled with the increasing divisions of Europe (below in yellow), indicate once again that we are considering three models which are not in harmony with one another.

Diagram 48: Alignment of GNP Spiral, Kondratiev Wave and System of Movement - Post-OPEC
- Source for Modern Kondratiev dates: Korotayev and Tsirel, 2010

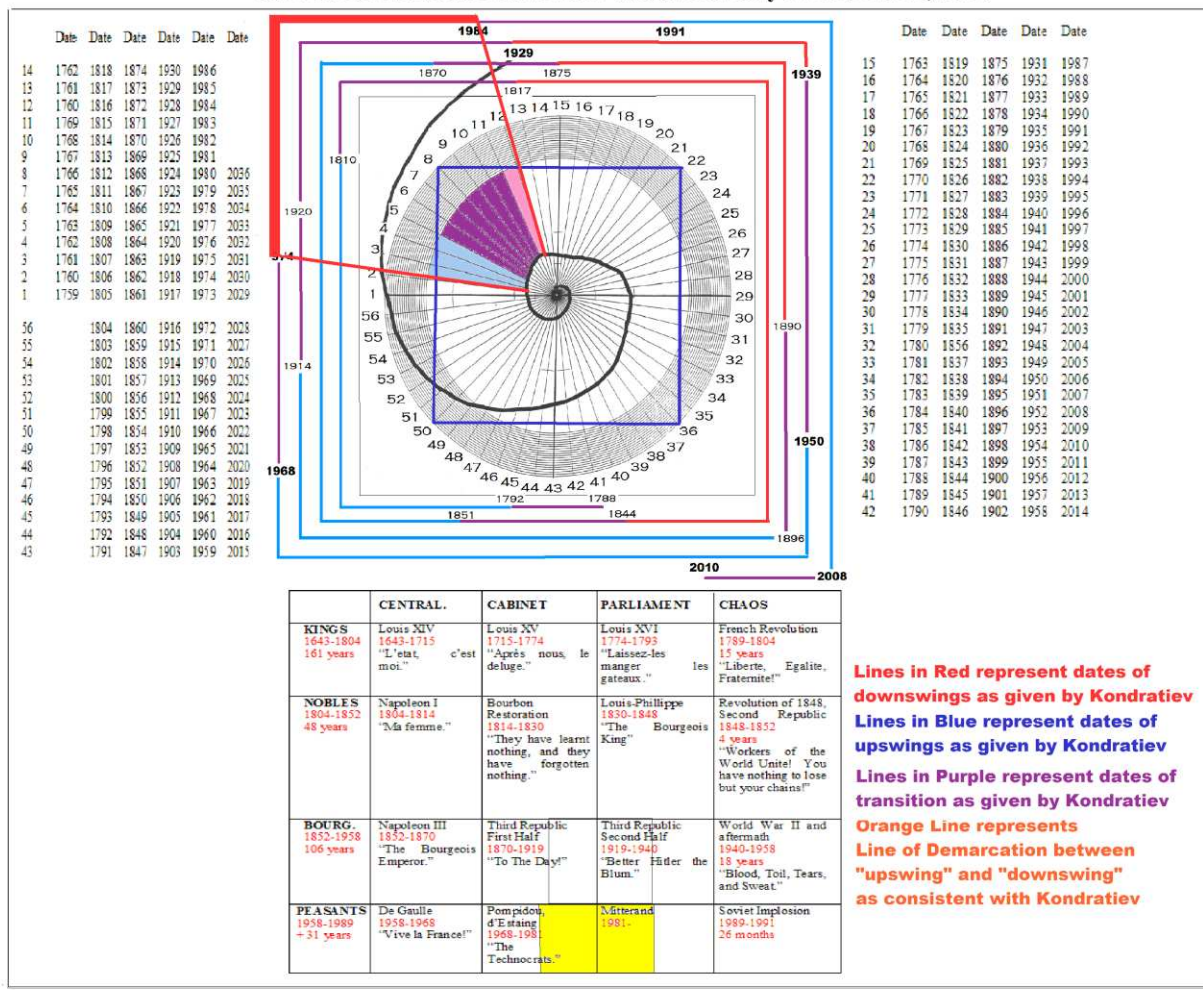
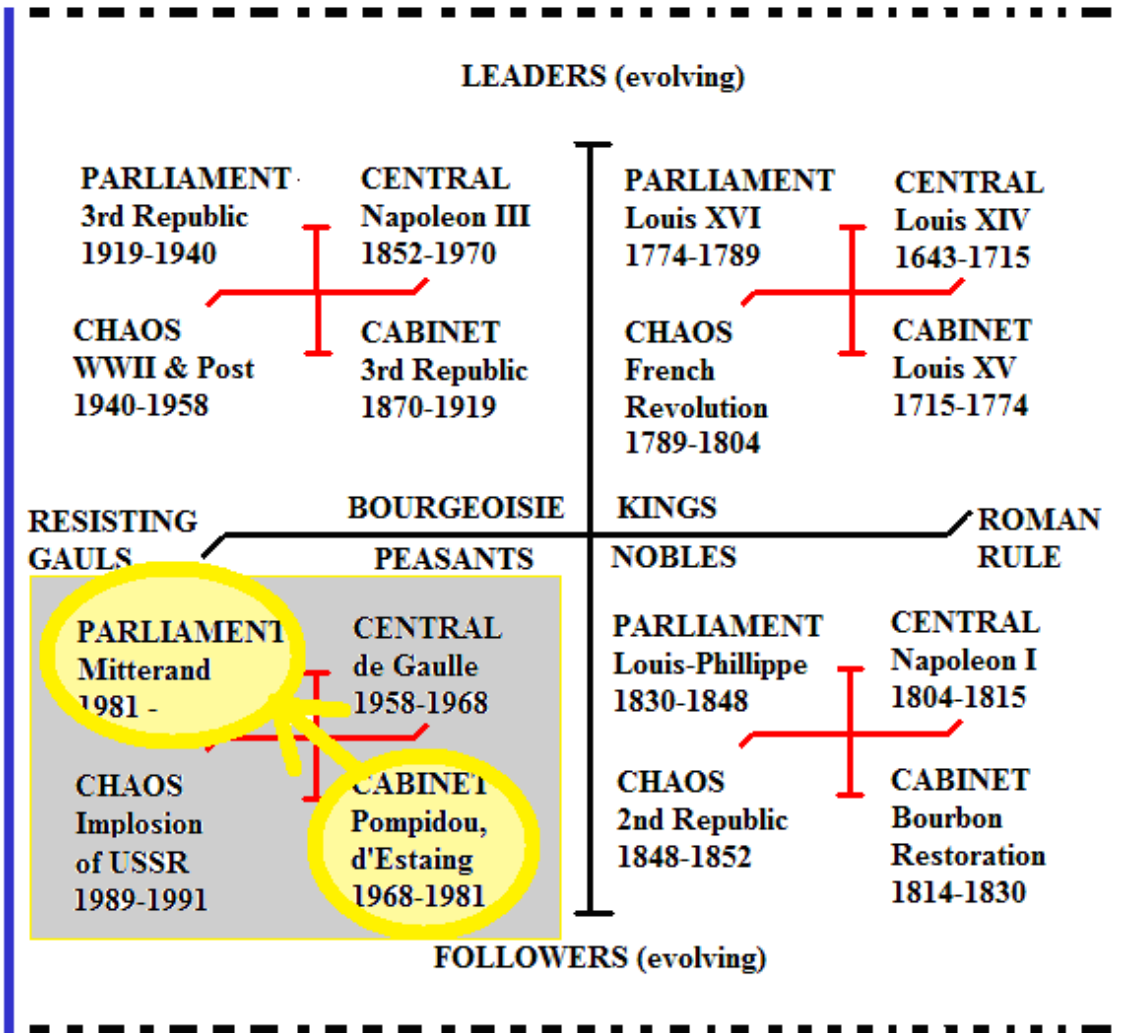


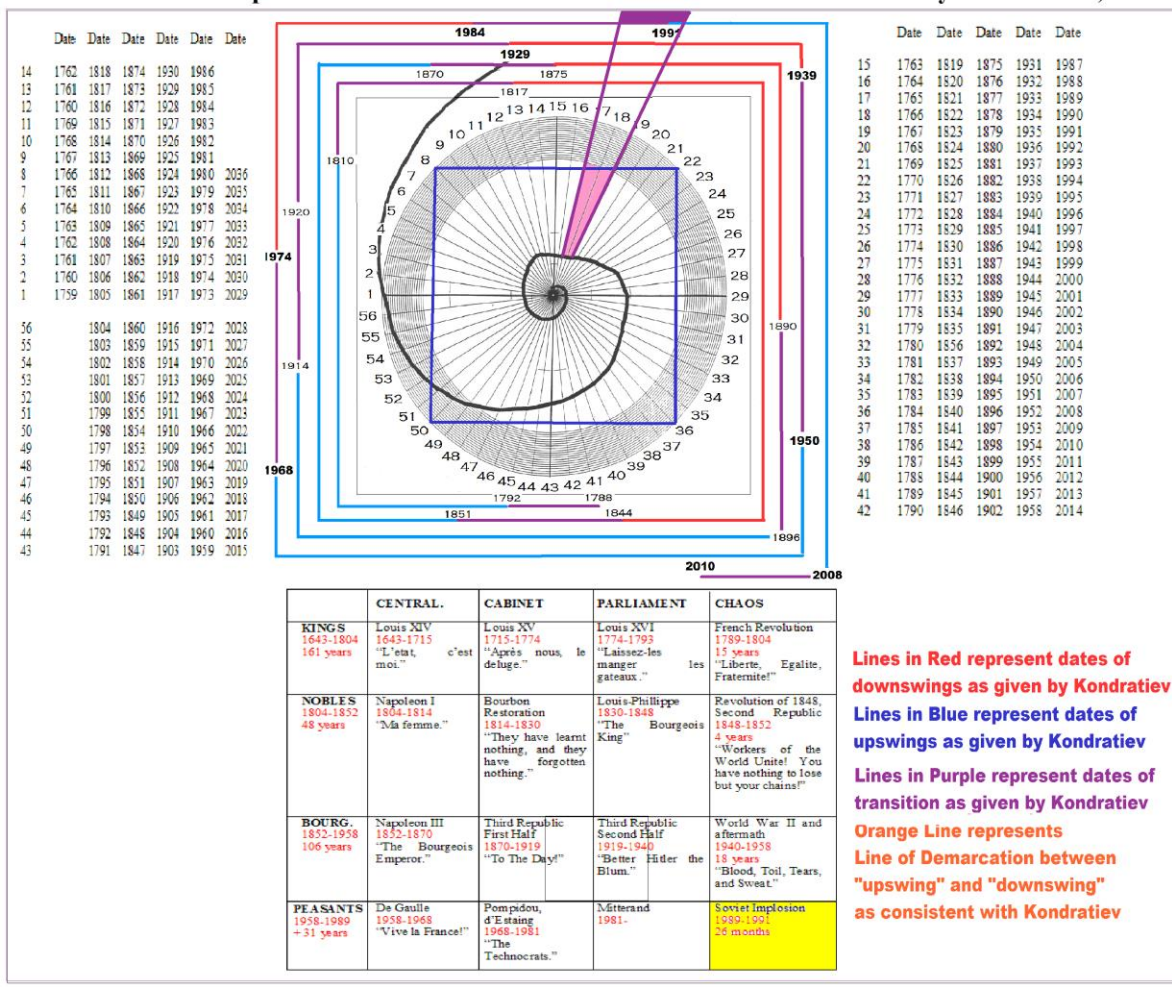
Diagram 42: A European System of Movement -



The implosion of the former Soviet Union between 1989-1991 is the last “period of chaos” we consider. Unlike previous periods of European chaos, the collapse of this government came just as the central depth of a projected downswing was beginning (shaded red area below).

At this juncture two periods – Medieval, Modern – of the European “system of movement” are complete. It is interesting that the last date of the system, December 25, 1991, Christmas Day, originated as the date of the Roman Saturnalia, the Festival of Saturn, the God of Time.

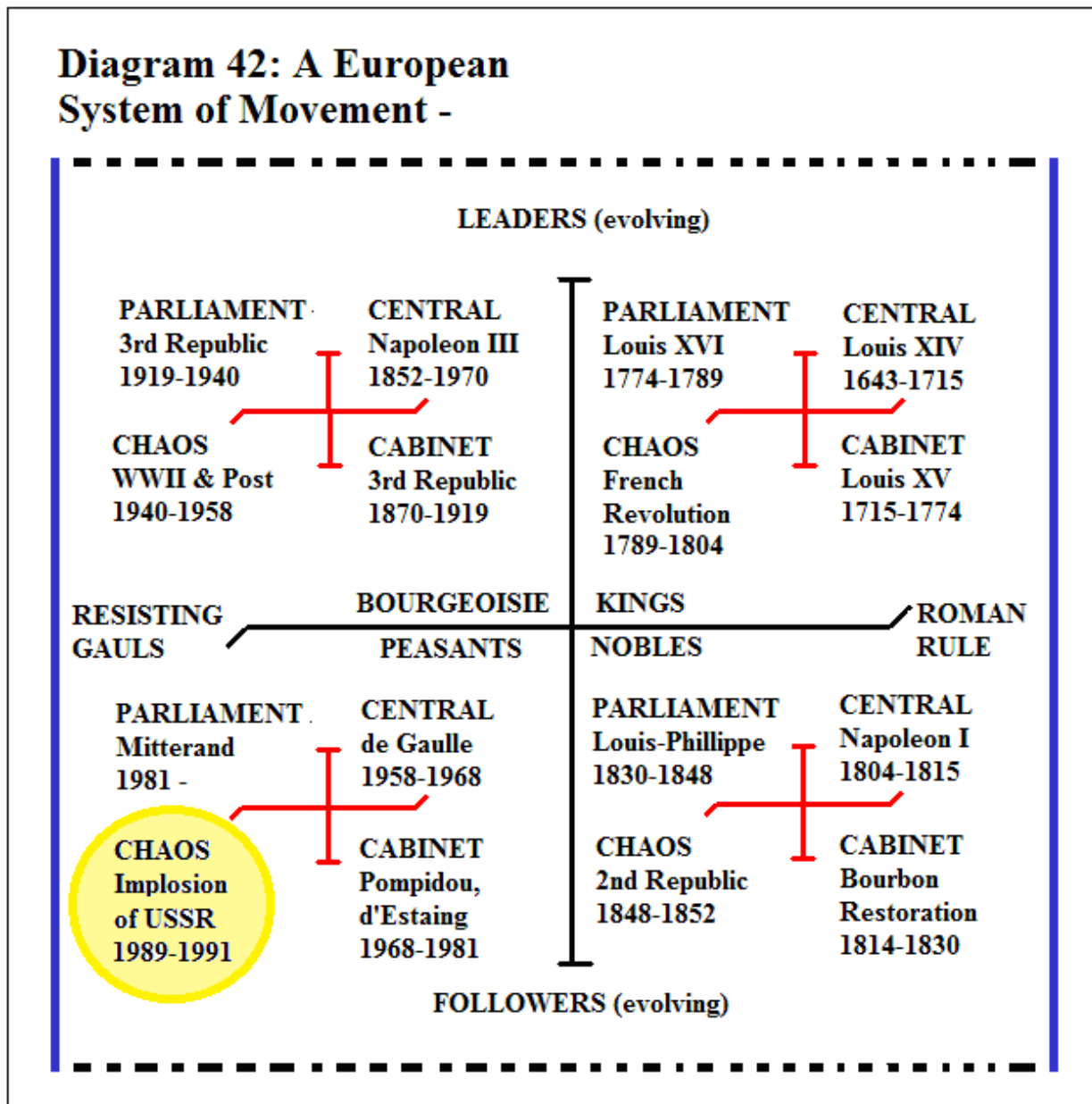
Diagram 49: Alignment of GNP Spiral, Kondratiev Wave and System of Movement - 1989-1991 Soviet Implosion - Source for Modern Kondratiev dates: Korotayev and Tsirel, 2010



Five hundred years prior to this date we come to December 25, 1491, the last Christmas of the Middle Ages before Columbus set sail to discover modern times.

And 1500 years prior to this, 2,000 year to the day prior to the implosion of the USSR, in 10 b.c., the Emperor Augustus moved a 30 meter, red granite pillar topped by a pyramid point - the obelisk of Psammetichus II (595-589 b.c.) - to its central place in his Solarium Augusti in Rome. It is an amazing coincidence that exactly 2000 years to the day prior to the collapse of the Soviet Union on Christmas Day, 1991, using this ancient Egyptian obelisk as gnomon, Augustus constructed a sundial to keep time for the world, dedicated it to the Sun and celebrated its first Saturnalia. It stands today in the Piazza Montecitorio.

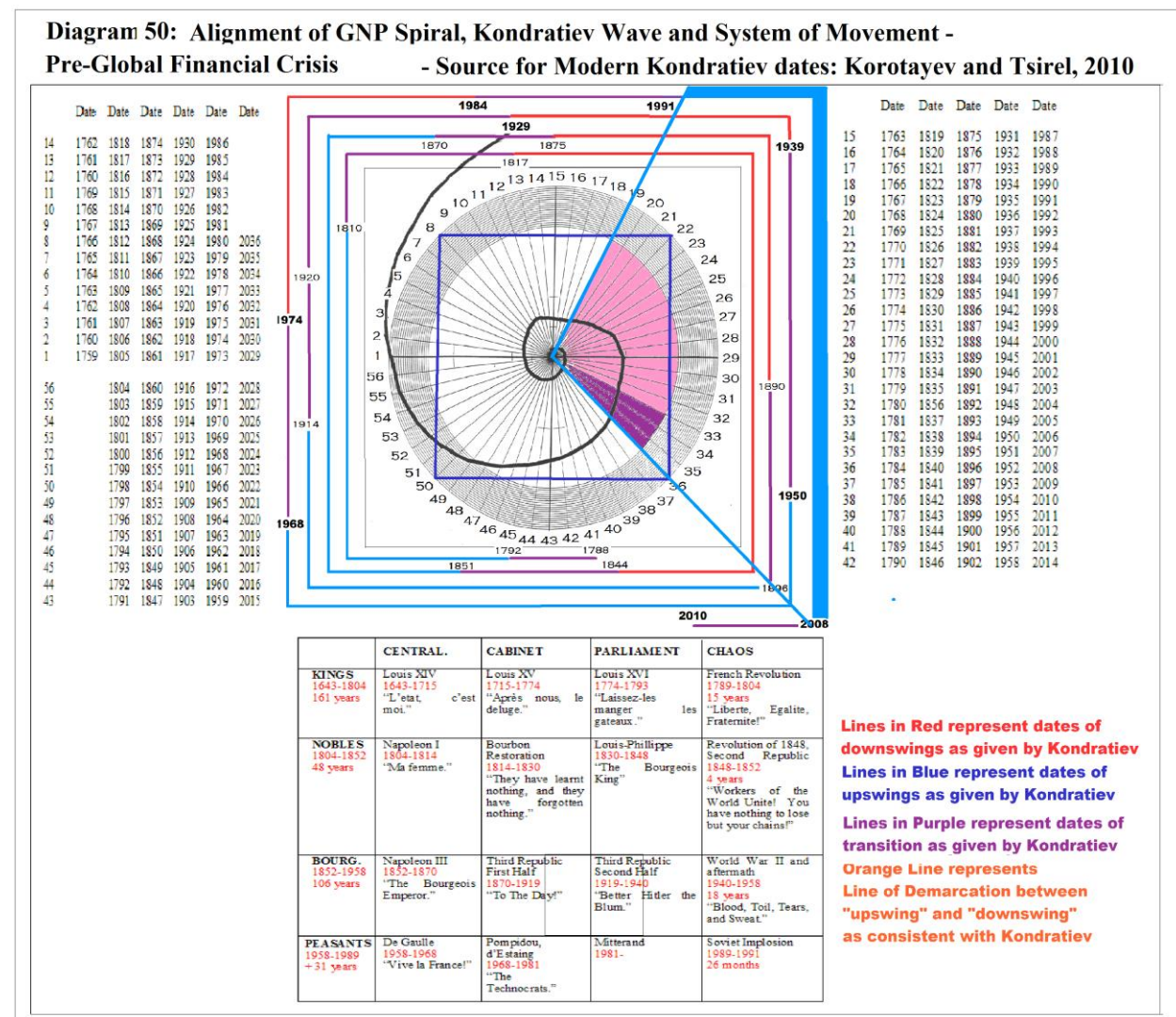
Diagram 42: A European System of Movement -



The American social, military and economic energy released from its mission of blocking the Soviet Union was “transitional” only in the most understated sense of the word. (see previous chart) Rather the Soviet implosion turned an expected downswing into an era of upswing, according to modern Kondratiev theorists.

Considering Diagram 50, one result of the timing of this final European “period of chaos” is that the liberalized flow of money and the increased efficiency which are typically associated with revolution took place during an expected Kondratiev downswing and a consolidating period of American history. The sudden freedom usually experienced by Americans when chaos has engulfed the European class system turned in this case towards a dramatic push towards conservatism and aggrandizement in the United States.

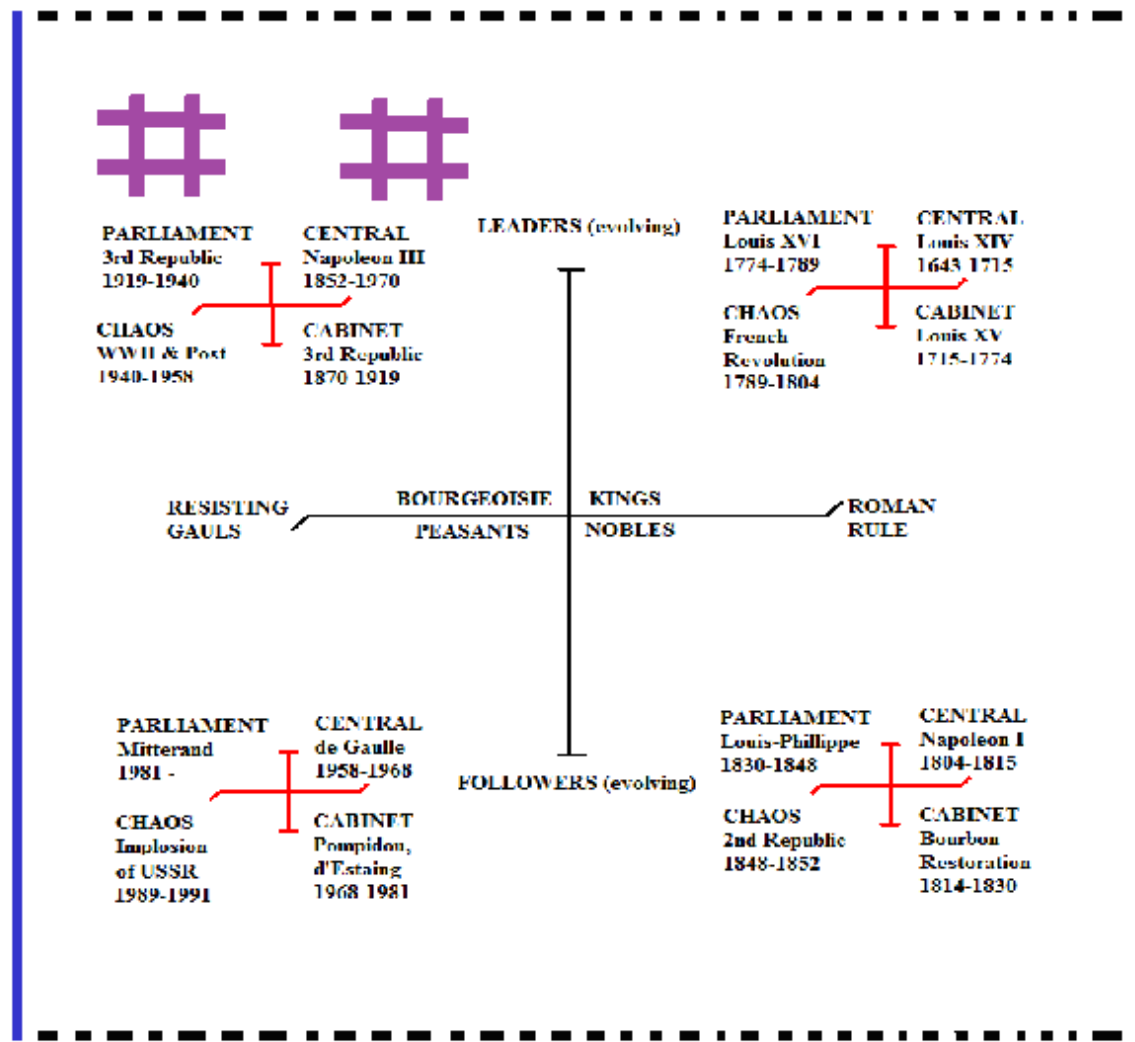
This in turn has led to a willingness, or perhaps simply “need,” to super-charge the development of the economy during what typically would have been anticipated to be the end of a downswing economically. As these annual GNP figures exceed a 3.4969% annual increase over time (see Albers & Albers, 2011, footnotes 9 and 10), a balancing factor may be expected to set in 14-years later, i.e. sometime after 2005.



If we begin to analyze what may be the next “rhythm” of history, we might note that the first section of time, stemming from 10 b.c. to 1492, a period of exactly 1500 years is followed by a rhythm of time one third this amount, i.e. 1492 to 1991. It may be that the next “rhythm” of time may be of much shorter duration per term.

If we note that a period of 18 sections follows upon 1991, we might add $1991 + 18 = 2009$. If we are translating these patterns into years, we might note that the collapse of the Euro began with the Global Financial Crisis in 2008, and quickly turned into a European debt crisis. This would appear to be consistent with the pattern explored previously wherein the United States also passes through a set period of time wherein enormous expansion takes place, these being Years 1 through 7.

Diagram 42: A European System of Movement -

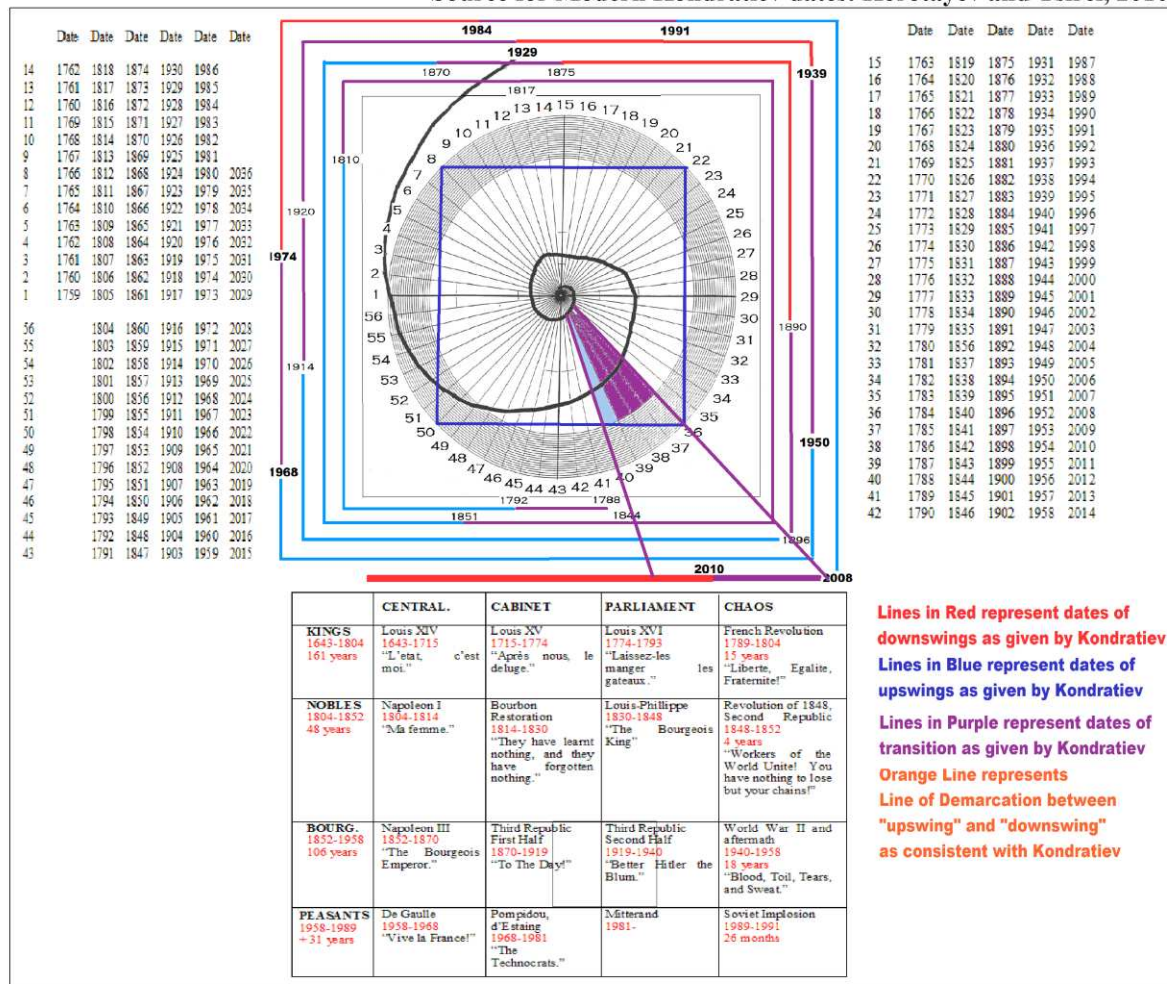


Considering Diagram 51 below, it is suggested today that we have now entered into a “transition period” of some unknown length. At this juncture modern researchers in Kondratiev waves present significant contradictions to the classic plan of Kondratiev. On the one hand, and according to the expectations of the classic Kondratiev wave, it would be presumed that we are transitioning to a period of upswing (see shaded area below). Nevertheless, in light of the previous extended run of “upswing” (1991 through 2008), we should – contrarily – be transitioning to a future downswing. Such a downswing is entirely opposite the expectations previously experienced at the southeast corner of the model.

Diagram 51: Alignment of GNP Spiral, Kondratiev Wave and System of Movement -

Post-Global Financial Crisis

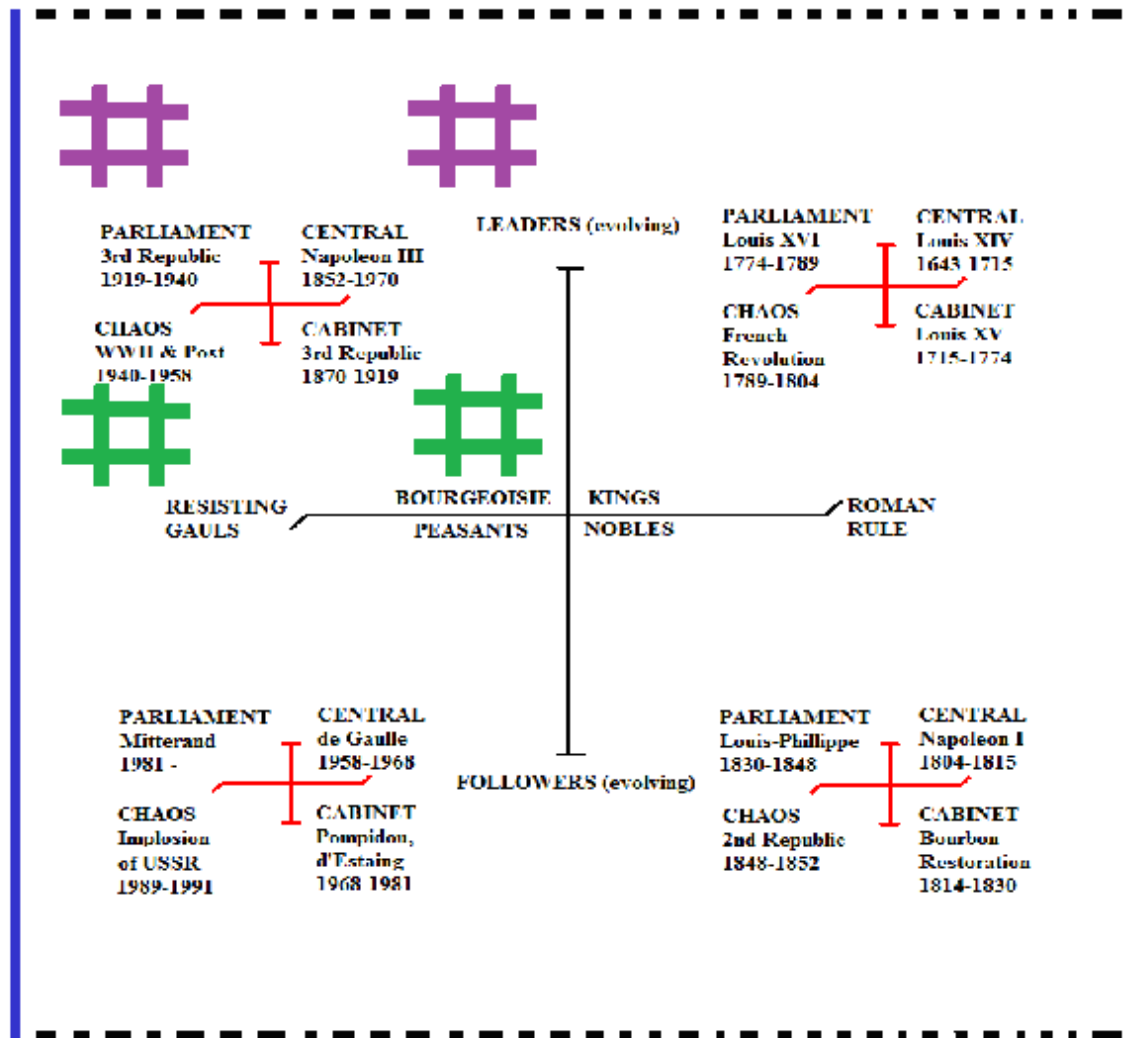
- Source for Modern Kondratiev dates: Korotayev and Tsirel, 2010



If it is true that we are now on a rhythm of time which goes from year to year, we might add 18 years to 2009 for a date of 2027. During this 18 year period one would expect a “meltdown” of the European system akin to the meltdown which accompanies Years 8 through 14 in the national economic history of the United States.

As this would be considered in light of GNP Spiral analysis in connection with the termination of this stage of the system of movement for Europe, it would appear that the inability to accommodate the downturn typically associated with this preceding period has pushed the melt-down date of 2005 to the very end of the 14-year period of consolidation, thereby bringing two terminating models together simultaneously. This confluence appears to be at the heart of the present Global Financial Crisis thereby confusing the present period of time.

Diagram 42: A European System of Movement -



Conclusion

If the year 2027 is the final year of the present European uncertainty, then it must be clear that a new and much more strict system is likely to be put into place. This is associated with the year April 9, 2029 in the national economic history of the United States. Perhaps, as these two years conjoin into the political and economic events of that period, Europe will approach a very great “coming revolution,” one which will clearly be different from those which have taken place to date.

As to the present and future status of Europe, it would appear obvious that further research in “systems of movement” are in order. As to the classic Kondratiev Wave, the Arab Spring and revolutions taking place throughout the Middle East since 2009 have reasserted the value of Kondratiev’s thesis in its original sense. The timing of these revolutions could not be more perfect as to the current predictions of the GNP Spiral or the original and still deeply significant work in 1925 by N. Kondratiev.

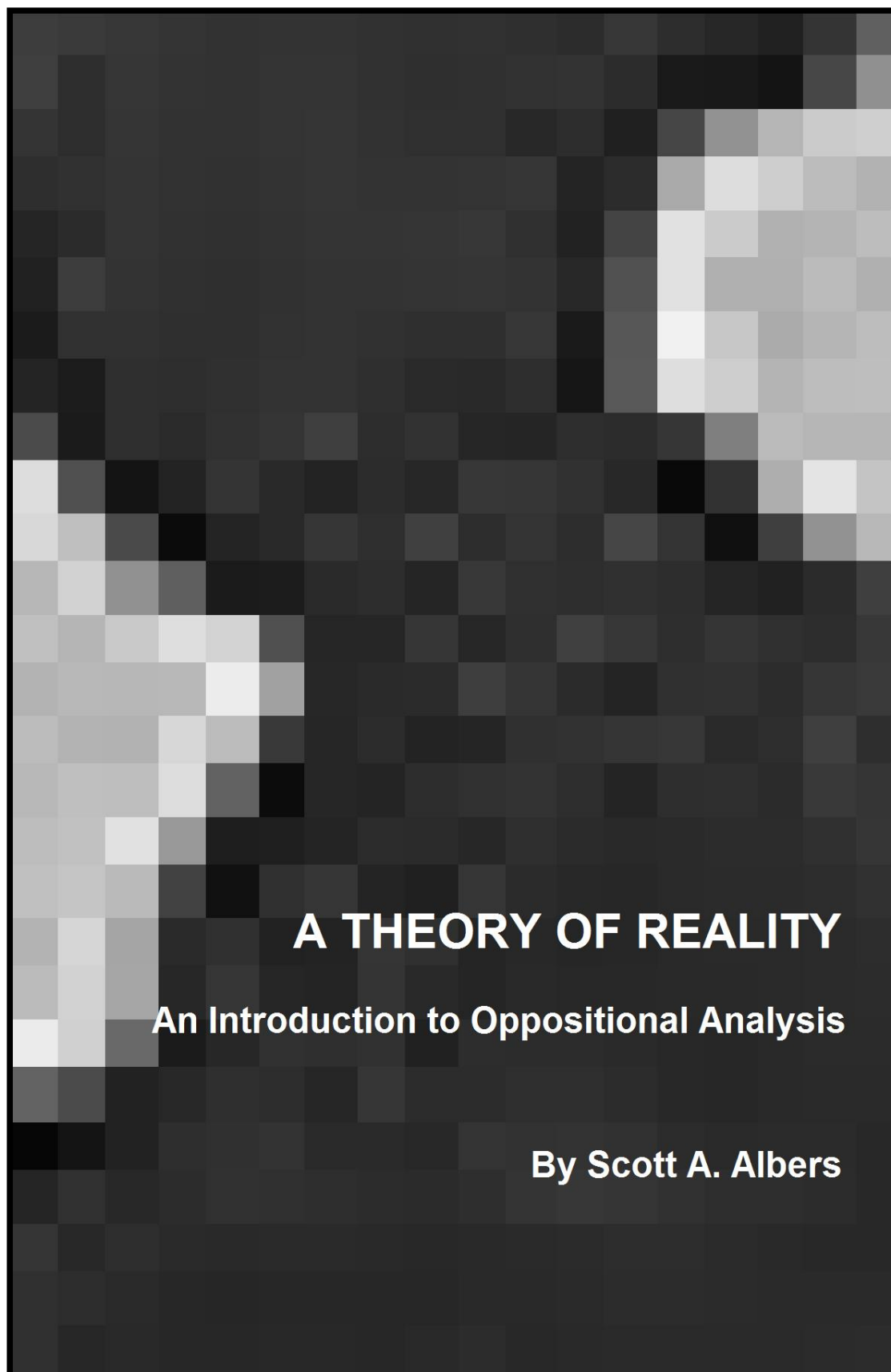
These three models – The Kondratiev Wave, The GNP Spiral, and the “system of movement” of European culture – are used to analyze potential patterns in French history. More broadly, they provide a sense of European cultural development as a pattern. This history has shape, dimension, a plan, a logic. This logic was noted by Alexis de Tocqueville in his book *Democracy in America*, first published in 1835. In his Introduction he describes briefly the fundamental direction of French History from 1100 to his day.

In perusing the pages of our history, we shall scarcely meet with a single great event, in the lapse of seven hundred years, which has not turned to the advantage of equality. ... Nor is this phenomenon at all peculiar to France. Whithersoever we turn our eyes we shall witness the same continual revolution throughout the whole of Christendom.

The various occurrences of national existence have everywhere turned to the advantage of democracy; all men have aided it by their exertions: those who have intentionally labored in its cause, and those who have served it unwittingly; those who have fought for it and those who have declared themselves its opponents, - have all been driven along in the same track, have all labored to one end, some ignorantly and some unwillingly; all have been blind instruments in the hands of God.

The gradual development of the equality of conditions is therefore a providential fact, and it possesses all the characteristics of a Divine decree: it is universal, it is durable, it constantly eludes all human interference, and all events as well as all men contribute to its progress.

If ratios and predictable dates may be associated with the rise and fall of governments; if revolutions may be anticipated as prolonged or rapid; if history repeats its patterns on a consistent basis with a clear logic; if these are true, then the “consciousness” of Europe - the history presented herein - may be part of an underlying logic applicable to all forms of evolution or change.



A THEORY OF REALITY

An Introduction to Oppositional Analysis

By Scott A. Albers

Introduction

Oppositional Analysis proposes a number of dichotomies through which one may analyze and understand systematically the structure of every level of reality. Based upon the circuit given for a musical note (see Introduction to Volume 2) and the circuit of being which will be introduced herein, a model supporting five dimensions as suggested by Theodor Kaluza may be proposed. I suggest that these dichotomies may underlie the unity created by Kaluza's work between General Relativity and Maxwell's equations for electro-magnetism.

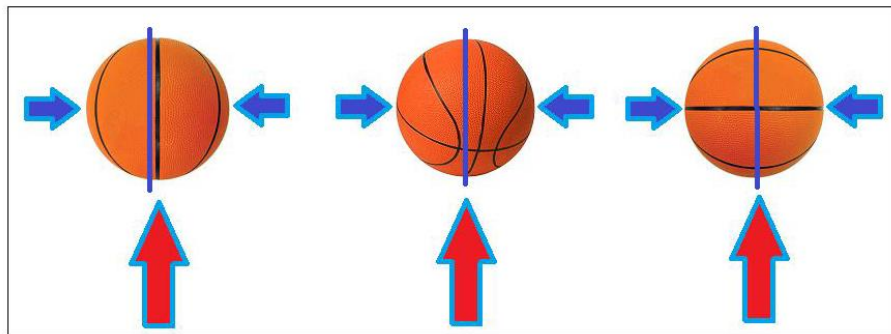
One may contemplate a fifth dimension, as added to the three dimensions of space and one of time studied in physics, if we first imagine a basketball floating in a pool of water. If the basketball is spun in the water as one holds the ball at two fixed points (blue arrows below), it is clear that the image of the equator of the ball will be quite different depending upon the poles chosen, even using the same direction of spin for each of the balls.

Referring to the basketball on the left, the basketball's equator (in black) will appear to be a steady, straight line, one which is parallel to the equator of spin (in blue).

Referring to the basketball in the middle, the basketball's equator (in black) will appear to wobble back and forth, forming a wave around the equator of spin (in blue).

Referring to the basketball on the right, the basketballs' equator will appear to be a set of flashing, solid lines (in black) perpendicular to the equator of spin (in blue).

In this way one may say that the equator of spin of the basketball is *relative* to the points chosen at which to hold the ball (poles, longitude) as it spins. Similarly one may say that the poles of the ball (longitude) are *relative* to the direction of the spin itself (latitude).

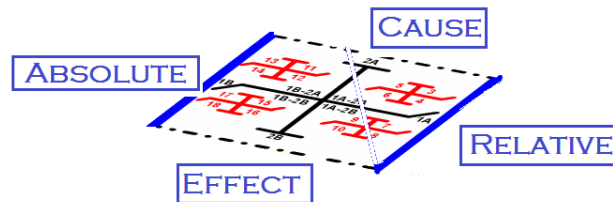


On the other hand the diameter of the ball is fixed at all times, and the area of the surface of the ball is directly related to the diameter. We may contrast the fixed nature of these properties by referring to them as *absolute*. The ball does not change its diameter or surface area based upon the points arbitrarily chosen as its poles, nor based upon the equator of spin.

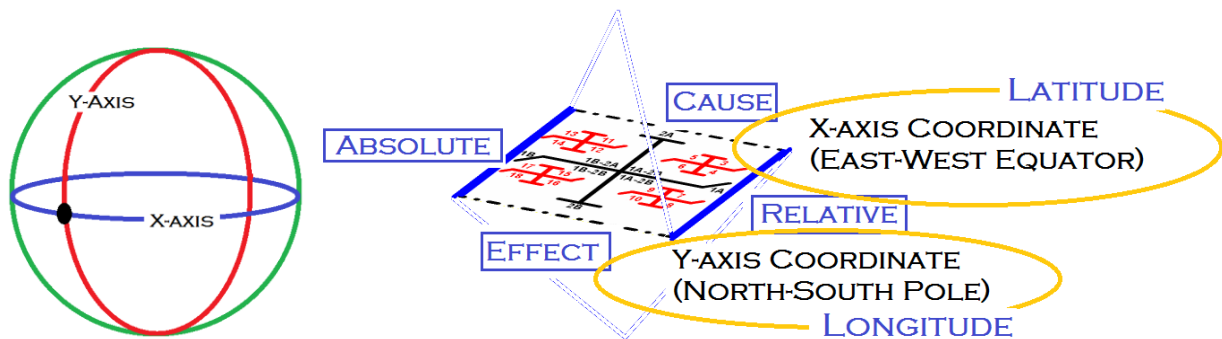
The logic of this set of relationships may be used to explain why, according to Einstein, there are four dimensions which are essential to our understanding of reality. This logic may be expanded to provide a place for a fifth dimension – one of “in - out” – which may be considered as the fifth dimension of consciousness.

In this brief introduction I present the dichotomies proposed by Oppositional Analysis as applied to the number of dimensions which we experience as human beings. These relationships will be developed at length throughout these essays. They are given here for the purpose of prompt exposition.

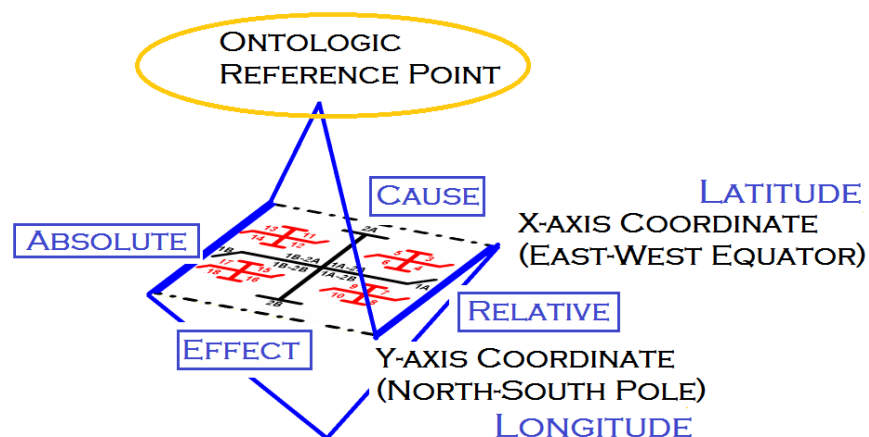
(1) The Primary Opposition of our understanding of physics is the distinction between (1) that which is Relative vs. (2) that which Absolute. The Secondary Opposition is the distinction between (3) Cause and (4) Effect. These are in blue. The study of these dichotomies will be referred to as “Oppositional Analysis.”



(2) As we look at a statement of reality obtained from just walking on earth, a sphere, we have the equator as an east-west “x-axis” (latitude, a geometric figure with no endpoints) and the poles as a north-south “y-axis” (longitude, a geometric figure with two endpoints). Using these relative positions every point on the surface of the sphere can be located.

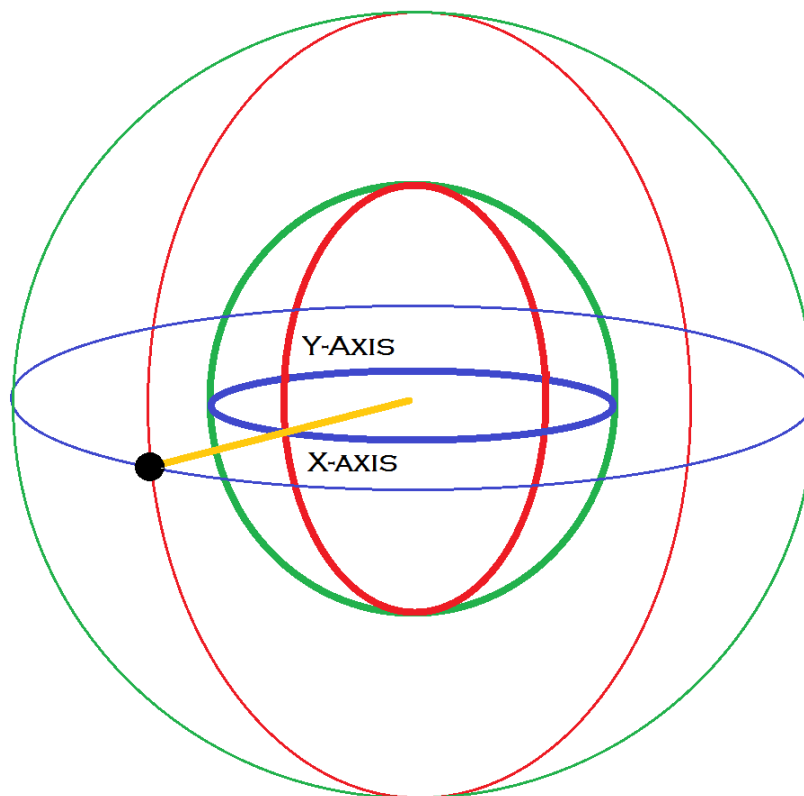
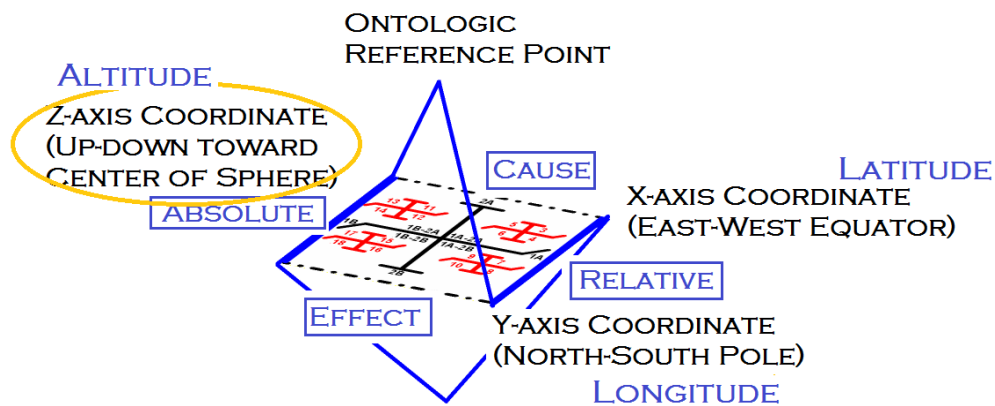


(3) These two positions state a Relative Cause (x-axis coordinate) and a Relative Effect (y-axis coordinate) which, in combination with each other, create the initial “point” of reference for the sphere. I use the term “relative” because the sphere may use any circumference as an equator and thereby indicate an infinite number of point-pairs as north-south poles.

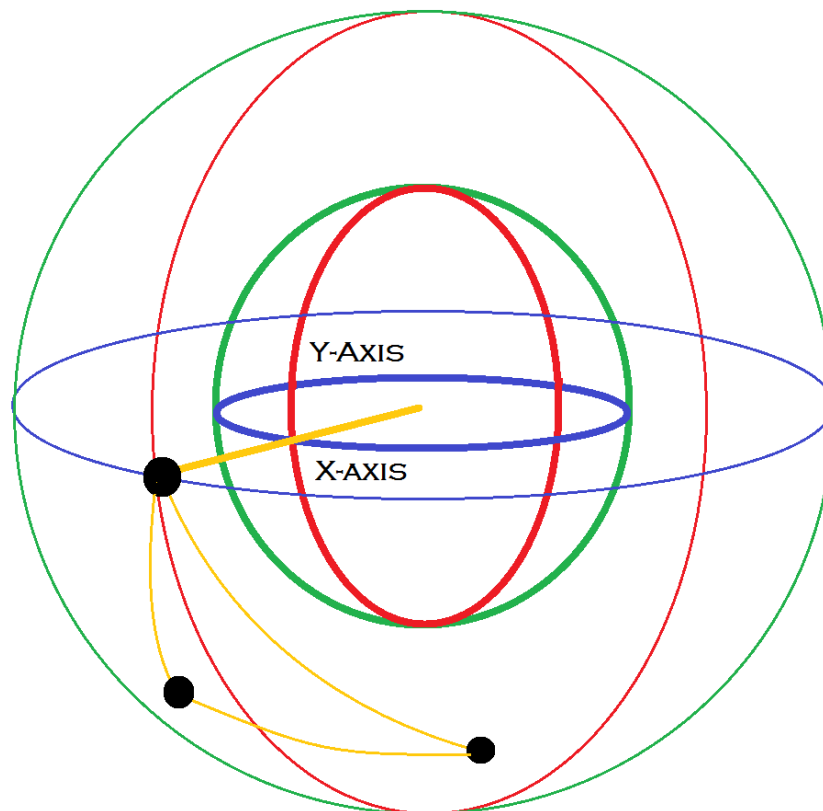
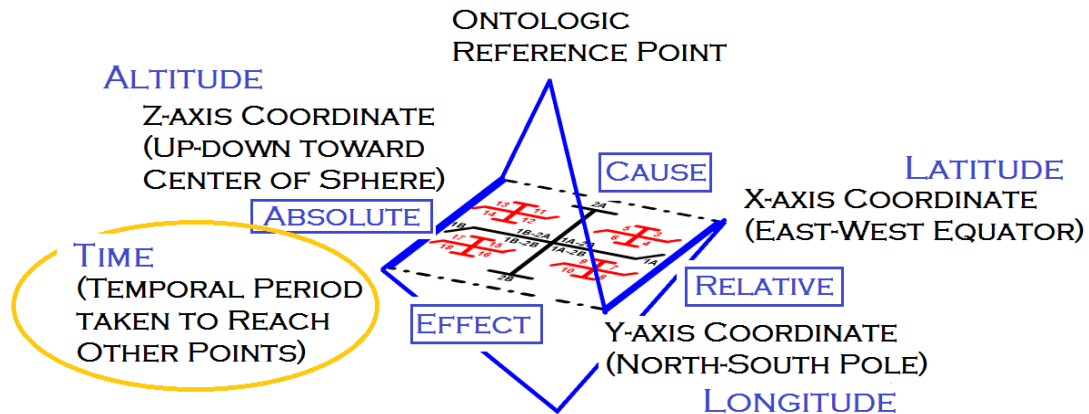


(4) Oppositional Analysis next requires an “Objective Cause,” this being the distance from the point in question to the center of the sphere. I refer to this as “Objective” because there is a single point – one and only one point - from which this distance is measured (the center of the sphere). As this is applied vis-à-vis the Cartesian coordinate system we have a straight-forward up-down axis.

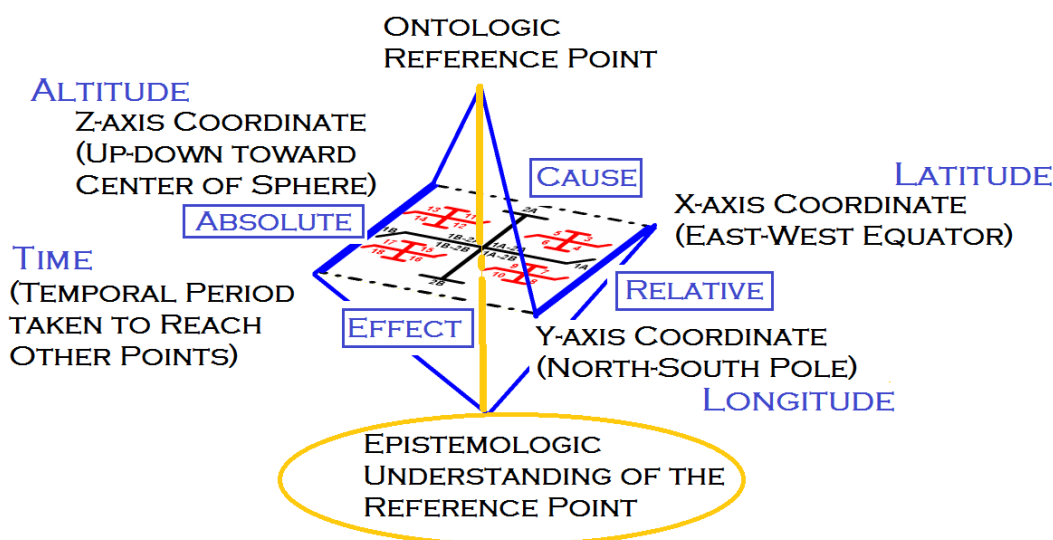
The difference between the relative dimensions of latitude and longitude, and the absolute dimension of altitude should be considered carefully. One may choose any number of circumferences as an equator, as then related to an infinite number of two-point pairs serving as the north-south pole of these coordinates. This is unlike the fixed, absolute distance of any point from the center of the sphere.



(5) Once we have an “up-down” dimension stated on this sphere, we come to the Objective Effect of this three-dimensional system, and this is the uniqueness of this point vis-à-vis all other points, i.e. the time spent moving from one place in a three-dimensional system to any other point in the system. In this fashion the “time-coordinate” of a four-dimensional system is logically required to make the system make sense.

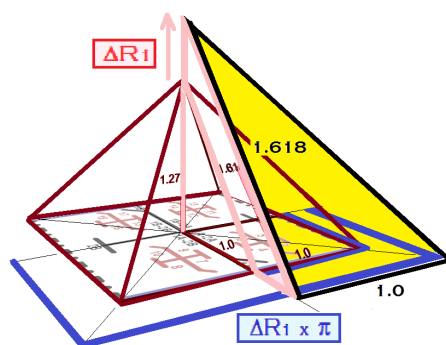


(6) However, and in accordance with the patterns developed through Oppositional Analysis, once we have each of these four dimensions stated, we have created an epistemologic statement of the previously ontologic point given initially.



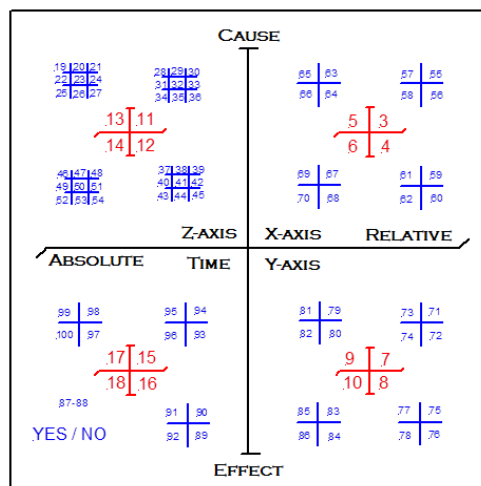
(7) This difference between that which is Ontologically Real vs. that which Epistemologically Known creates a “Fifth Dimension.” This might be termed a “spatial dimension” of “in-out,” i.e. the difference between the exterior world which is viewed and the interior world in which these experiences are registered as meaning something.

The oscillating, back-and-forth dynamic between the “in” of epistemology and the “out” of ontological reality is reduced in these essays to the Fibonacci series, 1, 1, 2, 3, 5, 8, 13, 21, etc. The fractions which result from this series, 1/1, 2/1, 3/2, 5/3, 8/5, 13/8, etc. have the Golden Mean, 1.6180... = ϕ as their asymptote. These proportions, in association with the ratio 1: π , are essential to an understanding of the economic structure of the United States, 1868 – present.



It is therefore possible to propose a thorough program of research toward the discovery of these ratios in economics in order that they may be of use to the physical sciences in their investigation of any phenomenon which requires an understanding of a fifth dimension, including in particular the effort on the part of Kaluza to unify gravity and electromagnetics. The similarity of these proportions to those of the Great Pyramid of Giza suggests that there may be more to the study of the fifth dimension than might be expected from a mathematic device.

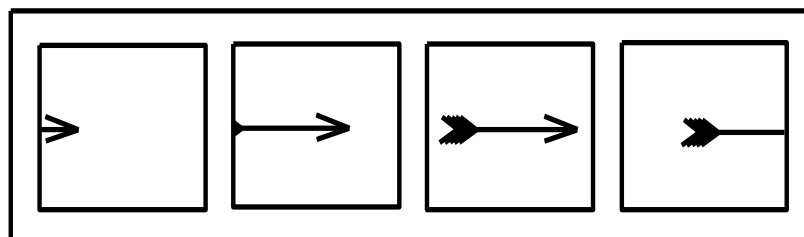
(8) This program of research will describe ultimately a set of relationships which resolves itself into the conclusions of this pattern when we come to the uncertainty of the “up-down” z-axis. The initiating question seems to be: “Where Is Up?” In a sense, “Up” is everything outside the sphere. But if “Up” is everything outside the sphere, how can this dimension relate to a dimension of a point *on* the sphere? This uncertainty initiates gravity toward the sphere, and even toward the very center of the sphere, because each moment of time will demand a more ordered state, or at least a less uncertain state. Because the “Up” aspect of the Z-axis is suspect, (upper left quadrant), the “Down” aspect of the Z-axis is unchallenged and predominates by default.



(9) The uncertainty of the Up-Down Axis, the Z-Axis, (top left quadrant) represents the possibility of a “hole” in the system, a place which may be filled in by the certainty of other things, a form of gravity, a motion into the center of the sphere.

The certainty which we associate with the x and y axis (top right and lower right quadrants) represents the certainty generally ascribed to geometry.

The Yes-No aspect of Time (lower left quadrant) represents the chronologic, frame-by-frame notion of motion “under the challenge of Zeno’s Paradox” which is what we are trying to described in the book.



Oppositional Analysis supports a logic for five dimensions, one which allows us to propose a formal fifth dimension of consciousness. I propose that this fifth dimension fulfills the specifications of the fifth dimension which Kaluza used to unify General Relativity with Maxwell’s equations.

The consistency and logic of the approach is for the reader’s consideration alone.

Essay One

Oppositional Analysis

*The Tao is constant in non-action
Yet there is nothing it does not do.*

Lao Tzu

ABSTRACT

Aims: To develop a philosophy based upon the patterns described at the lower levels of research in these essays.

Study design: Philosophic presentation of the necessary principles underlying any description of reality.

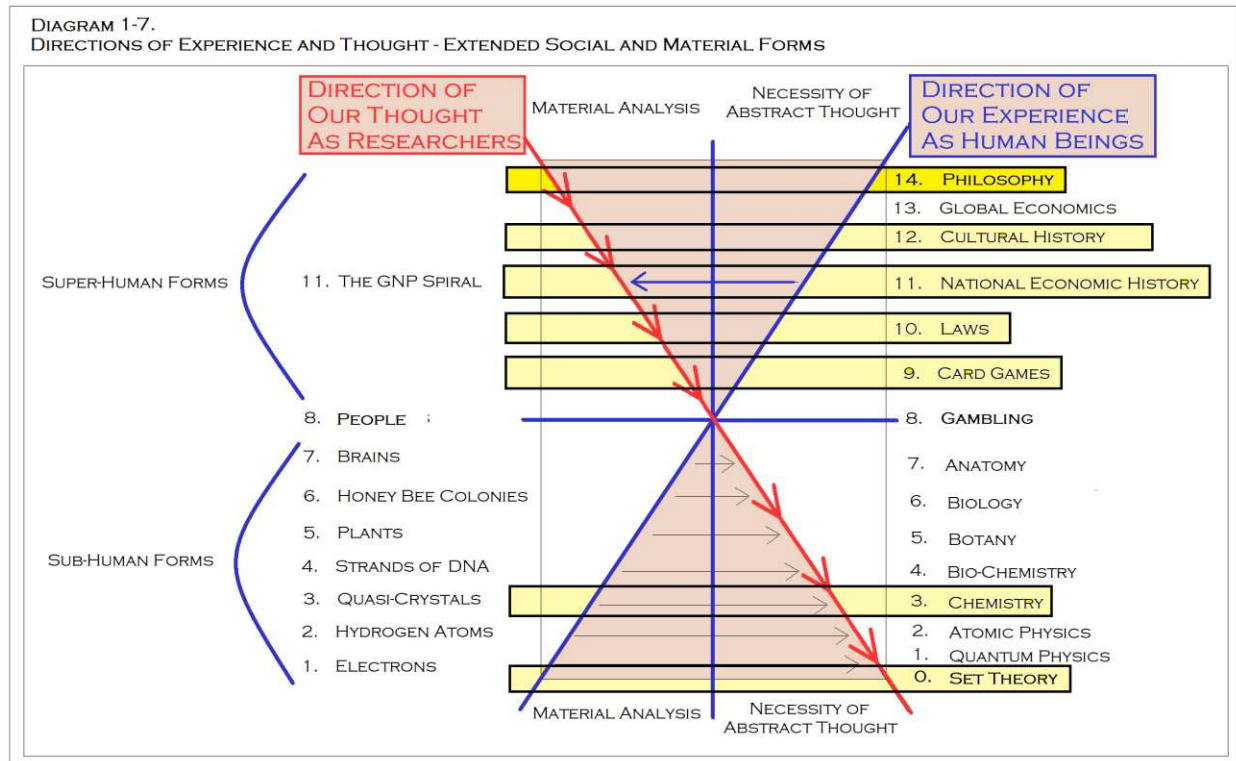
Place and Duration of Study: Library research.

Methodology: In this essay we present the Principle of Non-Contradiction in contrast to the Principle of Contradiction, fashioning these in their necessary developments toward a description of reality.

Conclusions: We conclude that “reality” may be understood as the operation of consciousness applied to every level of endeavor.

1. Hypothesis

We propose that a philosophy may be presented which ties the lower aspects of this design together through the operation of dichotomies.



2. Methods

We use the dichotomies introduced in previous essays to present a philosophy which builds upon them, to wit: Oppositional Analysis.

3. Data

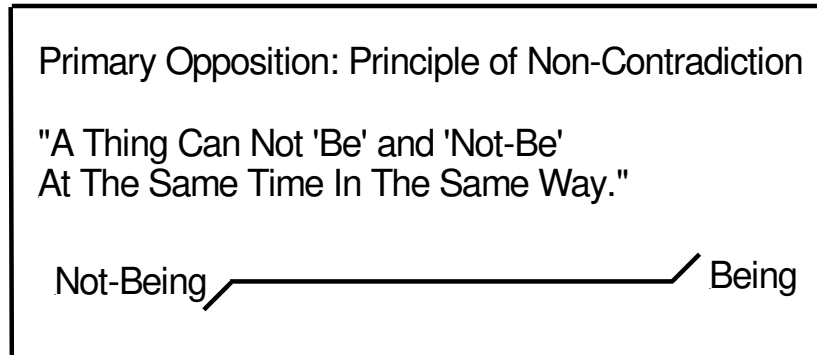
A study of basic principles of philosophy.

4. Procedure

In this paper we present a working alphabet of reality, one intended to follow up on the Socratic conversation presented in the introduction whereby letters seen “bigger and in a bigger place” may assist in reading these same letters at smaller dimensions.

4.1. “The Principle of Non-Contradiction” (The Letter “A”)

A thing cannot “Be” and “Not Be” at the same time in the same way.



A toy cap gun can not “BE” a toy cap gun, and “NOT BE” a toy cap gun, at the same time and in the same way. Nor can a star *be* a star and *not-be* a star. Nor can any other thing which actually has Being simultaneously possess its own Not-Being. Briefly, to “BE” something - a toy cap gun, a nuclear weapon, a star - implies that the object cannot “NOT-BE” itself simultaneously. True, a rose may be simultaneously a flower and a symbol of love. However the words “in the same way” restrict the meaning given to a particular object at a particular time. Likewise, a seed may be a seed at the beginning of one century, and a tree at the beginning of the next. However the words “at the same time” again restrict the meaning of “a thing” to the BEING of the thing itself.

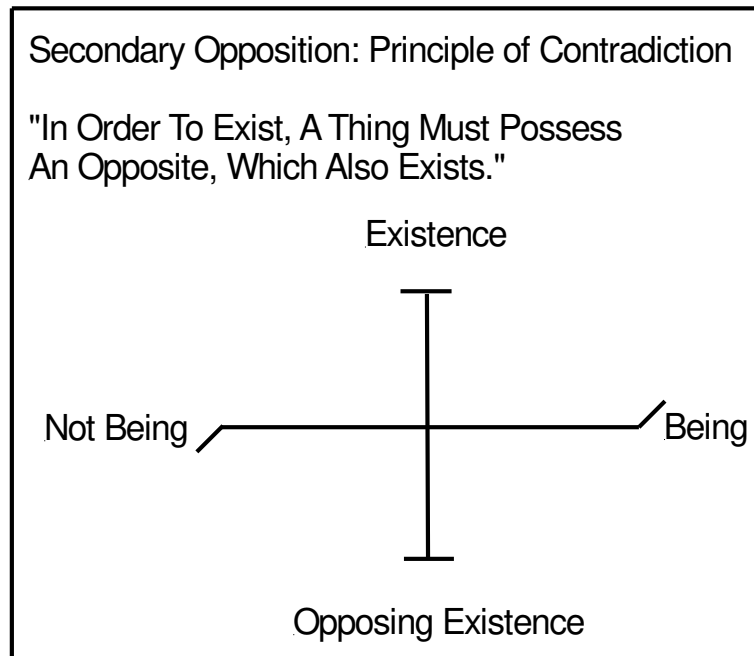
The horizontal symbol between these dichotomies is taken as a gulf between opposites, named here as the “Primary Opposition.” The Primary Opposition represents a *difference in kind*, a difference in the basic nature of two things, as opposed to oppositions arising from a struggle between similar elements or a difference in gradation between similar elements.

On the right hand side we place any object which “IS.” On the left we have an enormous opposition, all objects other than the object which “IS,” *including in this opposition all that the object “IS NOT.”* This statement might be represented as the statement “a ⊗ -a” where “a” represents “Being”; “-a” represents “Not-Being”; and “⊗” represents a fundamental and necessary opposition between these two states. This symbol “⊗” is distinguished from the opposing symbol, as represented by “Ⓢ” or “is,” which states – not a contradiction or eternal opposition between beings – but rather their fundamental equivalence within “Being.”

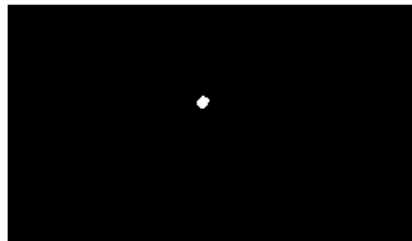
The ability to form an opinion about the relationship between “a” and “-a” (read “not a”) creates a Secondary Opposition.

2. “The Principle of Contradiction” (The Letter “B”)

In order to exist, a thing must possess an opposite, which also exists.



The vertical symbol is intended to represent a Secondary Opposition, a different type of gulf between the ideas organized by the diagram. The Secondary Opposition represents an opposition based upon like natures in conflict or in some competition with one another as *gradations of the same basic nature*. A Secondary Opposition is one which, unlike the Primary Opposition, is not absolute or complete, because it deals with a form of opposition which is based upon difference within like categories, not differences in kind between the categories themselves. The importance of the Secondary Opposition might be thought of in the following way. Imagine that I draw a dot of white chalk on a blackboard. How many dots are on the blackboard? The single-ness of the white dot against the solidity of the black blackboard make the answer of “one” very easy.



If I then enlarge the dot to a large solid circle, as if the dot was seen through a zoom lens, Now how many dots are on the blackboard? The answer again is “one” based upon the contrast between the large white dot, and the black of the blackboard itself.



If I enlarge the dot again to the size of a basketball, the answer will be the same.



If I enlarge the dot to cover the entire blackboard with white chalk, eliminating all black from the blackboard entirely, how many dots do we have? The answer is “none” because there is no way to see a single dot contrasted against its opposite, any more than a single black dot on the original empty blackboard would exist.



To give a second example, imagine a universe dominated by and containing only the color “white.” Does a relationship exist in such a universe whereby the existence of the color “white” may be demonstrated? My answer is “no.” Without the existence of some color “not-white,” the existence of the color “white” is itself impossible to show, imagine or prove. Because the color “white” in such a world is not permitted to define its opposite (the color "gray" for example), *The Principle of Contradiction* is not met and the color "white" can not exist. Therefore the universe of “white” as described does not “exist.” *The Principle of Contradiction* is as vital to the understanding of existence as *The Principle of Non-Contradiction*.

One might also propose as an illustration the loss of the sense of sight among various species of fish or salamander evolving within subterranean caves. The absence of light eventually deprives the species of sight, just as an absence of sight deprives a creature of the ability to detect light. As each generation of the species in the cave finds sight a useless sense in the struggle for survival, so the importance of the differentiation between sighted and non-sighted salamanders ceases to exist, and - ultimately - the sense itself is eliminated.

Without something upon which to base an opposition, the existence of any object is itself in question, just as shapes of indistinguishable shades of white superimposed upon one another are lost to view without some intervening criteria (shadow) by which to indicate their existence within one another. If we postulate that there exist no such independent criteria, we must conclude that these shapes do not “exist.” If we imagine a universe containing only the color white and no other colors or shades in opposition, we eliminate “the color white” itself.

To say that these objects might be demonstrated as functions of a mathematic imagination begs the issue. Like the “ether,” we must declare the non-existence of any “object ‘a’ ” which according to *The Principle of Contradiction* can not be shown to exist. Postulating the absence of all such criteria, eliminating from consideration all “opposites,” we must conclude that the object DOES NOT exist. Although in a theoretic way the property might “BE,” it does not “EXIST.”

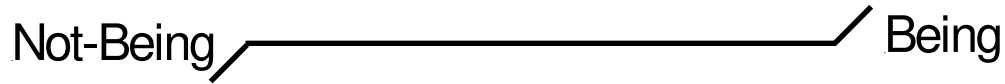
In our discussion of *The Principle of Non-Contradiction*, we noted that this principle might be represented by the statement “ $a \otimes -a$ ” where “ a ” represents “Being”; “ $-a$ ” represents “Not-Being”; and “ \otimes ” represents a fundamental and necessary opposition between these two states. What occurs if we reverse this statement?

We might represent *The Principle of Contradiction* as giving primacy to the concept of “Not-Being” or “ $-a$ ”, in an opposite of the statement of *The Principle of Non-Contradiction*. If this can be imagined, then we have the statement: “ $-a \otimes a$.” That is, just as “ a ” was the primary opposite of “ $-a$ ” or “not a ” (or “ $a \otimes -a$ ”) in *The Principle of Non-Contradiction*, so is “not a ” something different from “ a ” (or “ $-a \otimes a$ ”). From this reversal stems the ability to say that both “ a ” and “not a ” exist as opposites, each one to the other, under *The Principle of Contradiction*. Assuming only two separate items “exist” in our universe (“white” and “gray” for instance), each is a necessary element in determining the existence of the other. Without the one, its opposite is similarly in jeopardy of leaving the stage of existence, to wit, there is nothing existent from which to tell it apart or distinguish it as an actual existing object.

3. “The Standard Cross” (The Letter “C”)

Oppositional Analysis, as developed in these essays, begins with two symbols, each representing the tenor of the above principles. These symbols are placed in a union whereby the intellectual relationships supporting any whole object “a” may be broken down into constituent parts.

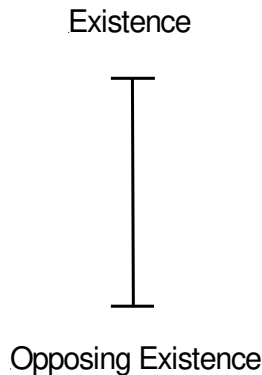
The first of these symbols, representing the Primary Opposition, is:



In Oppositional Analysis this symbol represents *The Principle of Non-Contradiction*, symbolizing the exclusivity of being at either endpoint. It is assumed that a thing cannot “be” simultaneously at both endpoints of our above symbol. This prohibition on “Being” or “a” places “a” on the right, and all “-a” (read “not-a”) on the left. The concept presumes a gulf, a separation, between the concepts to the left and right: “a” ⊗ “-a”.

This is our first alphabet letter, a letter “A,” which will be used in “reading” every phenomenon considered in these essays. This principle does not “affect” phenomena, in the sense that a ball crashes into a wall with a particular weight, force, momentum, etc. and leaves a dent or a disaster. Rather, if the phenomena truly IS, then it must satisfy *The Principle of Non-Contradiction* and in doing so, thereby manifests this “first letter” of our philosophical alphabet.

The second of these symbols, representing the Secondary Opposition, is:

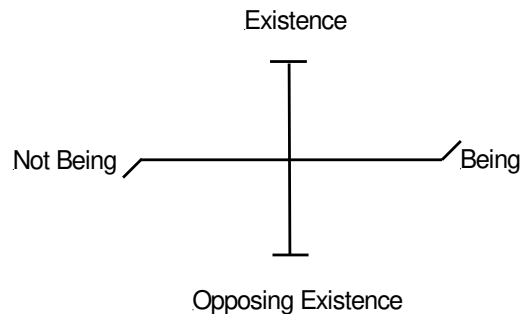


This symbol represents *The Principle of Contradiction*, i.e. the requirement that any Object Which Has Being “a”, in order to exist, must define in its existence some “-a” (read “not a”) by which to distinguish its existence as an object. This Opposite is also an Object Which Has Being. The existence of “a” is above, and the opposing existence of “-a” (“not a”) is below. This symbol represents a different type of gulf, or tension, or separation, than that the first horizontal symbol: “-a” ⊗ “a”.

The horizontal symbol, the Primary Opposition, here represents “Being/Non-Being”: “a ⊗ -a”. In this Primary Opposition we have our first letter, the “letter A.” The vertical symbol, the Secondary Opposition, here represents “Existence/ Opposing Existence: “-a ⊗ a.” In *The Principle of Contradiction* we have a second letter, the “letter B.”

The combination of the letters A and B could be numerous in an infinite number of arbitrary ways. For example (1) A, (2) AA, (3) AAB, (4) B, (5) BB, (6) BBA, (7) BABA, (8) ABAB, (9) BAAB, (10) ABBA, etc. As used herein, however, *The Principle of Non-Contradiction* and *The Principle of Contradiction* relate to one another in a fixed fashion, and phenomena are required to adhere to these axioms. When phenomena follow these rules, reality provides something which (1) makes sense, and (2) mimics all other phenomena wherein these two *Principles* are at work.

These two symbols when combined yield what will be referred to as "*The Standard Cross*." This new symbol is as follows:

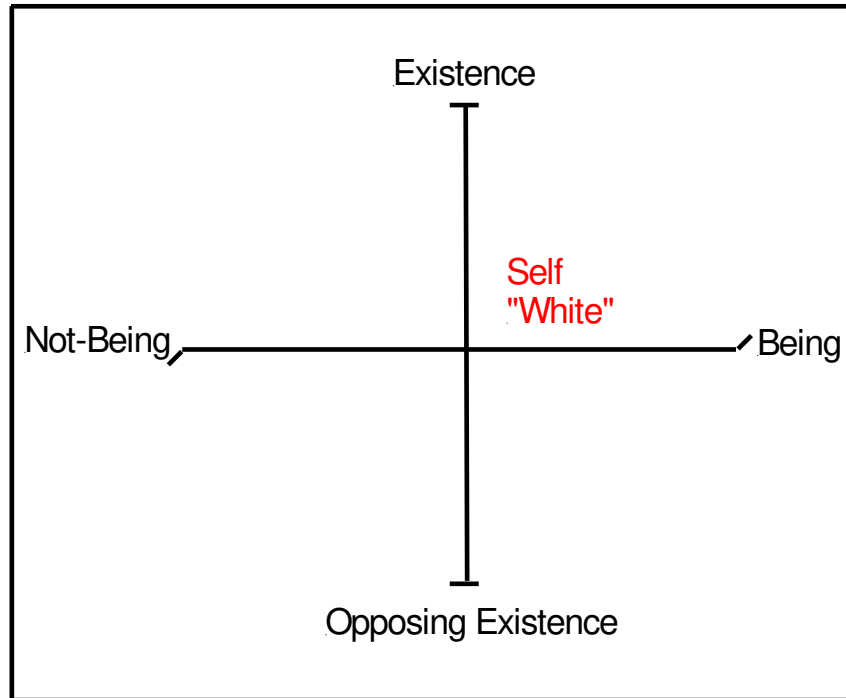


The joining of these picture-symbols indicates a “third letter C” of philosophy: the idea that two principles – *The Principle of Non-Contradiction* and *The Principle of Contradiction* – can merge and create between them four essential components of any and every study.

4. “The Plane Of Definition” (The Letters “D,” “E,” “F,” and “G”)

Once these opposing forces are put in place, we must develop language which will describe their four intersections, the four spaces which these forces define.

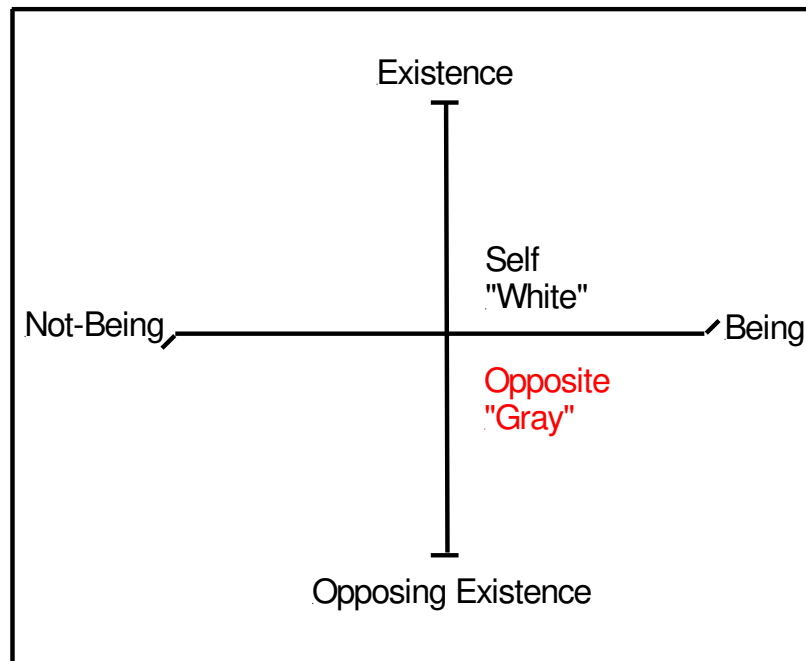
The word “self” is defined as “having a single character or quality throughout.”¹²⁰ The “white” dot on a blackboard represents such a “single character or quality throughout,” a very simple “self.” If we combine the concepts “Being” and “Existence” we have the basis for any “self,” something having “a single character or quality throughout,” an existent being.



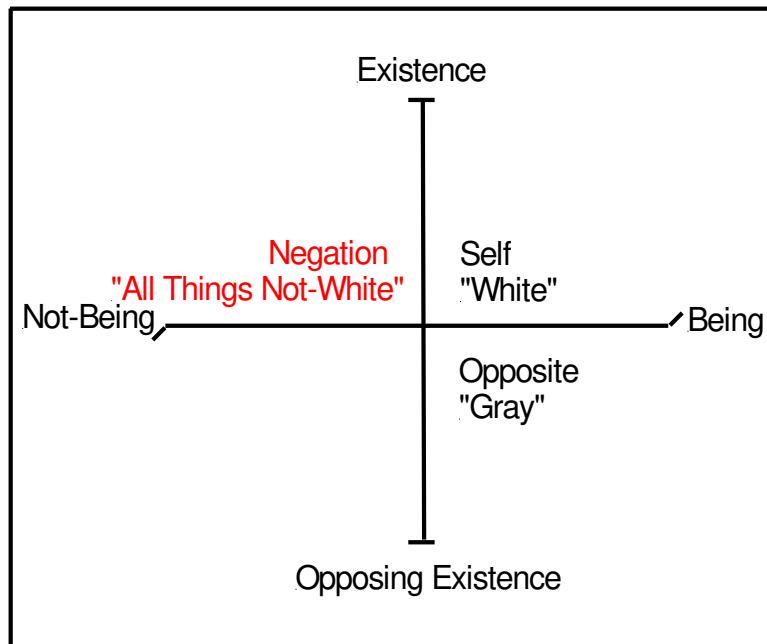
¹²⁰*Webster's New Collegiate Dictionary*, G. and C. Merriam and Company, Springfield, Mass, USA, 1975. Definitions for all terms given in this essay are taken from this basic source.

The word “oppose” is defined as “to offer resistance to,” and the word “opposite” is defined as “occupying an opposing and often antagonistic position ...; diametrically different (as in nature or character) ...; contrary to one another or to a thing specified.” In the second quadrant of a “Being” we have an “Opposing Existence” to the Self, i.e. an “Opposite.”

If the concept “white” is placed upon a blackboard, it is obvious that resistance offered by the black of the blackboard provides the “antagonistic position” or the “diametrically different” or the “contrary” element necessary to see and appreciate the concept “white.” In the same fashion, shades of gray in an otherwise all white universe provide the resistance necessary to appreciate the existence of the “white” world itself.

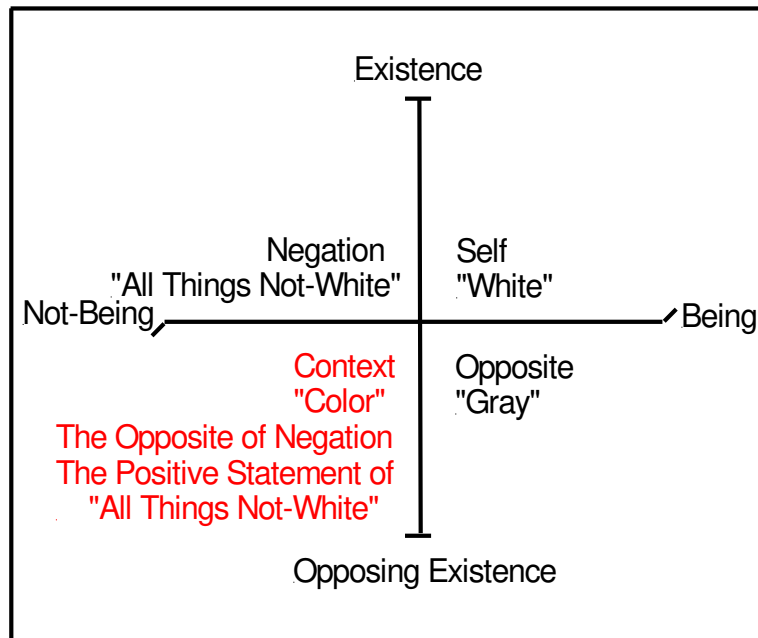


The word “negation” is defined as “something that is the absence of something actual.” This is the concept conveyed by “Non-Being’s” “Existence.” If the concept “white dot” on the blackboard is “actual,” then the negation of the white dot is not simply the blackboard, but includes with it the school room, the professor, the students, the weather outside, the concept of democracy, etc.; i.e. “the absence of something actual.” As used here the word “negation” is taken to be the sum total of all selves which have no part in the “self” under consideration.



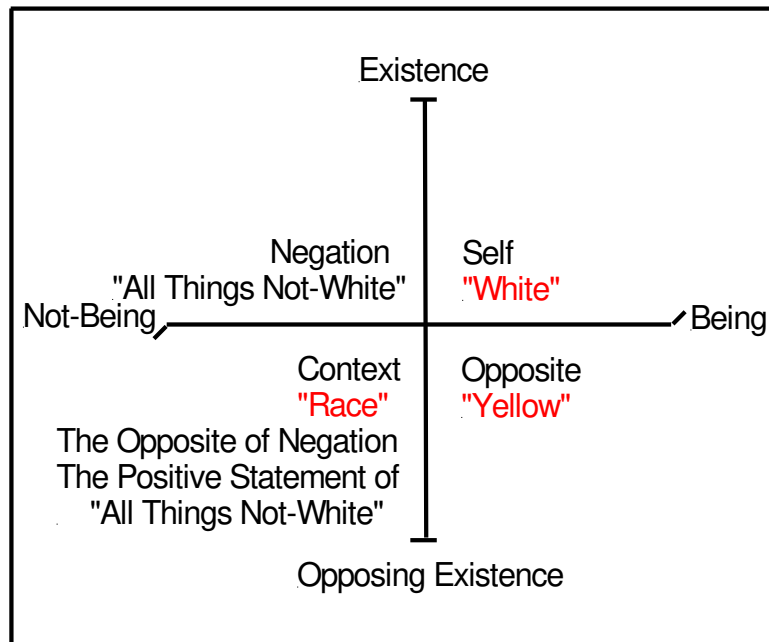
The requirement that “Negation” have its own “Opposite” is stated by the quadrant wherein “Opposing Existence” is combined with “Not Being.” If the Negation of something is the sum total of all things NOT that self, *then some sense of the nature of the Self must apply, if for no other reason than to ensure that the Self, properly understood, has been negated.* The word “context” is defined as “the interrelated conditions in which something exists or occurs.” In this sense, “Context” opposes the Negation of the self, because it states the full understanding of the Self, without which a Negation of the Self can not occur.

For example, although the concept of a white dot on a blackboard is clear enough, the word “white” is used in many ways: white as color, white as innocence or purity, white as a position in a chess game, etc. In as much as the understanding of “white” shifts and changes with the context in which it is used, the “context” of the word “white” must be considered in relation to (1) the white (self), (2) blackboard (opposite) and (3) all things not white (negation). These are the “interrelated conditions in which (white) exists or occurs,” i.e. white’s “context.”

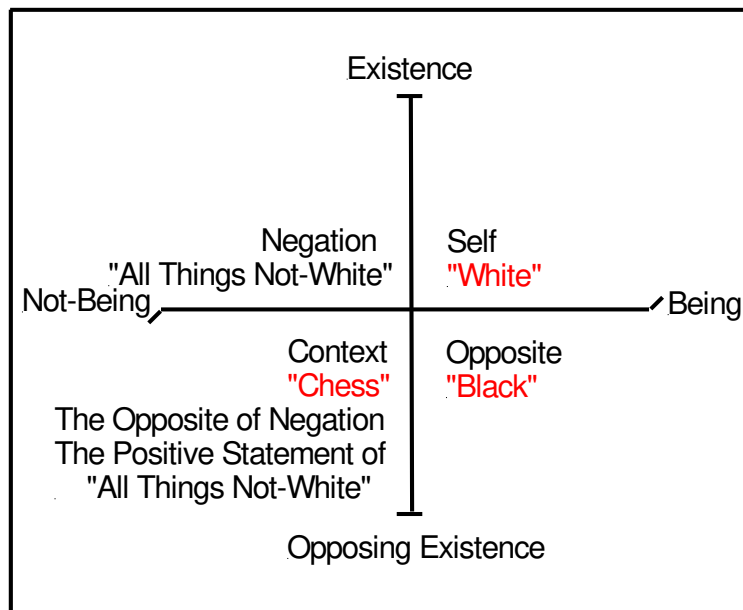


In the foregoing example, the “context” in this case applies is “Color.” However the term “White” could apply equally as well in a discussion of race; or to sin and forgiveness (“Though your sins are as scarlet, they shall be white as snow.” Isaiah 1:18); or to chess pieces; or to any number of other ways in which the term “White” is used. In these cases, the “Context” of the Self must change, even as the meaning of the Self has changed.

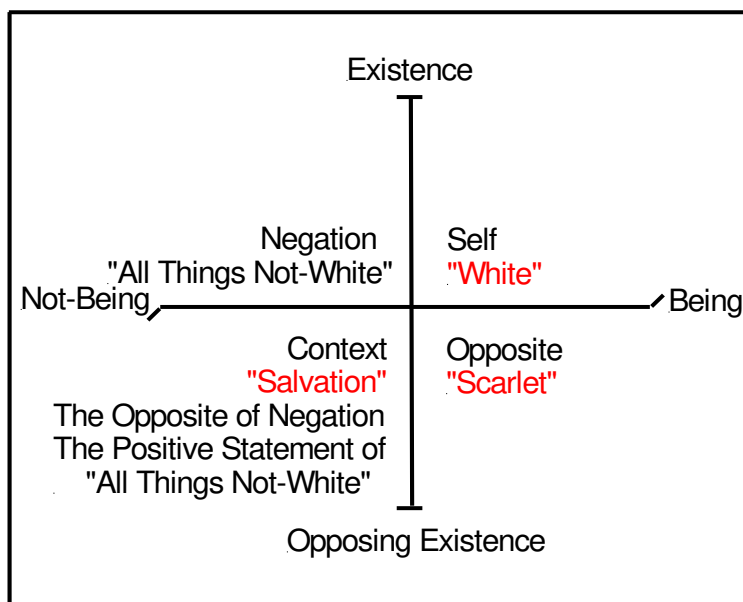
The analysis of Being and Non-Being, Existence and Opposing Existence is used to indicate the necessary aspects of any thought to which the mind can attach understanding. These principles form the psychological basis for understanding. If the term “White” is used in regard to a conversation regarding racial differences the categories may appear as:



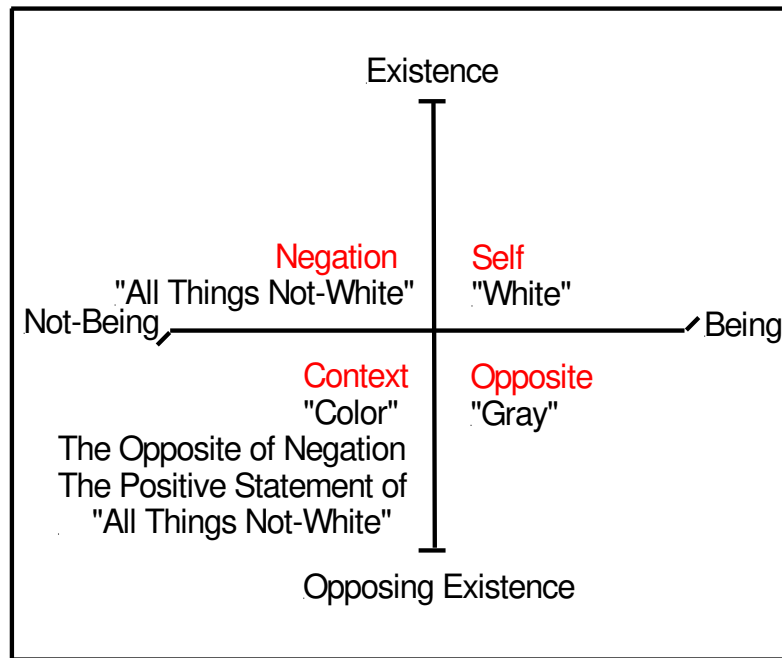
If we discuss “White” in the context of a game of chess, we might find that the existence of “White” is premised upon:



If we discuss the poetic metaphor of “White” as used in discussions of morality, we might consider the terms as follows:



Ultimately the term “White,” or any term which is deemed capable of understanding, must generate the above categories of thought. It is through the generation of these categories that the mind “moves” to accept the reality, the existence and the importance, of the object discussed. Placing within the quadrants created by our brief discussion of the necessary concepts supporting recognition of the color “white,” we have:



The resulting four quadrants of thought are:

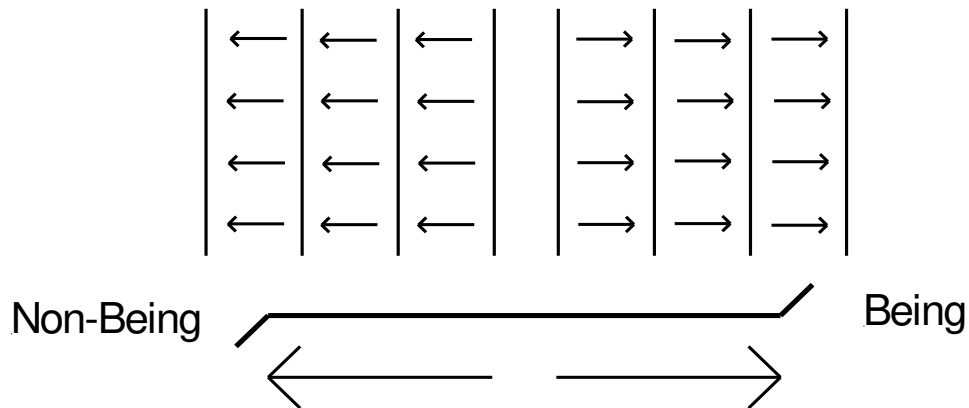
1. “a's self,” the being “a” as it exists (white); something “having a single character or quality throughout.”
2. “a's opposite,” the thing defined by the existence of “a” whereby “a” demonstrates or proves its existence (gray); something “to offer resistance to,” or “occupying an opposing and often antagonistic position ...; diametrically different (as in nature or character) ...; contrary to one another or to a thing specified.”
3. “a's negation,” or “the set of all not-a,” whereby “a” demonstrates its inability to both be itself and be not-itself simultaneously under *The Principle of Non-Contradiction*; (all things not white); the sum total of all things which are “the absence of something actual.”
4. “a's context,” the opposite of “a's negation” above it, stating in a positive fashion all that “a” is not (color); “the interrelated conditions in which something exists or occurs.”

These four new components of our scheme – like the letters “D,” “E,” “F” and “G” – provide us with an expanding alphabet of philosophical relationships. These components exist simply because the first three letters “A,” “B” and “C” – *The Principle of Non-Contradiction*, *The Principle of Contradiction*, and *The Standard Cross* – pre-exist them.

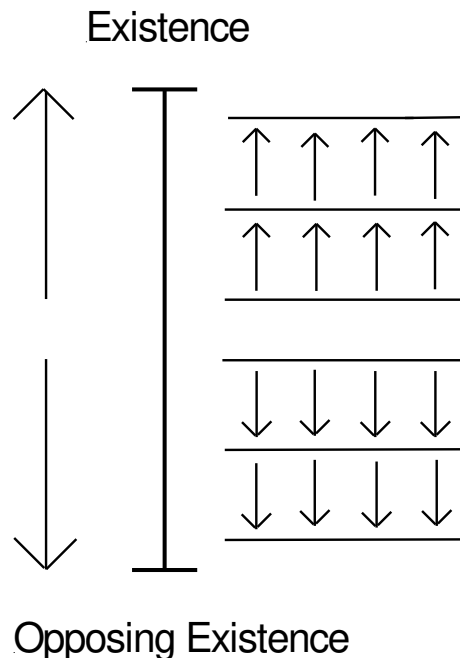
5. Comparisons To Earlier Essays

At this point we have described a partial “alphabet” of philosophical elements, one which permits us to organize distinctly different phenomena into analogous patterns. This in turn permits us to “read” the phenomena in systematic and helpful ways.

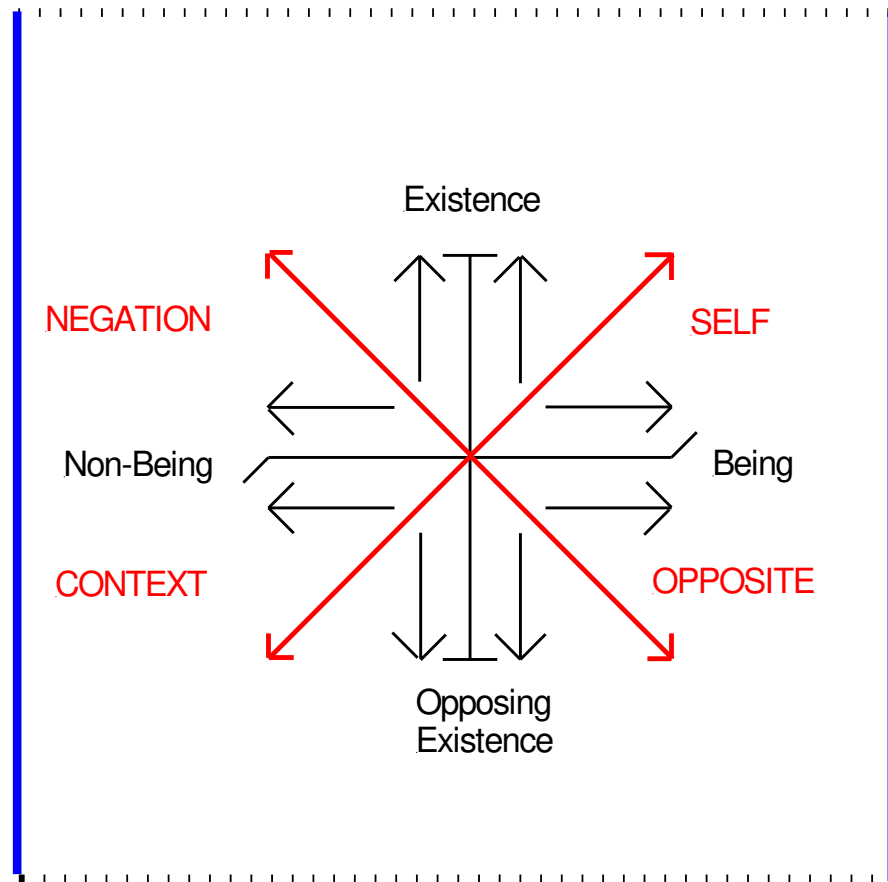
To continue at the level of philosophy, the further development of this “alphabet” is helped by imagining the opposition inherent in *The Principle of Non-Contradiction* - Being, Non-Being - as a “force” or a wave in philosophy, separating these two sides of the discussion by an enormous gulf or chasm. One might imagine a rod striking the water, sending up a series of waves moving in opposite directions from one another.



It is also helpful to imagine the opposition between the concepts of “Existence” and “Opposing Existence” as a separate force, or a separate wave in philosophy between opposing ideas or concepts.



Finally, we might imagine that the combination of these two different oppositions creates four “vectors,” four logical outcomes which must play out through the rest of the discussion.



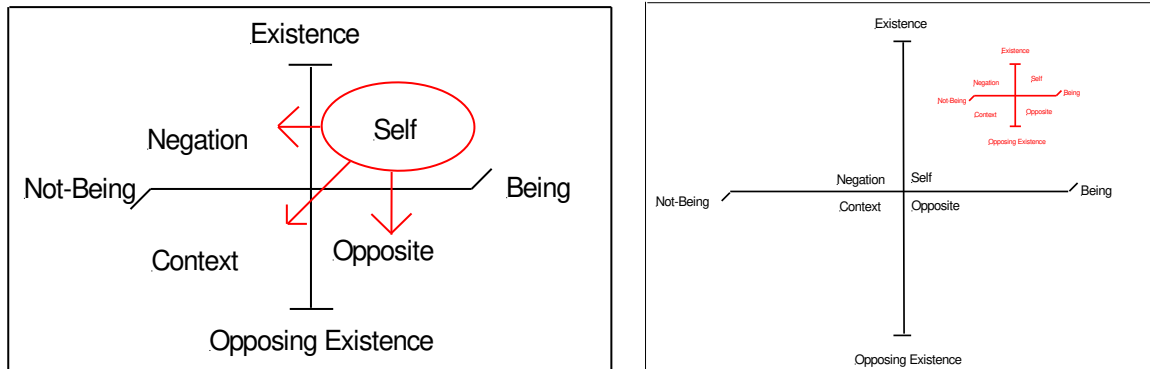
If this “alphabet” works, it helps us to “read” the underlying characteristics of any phenomenon. Reading the underlying structure is simply a matter of “seeing” the phenomena accurately, that is, “to read little letters from afar (but with) the thought that the same letters are somewhere else also, but bigger and in a bigger place...”¹²¹ Viewed in this fashion, reality becomes something self-referential, in effect telling us its secrets at one level and then hinting that some similar structure exists at a different level, one where such relationships might otherwise be entirely invisible or difficult to anticipate. Joining all levels into such a system, an understanding of the whole is developed.

By condensing the similarities into a philosophic alphabet, we can better approach the remaining levels, i.e. Sub-Physics, Physics, Biology, Law, Economics, the Nation-State, Race and Economics. If an over-all system can be completed, these remaining levels might be explored more thoroughly and in a new way. Once the system is complete, each level should relate to the others by way of a common analysis.

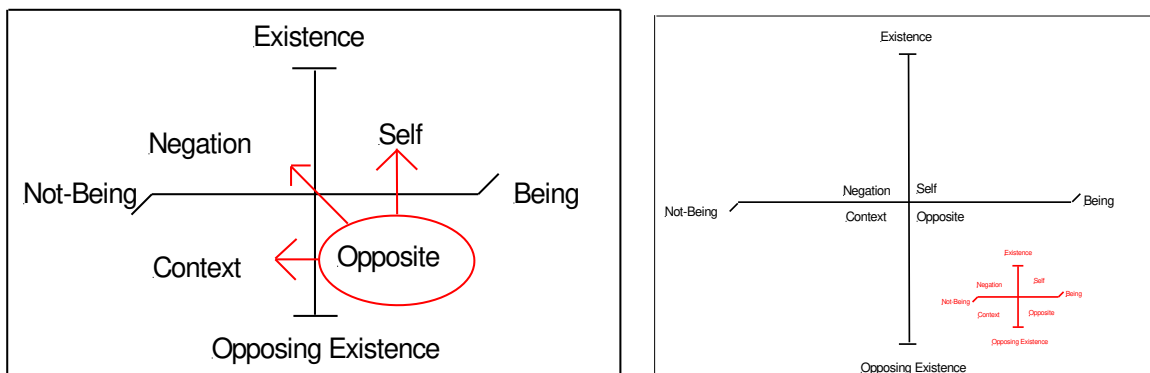
¹²¹ Plato’s *Republic*, see supra, page 3, and Essay Four.

6. “The Plane of Relationship” (The Letters “H” through “W”)

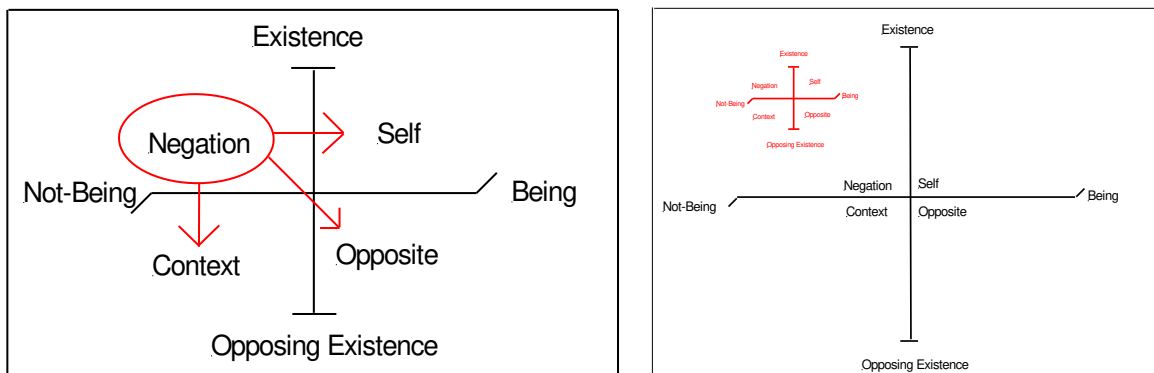
To expand our “philosophical alphabet” further, note that each of the quadrants must have a relationship with one another. That is, the self must have a relationship with itself, with its opposite, with its negation “all things not itself,” and with the context in which it is understood. This set of relationships - an “H”, “I”, “J”, and “K” - can be pictured as:



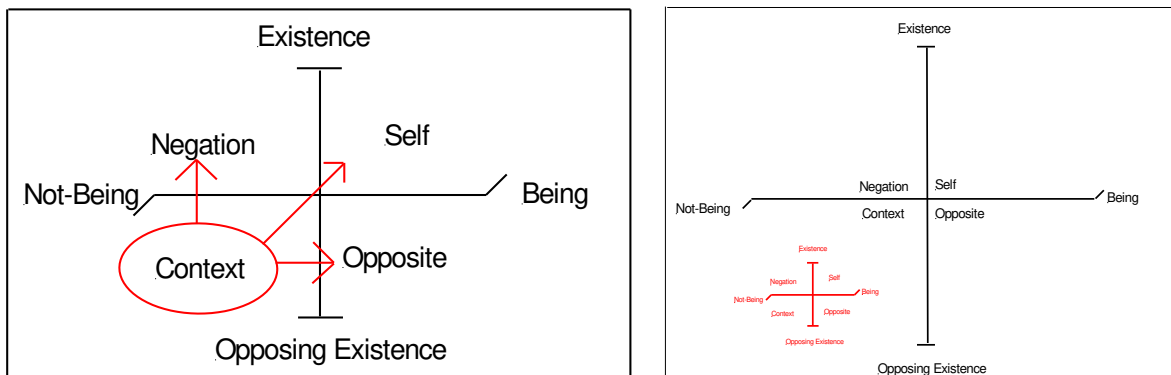
Similarly the “opposite” identified also must have a relationship with itself, with the originating “self,” with all things not “self” and with the context in which this opposite is created. This set of relationships - an “L”, “M”, “N”, and “O” for example - can be pictured as



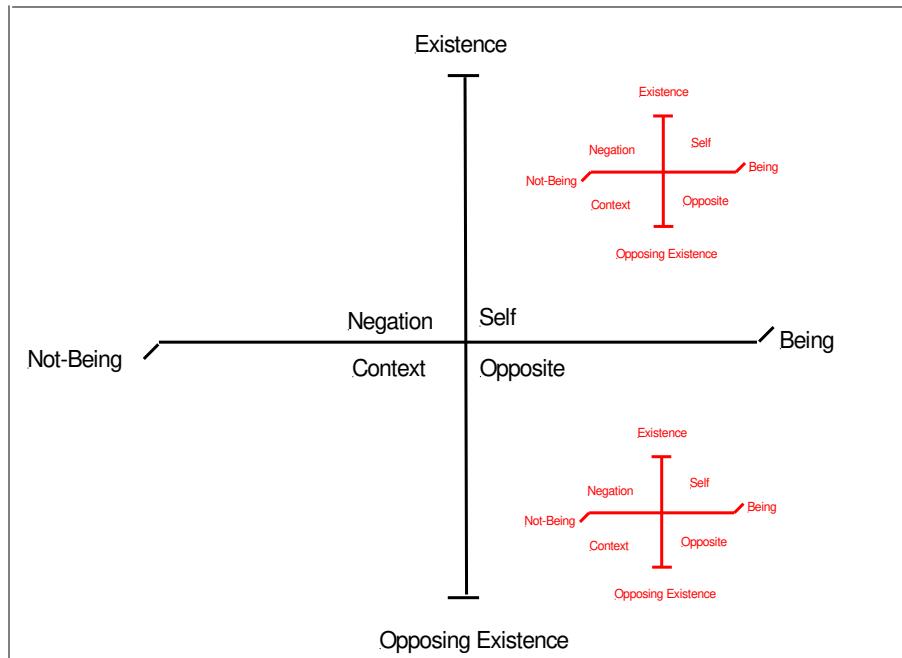
Additionally the negation of the self, “all things not ‘white’ ”, must have a relationship with itself, with the originating “self,” with the self’s opposite and with the context in which the self is understood. This new set of relationships - a “P”, “Q”, “R” and “S” - can be pictured as:



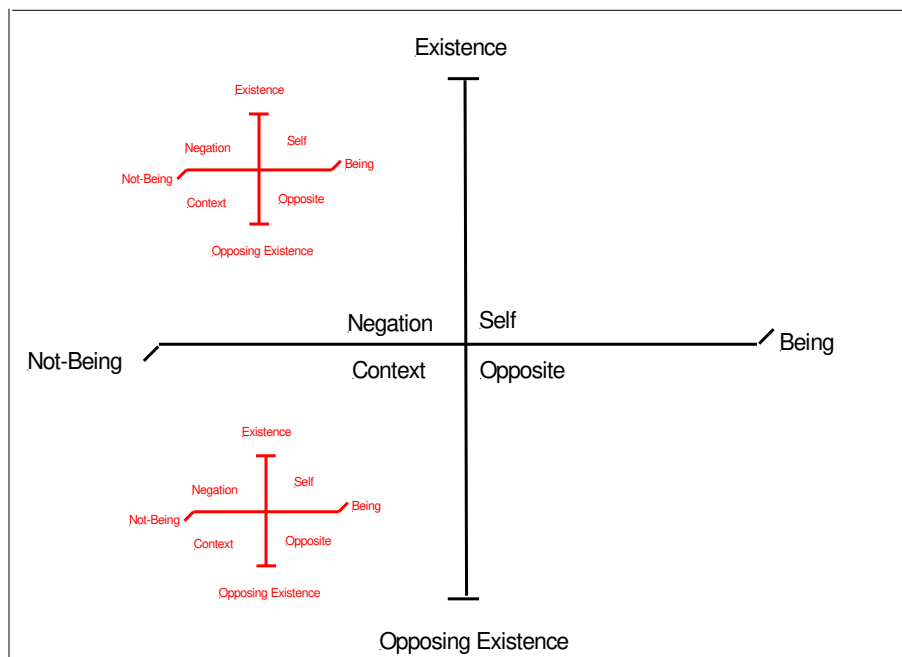
Finally the context of the self must have a relationship with itself, with the originating self, with the opposite permitting an understanding of the “self” and with the collection of things “not the self.” This new set of relationships – a “T”, “U”, “V”, and “W” - can be pictured as:



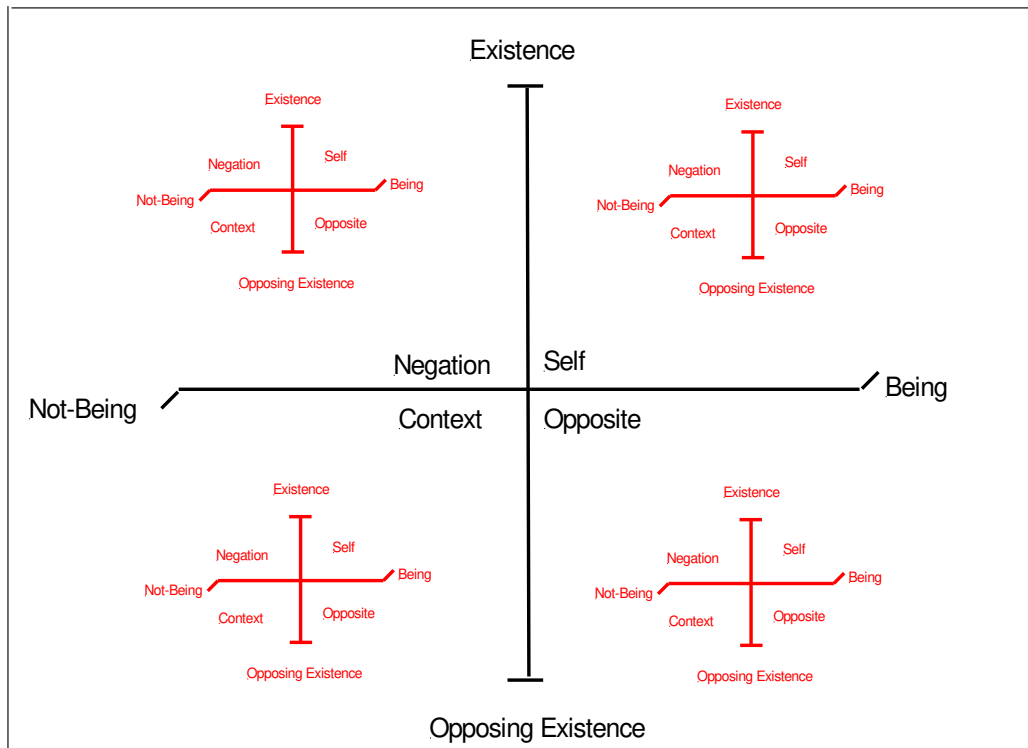
Dividing these along the categories of “relationships of being” we have:



The same set of relationships as applied to the left hand quadrants of “Not-Being” are:



Collectively, these may be placed as:



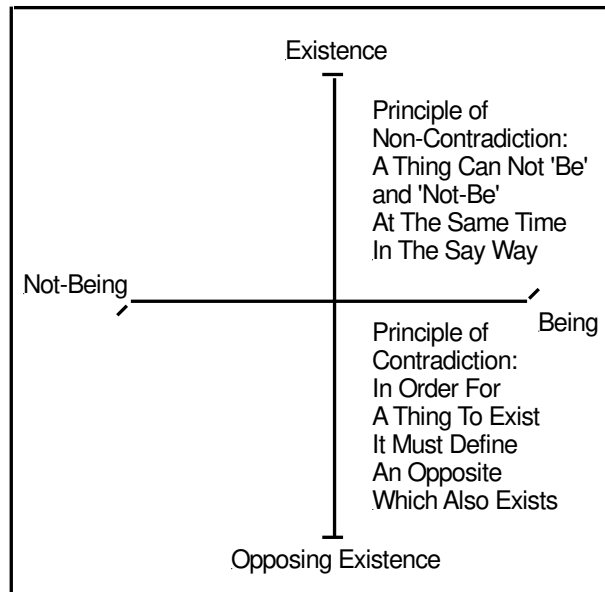
OPPOSITIONAL ANALYSIS

PART TWO

7. “The Principle of Consciousness” (The Letter “X”)

The development of the ontological/epistemological dichotomy is a central concept related to consciousness. Such a dichotomy is on a par with the original *Principle of Non-Contradiction* and *Principle of Contradiction*. But how might this sort of “letter” be developed using only the most basic and pre-existing letters of our “alphabet”? In other words, what sort of effort within the philosophy presented justifies an ontological / epistemological dichotomy for anything? To answer this question, let us consider the following:

What occurs if we apply *The Standard Cross* to Axioms I and II themselves? In other words, what happens if we treat *The Principle of Non-Contradiction* as a “Self” and *The Principle of Contradiction* as its “Opposite”? Letting Axiom I be the “Self” we investigate, and Axiom II be its opposite, we have:



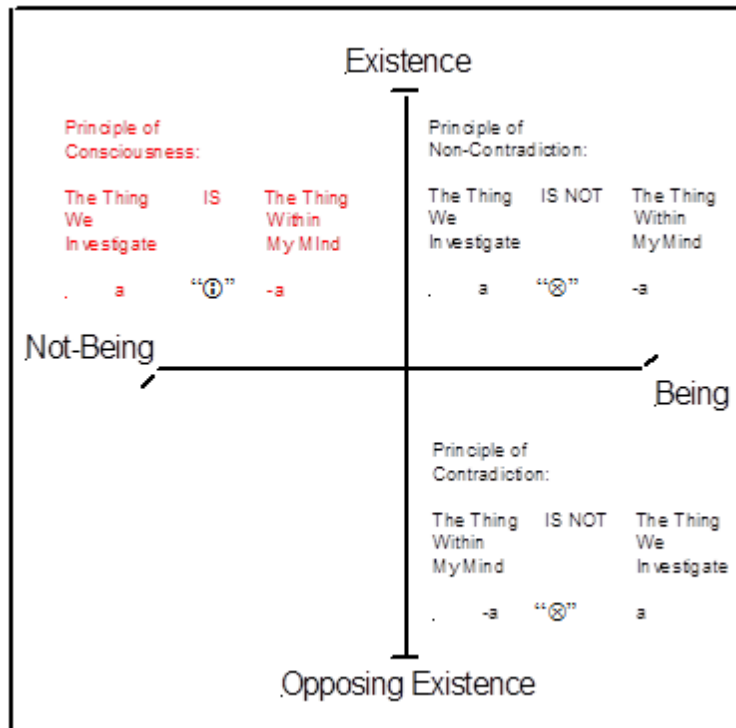
Under the technique of oppositional analysis, the third square *must negate The Principle of Non-Contradiction*, “a ⊗ -a,” “A thing can not be itself and be not-itself simultaneously.” To negate this is to state that a thing both “*IS itself*” and “*IS NOT itself*” simultaneously.

We have then the riddle:

Question: When can a thing both be itself and be not-itself simultaneously?

Answer: When I'm thinking of it.

If we re-state *The Principle of Non-Contradiction* with this possibility in mind, we can associate “a” with “any object which we investigate,” and “–a” (“not a”) with the *thought* of that object within my mind.



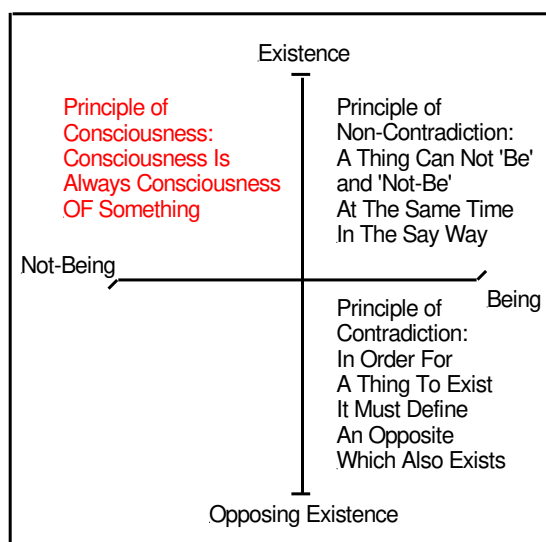
Stated concisely, a union exists *in the use of our consciousness* between any “object a which is investigated” and “the thought of object a.” Consciousness leads us to believe that the reality in which we are living, although on the one hand simply a thought of that reality, is yet “real.” We have in this axiom a union between the epistemological and ontological viewpoints of any object “a.”

In symbolic form we would negate “a ⊗ -a” with the statement “a ⓘ -a” where “⊗” represents an opposition between two poles of a dichotomy, and “ⓘ” represents a union or merger of two poles in a dichotomy. If “-a” (“not a”) represents one's “Consciousness of ‘a’ ” or “perception of ‘a’ ” or “image of ‘a’ ”, one sees that in this context and this context alone, OUT OF THE ENTIRE "SET OF ALL NOT A”, “a ⓘ -a.”

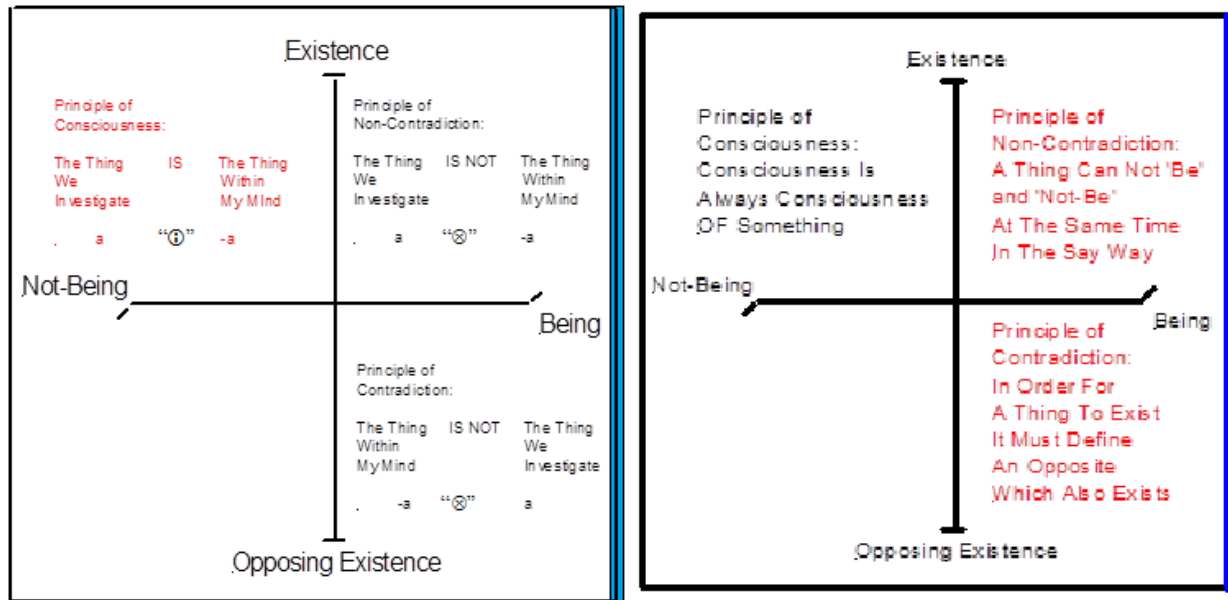
If we place the central idea of this situation into a simple rule, we have:

Axiom III: The Principle of Consciousness

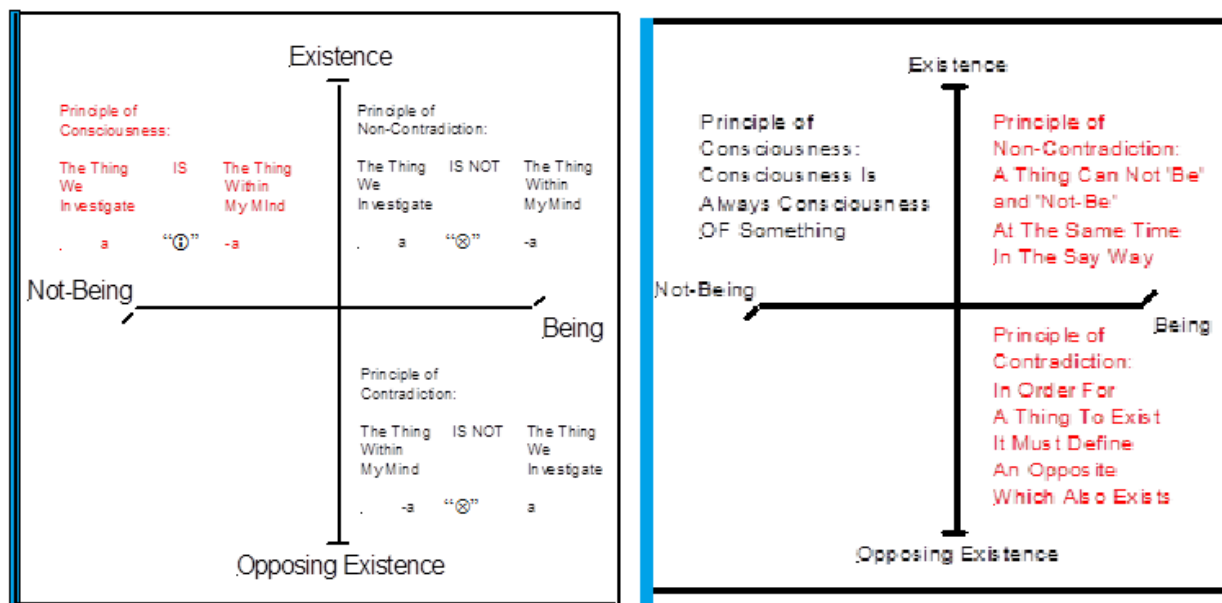
Consciousness is always consciousness OF something.



If we re-define “a” as “any object which we investigate,” and “-a” as “the consciousness of a” we have on the “Being” side of our above symbol a strict duality between mind and object (“a ⊗ -a”, “-a ⊗ a”).



Negating this on the “Non-Being” side of our symbol, we see a merger of mind and object (a ⊕ -a).



To make these distinctions clear: Imagine that I hold before you a pencil. Do I hold before you a pencil, or simply your thought of pencil? After considering the matter, is it not clear that there is a unity between these two “objects” in that one can not be separated entirely from the other? This is the essential unity suggested by Axiom III, *The Principle Of Consciousness*.

Note that under the concepts described above that *The Principle of Non-Contradiction*, a fundamental principle of “the hard” sciences, is *negated* by *The Principle of Consciousness*. It becomes an axiom, consciousness as a necessary principle. Axiom III states that to be “conscious” is to have something within the mind upon which consciousness focuses. Without

the simultaneous existence of the point and the thought of the point, consciousness of the point does not exist. Axiom III, *The Principle of Consciousness*, negates Axiom I, *The Principle of Non-Contradiction*, because it states a circumstance under which a thing IS both itself and not-itself simultaneously. Note also that this Third Axiom, *The Principle of Consciousness*, arises when we apply *The Standard Cross* to the two Axioms which make up the basis of *The Standard Cross*.

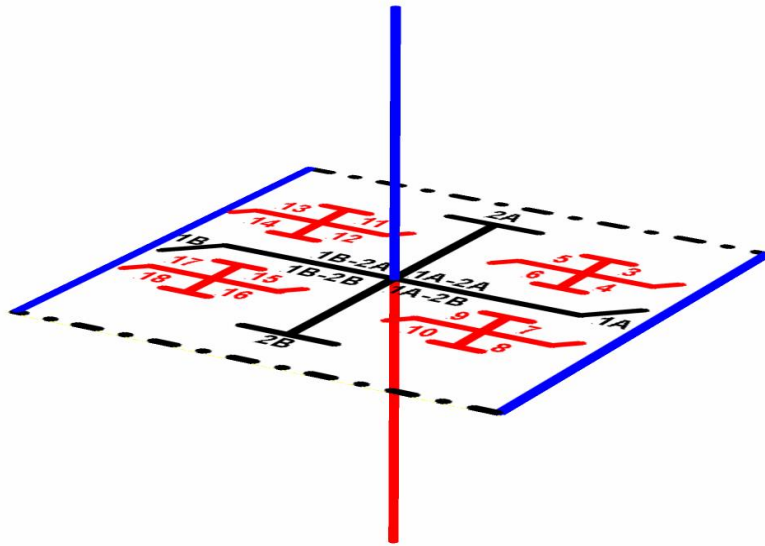
To review:

1. As we have developed this “alphabet” we are required to apply the Standard Cross to the only two “things” in existence, i.e. *The Principle of Non-Contradiction* (as a “Self”) and *The Principle of Contradiction* (as an “Opposite” to an existent “Self”).

2. Obviously we are not *required* to state “Consciousness” as a principle; we can simply refuse to consider what – if anything – might negate *The Principle of Non-Contradiction*.

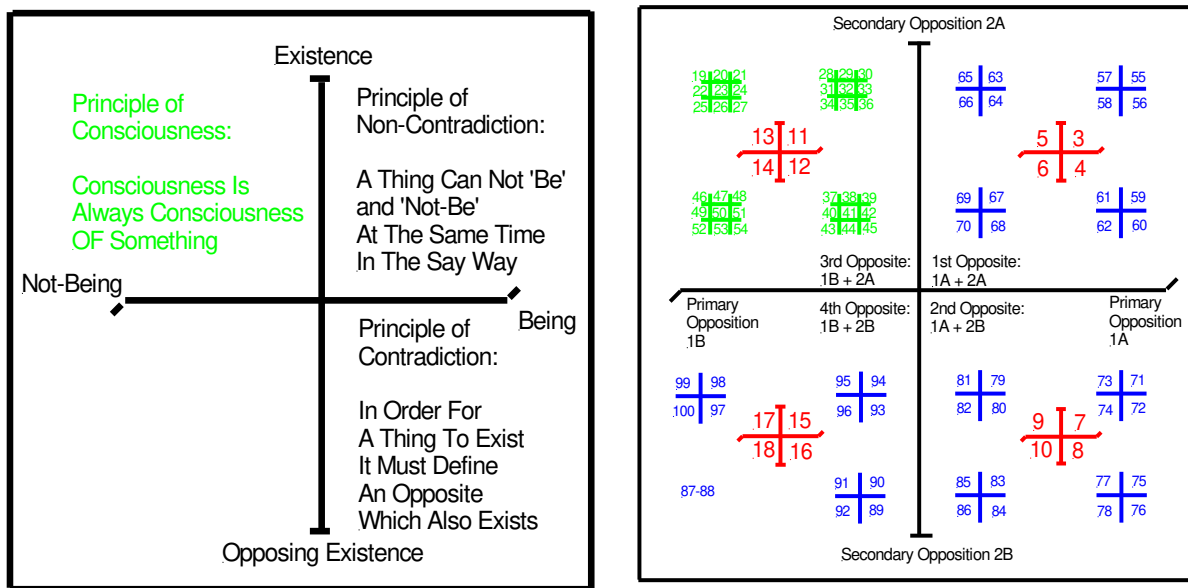
3. On the other hand if we develop this *Principle of Consciousness* we are forced to include it as an axiom, something imposed upon the Standard Cross in a fashion equivalent to that of *The Principle of Non-Contradiction* and *The Principle of Contradiction*.

4. If we are to include Axiom III, *The Principle of Consciousness*, as a part of the model developed and on a par with the first two Axioms of *Non-Contradiction* and *Contradiction*, a Third Axis is created, an “Image Axis” is created, as follows:



5. This “Image Axis” differs from the previous two axes, because it states the idea that “Two Are One,” i.e. that there exists in “Consciousness” a necessary and simultaneous existence – A MERGER (not a separation) – of two polar opposites: the way something *is*, and the way something is *within my mind*. In the alphabet analogy we now have a new letter: “X”.

If we consider the uncertainty typical of the “negation” quadrant, one would anticipate that any discussion of “Consciousness” must demonstrate an inherent, unavoidable uncertainty.



In other words one must consider: How can Consciousness, which *negates The Principle of Non-Contradiction*, be known by any science which *founds* itself upon *The Principle of Non-Contradiction*?

We might anticipate that an inherent uncertainty will arise in pursuit of an understanding of Consciousness. This inherent uncertainty will be described at the conclusion of this essay. For now we simply notice that a great deal of uncertainty presently surrounds not only the scientific importance of Consciousness, but also the methods and tools which should be used to approach it. Contrast this with the approach used here.

For as stated above, we view Consciousness as an axiom, a central and unavoidable part of all mathematical models of motion, change and development, and moreover an axiom which negates the Principle of Non-Contradiction, one of the central tenets of the physical sciences.

8. Other Approaches To Consciousness

The scientific study of consciousness and its physical origins has taken on considerable interest recently due at least in part to the efforts of Francis Crick, microbiologist and Nobel Prize winner for his discoveries regarding the double-helix structure of the DNA molecule. In an effort to distinguish between the ideas presented here and others prevailing at the present time, some mention might be given as to the wealth of views on this topic.

In an article by John Horgan, senior writer for *Scientific American*, the question is asked “Can Science Explain Consciousness?”¹²² In this article Mr. Horgan describes the extensive number of opinions and approaches to consciousness at the present time. The views described by Mr. Horgan permit us to distinguish these approaches to Consciousness from that used herein. Regarding Francis Crick of the Salk Institute for Biological Studies Mr. Horgan states:

In 1990 Crick and Christof Koch, a young neuroscientists at the California Institute of Technology who collaborates closely with Crick, proclaimed in Seminars in the Neurosciences that the time was ripe for an assault on consciousness.

They rejected the belief of many of their colleagues that consciousness cannot be defined, let alone studied. Consciousness, they argued, is really synonymous with awareness, and all forms of awareness - whether involving objects in the external world or highly abstract, internal concepts - seem to involve the same underlying mechanism, one that combines attention with short-term memory.

Contrary to the assumptions of cognitive scientists, philosophers and others, Crick and Koch asserted, one cannot hope to achieve true understanding of consciousness or any other mental phenomenon by treating the brain as a black box - that is, an object whose internal structure is unknown and even irrelevant. Only by examining neurons and the interactions between them could scientists accumulate the kind of empirical, unambiguous knowledge that is required to create truly scientific models of consciousness, models analogous to those that explain transmission of genetic information by means of DNA.¹²³

¹²²*Scientific American*, Vol. 271, No. 1, July 1994, p. 88.

¹²³ Id., p. ----

Mr. Horgan mentions a number of other approaches to the study of consciousness at the present time. Persons rejecting the strictly biological nature of consciousness are referred to by Mr. Horgan as “mysterians,” i.e. persons who look for significant insights into consciousness outside the realm of neuroscience and molecular biology.

...Roger Penrose, a physicist at the University of Oxford, proposes that the mysteries of the mind must be related to the mysteries of quantum mechanics, which generates non-deterministic effects that classical theories of physics (and neuroscience) cannot. Although at first ignored and then derided by conventional neuroscientists, this alternative has steadily won popular attention through Penrose's efforts. ...

...Since the 1930s some physicists have speculated on the principle that the act of measurement - which ultimately involves a conscious observer - has an effect on the outcome of quantum events. Such notions have generally involved little more than hand waving, but they have become more prominent lately because of Penrose.

...The key to Penrose's argument is Godel's theorem, a 60-year old mathematical demonstration that any moderately complex system of axioms yields statements that are self-evidently true but cannot be proved with those axioms. The implication of the theorem, according to Penrose, is that no deterministic, ruled-based system - that is, neither classical physics, computer science nor neuroscience - can account for the mind's creative powers and ability to ascertain truth.

In fact, Penrose thinks the mind must exhibit non-deterministic effects that can be described only by quantum mechanics or "a new physical theory that will bridge quantum and classical mechanics and will go beyond computation." He even suggests that non-locality, the ability of one part of a quantum system to affect other parts instantaneously (Einstein dubbed it "spooky actions at a distance") might be the solution to the binding problem.¹²⁴

The “binding problem” is described as follows:

The answer (to problems relating to attention and visual input) is complicated by the fact that "there is no single place where everything comes together" in forming a perception; even a single scene is processed by different neurons in different parts of the brain. One must therefore determine what mechanism transforms the firing of neurons scattered throughout the visual cortex into a unified perception. "This is known as the binding problem," Koch explains, noting that it is considered by many neuroscientists to be the central issue of their field.¹²⁵

¹²⁴ Id., p. ----

¹²⁵ Id., p. ----

A separate and significant group of persons insist that physical systems cannot predict non-physical systems including that of consciousness.

Another group of mysterians, which consists for the most part of philosophers, doubts whether any theory based on strictly materialistic effects - quantum or classical - can truly explain how and why we humans have a subjective experience of the world.

"The question is, how can any physical system have a conscious state?" says Jerry A. Fodor, a philosopher at Rutgers University. Scientists who think that science alone can answer the question "don't really understand it," Fodor declares.¹²⁶

Describing a conference on consciousness at the University of Arizona, Mr. Horgan includes additional points of view.

(Attending the conference was) Steen Rasmussen, a biologist and computer scientist from the Santa Fe Institute, headquarters of the trendy fields of chaos and complexity. He suggests that the mind may be an "emergent" - that is, unpredictable and irreducible-property of the brain's complex behavior, just as James Joyce's *Ulysses* is a surprising outcome of applying the rules of spelling and grammar to the alphabet.¹²⁷

Other points of view are voiced as well.

Brian D. Josephson of the University of Cambridge, who won a Nobel Prize in 1973 for discovering a subtle quantum effect that now bears his name, calls for a unified field theory that can account for mystical and even psychic experiences.

Andrew T. Weil, a physician at the University of Arizona who is an authority on psychedelia, asserts that a complete theory of mind must address the reported ability of the South American Indians who have ingested psychedelic drugs to experience identical hallucinations.

In his 1992 book *Consciousness Reconsidered*, (Owen) Flanagan, (a philosopher at Duke University) argues on behalf of a philosophy called constructive naturalism which holds consciousness to be a common biological phenomena occurring not only in humans but in many other animals - and certainly all the higher primates. Other adherents to this position include Daniel C. Dennett of Tufts University (author of *Consciousness Explained*, also published in 1992) and Patricia S. Churchland of the University of California at San Diego. "We say you can acquire knowledge of consciousness by triangulation," Flanagan remarks, that is, by combining neural and psychological data from experiments on humans and animals with subjective reports from

¹²⁶ Id., p. ---

¹²⁷ Id., p. ---

humans.¹²⁸

A final opinion given by the article is that of David Chalmers of Washington University who “agrees with McGinn that no strictly physical theory - whether based on quantum mechanisms or neural ones - can explain consciousness.”

All physical theories, Chalmers claims, can describe only specific mental FUNCTIONS - such as memory, attention, intention, introspection - correlating to specific physical processes in the brain. According to Chalmers, none of these theories addresses the really “hard” question posed by the existence of the mind: Why is the performance of these functions accompanied by subjective experience? After all, one can certainly imagine a world of androids that resemble humans in every respect - except that they do not have a conscious experience of the world.

“Science alone cannot supply an answer to this question,” Chalmers declares. Unlike McGinn, however, Chalmers holds that philosophers can and must construct a higher-level theory to bridge that “explanatory gap” between the physical and subjective realms. In fact, Chalmers has such a theory. He asserts that just as physics assumes the existence of properties of nature such as space, time, energy, charge and mass, so must a theory of consciousness posit the existence of a new fundamental property: information. The concept of information, Chalmers explains, has aspects that are both physical and “phenomenal” (a philosopher's term that is roughly equivalent to “experiential” or to “subjective”).¹²⁹

The union which is speculated by philosophers between the way something IS and the way something is WITHIN MY MIND forms one of the most important points in logical inquiry. This point is summed up in *the Encyclopedia of Physics* as follows:

We have to distinguish between the *ontological priority* of physical objects (their fundamental status among existing things) and an assumed *epistemological priority* (their being the basis of the rest of our knowledge). Strictly speaking, of course, we do not know physical things, only their appearances. The attempt to provide a purely phenomenological foundation for science, however, has been unsuccessful, and most philosophical accounts accept an initial hypothesis of matter in some form or other.¹³⁰

We are approaching Consciousness in these essays as an Axiom, something as basic as a letter of an alphabet in the reading and understanding of all phenomena, something from which other points follow, and which can only be investigated in this context. The significance and meaning of the term “consciousness” should be discussed.

¹²⁸ Id., p. ---

¹²⁹ Id., p. ---

¹³⁰ Peter Caws, "Philosophy of Physics," *Encyclopedia of Physics*, Editors Rita G. Lerner and George L. Trigg, Second Edition, VCH Publishers, Inc. New York, cc 1990, pp. 902-904.

9. Our Use of the Term “Consciousness”

Regarding the purely human experience of consciousness let us consider *The Principle Of Consciousness* presented here as an axiom, as a basic letter of a universal alphabet. Imagine that a person finds himself or herself in outer space. Imagine that there is no force of gravity, no sensation, no other object, star, light or countervailing “existence.” In fact there is no sense of touch or sound or other contact in this dark void of outer space into which this individual consciousness has wandered, including even the sensation of touching one's own body. Let us go further and exclude the sense of previous touchings, contacts, motions, movements and occurrences, in fact excluding all sense or memory of history entirely such that the past is no more an object of the consciousness than is the present. The question arises, does the person's consciousness “exist?”

My answer is “no,” for the ability to separate consciousness itself from consciousness OF SOMETHING does not exist. By removing all objects of consciousness entirely the consciousness - I speculate - will leave this unfortunate person as a dead and lifeless mass.

An interesting biological note might be made. On two occasions, once in Nazi Germany, once in thirteenth century Sicily under King Frederick II, “stupor mundi” 1194 ad. to 1250 a.d., experiments were made in which newborn infants were given all food, clothing, and warmth necessary for their development, but were deprived the love, comfort and interaction of their mothers. In both instances the children died.

I give this as an example of the need for human consciousness to attach itself to some thing other than itself as the very premise of its own existence. The example from the middle ages is as follows:

Frederick's curiosity was limitless and wholly unconstrained by such few notions of mercy as light a savage age. One monkish chronicler relates that Frederick, “Wanting to find out what kind of speech children would have when they grew up, if they spoke to no one before hand ... bade foster mothers and nurses to suckle the children, to bathe and wash them, but in no way to prattle with them, for he wanted to learn whether they would speak the Hebrew language, which was the oldest, or Greek, or Latin, or Arabic, or perhaps the language of their parents, of whom they had been born. But he labored in vain, because the children all died. For they could not live without the petting and the joyful faces and loving words of their foster mothers.”¹³¹

The above facts indicate the need for consciousness to be conscious OF something. If an infant's consciousness is one in which emotional needs are not met, then on a very basic level there is nothing to be conscious OF. This short-circuiting of consciousness, this refusal to return the love and affection of an infant from one conscious being to another, has been shown to end further development of the infant's consciousness, leading to death. This is taken herein as a basic fact of consciousness, the equation of the *idea* with the *reality* of any object as developed

¹³¹ Taken from Edmund Stillman, “Frederick II: Wonder of the World,” c. 1968, American Heritage Publishing Company, as found in *Perspectives in Western Civilization: Essays from Horizon*, Volume I, American Heritage Publishing Company, New York, New York, 1972, pp. 154-164, 163.

from birth.

The question “Does a tree falling in a forest make a sound if there is no person there to detect the sound?” is far from the point. In this question we have the laws of physics, gravity, sound, vibration, and planetary existence all assumed. On these assumptions, the “sound” of the tree falling can be predicted and assumed as the result of all previous assumptions of the question.

However removing these assumptions, such that the bare assumption of consciousness without “consciousness OF something” is attempted, existence is itself in question.

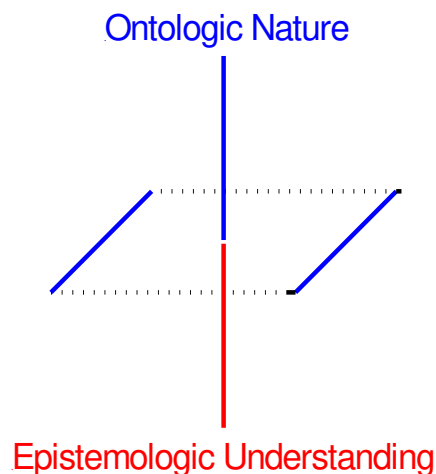
OPPOSITIONAL ANALYSIS

PART THREE

10. The Concept of a Circuit

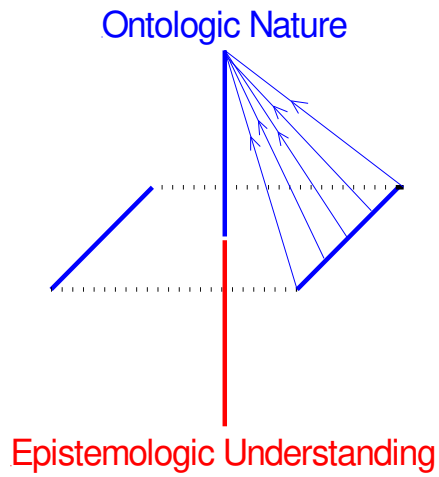
The fundamental question posed by the Mind-Body problem is well stated by Chalmers, *supra*: “None of these theories addresses the really ‘hard’ question posed by the existence of mind: Why is the performance of these (neural, physical, chemical) functions accompanied by subjective experience?”

To re-state the same question using the diagram proposed as the Image Axis: If it is axiomatic that the lower pole (Epistemologic Understanding) and the upper pole (Ontologic Nature) at some point merge in subjective experience, how does this merger take place?

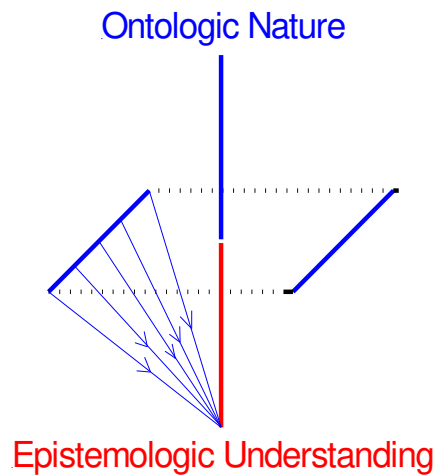


Let us analyze how this may occur.

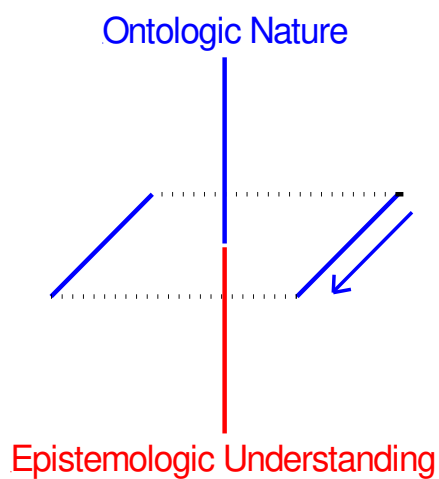
We begin with the observation that the basis for the Ontologic Nature of anything is the result of the Being side of reality.



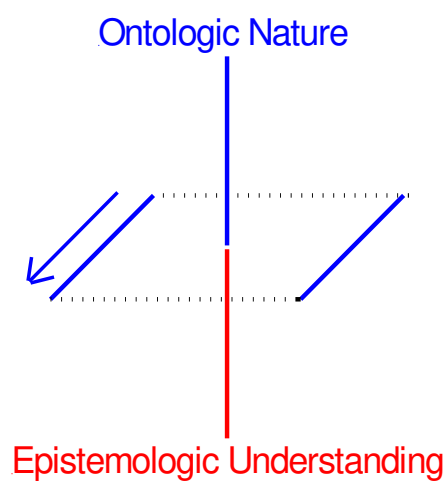
If this is true then the basis for an Epistemologic Understanding of that Ontologic Nature must be found in the Non-Being side of reality.



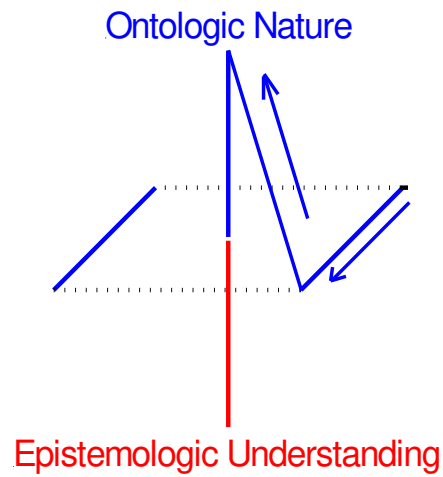
In terms of priority, the Self must come before its Opposite on the Being side of our diagram ...



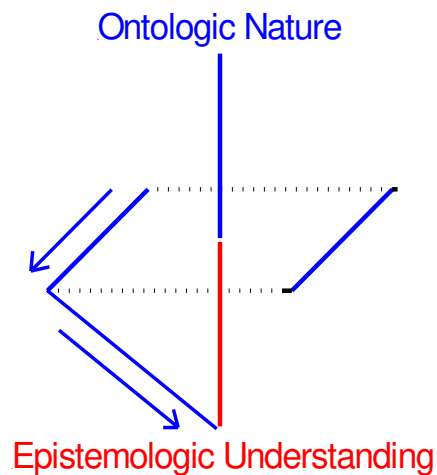
... Just as Negation must come before Context on the Non-Being side of our diagram.



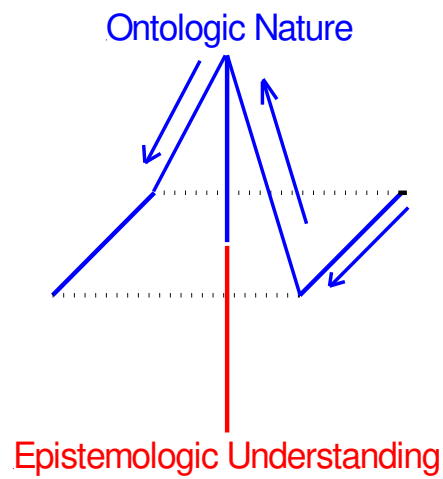
Using this approach, the struggle between the Self and its Opposite on the Being side of reality is the basis for the Ontologic Nature of any existing thing.



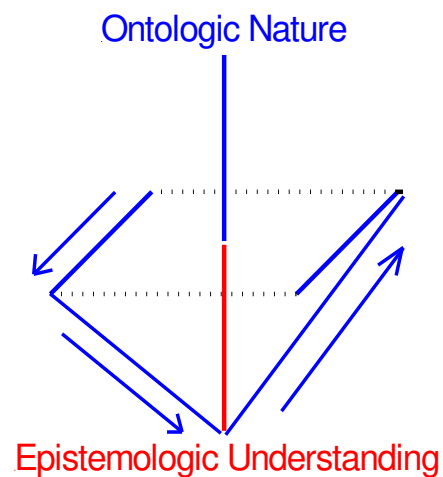
Conversely, the struggle between Negation and Context on the Non-Being side of reality is the basis for the Epistemologic Understanding of the Ontologic Nature.



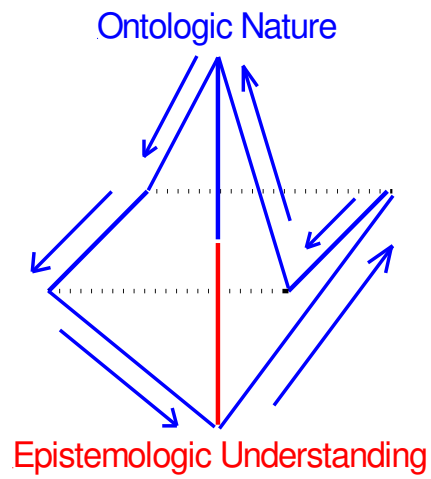
We must observe further that the Ontologic Nature must precede its Epistemologic Understanding...



And we may also observe that once an Epistemologic Understanding has been obtained, this Ontologic Nature has been affected in some fashion.

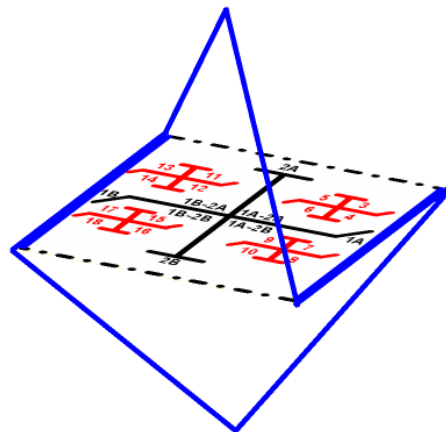


Connecting these ideas we have a in a circuit of relationships.



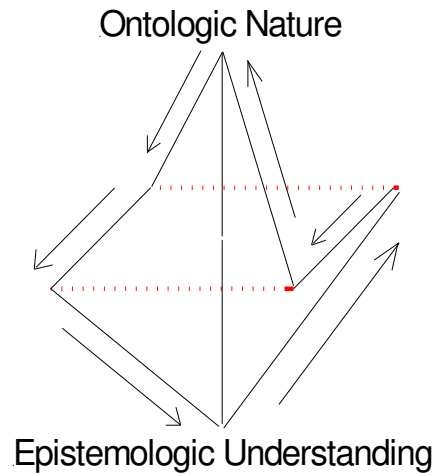
or to include the entire system as developed to this point:

ONTOLOGIC NATURE

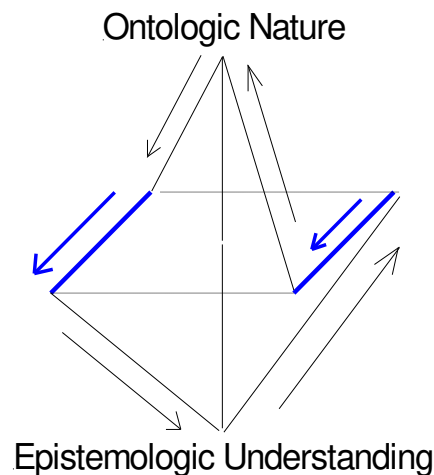


EPISTEMOLOGIC UNDERSTANDING

This figure avoids the gulfs imposed by the Primary Opposition, i.e. the *Principle of Non-Contradiction*, between “Self and Negation,” and “Opposite and Context.” The *Principle of Non-Contradiction* states: “A thing can not be itself and be not itself at the same time in the same way.”



This figure is designed to include the tension created by the Secondary Opposition, i.e. the *Principle of Contradiction*, between “Self vs. Opposite” and “Negation vs. Context.” The *Principle of Contradiction* states: “In order to exist, a thing must possess an opposite, which also exists.”



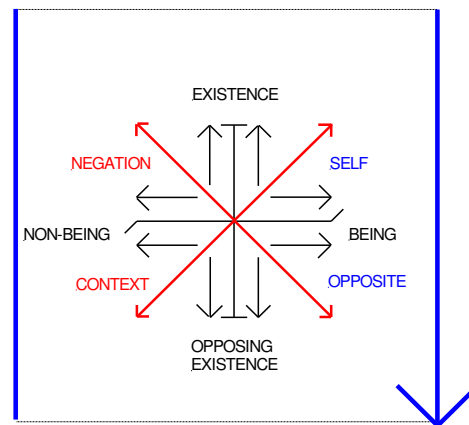
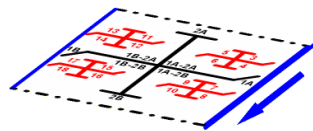
This figure suggests that a constantly self-referencing circuit is the basis of the merger between the Ontologic Nature and the Epistemologic Understanding of anything which exists.

The analysis of these relationships at the philosophic level is intended (1) to simplify explanations of the characteristic structure of various levels of reality, and (2) to aid in an understanding of the whole by the way of providing a single, common reference for all levels.

Let us reformulate this circuit into a set of seven statements each of which is consistent with the tenor of the observations made so far. These statements provide a philosophic foundation for the investigation of consciousness at various levels of reality.

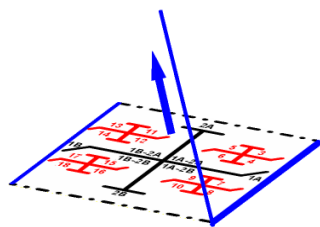
11. Circuit of Being

- (1) *Every Self must have an Opposite in order to exist.*



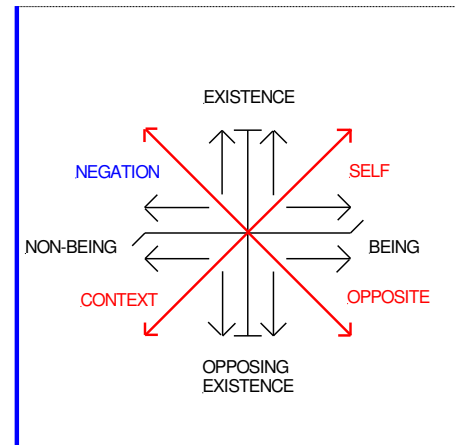
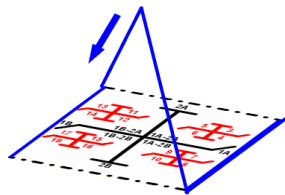
- (2) *Once this “Opposite” has been declared, an Ontologic Entity exists. This does not mean that the Entity is known; it merely means that it Exists as an independent thing in reality.*

ONTOLOGIC NATURE



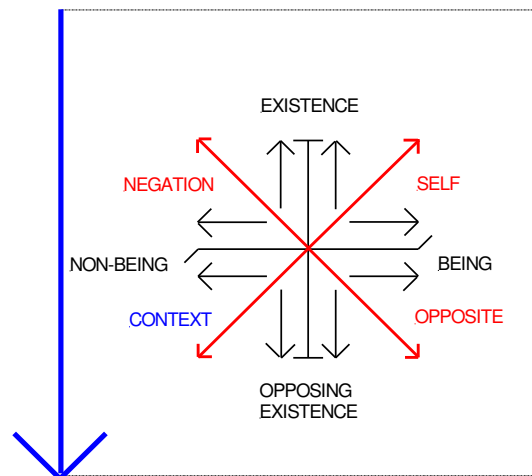
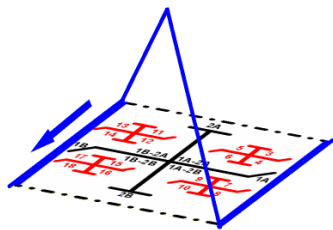
(3) *Status as an Ontologic Entity permits the Self to differentiate itself from every other thing in the Universe. This status permits the Self to have a Negation, i.e. "Everything which the Self is Not." In this manner, the Self is empowered to maintain its integrity under the Primary Opposition, the statement that "A thing can not 'Be' and 'Not-Be' simultaneously and in the same way."*

ONTOLOGIC NATURE



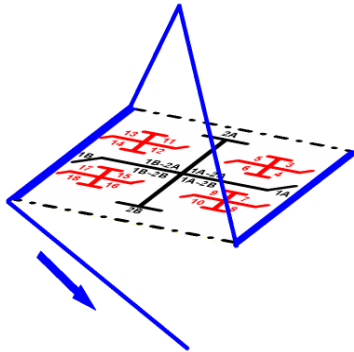
(4) *This Negation gives rise to a positive statement of the Self, a Context, in order to distinguish what the Self truly IS.*

ONTOLOGIC NATURE



(5) Upon satisfactorily identifying the Self and its Opposite, as well as its Negation and Context, an Epistemologic Understanding of the Self of some sort has been reached.

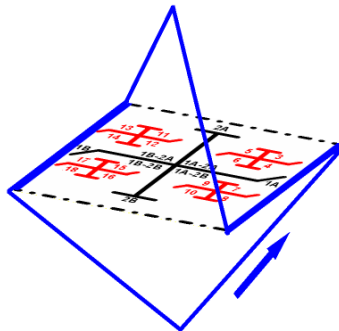
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

(6) The Epistemologic Understanding of a Self has a direct bearing on the Self. Once the Self is known, it has become a "Known" Self rather than an "Unknown Self."

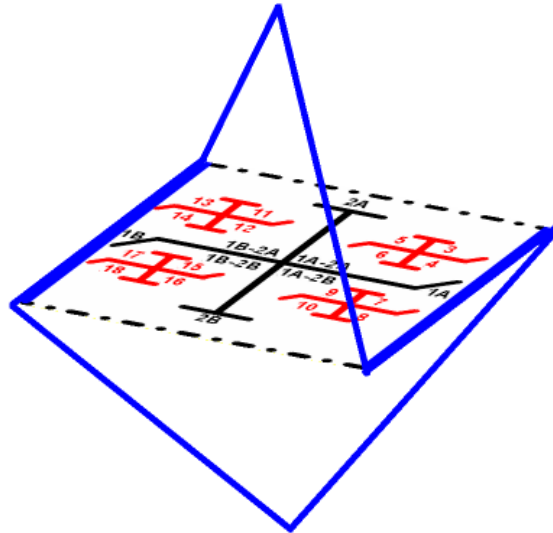
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

(7) *This circuit of considerations might be represented by the following figures, in which each line is of equal length.*

ONTOLOGIC NATURE

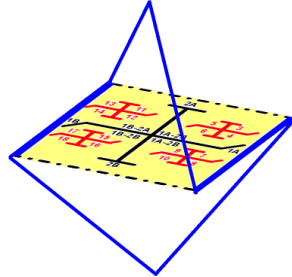


EPISTEMOLOGIC UNDERSTANDING

This model is of three planes:

(1) a plane of dichotomies, one which defines the basic categories of anything which can be deemed to exist,

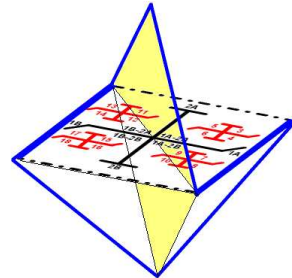
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

2) a plane of the essential Ontologic Aspects creating the level of reality in question, the contest between the Opposite and the Negation of the Self, and

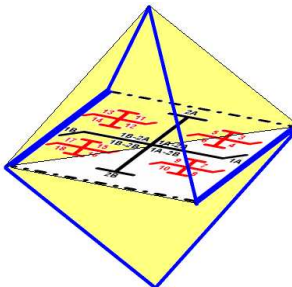
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

3) a plane defining the essential epistemologic relationship permitting the level of reality to be understood and comprehended, i.e. the epistemologic understanding of the Self and its Context.

ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

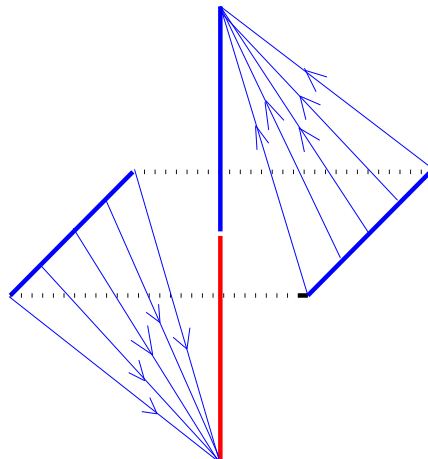
The circuit described answers the Mind-Body Problem first raised by Descartes in that this circuit permits the merger of an Ontologic Nature and an Epistemologic Understanding in a fashion which takes into account the *Principle of Non-Contradiction* and the *Principle of Contradiction*.

We have seen, however, that an uncertainty arises on the left hand “negation” quadrant. This occurred when we considered the impossibility of knowing with certainty the top draw card while remaining true to the rules of Gin Rummy.

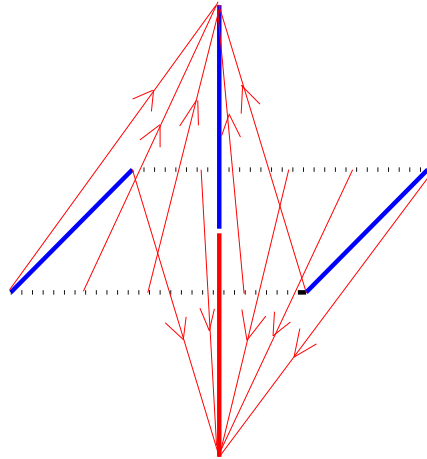
What is the philosophic basis of inherent uncertainty?

12. The Concept of Non-Being

The Being side of this figure has been given as the basis for Ontologic Nature and the Non-Being side has been given as the basis for an Epistemologic Understanding. These arose when we adhered to the *Principle of Non-Contradiction* used the “Self” and “Opposite” generated by the *Principle of Contradiction* as the basis for an Ontologic Nature and Epistemologic Understanding.

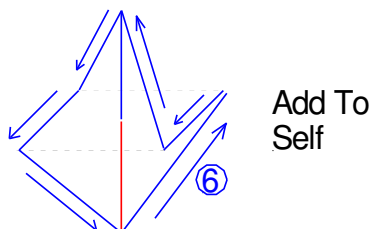
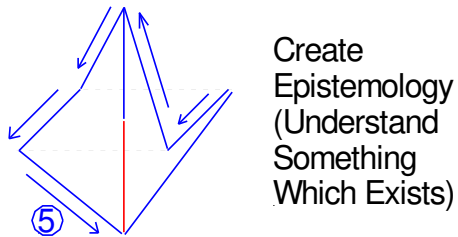
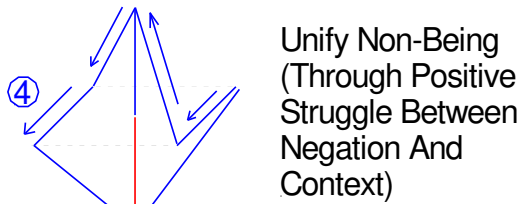
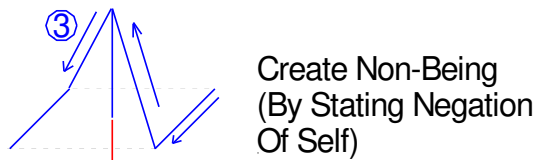
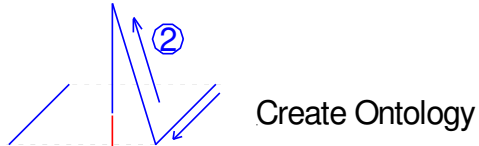
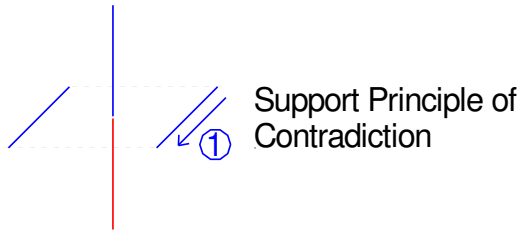


But what happens if we violate the rules set down? In other words, what occurs if we deny the validity of the *Principle of Non-Contradiction*, ignore the *Principle of Contradiction*, and use this position as the basis for an understanding of the world around us? This must create the basis for an attack upon our scheme.

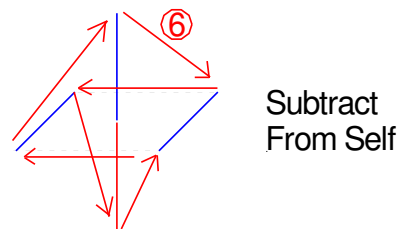
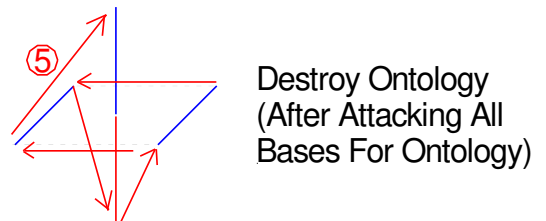
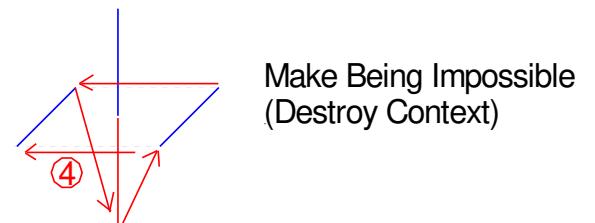
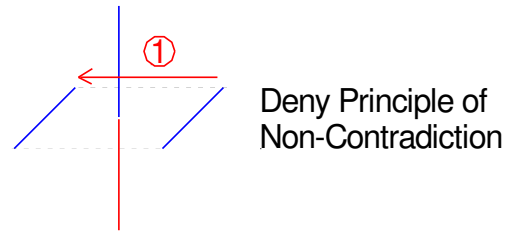


Let us begin with a “Circuit of Being” and label its opposite a “Circuit of Non-Being.”

BEING



NON-BEING



How can one deny the *Principle of Non-Contradiction*? One method is as follows:

Note first that the concept “Negation” has been placed as a “Primary Opposite” from the concept “Self.” In other words, once a particular “Self” has been found to exist, this very existence gives rise to “everything which the Self IS NOT,” i.e. the ‘Self’s’ “Negation.”

Moving further, what occurs if we use the concept “Negation” as an independent, originating “Self”? This is not the standard use of the term “Negation.” Typically the use of the concept “Negation” makes sense only in light of some independent, originating “Being.” In this standard usage, the concept “Negation” functions vis-a-vis an original, separate, independent, particular “Self.” In this standard usage, the “Negation” of that particular “Self” represents “all that (a very particular, originating, independent) Self Is Not.”

On the other hand, if we treat the concept of an undifferentiated “Negation” as an original, independent, originating “Self” we state that the concept “All that the Self Is Not” has some validity absent some separate, independent, particular and originating “Self.” If, under the *Principle of Non-Contradiction*, a thing cannot “Be” and “Not Be” simultaneously and in the same way, then the assertion that the “Not Be” can function as an independent “Being” (without reference to a separate, independent, originating “Self”) is inherently contradictory of this First Principle. In short, when the Negation is treated as a Self, we find ourselves asserting that “Not Be” can “Be” and “Not Be” simultaneously and in the same way. This violates the *Principle of Non-Contradiction*.

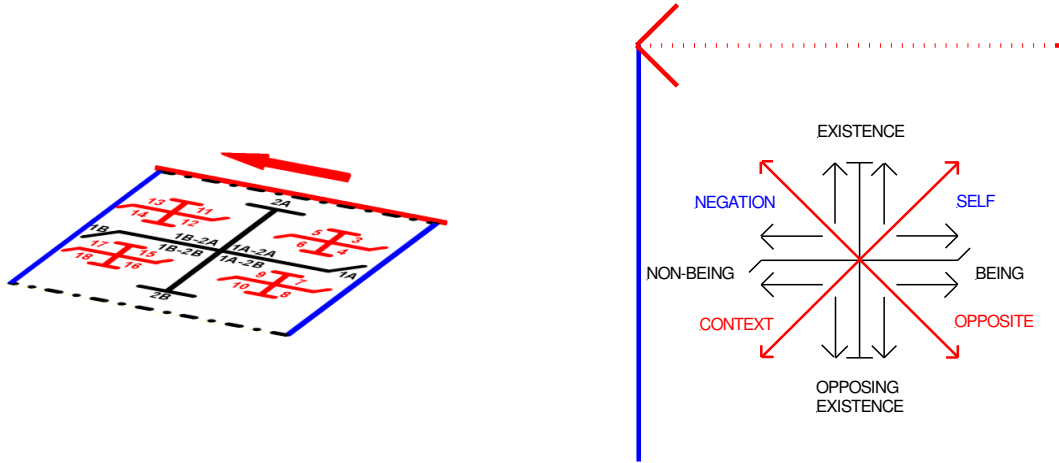
One philosopher referred to this as the topic which is never raised in philosophy. The very thought that “Negation” might have some independent existence absent reference to a particular “Self” gives rise to a number of philosophic problems, beginning with the impossibility of defining such a “Negation’s” independent, originating existence in a rational way.

Let us consider a “Circuit of Non-Being” in connection with this effort. In this case, should the concept “Negation” be treated as a “Self,” we face a number of challenges to our existing scheme. Let us label these as “prohibitions” and list them in seven statements. Allowing these assertions to follow the “Circuit of Non-Being,” we have the following circuit.

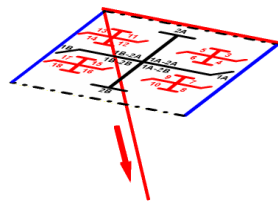
13. Circuit of Non-Being

(8) *One prohibition exists upon the use of these concepts: The Concept of “Negation” must itself have something upon which to work, i.e. it represents everything that a particular Self IS NOT.*

If the Concept of Self is applied to Negation...

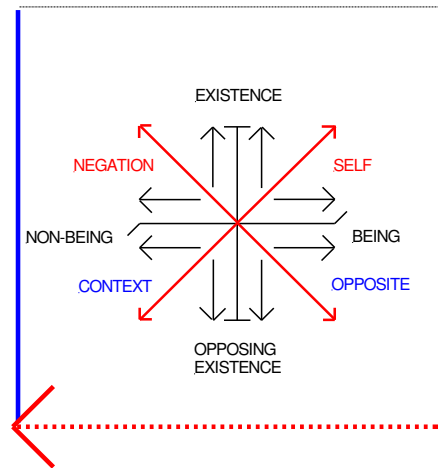
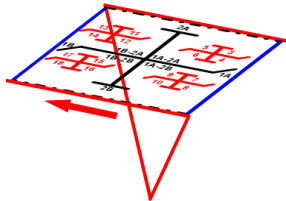


(9) *... an immediate Epistemological Difficulty arises ...*



EPISTEMOLOGIC UNDERSTANDING

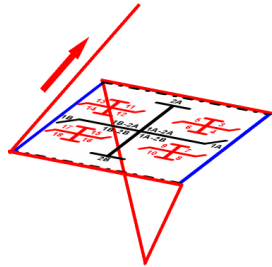
(11) Moreover, no Context for such an entity can exist, because neither an Opposite nor a Negation for “Negation” can exist.



597

(12) *The very idea that Negation might be treated as a “Self” constitutes an attack on the concept of “Ontologic Nature.”*

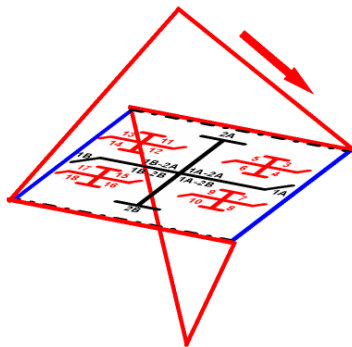
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

(13) *If the concept of Ontologic Nature is invalid, there can be no application of the concept “Self” to Negation.*

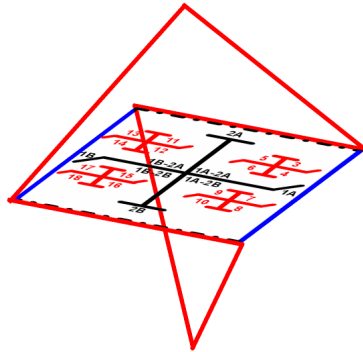
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

(14) We have then a circuit wherein philosophy declares certain thoughts improper, illegal. This illegality is found in the treatment of Negation as a form of Self. This circuit might be represented as:

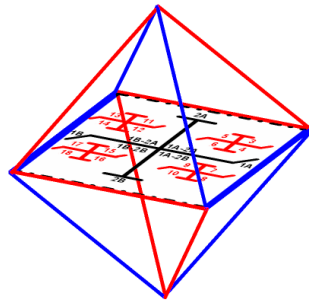
ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

(15) Joining the positive (blue) and negative (red) circuits of philosophy together we have the following:

ONTOLOGIC NATURE



EPISTEMOLOGIC UNDERSTANDING

OPPOSITIONAL ANALYSIS

PART FOUR

15. Merger of the Poles of the Image Axis in Reflective Capacity

Any consideration of the term “consciousness” as used herein must bear in mind that consciousness is a structure, a form for understanding something. To “see” the workings of an economy or the organization of the Periodic Table of Chemical Elements means to “understand” these workings and organizations; it does not mean to “see” them in some physical sense.

The concepts of ontology and epistemology as used herein associate a level of “conscious” behavior with the international economy, the history of Europe, the economic development of the United States and the functioning of the judicial branch of the United States. These levels of “consciousness” build upon the game-playing psychology of Gin Rummy and they repeat the underlying structure which was discovered in this simple two-handed card game. By expanding the search for “consciousness” to these broader levels, a scheme for consciousness at all possible levels is presented. This structure is found in the non-living as well as living levels of the reality around us.

In order to develop this understanding of consciousness, the underlying concepts of “ontology” and “epistemology” must be expanded to include levels of consciousness which are not solely connected to the solitary human perception.

Our Third Axiom, the *Principle of Consciousness*, states: “Consciousness is always Consciousness OF something.” This Axiom has been personified by the introduction of an “Image Axis.” This Axis represents the opposition between the nature of the thing as it exists (ontologic nature), and the understanding of that thing (epistemologic understanding).

Prior to the introduction of the Principle of Consciousness, two other axes already existed in this system. The First Axiom, the *Principle of Non-Contradiction* states: “A thing can not be and not-be at the same time in the same way.” The Second Axiom, the *Principle of Contradiction* states: “A thing which exists must have an opposite which also exists”)

Unlike these first two axioms, the *Principle of Consciousness* does not separate reality into irresolvable halves or oppositions. Rather, it forces a joinder, an inviolable unity, between “Consciousness” and the “Something” of which consciousness is conscious.

This understanding of ontology and epistemology is perhaps a bit different. As I tried to describe these ideas to a friend of mine, Thad Suits, the following conversation was helpful.

Thad: I don’t understand how the epistemologic existence of something has anything to do with the ontologic reality of that thing. Just because I know that there is a quasar out there doesn’t affect the quasar.

Scott: Assume for the moment that you don’t know that the quasar is there. Is it a quasar?

Thad: Sure.

Scott: Now, assume that you just got word that the quasar exists. Is it the same quasar?

Thad: Sure!

Scott: How can it be? Before it was an unknown quasar. Now, it's a known quasar. Those are two different things, ontologically speaking.

Thad: That's absurd! The ontologic existence of the quasar hasn't changed at all! My perception of the quasar has perhaps changed. My understanding of the quasar has perhaps changed. But the ontologic existence of the quasar itself has not changed a bit.

Scott: If the quasar is now known to you, when before it was not known to you at all, then it seems to me that this single change has affected the ontologic existence of the quasar. It is not the same quasar as before.

Thad: I guess I just don't buy that.

Scott: Let's imagine the continent of South America before the voyages of Columbus. Prior to the discovery of South America stemming from Columbus' voyages, South America was unknown to Europeans. After the first European sets foot on South America, is it the same South America? Is the South America, post-European invasion, the same South America pre-European invasion?

Thad: No, of course not. These are different South Americas. But the difference stems from a whole invasion of the continent, not from the knowledge of a single person.

Scott: But that invasion would not have been possible without the first discovery of a single European who goes back to Europe and starts the invasion. Therefore, once the epistemologic understanding of a single person has changed, the ontologic reality of the thing changes with it.

Thad: That seems just too far out to me. It seems too extreme.

Scott: Well, let's try another example. Right now we are sitting in the Morning Light Café in Great Falls, Montana. I am sitting on a typical restaurant chair. I can't actually see this chair without moving around to look at it, but I assume that this chair is exactly like the chair that is next to me on my right facing you. I also assume that you are sitting on a similar chair and that this chair looks exactly like the chair next to you on your left. So far so good?

Thad: OK, sure.

Scott: Now from where I am sitting there is a chair possibly behind you, facing the table behind you, but I can't tell. Your torso is blocking my view of that chair, so I don't really know if there is a chair behind you or not, and without turning around you can't see the chair either. But really, just given the position of our bodies in the room, there might not be a chair behind you at all. Still ok?

Thad: I can buy this so far.

Scott: Now right now we are in a ground breaking philosophic discussion about the relationship between ontology and epistemology. And we are discussing a chair which may be, but we don't know, directly behind you. In other words, if there is a chair behind you, then it has a particular ontology. On the other hand, if there is no chair behind you, then it can not have an ontology at all, because it doesn't exist. So far, so good?

Thad: I guess.

Scott: Now let's imagine that there is a chair behind you, and sure enough, that is THE CHAIR which Thad Suits and Scott Albers were referring to in this ground-breaking discussion of the relationship between ontology and epistemology. That is THE CHAIR. THE FAMOUS CHAIR. For the next one thousand years people will want to see that chair, visit the museum which houses that chair, etc. etc. That chair will be as famous as anything that Plato ever mentioned or that Descartes ever thought about. If, of course, it actually does exist. At the present time, I don't even know if there is a chair there or not, because you are blocking my view. And you can't tell me without turning around, which you are not doing yet.

Thad: Go on.

Scott: Think of it. If there actually is a chair there, we could take that chair, initial it, send it to Sotheby's for auction and we'd both be rich! We could get a million dollars for that chair because that is THE CHAIR!

Thad: OK.

Scott: If there is a chair there, would our knowledge of the existence of that chair change the chair? Would our epistemologic awareness of that chair change the ontology of the chair itself?

Thad: I'm not sure.

Scott: Think of it. Right now we don't even know that there's a chair behind you. So just knowing that the chair exists gives us the beginnings of an epistemology of the chair. Once we go beyond the simple existence of the chair to our mutual knowledge of the chair, we now have a million dollar museum piece which we can both cash in on.

Thad: If there is a chair there at all.

Scott: Right. We could both take magic markers, sign the chair, and then send it to Sotheby's for auction. Before it was just a regular old chair. Now it is THE CHAIR, THE CHAIR THAT ACTUALLY EXISTED. If, of course, there is a chair there in the first place.

Thad: So our knowledge of the chair would change the chair itself.

Scott: That's my point. The ontologic existence of something is changed by an epistemologic awareness of the thing, and this change in the ontology of the thing is subject to further changes in epistemology. In essence, the relationship between ontology and epistemology is a circuit. The Image Axis is the foundation of that circuit.

Thad: I can see your point, but I think you need to cover it in an additional essay.

Waitress: You're going to have to move now. I'm cleaning up the room. Please take your things to the next room.

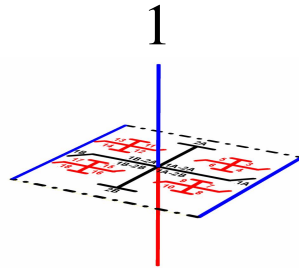
Scott, Thad: Sure, no problem.

(As Thad and Scott change tables)

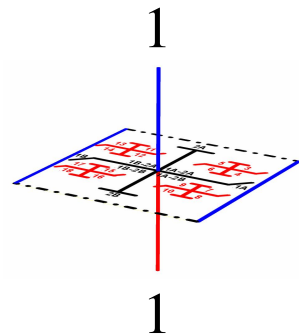
Thad: There IS a chair there! The chair actually DOES exist!

In this essay, the possibility of a connection or harmony between mind and matter has been made through a "Circuit of Being" and an equally necessary "Circuit of Non-Being." These circuits arise from the basic terms of any level of reality studied.

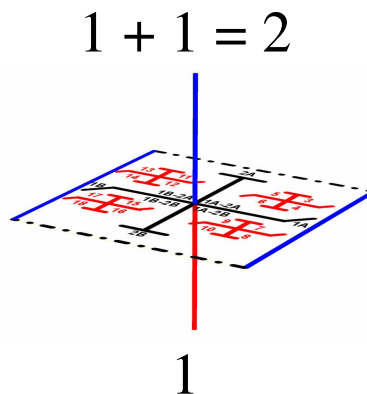
As a “Circuit of Being” and “Circuit of Non-Being” join the elements necessary to sustain the ontologic nature and epistemologic understanding of any self, a mirror reflection is created wherein *the ontologic reality of the object* contrasts directly with *the epistemologic reality of that object*. If the unit “1” represents the “Ontologic Nature” of any self, we have:



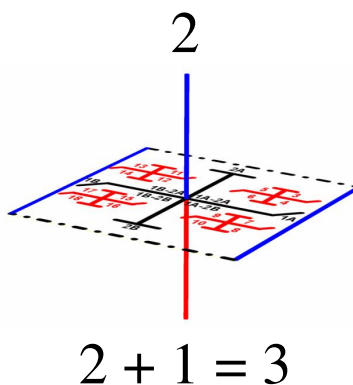
Let us oppose the “Ontologic Nature” of any object with the “Epistemologic Understanding” of that same object. Because these two concepts of “Ontology” and “Epistemology” are intended to mirror one another – i.e. “object” and “understanding of that object” - we may give a second unit “1” to represent the Epistemologic Understanding of that object. (I use capitals to emphasize the formal placement of these ideas in the Image Axis.)



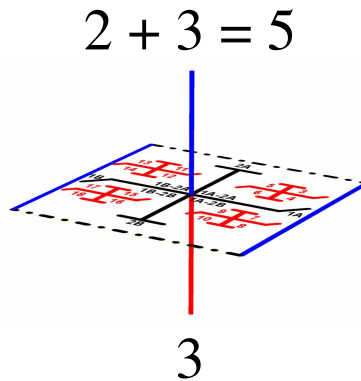
The “Image Axis,” standing as a vertical line above the standard cross, represents an absolute equivalence between the object which “IS” (ontologic nature) and the object which “IS IN MY MIND” (epistemologic understanding). However, once an object is “known,” the object itself becomes – no longer simply “an object,” but rather – “a *known* object.” This addition of an Epistemologic Understanding of an underlying Ontologic Nature may be represented as the addition of both the “ontologic 1” and the “epistemologic 1” in a new ontologic unity, $1 + 1 = 2$, i.e. “a *known* object.”



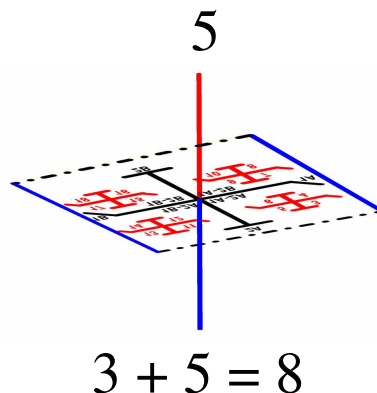
On the other hand, once the Ontologic Nature of an object has had added to it an Epistemologic Understanding of that object, a *new* understanding of the now “*known* object” must occur as well. This might be represented as “ $2 + 1 = 3$ ” where the “2” represents a “*known* object” and the “1” represents the prior Epistemologic Understanding of the object which has now changed. This process begins an infinite progression as these opposites reflect one another.



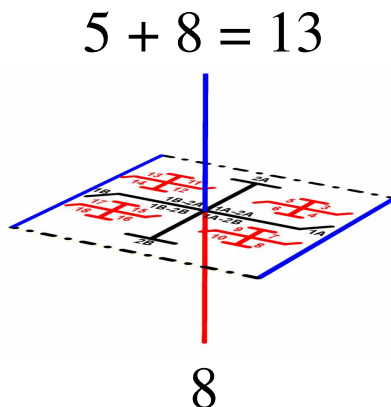
Once this new Epistemologic Understanding has been achieved, the object is now “known” *in a new and more complete manner*, which again changes its Ontologic Nature. This new Ontologic Nature might be represented as the equation “ $2 + 3 = 5$ ” where the “2” represents the former Ontologic Nature, the “3” represents the new Epistemologic Understanding of that object, for a new Ontologic Nature of “5.” This process may continue infinitely. At every new addition, the Ontologic Nature of a thing is reflected by a new Epistemologic Understanding, which in turn alters the Ontologic Nature of the thing, which again forces a revision of our Epistemologic Understanding of the same thing, etc. etc.



If a new Ontologic Nature of an object is given as a “5”, then this must have a bearing on the Epistemologic Understanding of the same object. If this previous Epistemologic Understanding of the set was given as “3”, and if added to this is the new Ontologic Nature of “5,” a new Epistemologic Understanding is stated, “8”. This new Epistemologic Understanding can be represented by the equation “ $3 + 5 = 8$.”



This new Epistemologic Understanding of the object (“8”) again changes the Ontologic Nature of the object (“5”) for a new Ontologic Nature (“13”). This change is stated by the equation “5 + 8 = 13.”



This presentation of the Fibonacci Series is central to the possibility of a merger of Ontologic Nature and Epistemologic Understanding. After my conversation with Thad I was pleased that a way had been developed to convey this possibility. My son was not impressed.

Andrew: But how do you get the Fibonacci Series out of this?

Scott: Well, we have a chair to start with, right?

Andrew: OK.

Scott: Well, let’s arbitrarily give the number “1” to the ontologic existence of THE CHAIR.

Epistemol.	Chair	1				

Scott: And then let's make a mirror image of that chair with our mind, and call this the epistemologic understanding of THE CHAIR, and as such, simply assign it as the number one also.

Ontology	Chair	1				
Epistemol.	Knowledge of Chair	"1"				

Andrew: Why another number one?

Scott: Because the purpose of the number is simply to provide a mirror image of the chair itself. Nothing more, nothing less.

Andrew: So how does this turn into the Fibonacci Series?

Scott: Once it's conceded that the ontologic existence of something changes with an epistemologic awareness of that thing, we can combine the ontologic and epistemologic "1"s into a single phrase. In other words, once we know about the chair, it is no longer simply a chair. Now it is a Known Chair. This is a different form of ontology, and we can use the phrase "Known Chair" to be the same as "1 + 1".

Ontology	Chair	1	Known Chair	1 + "1"		
Epistemol.	Knowledge of Chair	"1"				

Andrew: But how does this equal the Fibonacci Series?

Scott: Once we have a new ontology, a "Known Chair," our epistemology of that "Known Chair" also has to change. We now have not only a "Known Chair." We also know that we have a "Known Chair."

Andrew: But that's not the Fibonacci Series.

Scott: But once again, once we have a new epistemology, we have changed the ontology of the chair itself.

Andrew: And so on?

Scott: Yes. Every time there is a change in the ontology, the epistemology must change as well. And every time there is a new epistemology, the ontology is forced to change in turn.

Ontology	Chair	1	Known Chair	$1 + "1"$	A "Known Chair" Which Is Known To Be A "Known Chair"	$(1 + "1")$ + "1" + $(1 + "1")$
Epistemol.	Knowledge of Chair	"1"	Know We Have A "Known Chair"	"1" + $(1 + "1")$	Know We Have A "Known Chair" Which Is A Known Chair Known To Be A "Known Chair"	"1" + $(1 + "1")$ + $(1 + "1")$ + "1" + $(1 + "1")$

Scott: If we replace these relationships with the whole numbers which are implied, we have the Fibonacci Series.

Ontology	Chair	1	=1	Known Chair	$1 + "1"$	=2	A "Known Chair" Which Is Known To Be A "Known Chair"	$(1 + "1")$ + "1" + $(1 + "1")$	=5
Epistemol.	Knowledge of Chair	"1"	=1	Know We Have A "Known Chair"	"1" + $(1 + "1")$	=3	Know We Have A "Known Chair" Which Is A Known Chair Known To Be A "Known Chair"	"1" + $(1 + "1")$ + $(1 + "1")$ + "1" + $(1 + "1")$	=8

By condensing this series of sums into a pattern we have the Fibonacci series, to wit:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc.

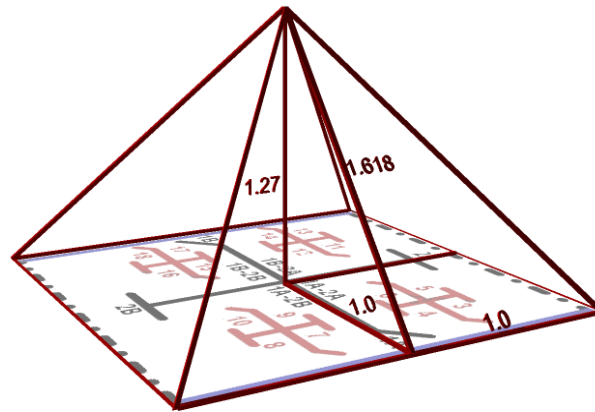
Joining these numbers into fractions in an effort to determining a common ratio, we have:

$\frac{1}{1}$ $\frac{2}{1}$ $\frac{3}{2}$ $\frac{5}{3}$ $\frac{8}{5}$ $\frac{13}{8}$ $\frac{21}{13}$ $\frac{34}{21}$ $\frac{55}{34}$ $\frac{89}{55}$...

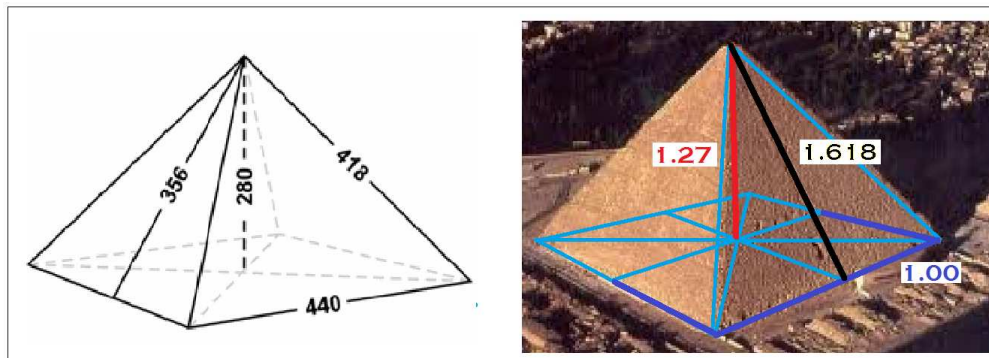
This continuing series renders the constant $\phi = 1.6180...$ ¹³²

¹³² For a collection of various comments on the importance of this mathematical series, see the Appendix.

Let the number 1.6180... stand for the relationship between the “Being,” “Non-Being,” “Existence,” “Opposing Existence” as associated with the merged “Ontological/Epistemological” end points of the “Image Axis.” This merger states the Third Axiom, the Principle of Consciousness (“Consciousness is always consciousness OF something”). We have then the following construction.¹³³



¹³³ These are the approximate proportions of the Great Pyramid of Giza, as displayed below. At left are the measurements of the Great Pyramid in cubits, and to the right are the proportions suggested by these lengths.



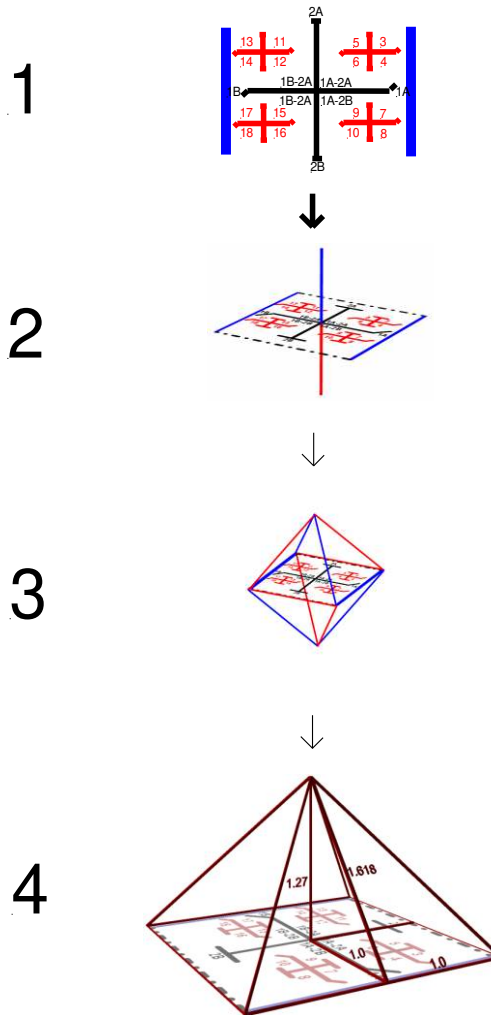
The extent to which the Great Pyramid fulfills the dictates of this philosophy depends upon one's view of the mathematic structure of the Great Pyramid itself. As to the incorporation of pi into the design see Tompkins (1971:70) “Taylor then discovered that if he divided the perimeter of the Pyramid by twice its height, it gave him a quotient of 3.144, remarkably close to the value of pi, which is computed as 3.14159+. In other words, the height of the Pyramid appeared to be in relation to the perimeter of its base as the radius of a circle is to its circumference.” In accord see DeSalvo (2008:72-73), Skinner (2006:116-119), (Dunn, 1998:59).

As to phi see Tompkins (1971:190) “(T)he Pyramid was designed to incorporate not only the pi proportion by another and even more useful constant proportion, known in the Renaissance as the Golden Section, designated in modern times by the Greek letter ϕ (pronounced phi) or 1.618. (If the 356 cubits of the Pyramid's apothem are divided by half the base of 220 cubits, the result is 89/55, or 1.618.)” In accord see Skinner (2006: 119-121), Hemenway (2005:68).

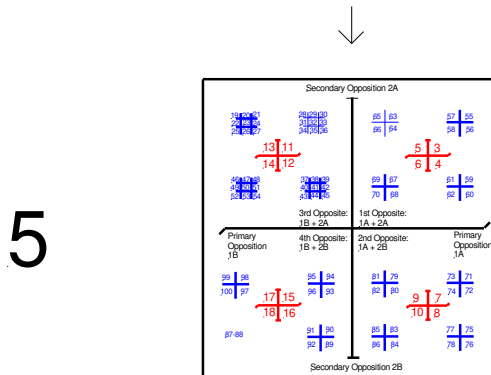
In opposition to both see Livio, (2002:53-61). Calculating a difference from phi at “less than 0.1%” (at 56) and “differing (from pi) only by about 0.05%” (at 58), he argues that these proportions are not those of an original design by the builder of the Great Pyramid. “(I)t is highly unlikely that either the ancient Babylonians or the ancient Egyptians discovered the Golden Ratio and its properties; this task was left for the Greek mathematicians.” (at 61)

CONCLUSION TO PART FOUR

We have now discussed four levels of Oppositional Analysis, to wit:



We move now to the next stage of Oppositional Analysis, the consideration of the resolution of the Image Axis into a Plane of Conclusion.



OPPOSITIONAL ANALYSIS PART FIVE

20. The Plane of Conclusion

At the conclusion to Part I a plane of definition and a plane of relationship had been considered in connection to the four basic terms of Oppositional Analysis: self, opposite, negation and context. We may treat the concept of "defining" in philosophy, and of interpreting "relationships" between defined entities, as two separate aspects which "control" our "conclusion" to any philosophical question.

For example, we might define a "good" as something worthy of respect, and "evil" as that which is not worthy of respect. Under this definition, if we ask whether something is good, we simply ask whether it is worthy of respect. One may agree or disagree about whether an object is good, but under the *definition* given, if it is not worthy of respect, it can not be good.

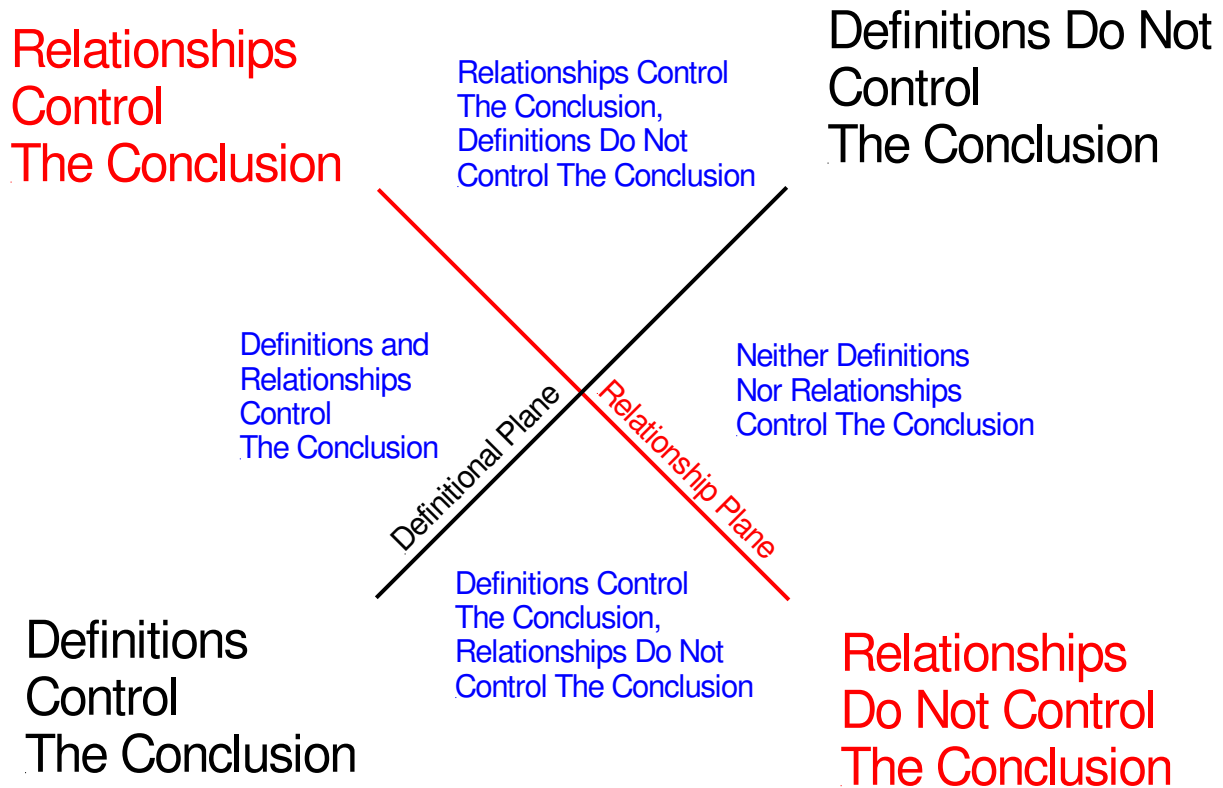
If we ask whether a particular action is better than another, we are asked to make a choice which largely must be based upon the relationships – the circumstances, the consequences, the motives, etc. – underlying each of the alternative actions. Although definitions may play a part in setting up the examples used, it is the *relationships* between defined categories which will determine the outcome of the question as to which of the alternatives is best.

If we ask whether a possible action is good or evil, that determination might depend upon circumstances which lay outside the action itself. For example it may be admirable and worthy of respect to always tell the truth. However if something is told in a fashion which, albeit accurate, nevertheless is unnecessarily harmful and cruel, it may not be good and may in fact be evil to tell the truth at that particular time or in that particular manner. In this case the respect or lack of respect to be given to an action is defined, *both by the definition of good and evil, and upon a full understanding of the consequences of – the relationships engendered by - a particular act.*

If we ask whether the element Hydrogen is "good" or "evil," we ask something which can not be subject to the definition given, because a chemical element – albeit a necessary part of Nature – is not a moral actor and therefore can neither be subject to respect or disrespect. *Neither the definitions proposed, nor the relationships contemplated, permit us to answer this question.*

The Plane of Definition and the Plane of Relationship are two fundamental forces controlling the development of philosophy. These planes are stuff upon which the previous dichotomies of "Being" and "Not-Being" are written, and they have their own oppositions. These oppositions concern the extent to which either "Definition" or "Relationship" control the final conclusion to any question posed.

A consistent philosophy is expected to come to conclusions regarding the interplay between the *definitions* proposed and the *relationships* inherent in the definitions proposed. We may treat the concept of "defining" in philosophy, and of interpreting "relationships" between defined entities, as two separate aspects which "control" our answer to any question. As this pertains to any branch of philosophy, we would then have the following "conclusion" plane:



A fundamental expectation of every consistent form of philosophy is that one of these quadrants will render an appropriate answer.

16.a. Conclusions Regarding “Negation”

If we ask whether the Negation of “a” can ever “BE” we find ourselves facing a difficult question.

First, if we say that Negation IS, it contradicts the concept of “Non-Being” itself. Something which is, by definition, part of Non-Being, can not BE.

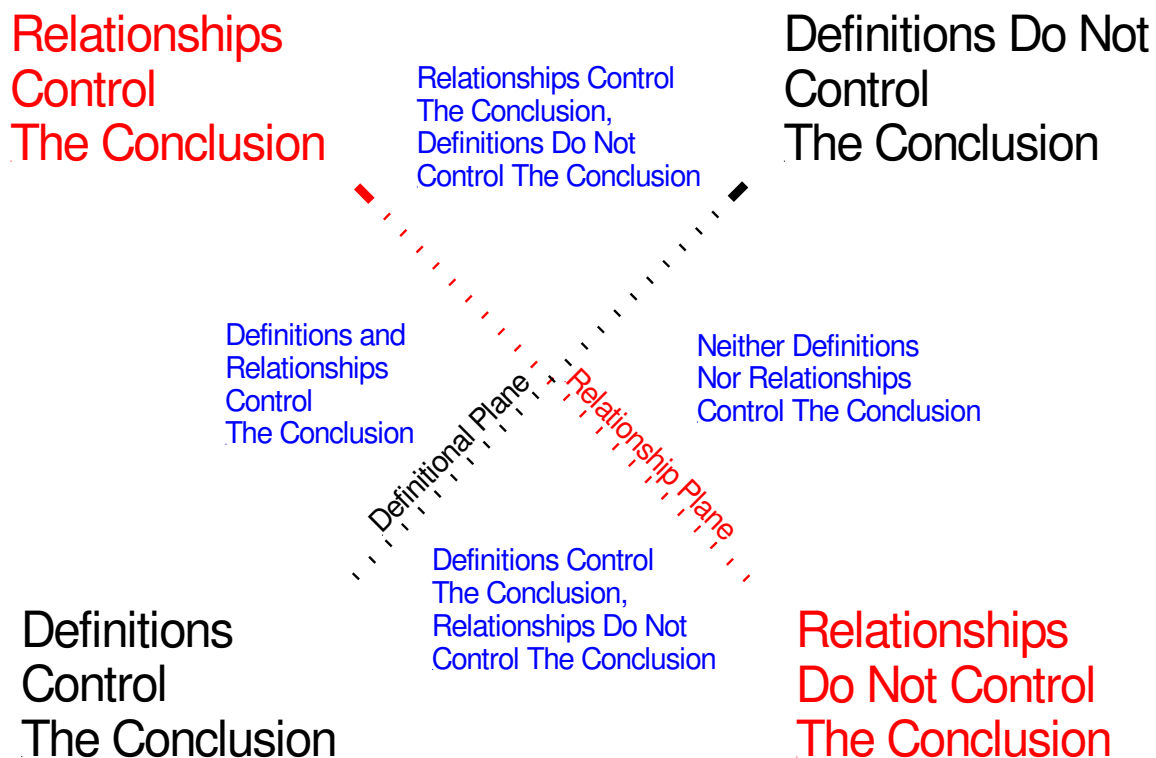
On the other hand, if we say that it IS NOT, then it can not BE, which makes the existence of both “a” itself, as well as Negation itself, impossible.

To take a specific example, attempting to understand the top left quadrant –

"all things not-white"

- we might inquire whether it is possible to understand something defined by solely its negative characteristics. To say simply that something "is not" something else does not tell us what it "is." We understand that "my right hand" is distinguished from all other things in which have being or existence. But can we truly understand the concept "all things not-my-right-hand" as implied solely upon a set of negative characteristics, i.e.. "not-my-right-hand"?

Here we are placed in the quandary of attempting to understand the relationship between our definitions, the relationships drawn, and conclusions sought. In the case of “Negation” we are uncertain about the Definitions, and the Relationships, which control the answer to the entity discussed.



The checkerboard of possibilities below represents the uncertainty inherent in the contradictions found in attempting to understand, or draw conclusions regarding, the Negation of anything. The attempt to determine what a Negation "IS" brings us to face nine separate possibilities.

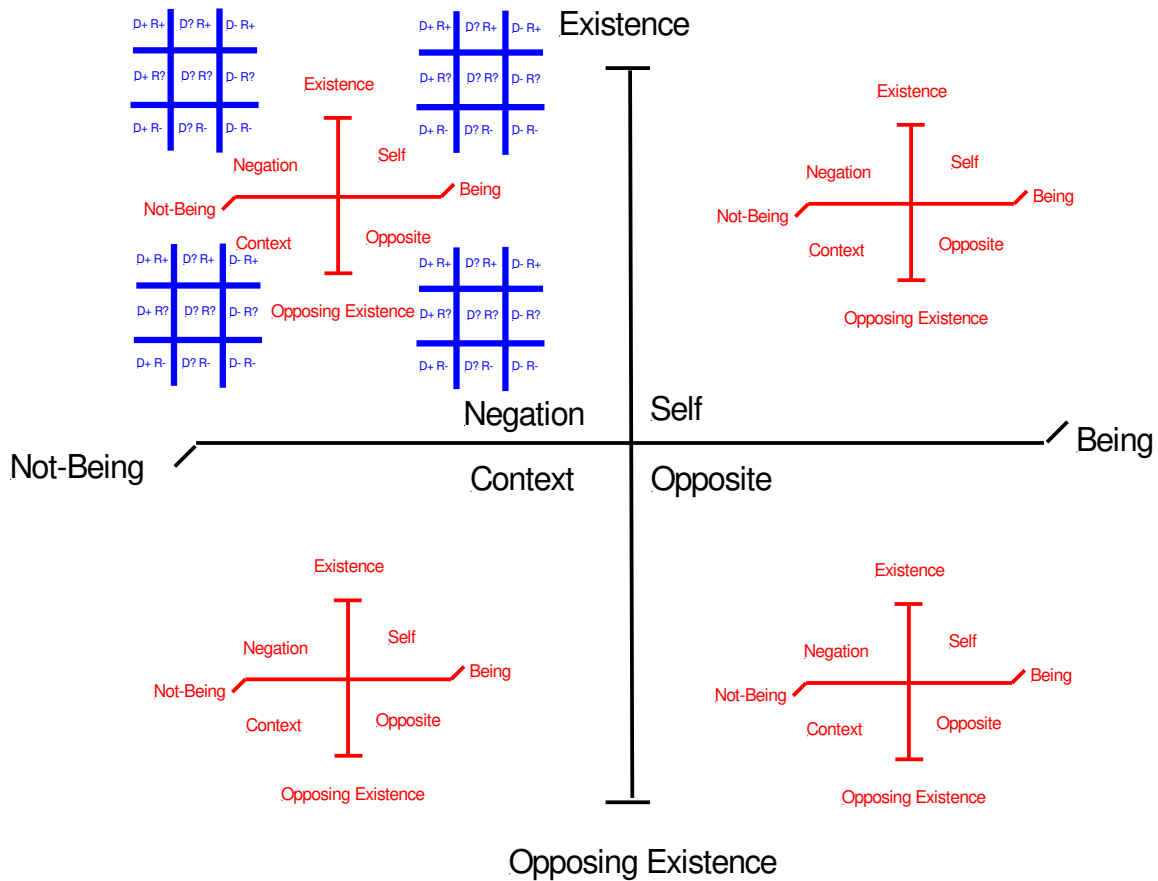
This "negation" quadrant is thus facing ambiguities of a fundamental nature. Because the definitions and relationships do not control entirely the understanding of the negation of a topic, we must acknowledge our uncertainty in describing its relationship to itself. That is to say, in attempting to align the concepts of definition and relationship in answering whether a Negation can "BE," we have nine possible answers, none of which takes precedence over the others.

We may place this blue "Conclusion Plane" within the Relationships of the Negation to Itself. That is, when attempting to draw conclusions regarding the relationship which the Negation has to itself, whether it can itself be a form of Self, we may not define or understand the topic which we are discussing without some ambiguity and even contradiction.

Similarly, when attempting to draw conclusions regarding the relationship which the Negation of the Self as to the Self as such, the relationship which the Negation has with the Self which has made such a negation necessary, it is impossible to know clearly the relationship which such a negation has with this "self." That is, when I discuss the relationship which "all things not my right hand" has with "my right hand" the nine possible categories reassert themselves. When we attempt to understand the relationship which the negation of a thing has with the Opposite of the "self" which defines the negation, we again are faced with the need to take into account the uncertainty inherent in our understanding of the "negation" of the self.

Finally, how may something which is ambiguous in nature have a comprehensible relationship with the Context of the self? Again the nine possible conclusions indicated before may be written as follows.

The inherent uncertainty created by the negative - "all things not 'white' " - is found in the relationship of this negative to itself as well as to each of the other aspects of our analysis.



16.b. Conclusions Regarding “The Self” and “Opposite”

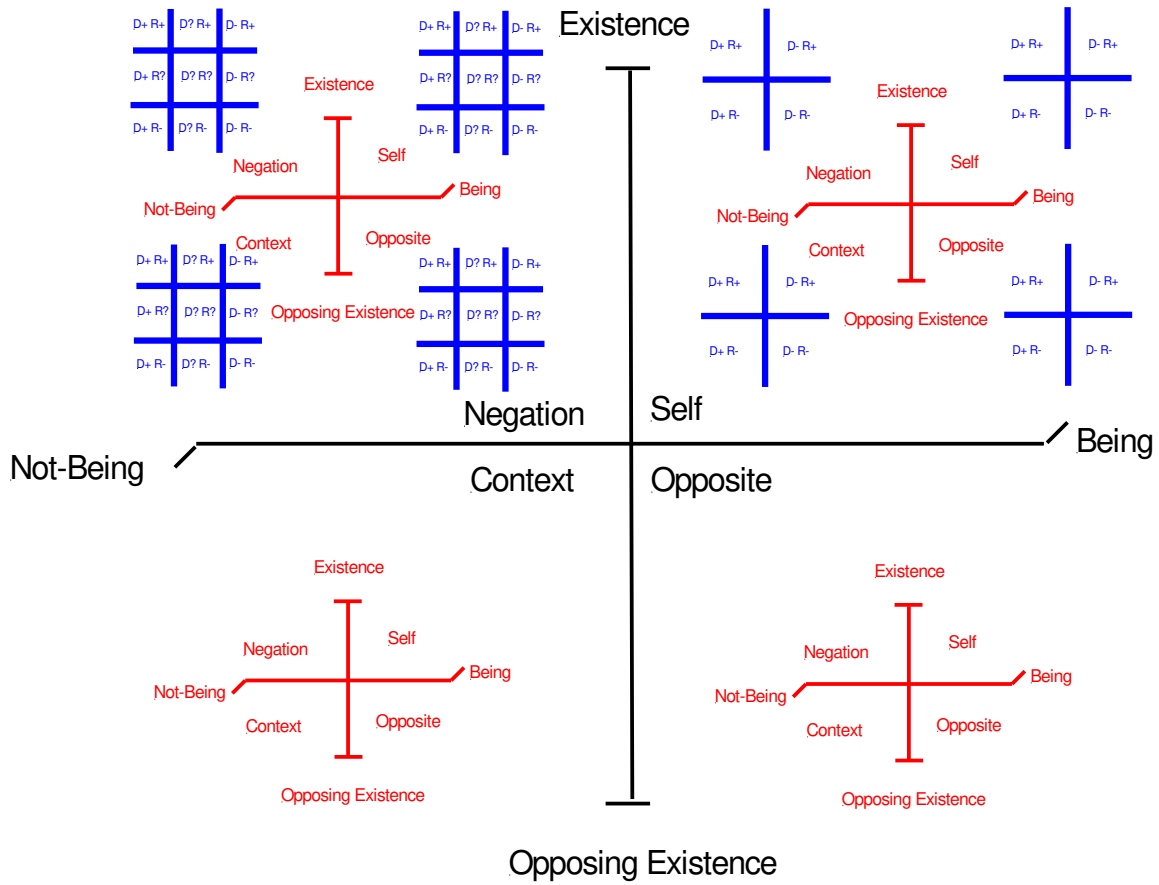
It may be feared that the ambiguity which exists when we seek to understand a Negation may infect the entire philosophical process. However, when we deal with objects having some objective being we are free to define them clearly. Both the relationships and definitions have clear control over the situation. Through this clarity we assert our knowledge of the thing discussed. That is, we might attempt to understand the relationship which the Self has with Itself. In so far as we are able to discuss the thing, we must have in mind some parameters set. There is nothing inherently ambiguous or uncertain about the existence of a thing capable of meeting the principles given.

That is, when attempting to define a thing that "is" we simply point it out and describe it. "It" may be a concept, a physical object or an emotion. But in the context in which the "it" - the "Self" - manifests itself, the "Self" must define by its relationships and definitions its existence and being. *There is no inherent ambiguity in the existence or being of any "Self" which is not defined exclusively by Negation.* Hence our conclusion "cross" does not reflect such ambiguity, unlike the previous "negation" quadrant.

When the "Self" defines itself by way of its *Opposite*, the Opposite becomes increasingly clear as well. There is nothing inherently ambiguous or uncertain about the relationship of "white" and "gray" for example. The definition and relationship which a "Self" has with its Opposite is clear and unambiguous. Thus there is no inherent uncertainty in the definitions or relationships between these two concepts in this quadrant.

Similarly as the Self defines itself, it must create a form of *Negation to itself* in order to satisfy our first principle. The clarity of the Self's relationship to its Negation is one which it defines, just as "all things not my right hand" are defined by the concept of "my right hand." From the point of view of the Self, its Negation is an unambiguous concept.

Finally, when the Self creates a relationship between Itself and its *Context*, the relationship must be clear and unambiguous. If it is not, the "Self" may not exist as a knowable entity. Conclusions regarding this relationship are not inherently ambiguous and may be written as:

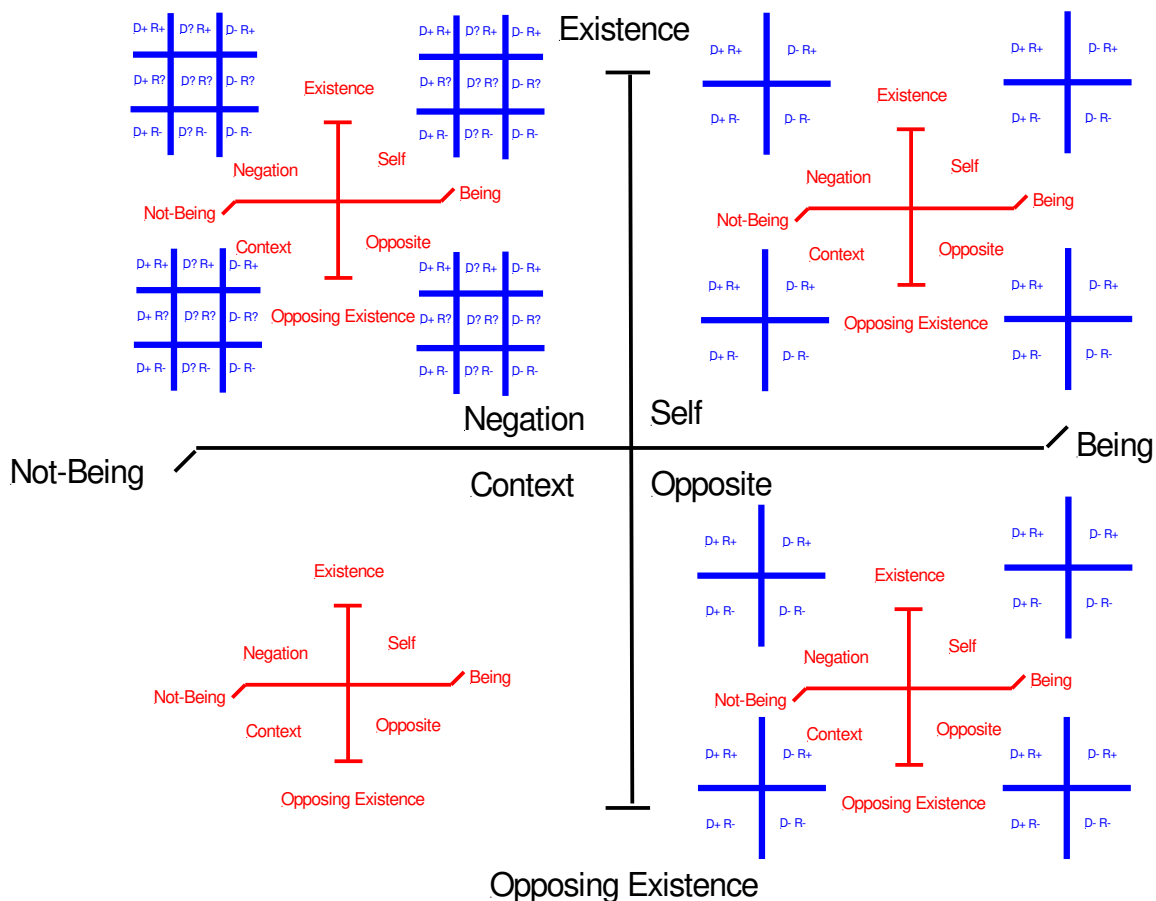


The Opposite of the Self, "gray" for example, is in exactly the same position as the Self itself. In order to form an effective Opposite to the Self, its relationship *with Itself* and its definition possesses no ambiguity. If it does the Self can not effectively use it as an Opposite.

Similarly the relationship which the Opposite has *with the "Self"* must be clear. That is if "white" uses "gray" to define its existence, "gray" must likewise use "white" to establish its own existence. The amount of clarity needed is equal to the Self's relationship with the Opposite.

Just as the Self "white" must have a clear relationship *with "all things not white"*, so must the Opposite "gray" have a clear relationship with "all things not white." If we define the reality in which these two things "exist" as containing only the Negation of these two things, then the relationship which gray (Opposite) has with this reality (Negation) is equivalent to that of "white" itself. Again there is no ambiguity in defining the relationship which "gray" must have with this Negation "all things not white."

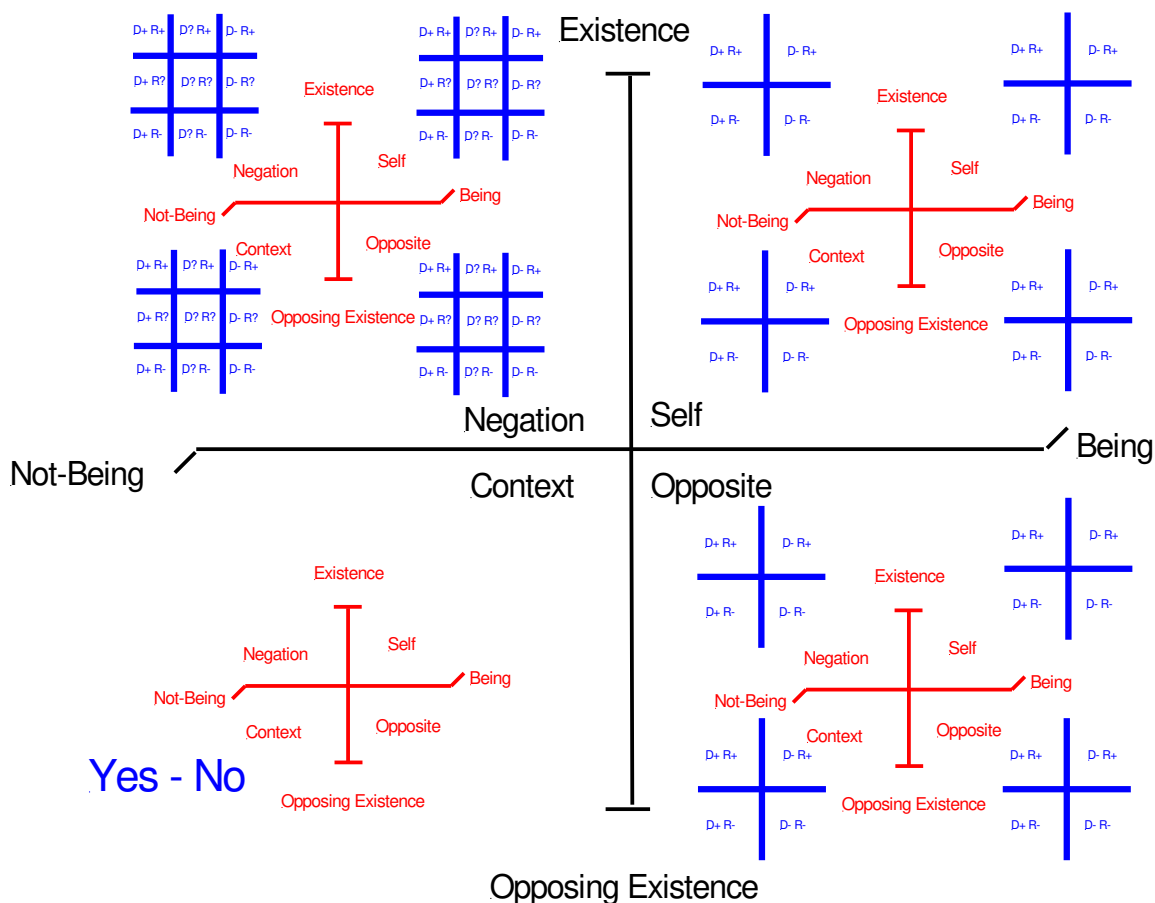
In the relationship which the Opposite must have *with the Context*, it must be the same Context in which the Opposite is itself understood. There is no inherent uncertainty in either the definitions or relationships in this quadrant of "Opposite." Again we might write this lack of inherent uncertainty as:



This pattern above is requisite to the understanding of any existent being. It attempts to provide a clear and definite juxtaposition between Being and Non-Being such that any "Self" might be understood clearly. In this pattern the understanding of any Self and Its Opposite (right-hand quadrants) is contradicted by the inherent uncertainty present when the same Self considers its own negation (top left-hand quadrants).

16.c. Conclusions Regarding "Context"

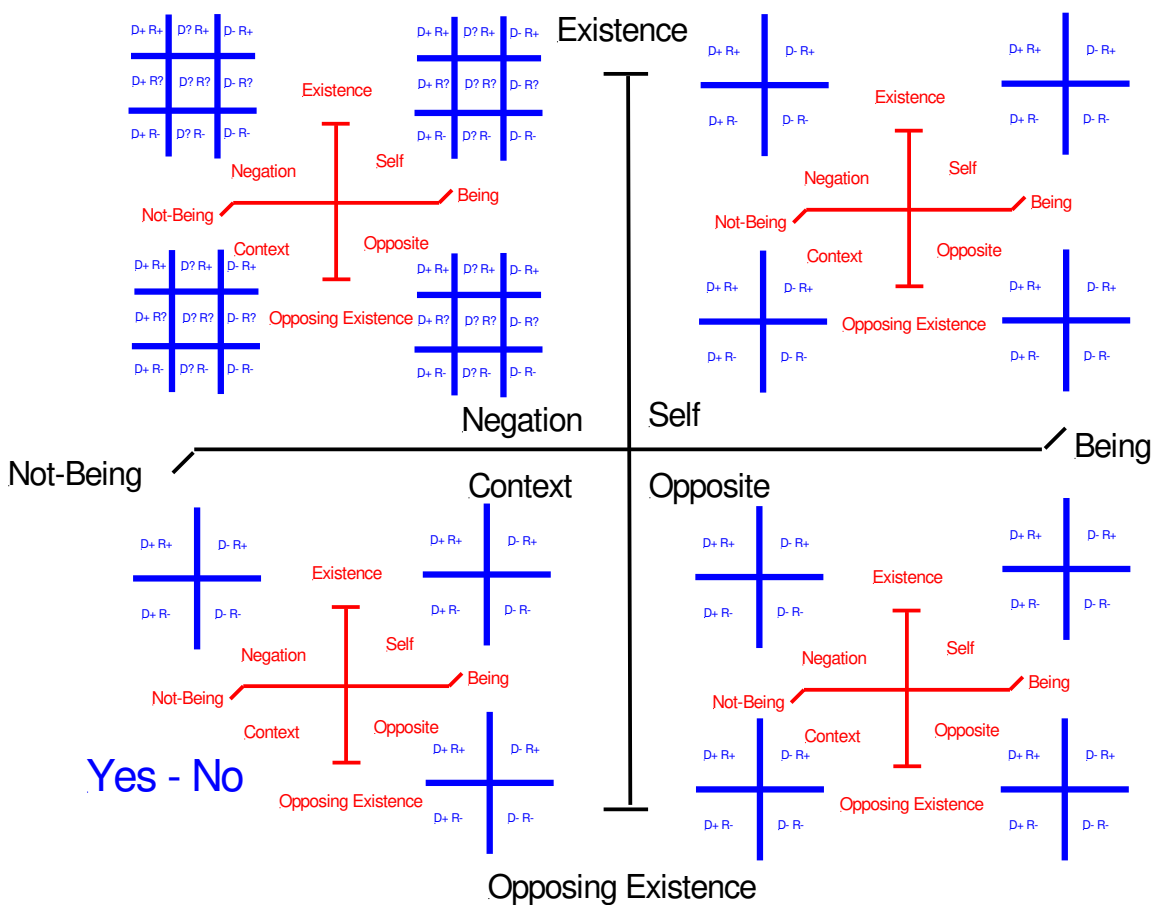
What of the relationship which Context has with Itself? This must be considered a "yes-no" form of dichotomy. That is, if we say that the concept "white" is to be considered in the context of "color" we exclude arbitrarily all other Contexts. If we use the Context "race" we again exclude all other Contexts. There is nothing in any "self" which requires its use in a particular Context. Just as the word "rose" may in one Context represents a flower, another Context a color, and in another Context a pattern, so does the Context shift arbitrarily. It is a simple matter of choosing or rejecting the Context proposed.



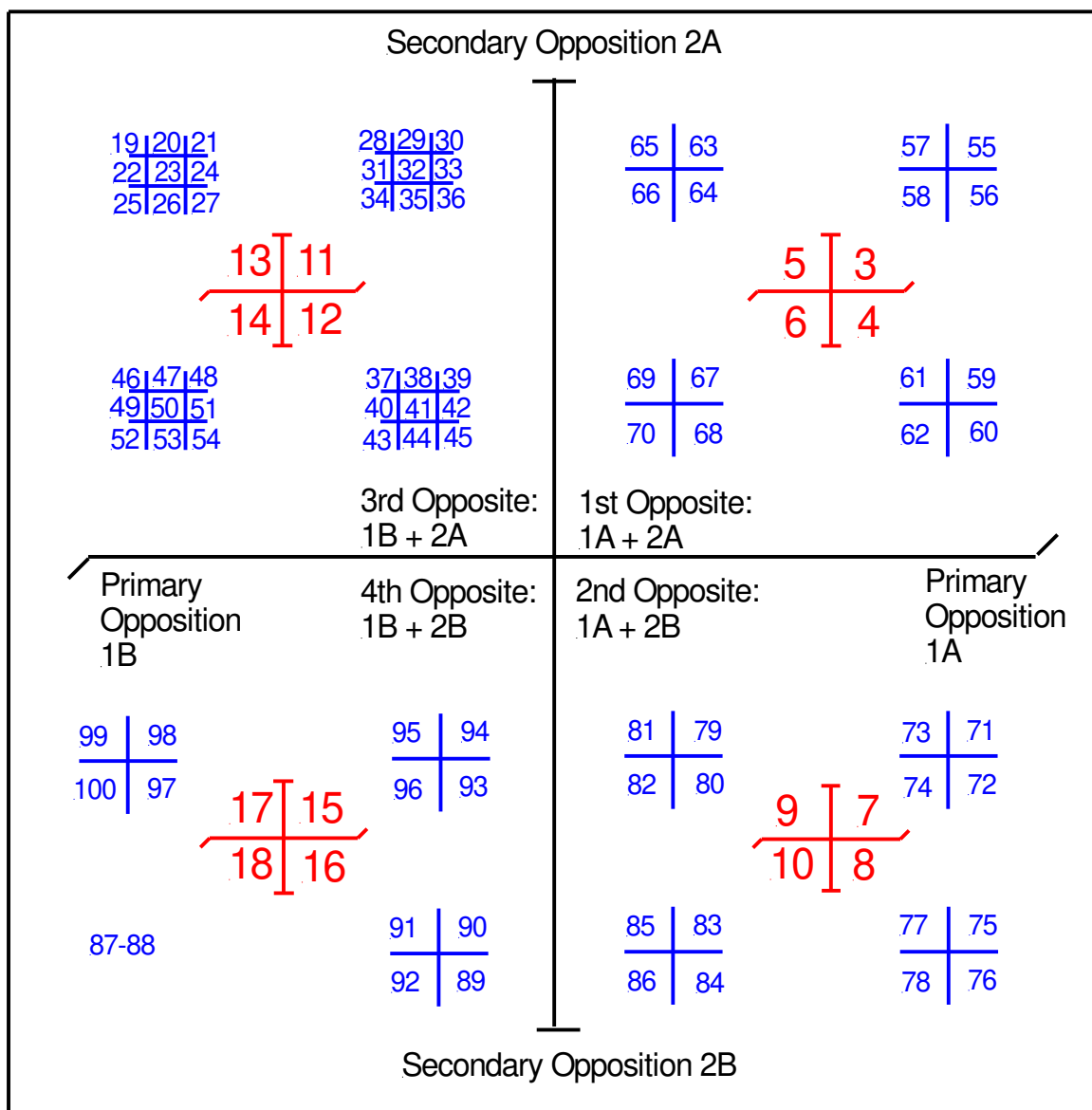
As we apply a particular Context to the Opposite we understand *the Opposite* in the Context given. Once the Context has been understood, the rest of the dichotomies fall into place without ambiguity.

Similarly as *the Self* relates with a particular Context it will generate a clear and unambiguous relationship with this Context. There is no uncertainty inherent in this relationship. One can not imagine a particular Context without a particular Self. There is no inherent uncertainty in the definitions or relationships therein once the particular Context is chosen.

Finally the relationship which the Context has with the *Negation* of the Self is without inherent uncertainty once the Context itself is chosen.



This philosophic “alphabet” of 100 units, as tracked from “A” through “Z,” is proposed as a "System Of Movement," i.e. a method wherein any “Self” must find expression. This expression is based upon the three mental planes of Definition, Relationship and Conclusion.

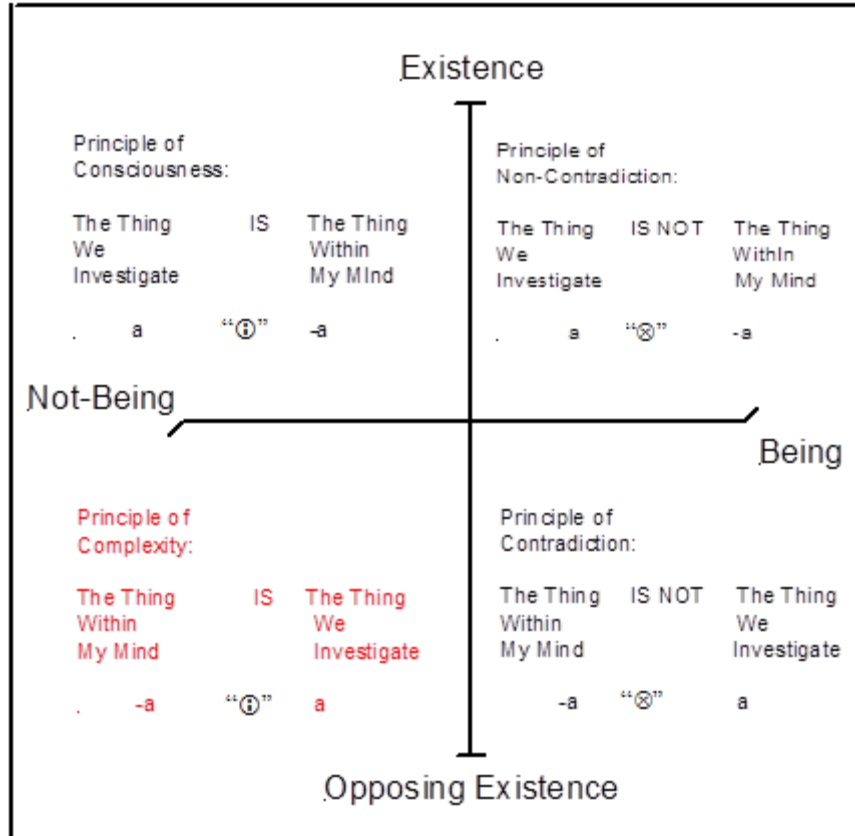


But how does this pattern duplicate itself throughout reality? For this let us turn to the next section of this essay.

PART SIX

20. "The Principle of Complexity"

We have introduced an "Image Axis" to accommodate *The Principle of Consciousness*. This *Principle* was obtained by applying *The Standard Cross* to *The Principle of Non-Contradiction* and *The Principle of Contradiction*. However if this exercise is undertaken, a fourth quadrant remains to be considered. Representing the fourth quadrant we are compelled to propose *the opposite* of "a ① -a" or "-a ① a."



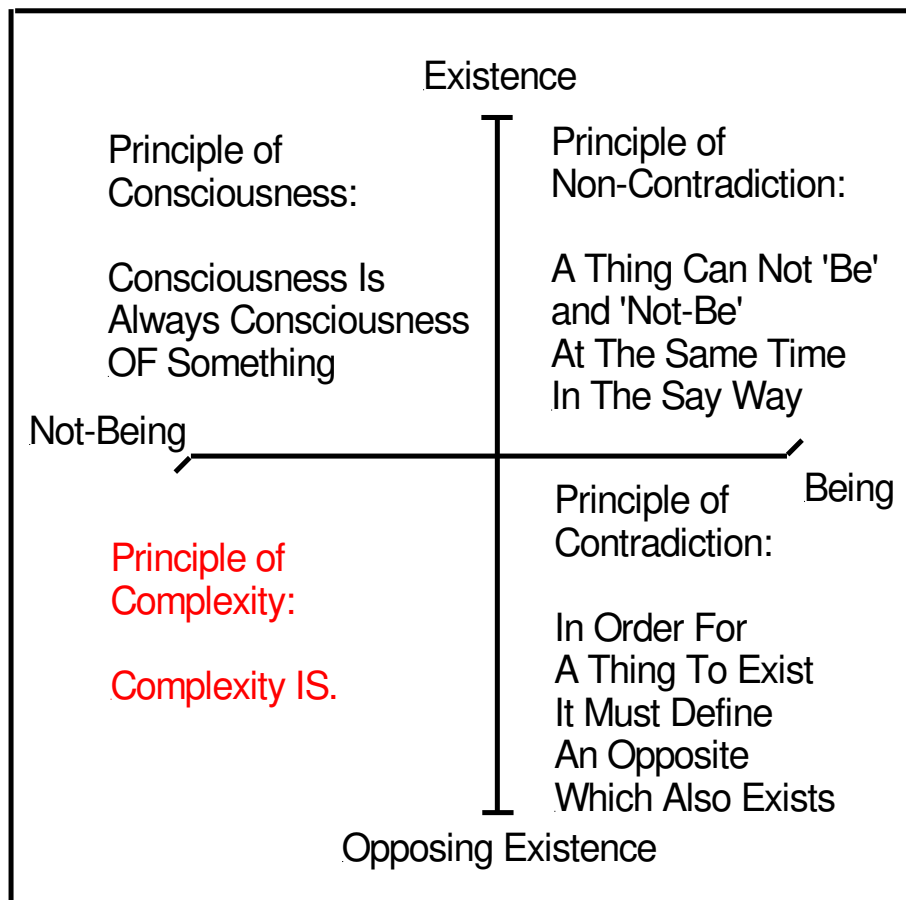
The opposite of *The Principle of Consciousness*, (a ① -a), in the form of a new *Principle*, "-a ① a," represents the notion that "The Thing Within My Mind IS The Thing We Investigate." This would suggest that the principles of mental organization (The Thing Within My Mind) ARE the principles of ALL organization (IS The Thing We Investigate).

In this manner a Fourth Principle emerges, proposed as “-a ① a.” *The Principle of Complexity* is the opposite of *The Principle of Consciousness*, for it states that the reality of anything is the reality which My Mind imposes upon it, or broadly, the reality which the Universal Mind imposes upon it:

“The Thing WITHIN My Mind IS The Thing We Investigate.”

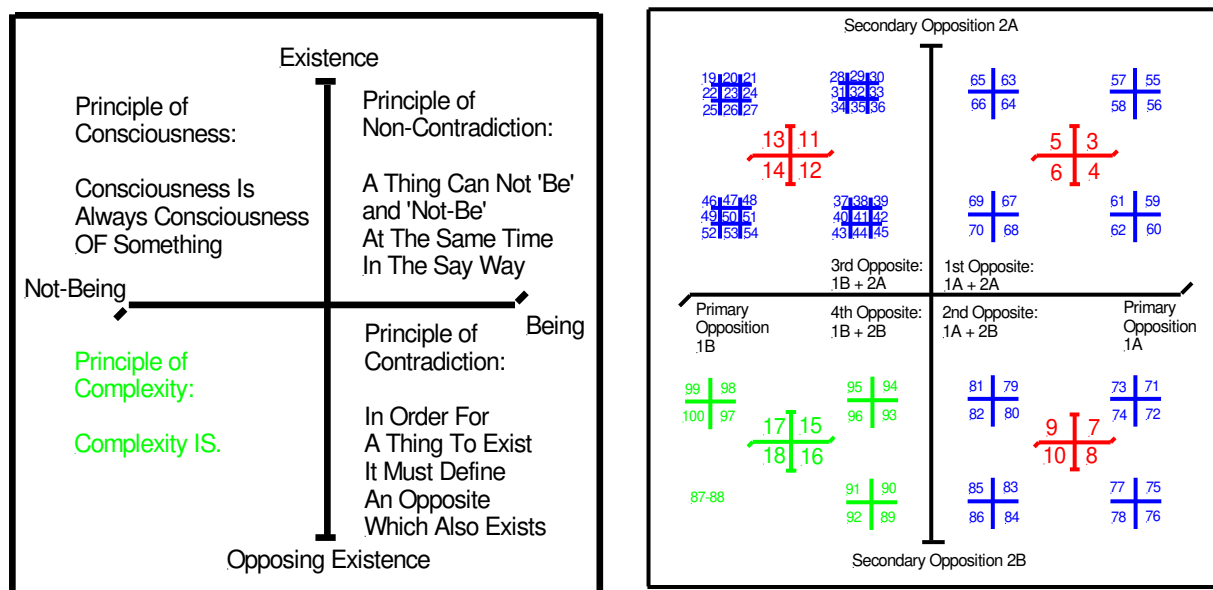
Axiom IV: The Principle of Complexity

Complexity IS.



By “Complexity” I mean the repeating patterns described as governing core aspects of the reality around us, the mental construct of reality itself.

We consider this forth Axiom, The Principle of Complexity, “Complexity IS,” in the context quadrant, as follows;



One can easily anticipate an arbitrary element to this understanding of reality, a Yes-No characteristic, exactly as in the “context” quadrant.

The idea conveyed may be best summed up as an “Attitude” of Complexity, an aesthetic “Yes-No” choice, something not necessarily “prove-able” in some sort of deterministic way, but nevertheless fundamental and basic to an understanding of the entire system, a “Seeing is Believing” characteristic.

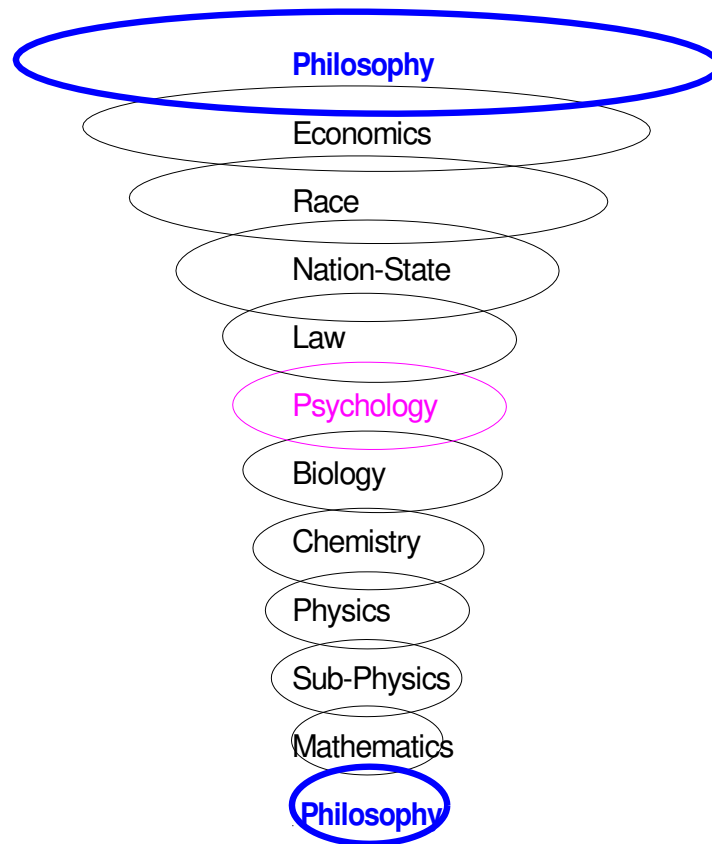
To introduce this idea of the “Complexity” of nature, the middle ages assumed that the earth was the center of the Universe, and that *perfect spheres* controlled the movement of planets around us. The discovery of additional facts led to deviations from this perfect sphere model, which in turn led Copernicus to construct a new “*perfect circles*” model with the sun as the center of a solar system, a heliocentric system, rather than the earth. Additional facts accumulated by Tycho Brahe led Kepler to elaborate on the heliocentric system as a set of ellipses, rather than spheres, held together by geometric constructs of cubes, dodecahedrons, etc. In this way, God’s perfection was not slighted by the absence of spheres or circles, because a *perfect geometric figures* continued to operate divinely and to place man in his proper place within the universe.

The perfection sought by scientists in exemplification of the work of God underwent another reduction when the perfection and simplicity of Newton’s *Laws* replaced the perfect geometric shapes idea. Gone were the perfect cubes, dodecahedrons, etc. which held together the ellipses of Kepler. In their place came rules governing force, acceleration, mass, etc. The perfection and simplicity of these laws, rather than the geometric simplicity of the results, became the hallmark of divine perfection.

Today, in turn, our sense of aesthetically based certitude has been reduced to Einstein’s

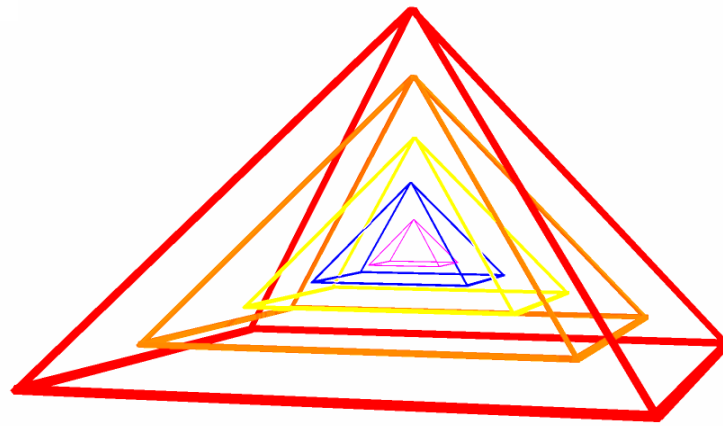
Theories of Special and General Relativity, which provide for us the result that $E = mc^2$. In turn the simplicity of this equation, which mimics the $A = \pi r^2$ for the area of a circle, have given place to the *Principle* of Electron Uncertainty. So we have gone from God's perfect spheres, to God's perfect ellipses arranged by perfect geometric shapes, to Laws, to Theories, to Principles.

This collection of essays is entitled “An *Attitude* of Complexity” because under the approach considered here the concept of perfection which has characterized the scientific pursuits of the past must undergo another transformation. The science of Complexity is, and always will be, a choice of aesthetics, a Yes-No conclusion. The only way in which to prove their truth is to see them operate: Does it work? In order to evaluate this question, we must consider the concept of reality from a completely different point of view.



Mathematics has been suggested as the basis for the physical world with mathematical principles extending upwards to increasingly social levels. Conversely, taken from another point of view, from the top down, beginning with philosophy, states its principles which move down in possibly more observable patterns, the principles discovered at the upper reaches of our understanding should have a direct applicability for the lower levels, if in fact, our reality is a complex one.

If we were to draw a fourth “Axis” of complexity, one emphasizing a merger of Mind with Matter, we have the following:



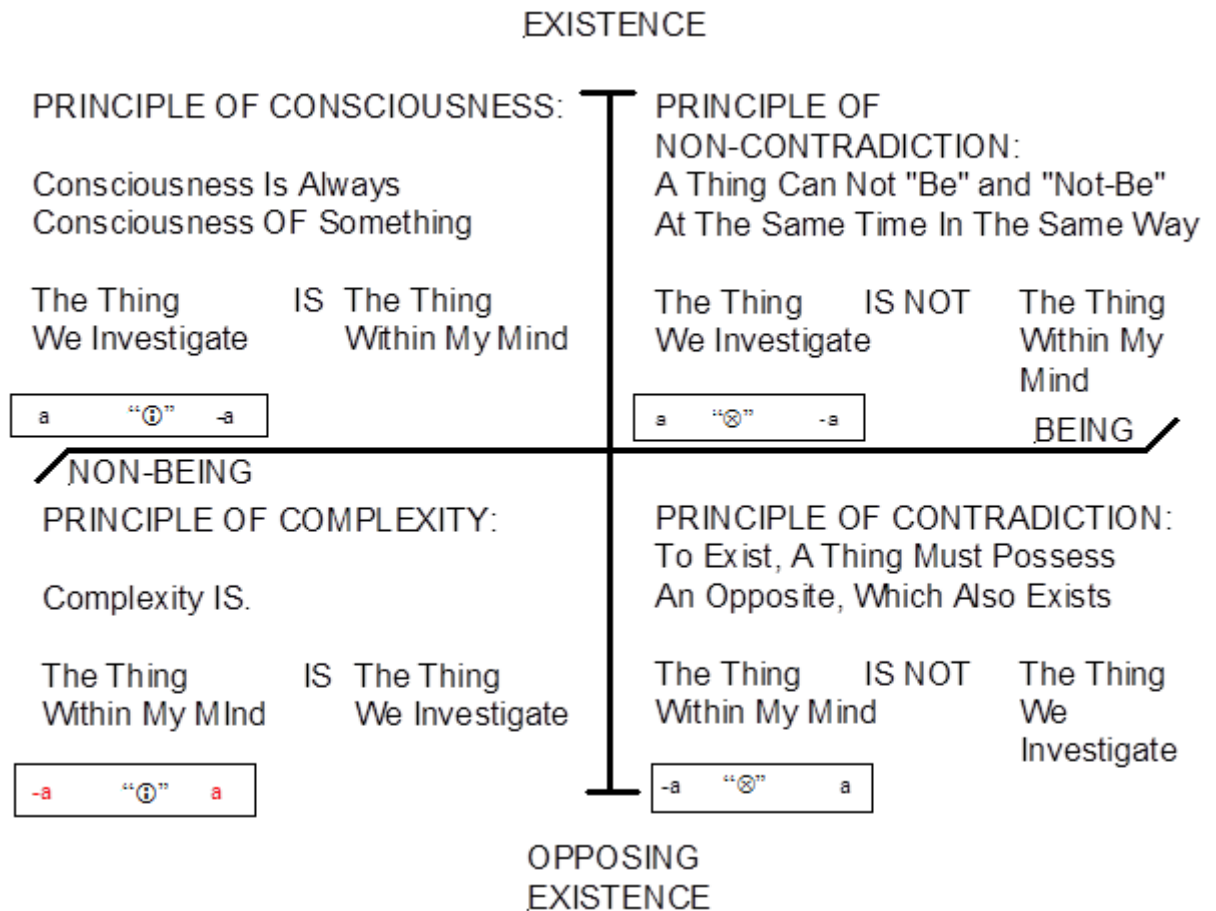
An “Attitude of Complexity” considers reality and the laws governing various levels of reality as “fractals” based upon one another. If we attempt to imagine an “Axis of Complexity” to correspond to the Image Axis and the inclusion of the Principle of Consciousness, we can simply imagine a set of concentric pyramids, each one dedicated to the development of the same principles at a separate stage, in effect an equation: (A1 through Z1) + (A2 through Z2) + (A3 through Z3) + etc.

The pyramid governing mathematics (purple) is within that of physics (blue), which is within chemistry (yellow), which is within biology (orange), which is within psychology (red), which is within law, which is within the development of a nation state, which is within racial history, which is within economics, which is within philosophy itself. These latter are not pictured in the pyramid above but they may be easily imagined. This “fractal” of governing principles resonate through the universe, and the appearance of this pyramid on each level leads to a deeper understanding of the rest. This is not stated as a new letter, but constitutes the “context” of the entire alphabet here-to-fore provided.

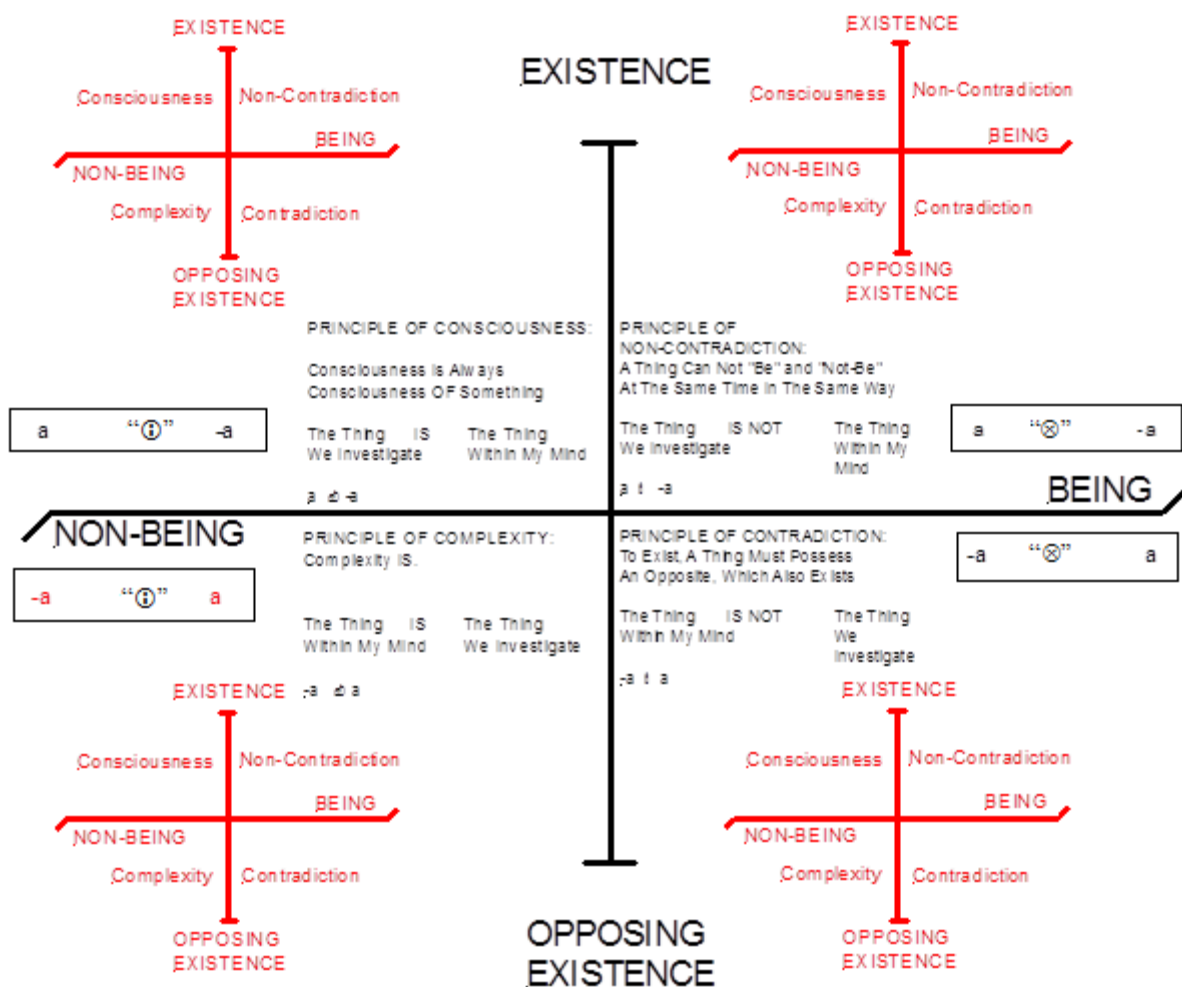
PART SEVEN

22. The Construction of Reality

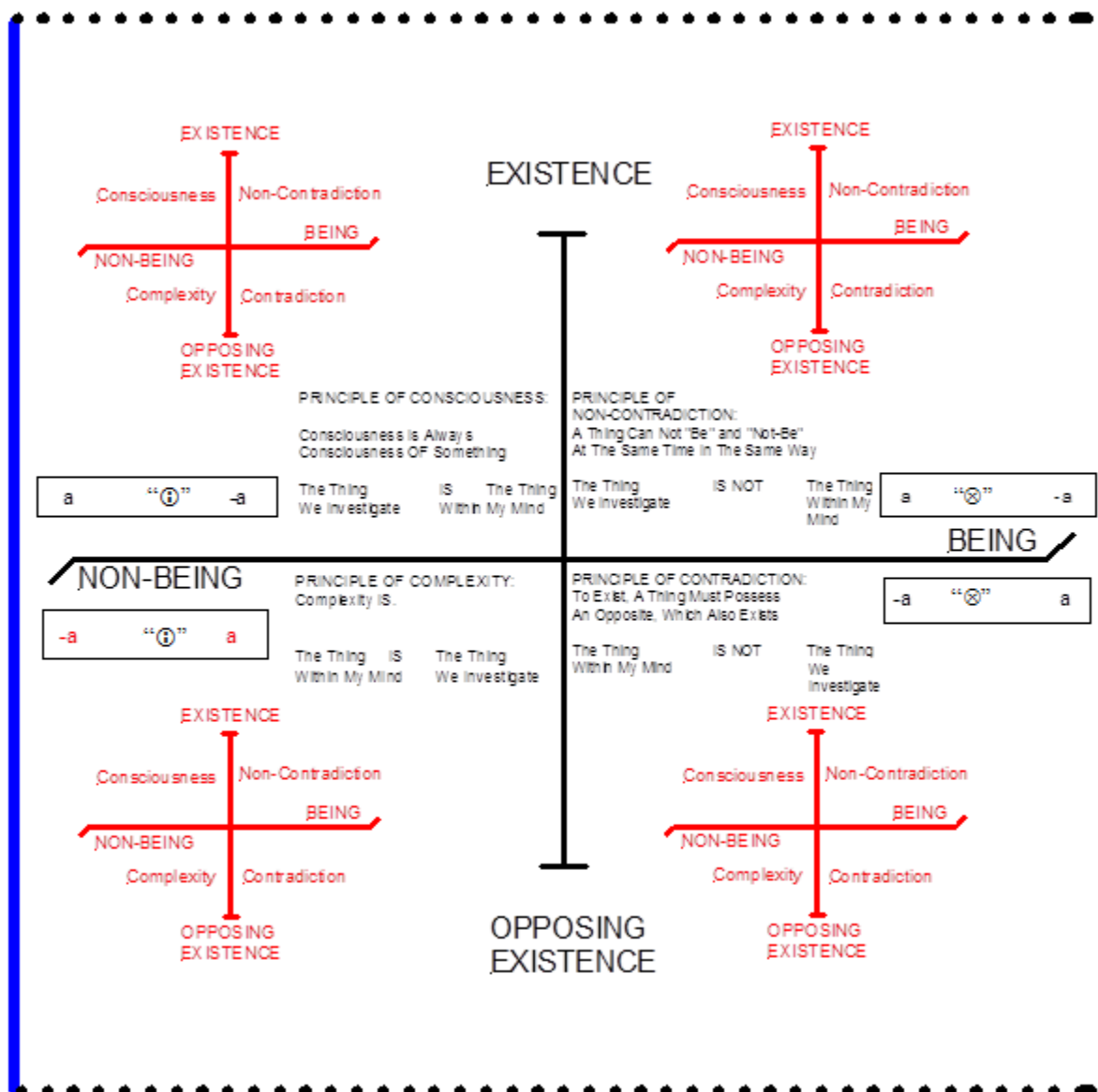
The foregoing permits us to speculate how reality is constructed. If we consider the four elements given, we may apply the principles of *Non-Contradiction* and *Contradiction* to themselves and obtain a set of four principles: these two, plus the *Principle of Consciousness* and the *Principle of Complexity*.



The definitional plane given must rise to a plane of relationship, one wherein we simply extend the Standard Cross and apply the necessary relationships.



Next, if we note that the Principle of Non-Contradiction and the Principle of Contradiction define for us the “real-ness” of what we see around us, and that the Principle of Consciousness and the Principle of Complexity define for us our mental image of that reality, we can draw the tensions which much exist under this scheme as follows.

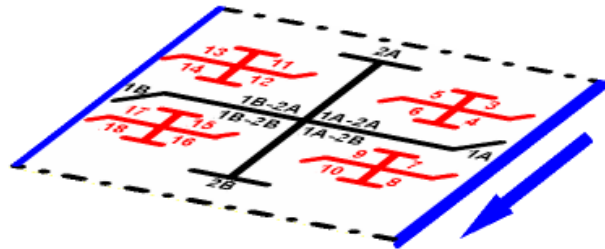


These are unified in circuits of Being and Non-Being as follows:

23. Circuits of Being and Non-Being

- (1) *Every Self must have an Opposite in order to exist.*

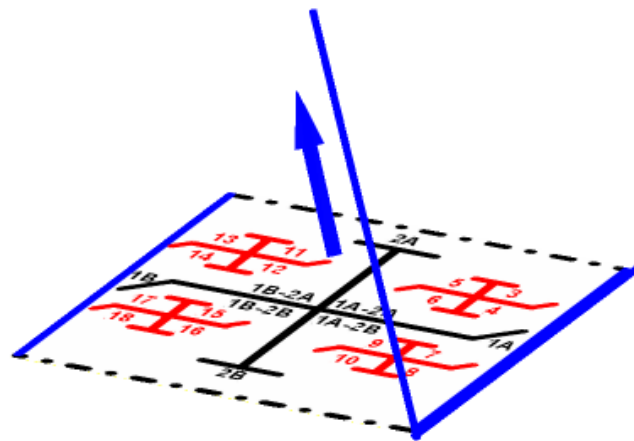
In this context the Principle of Non-Contradiction is directly dependent upon the Principle of Contradiction. These two principles work together to create the “real world” around us.



(2) *Once this “Opposite” has been declared, an Ontological entity exists. This does not mean that the Entity is known; it merely means that it Exists as an independent thing in reality.*

The Principle of Non-Contradiction and the Principle of Contradiction work to create “Real” things, things which can be known, but which are not necessarily known. The ontological existence of anything depends upon the simultaneous application of the Principles of Non-Contradiction and Contradiction.

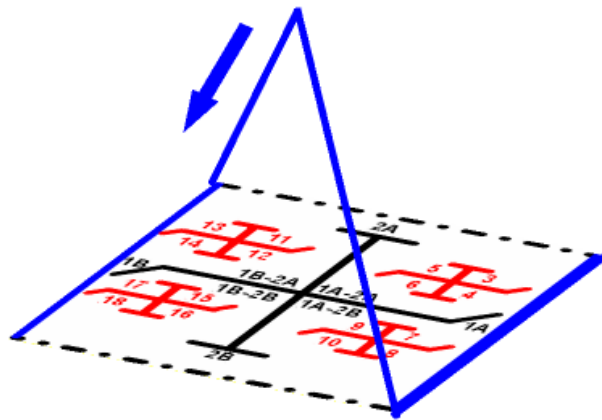
ONTOLOGIC NATURE OF REALITY



(3) *Status as an Ontological Entity permits the Self to differentiate itself from every other thing in the Universe. This status permits the Self to have a Negation, i.e. "Everything which the Self is Not." In this manner, the Self is empowered to maintain its integrity under the Primary Opposition, the statement that "A thing can not 'Be' and 'Not-Be' simultaneously and in the same way."*

The Negation of the Principle of Non-Contradiction requires that a separate principle merge that which IS and IS NOT simultaneously. The only thing that answers this is the Principle of Consciousness itself.

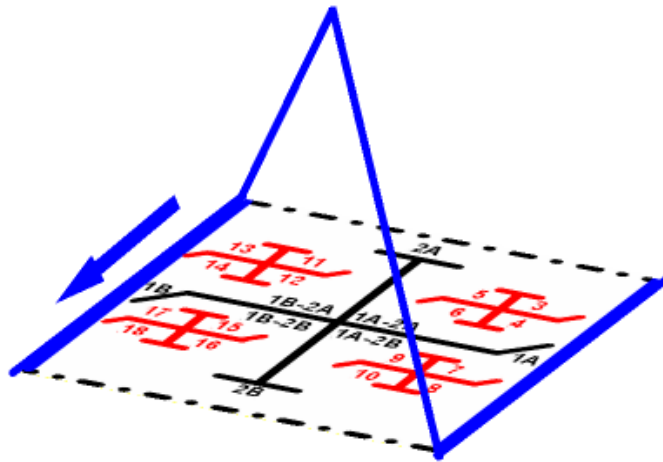
ONTOLOGIC NATURE OF REALITY



(4) *This Negation gives rise to a positive statement of the Self, a Context, in order to distinguish what the Self truly IS.*

In the case of these initial principles, the Principle of Complexity provides a Context for the display of each of the preceding Principles: Non-Contradiction, Contradiction and Consciousness. The workings of the Mind, functioning at various levels and as a unified whole, ARE the Principles which organize the reality around us, and this states the Principle of Complexity.

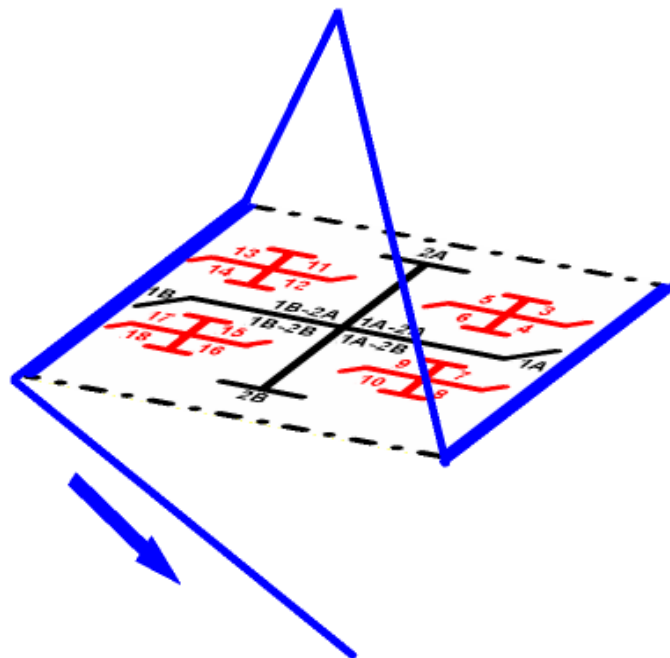
ONTOLOGIC NATURE OF REALITY



(5) *Upon satisfactorily identifying the Self and its Opposite, as well as its Negation and Context, an Epistemological understanding of the Self has been reached.*

In the context of these four principles – Non-Contradiction, Contradiction, Consciousness and Complexity – an understanding may be reached of any phenomenon through the use of analogy between the level studies and other levels of reality already considered or understood.

ONTOLOGIC NATURE OF REALITY

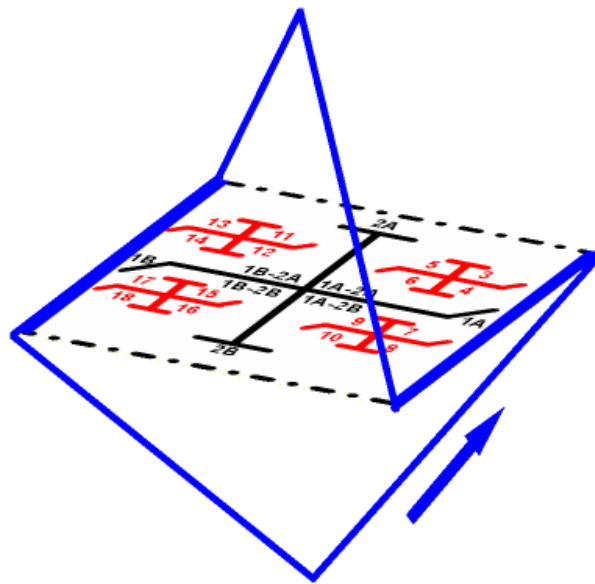


EPISTEMOLOGIC NATURE OF REALITY

(6) *The Epistemological Understanding of a Self has a direct bearing on the Self. Once the Self is known, it has become a “Known” Self rather than an “Unknown Self.”*

In the case of the inter-working of these four principles, as soon as an understanding of the complexity of any level is obtained, a new understanding of the Principle of Non-Contradiction is arrived at, and this changes everything.

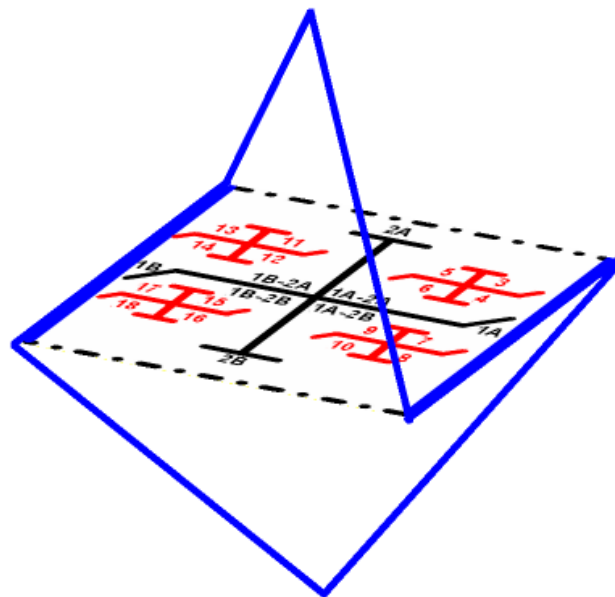
ONTOLOGIC NATURE OF REALITY



EPISTEMOLOGIC NATURE OF REALITY

(7) *This circuit of considerations might be represented by the following figures, in which each line is of equal length.*

ONTOLOGIC NATURE OF
REALITY

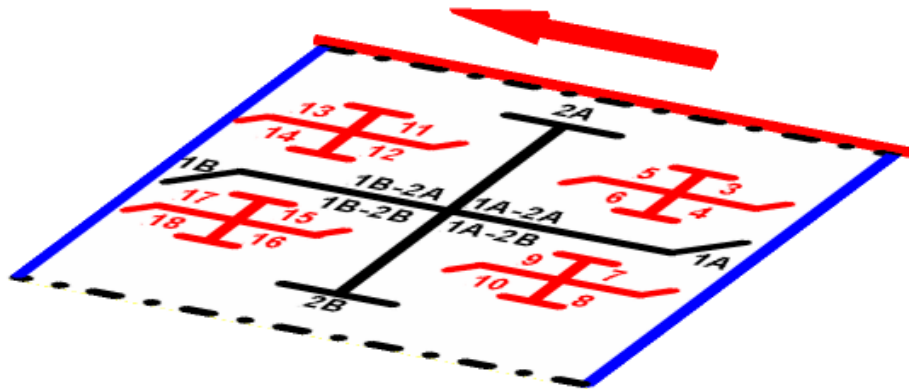


EPISTEMOLOGIC NATURE OF
REALITY

(8) *One prohibition exists upon the use of these concepts: The Concept of “Negation” must itself have something upon which to work, i.e. it represents everything that a particular Self IS NOT.*

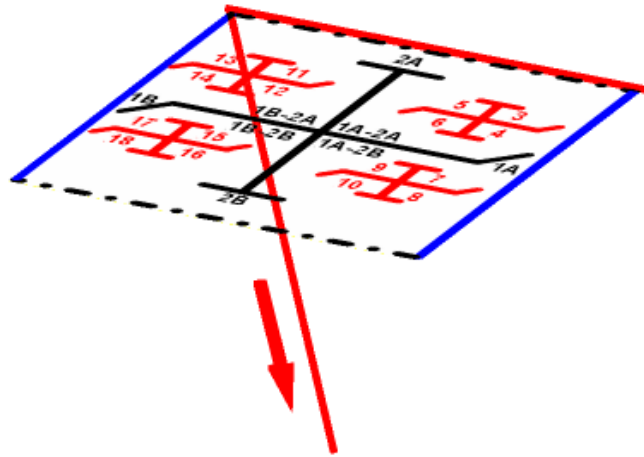
In the case of the inter-working of these four principles, if Science, using the Principle of Non-Contradiction attempts to study the workings of Consciousness directly, it attempts something wholly illogical, because Consciousness is the Negation of the Principle of Non-Contradiction.

If the Concept of Self is applied to Negation



(9) *an immediate Epistemological Difficulty arises.*

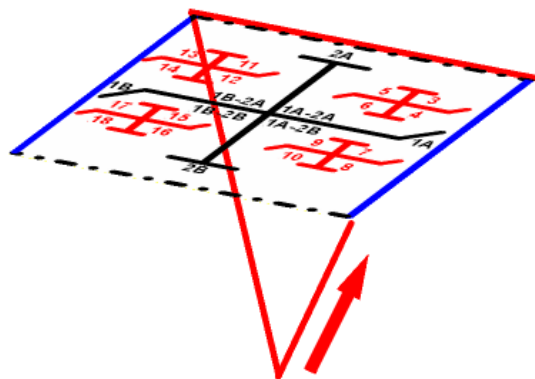
In the case of these four principles, as soon as science attempts to do the impossible – i.e. use the Principle of Non-Contradiction to study Consciousness - a complete breakdown by what meant as science and “non-contradiction” itself must take place.



EPISTEMOLOGIC NATURE OF
REALITY

(10) *No Opposite can be found for Negation treated as a Self. The Concept of Negation, treated as “Self,” simply means “everything” and its Opposite would be “Nothing.” (Moreover, how can Negate have a “Negation”?) This would give the absurd conclusion that (1) that “Negation” (treated as “Self”) is “Everything”, and (2) the opposite of the “Negation” is “Nothing”, a double negative.*

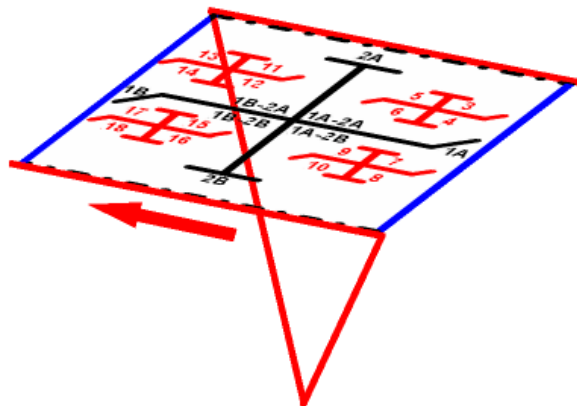
In the case of the working of these four principles: Consciousness is always Consciousness OF Something. It relates to something which pre-exists itself. Treated as a “Self” there is nothing which it can be conscious OF, and thereby contradicts itself. If Science approaches Consciousness as a matter of direct inquiry using the Principles of Non-Contradiction, the Principle of Contradiction is immediately under attack. One simply can not distinguish what is meant by the Objective and Subjective, between that which IS and that which is KNOWN.



EPISTEMOLOGIC NATURE OF
REALITY

(11) *Moreover, no Context for such an entity can exist, because neither an Opposite nor a Negation for “Negation” can exist.*

In relation to the inter-working of these four principles, If there is no ability to distinguish what IS from what IS KNOWN, complexity itself is under attack; it would be as if a single, undifferentiated blob of the universe had descended upon the study of anything, rendering all studies both formless and meaningless.

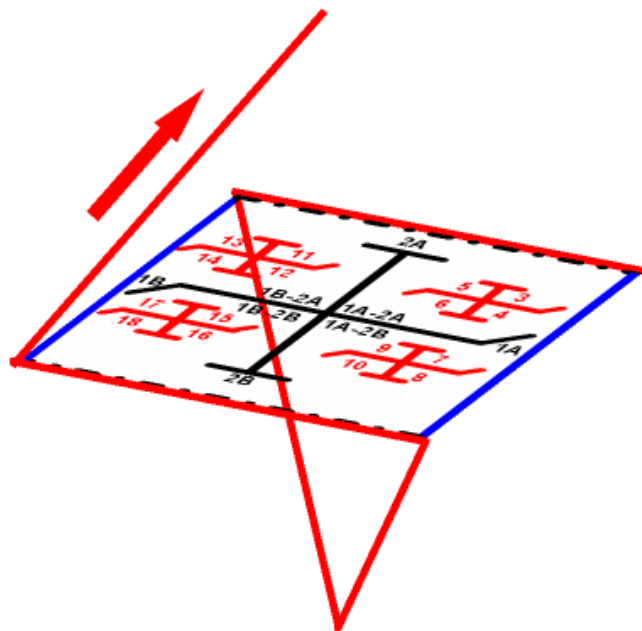


EPISTEMOLOGIC NATURE OF REALITY

(12) *The very idea that Negation might be treated as a “Self” constitutes an attack on the concept of “Ontological Existence.”*

In the context of these principles, Once the complexity of the relationships of the various levels of the Universe have been destroyed, the ontological basis for identifying anything has gone with it. One can not tell the difference between the ontological existence of snail from the existence of the United States.

ONTOLOGIC NATURE OF REALITY

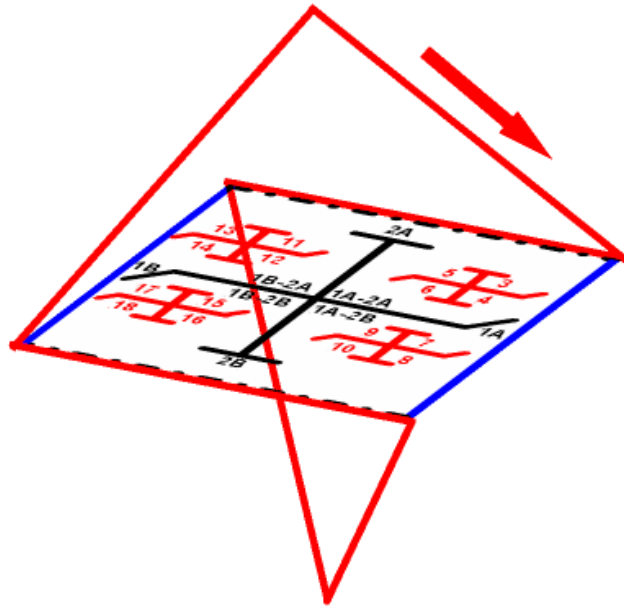


EPISTEMOLOGIC NATURE OF REALITY

(13) *If the concept of Ontological Existence is invalid, there can be no application of the concept "Self" to Negation.*

Once the very concept of Ontological Existence is done away with, there is only the attack on the Principle of Non-Contradiction itself, and the whole of Science falls into a form of dishonesty.

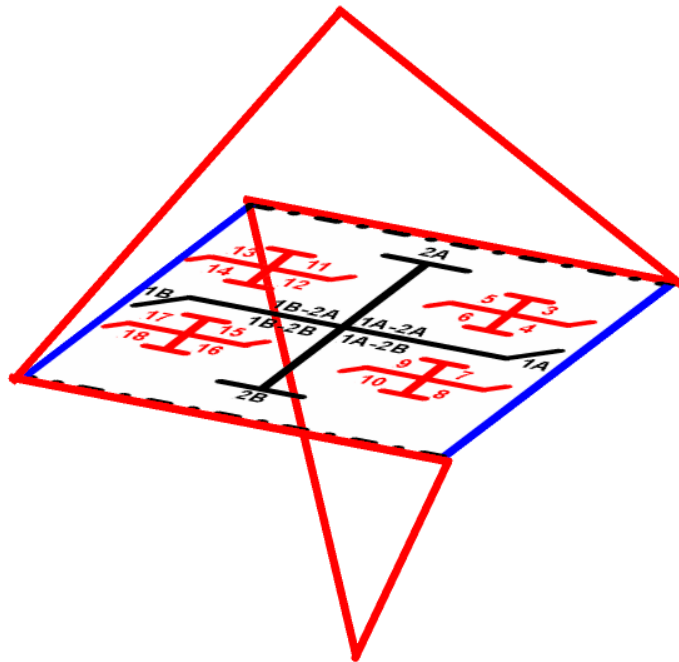
ONTOLOGIC NATURE OF REALITY



EPISTEMOLOGIC NATURE OF REALITY

(14) We have then a circuit wherein philosophy declares certain thoughts improper, illegal. This illegality is found in the treatment of Negation as a form of Self. This circuit might be represented as:

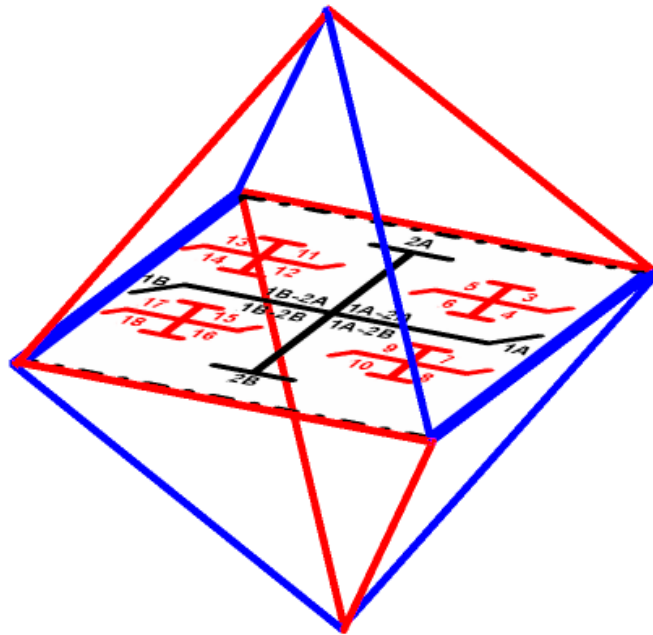
ONTOLOGIC NATURE OF
REALITY



EPISTEMOLOGIC NATURE OF
REALITY

(15) *Joining the productive (blue) and destructive (red) circuits of philosophy together, we have the following:*

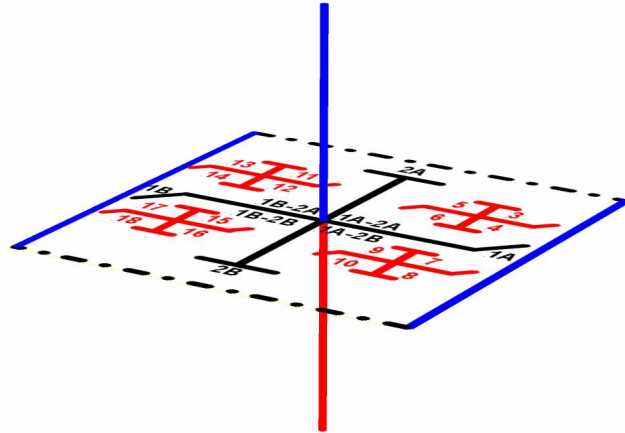
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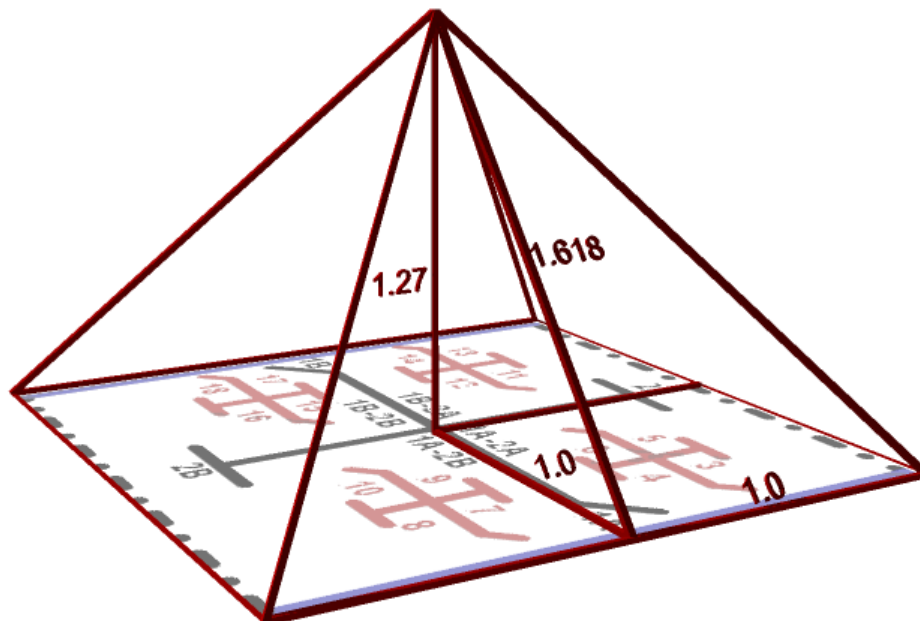
We have previously set these two equal to “one” as an initial point of departure, and then used the circuit of being concept to generate the following sequence.

$$1, 1+1=2, 2+3=5, 5+8=13 \dots$$

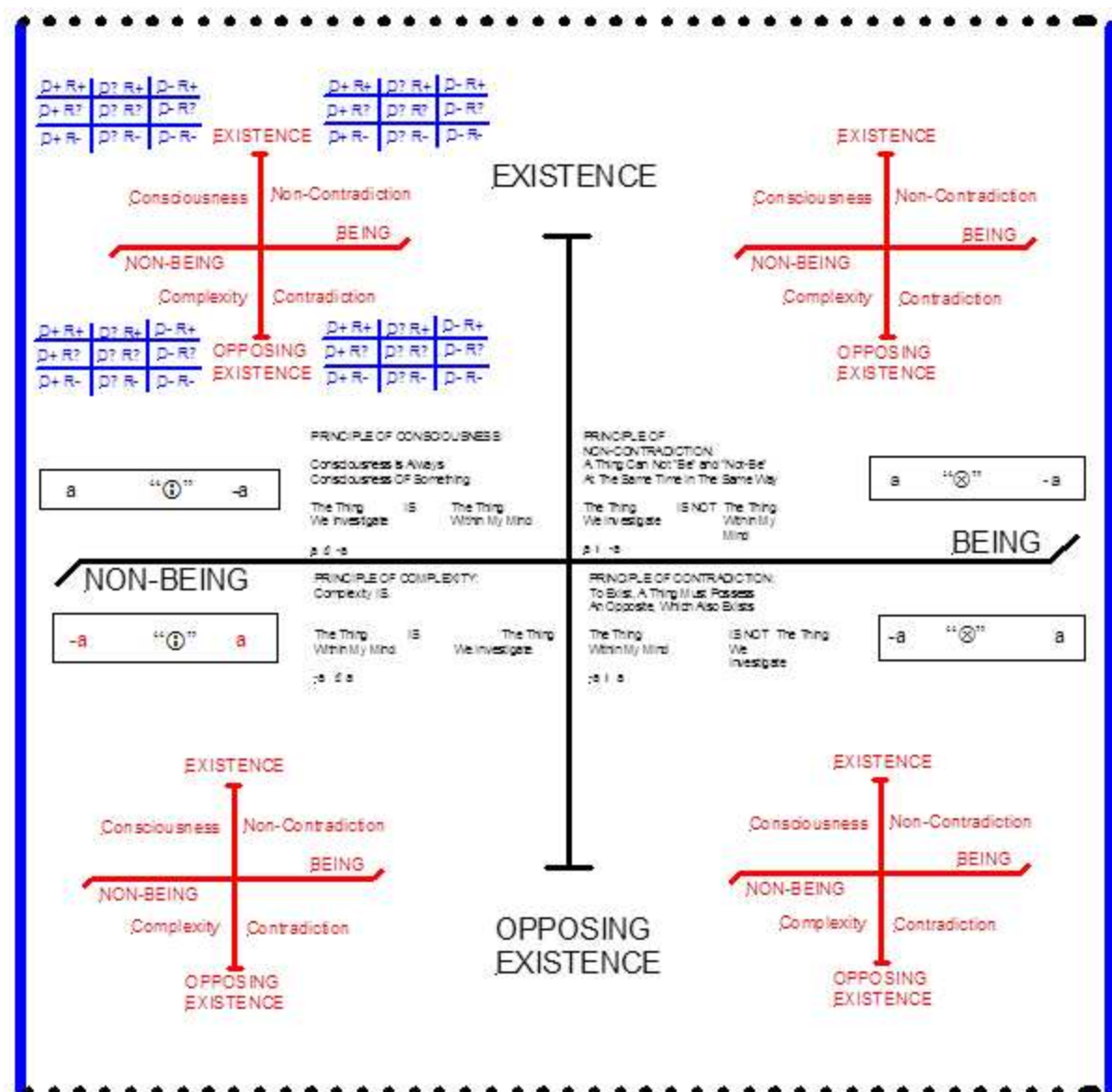


$$1, 1+2=3, 3+5=8 \dots$$

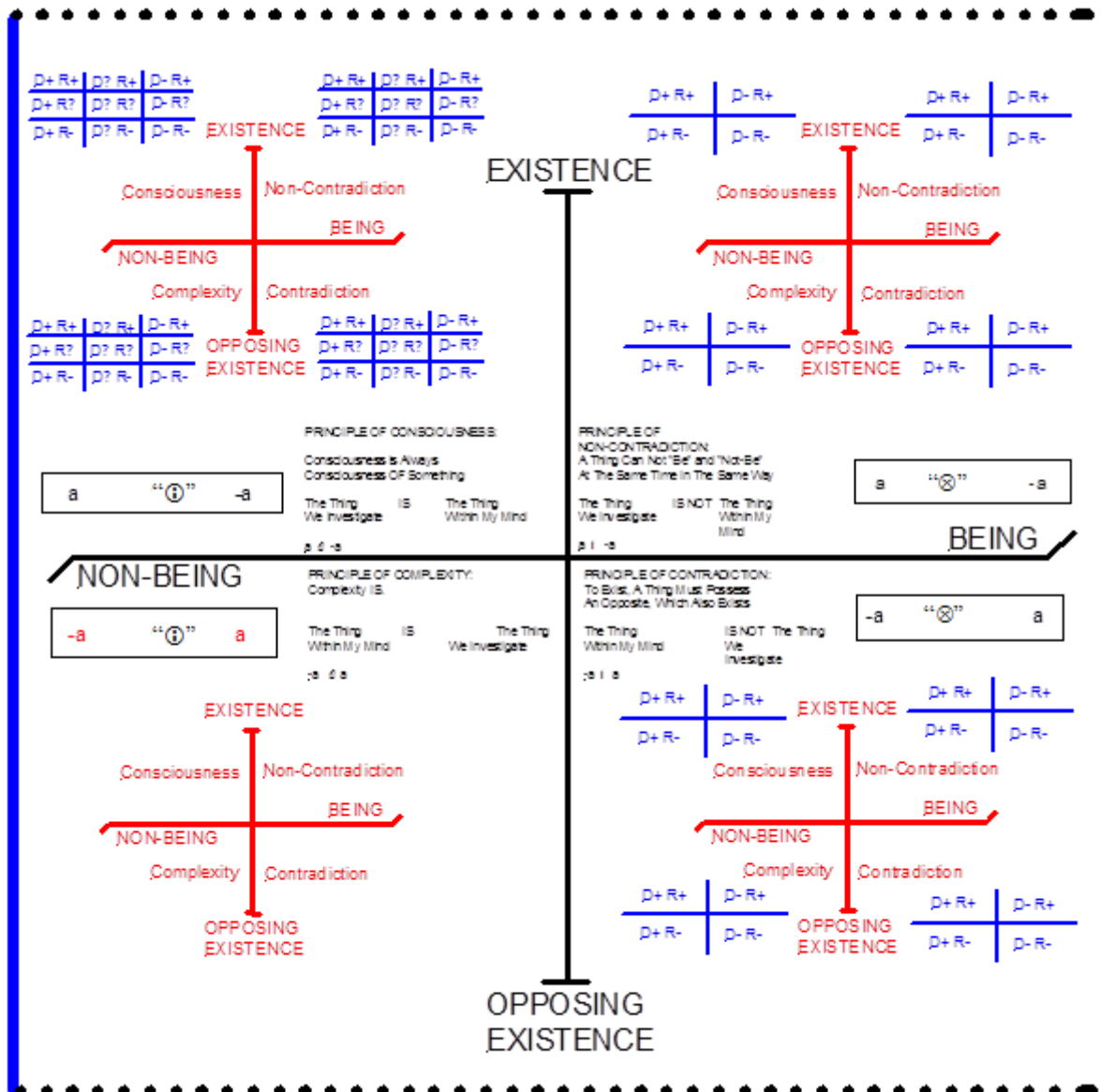
We could view the development of these four principles - *Non-Contradiction*, *Contradiction*, *Consciousness*, *Complexity* - as subject matter themselves, with the following patterns developing as an ontological/epistemological axis is imposed upon them.



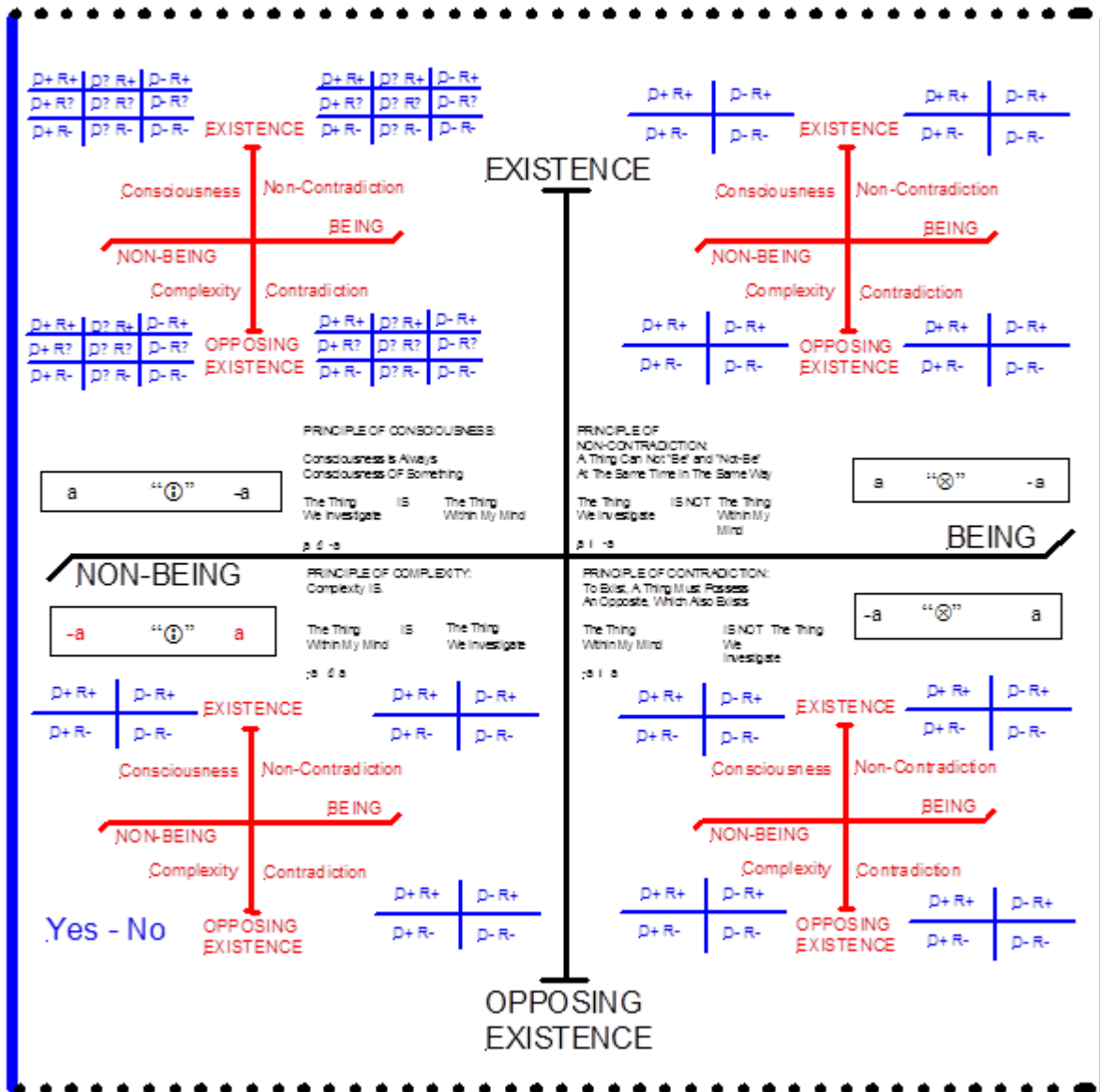
And from there we can figure the areas of unavoidable uncertainty, first beginning with the impossibility of establishing Negation (Consciousness) as it relates to itself, or as the subject of inquiry by the *Principle of Non-Contradiction*. From there we view the uncertainty generated as Negation (Consciousness) relates to either Opposite (*Contradiction*) or Context (*Complexity*).



Next the lack of inherent uncertainty as related to the Self (*Principle of Non-Contradiction*) and Opposite (*Principle of Contradiction*) on the Being side of the equation:



And finally as to the arbitrary-ness of Complexity itself. Either you see it, or you don't.



And so we have Complexity as an Attitude, nothing more. Something from which other things stem, making possible a study of levels of consciousness, but never broaching the heart or uncertainty of the matter of consciousness viewing itself. This matter must be inherently uncertain for all time, it can not be understood through science, but it may be understood through analogy.

To make more simple and direct the creation of these analogies, we turn to the simplest analogy yet invented whereby these methods may be utilized, i.e. that of music.

Essay Five: Piano Performance

I tell my piano the things I used to tell you.

Frederic Chopin

ABSTRACT

Aims: To introduce the basic ideas underlying five essays on a testable theory of reality.

Study design: Description of Piano Performance according to the graphic explored in the previous ten essays.

Place and Duration of Study: Library research.

Methodology: In this essay we propose a model of the interaction of the physical with the conscious act of making something physical, i.e. musical performance. By describing the act of playing the piano in the simplest possible terms, we lay a foundation for a further description of reality as the creation of physical by way of consciousness itself.

Conclusions: This model is a simple example of the more elaborate philosophy which follows from it.

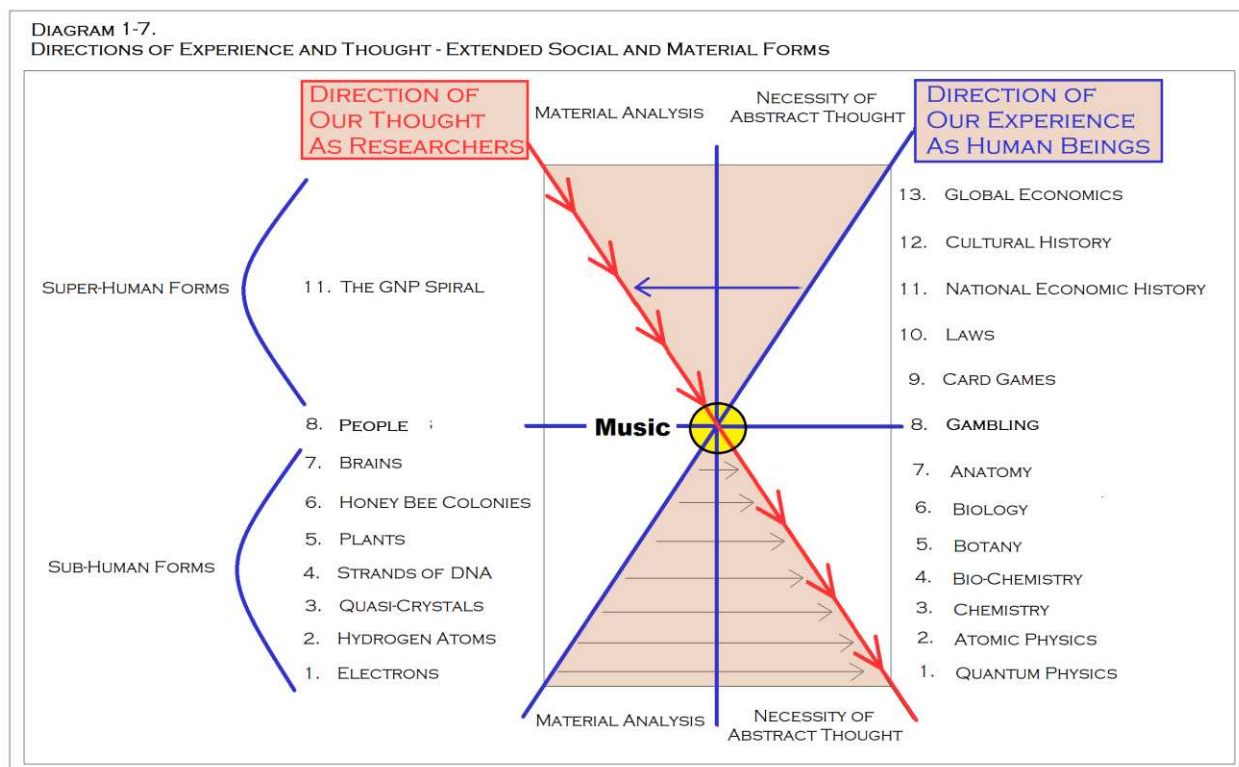
1. The Merger of Life and Non-Life

In the previous eleven essays we have explored the possibility that a single pattern may unify each of at least ten different levels of reality. Through an understanding of this pattern we are able to organize simply (1) the normal psychological interaction between people in a game of gin rummy, (2) the Prohibition Against Hearsay, one of the chief features of the law of evidence in the United States, (3) the final number of chemical elements which make up the world around us, (4) Russell's Paradox and its relationship to the (5) economic and social history of the United States, and (6) the pattern of revolutions which characterizes European cultural development.

We have premised this effort on the possibility that such a pattern exists and that it can be useful. But a central and perhaps chief reason for objection to this scheme is that it would appear to confuse the living with the dead. There is no demonstrable evidence that the Periodic Table of Chemical Elements is alive, and it is hard to imagine that something completely without life should have a structure in any fashion similar to that of the history of Europe.

The point which we must reach in this is to combine life and non-life in a single place. I propose that we consider the possibility that animal life as a strictly biologic occurrence takes a significant step when animals develop art. By this I do not mean merely the accumulation of tools or the ability to copy tool making behaviors. Rather I suggest that animals become men when art becomes a part of their life.

Therefore I place the study of music squarely in the center of the intersection of our understanding of consciousness, both as a pre-human and a super-human construct, not as a level in itself as a joinder of two entirely separate worlds into one, i.e. the common vibration of a string which of its own accord signifies nothing, as conjoined with a multitude of strings in musical performance which in their merger attempts to mean a great deal.



In other words at some point in the spectrum of reality, between the non-living mathematic-chemical levels and the living psychologic-cultural levels, there must be a joiner, a merger, of the living and non-living realms in which we live. A study of the merger of these two is found in the science of biology, the “study of life.” The simplest way to move into a discussion of the realm of law, philosophy, economics, national economic history, and physics is to begin first with a discussion of the interaction of life with non-life.

If we seek a parable for the combination of life and non-life at the biologic level, we may find it in the world of art. In art, the artist combines something which is entirely non-living – the vibration of strings, the color of paint, the dimensions of stone or metal – with the living inspiration of the artist. If we acknowledge that in the art of music life and non-life combine we have the beginning of such an approach.

Imagine then a great pianist sitting at the piano in a great hall playing for an audience. The piano, a large musical instrument made of wood, metal and felt, is non-living. The sounds created by vibrations of inanimate strings emanating from the piano are also non-living. But the human performer which causes these vibrations and these sounds to occur is a living force, something completely above and beyond the material, physical musical instrument. The music created is intended to appeal to other living things, and the beauty of the performance – or the lack thereof – is judged by other living human beings. These judgments are not material, and the purpose of the performance is not physical.

In some way similar to this, the living spirit of the individual enters into a cooperation with the physical, chemical and structural mechanism of the human body. The human mechanism is “played” by this spirit, as a musician plays a musical instrument. The consciousness of this physical body rests upon the physical mechanisms of the body much as a pianist’s hands rest upon the piano keyboard. The “music” which biology studies is life itself.

Life rests upon the physical structures of nerve, heart, lung, liver, DNA etc. But “life” as such may no more be equated with these structures than the Moonlight Sonata equated with a piano. In other words, there is no difference between the DNA of Horowitz living and Horowitz dead. But there is a great difference between Horowitz living and Horowitz dead if one considers his approach to the nuances of a Chopin Prelude.

Obviously there are thousands of other interests to the field of biology. But if we concern ourselves solely with the manner in which non-life and life interact, the simple act of playing the piano has its advantages.

Every art has this combination of living and non-living elements. Every art seeks to appeal to the imagination and spiritual depth of the member of the audience by way of an arrangement of things which are, in themselves, generally non-living. The arts of gardening, landscaping and dance may be examples of arts wherein living things, rather than non-living things, are the focus of the artist. But it is not incorrect to note that the arts of painting, sculpture, architecture and music deal with media which are non-living and material as constructed and arranged by human forces which are in themselves both living and non-material.

Comparing the graphic arts to music, one can easily observe that the pianist strives to construct the “consciousness” of a piece of music - the emotional connection, the human understanding - using nothing but the sound of vibrating strings and the force of his or her own character. In this sense music is even more elemental and abstract than painting. Whereas the arts of painting and sculpture frequently refer to some existing physical object – a face, a view of mountains, the human form, a table with flowers, etc. – musical works generally defy an objective physical comparison. Although one might hear music which sounds like chicks

pecking their way out of egg shells, or water in a lagoon at night, these associations are not made with the same facility in music as in the graphic arts.

Consequently the simplicity of music is useful in describing all artistic effort. Regarding piano performance, Charles Rosen writes:

There are indeed different kinds of tonal beauty in piano sound, and each pianist can develop a personal sonority that makes his or her work recognizable, but it does not come from the way any individual note is produced. A “singing” sound on the piano is not given by the instrument but by the way it is exploited with a specific musical phrase, and this exploitation is not mechanical and not a simple matter of technique: *it requires at every moment a sense of the music.* Beautiful tone production does not exist on the piano apart from the music. A single note on the violin can be beautiful because it can be controlled and made vibrant as it continues to be sustained: a single note on the piano is just a single note. It will appear more agreeable in isolation if it is not too loud and if the pianist does not appear to be thumping it awkwardly. *In performing a work on the piano, a beautiful quality of tone is achieved by shaping the melody and molding the harmony and the counterpoint. When that is done right – when the harmonies vibrate and the melody has a unified and convincing contour – the sound is beautiful.* In fact, that is how one can produce a beautiful sound even on a piano which may seem at first to give a sonority that is intractably ugly.¹³⁴

Let us begin here, in the world of piano performance, to commence an analysis of the merger of the non-living and living realms of the reality around us.

¹³⁴ Charles Rosen, *Piano Notes; The World Of The Pianist*, The Free Press, New York, New York, 2002. Page 24-25.

2. The Action And The Strings

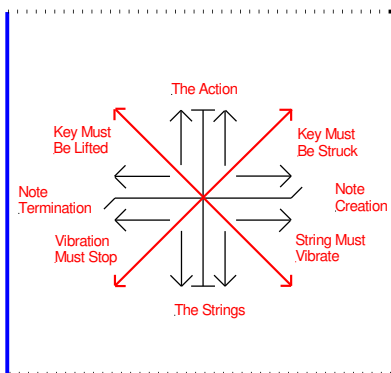
To create a circuit whereby musical artistry can take place, pianos are constructed of two basic parts: “The Action,” and “The Strings.”

“The Action” refers to (1) a set of keys, hammers and levers which strike the strings, and opposing these (2) a companion set of mechanisms - “dampers” - to stop the strings from vibrating at the will of the performer. The creation and the termination of the sound are of equal importance to the performer, for without both the music created would be a blur, an indistinguishable mass of strings vibrating. With the termination of the sound the distinctions between a whole note, a half note, a quarter note, an eighth note, etc. are created.

The most visible parts of The Action are the black and white piano keys held toward and beneath the performer’s hands. These keys are struck by the performer at varying levels of speed, force and held down for varying lengths of time. These set in motion a simultaneous striking of the strings. Ultimately, the key is lifted, the dampers fall in place, the string’s vibration is ended, the sound stopped, and the note both terminates and becomes recognizable as a timed pulse.

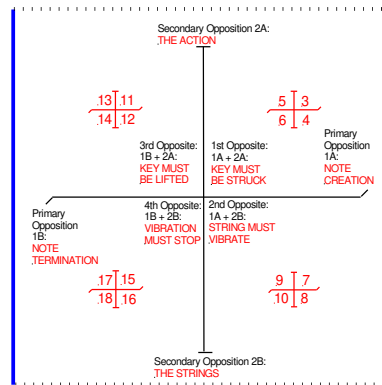
“The Strings” are strands of wire, constructed at different lengths, thicknesses and at different tensions, all tuned to complete a recognizable scale of musical relationships and harmonies. These vibrations create the sound which serves as the basis of all piano music.

There are then four essential aspects of playing a musical note on the piano. 1. The key must be struck. 2. The string must vibrate. 3. The key must be lifted. 4. The string’s vibration must stop. The formulation of these four points is presented as follows, and the central terms of the figure perhaps can be anticipated by the reader.



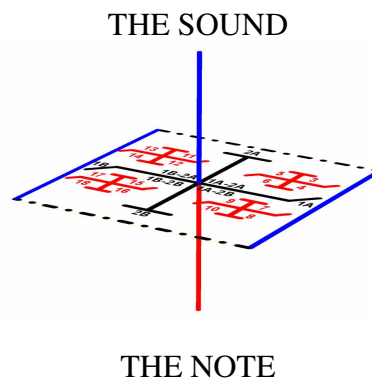
These four quadrants are stated by the mechanisms of the piano, provided by The Instrument itself. They exist whether the piano is played by a pianist or simply banged on by a child for joy of making racket. The physical instrument of the piano forms The Plane of Definition for piano performance.

Piano performance requires more than sound from a piano. A piece of music states a set of artistic relationships occurring through time between each of these four quadrants as created by The Performer. The Pianist creates a Plane of Relationship as each of these quadrants is called into play at particular times, indicating particular notes, played in particular ways, each of which is set forth in the written music played by The Performer.



On the right hand we have a vertical blue line representing the tension which exists between the key being struck and the string vibrating. On the left hand we have a vertical blue line representing the tension between a key being lifted and the vibration stopping.

The foregoing model is exactly like those of the preceding three essays. The benefit of the present level lies in the fact that the musician understands and assumes that a physical level of “Sound” is intended to merge with a spiritual or non-material level of understanding, the “Note” of music itself. If an “Image Axis” is added to this model, we have a contrast between the creation of the simple “sound” of vibrating strings, as opposed to the finished “note” of music as terminated by the performer at a particular time.



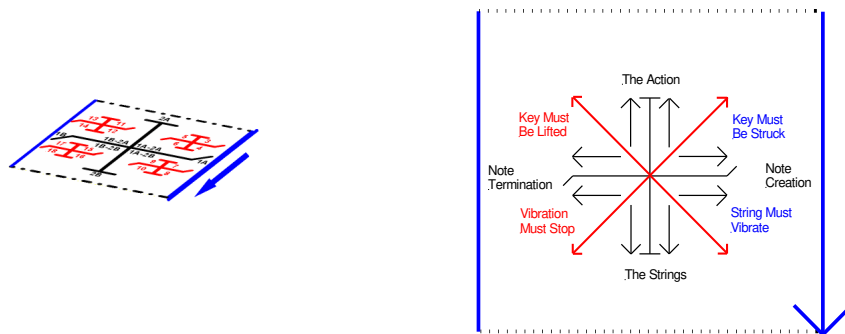
This musical sense of “note” is something more than the simple occurrence of vibrating strings. It is the understanding that the termination of the sound has added, in itself, something of value to the melody, that the termination at a particular time in the piece has permitted a certain “note value” to occur.

The idea of a note as “sound heard and terminated” is akin to the koan, the mystic riddle, of Taoism: “What is the sound of one hand clapping?” The answer: wave one hand through the air and stop where it might have met the other hand. The relative silence of the one hand clapping is nevertheless a sound, and a fundamental part of the idea of a clapping hand.

In music, one can not consider simply sound alone. One must also consider when the sound is ended, giving way to the next sound, in a motion of sound or melody of music. It is only when the sound is ended that the note has been heard. A similar insight may have been intended by Hegel’s famous observation: “The owl of Minerva flies at dusk,” or more prosaically, one can not understand something until it is finished.

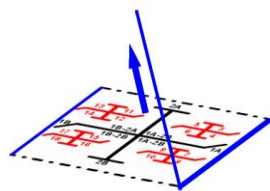
The above constructed “Image Axis” is connected to the piano through the following “circuit of logical relationships.”

- 1) The key/hammer strikes the string, which then vibrates.



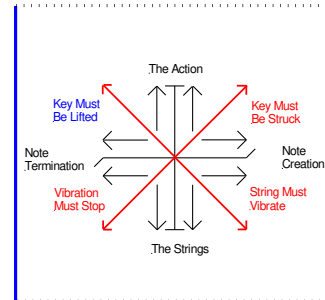
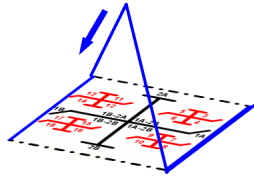
- 2) This vibration creates the sound of piano performance.

THE SOUND



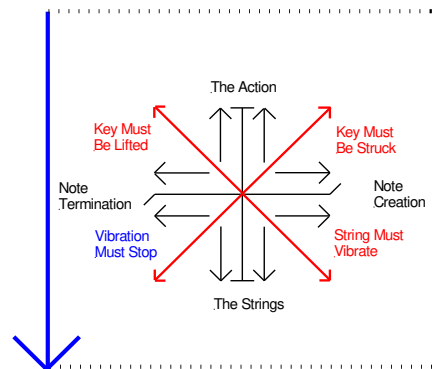
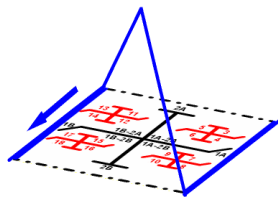
- 3) A note - a sound which has ended on time - is created by lifting of the key...

THE SOUND



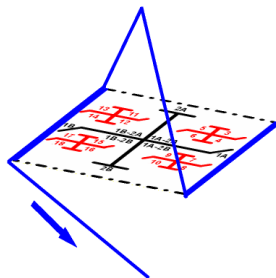
- 4) ... Which permits the damper to fall onto the string, thereby stopping the vibration and the sound at a particular time in the piece of music.

THE SOUND



- 5) This in turn terminates the duration of the note and provides a basis to understand the relationship of the note to the rest of the piece of music,

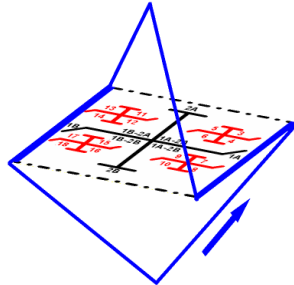
THE SOUND



THE NOTE

6) ... Which in turn gives rise to a new understanding of the note, i.e. it is now a particular note in the context of the rest of the piece.

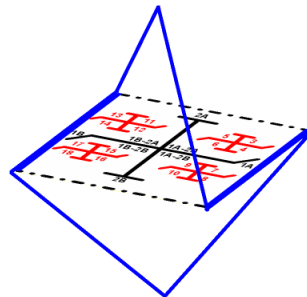
THE SOUND



THE NOTE

7) Each note of music represents a circuit of relationships, as follows.

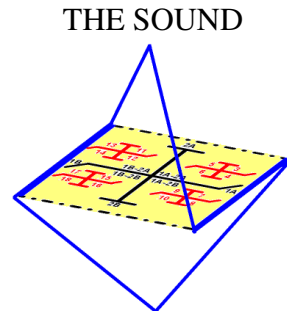
THE SOUND



THE NOTE

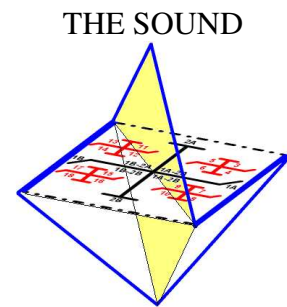
This model is of three planes:

- (1) a plane of dichotomies, one which defines the basic things which must occur if a note of music is to come forth



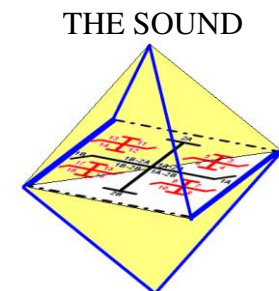
THE NOTE

- 2) a plane connecting the creation of the sound to its physical termination, and



THE NOTE

- 3) a plane connecting the termination of one note to the possibility of creating a second.

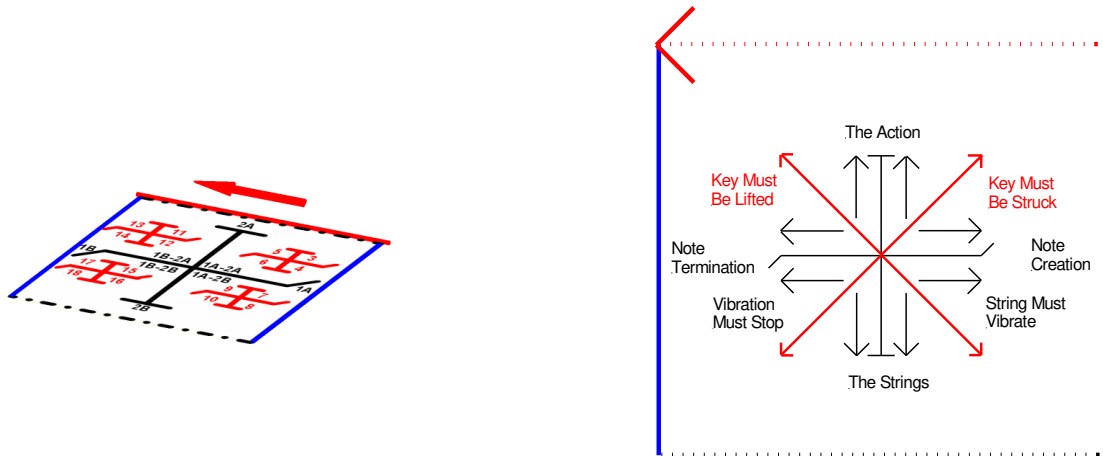


THE NOTE

In the above, a circuit has been designed which incorporates the blue lines by way of their connection to the creation of something.

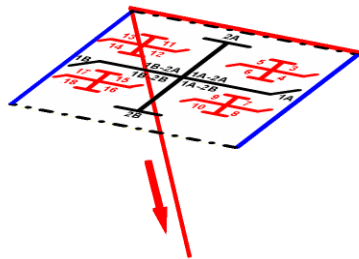
An *inherent* uncertainty arises if we ask: What occurs if we design a circuit based upon the dotted black lines (Primary Opposition), rather than the blue lines (Secondary Opposition)?

(8) The “Primary Opposition” of Music - “note creation” vs. “note termination” - presents a gulf or logical impasse between simultaneously striking and lifting a key. If the bare striking and lifting of keys in the action is made to be the basis for an understanding of music,



9) a break down or attack is made against the very meaning of music, ...

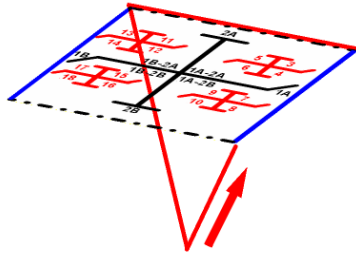
THE SOUND



THE NOTE

(10) in that a sounding of strings ...

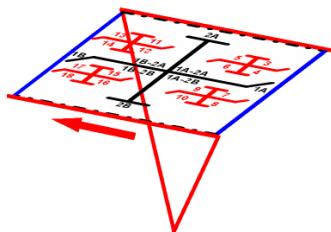
THE SOUND



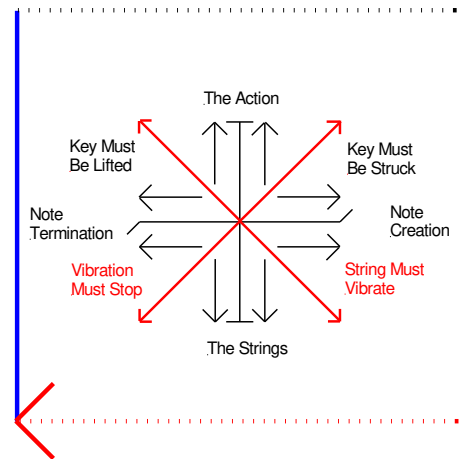
THE NOTE

(11) must be equated – bizarrely - with the termination of that sound.

THE SOUND

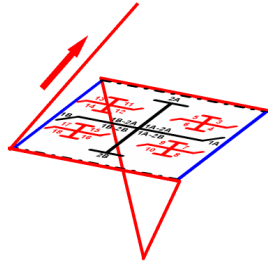


THE NOTE



- (12) This leads to an attack on the concept of sound itself, ...

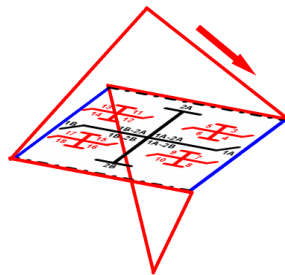
THE SOUND



THE NOTE

- (13) and destroys the very idea of a note of music in the context of a larger piece.

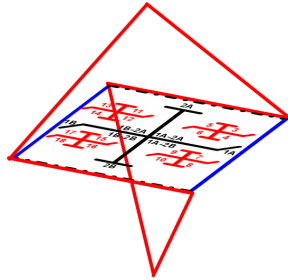
THE SOUND



THE NOTE

(14) This red circuit constitutes a sort of anti-music, a definition of music which is at odds with all musical understanding.

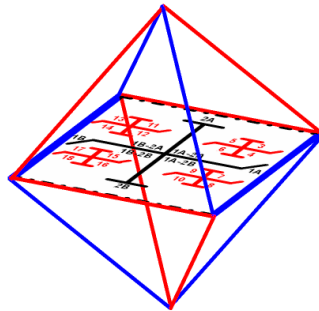
THE SOUND



THE NOTE

(15) Taking the blue circuit which might be defined as “music,” and contrasting this with the red circuit which might be defined as a sort of “anti-music,” we have the following two circuits simultaneously.

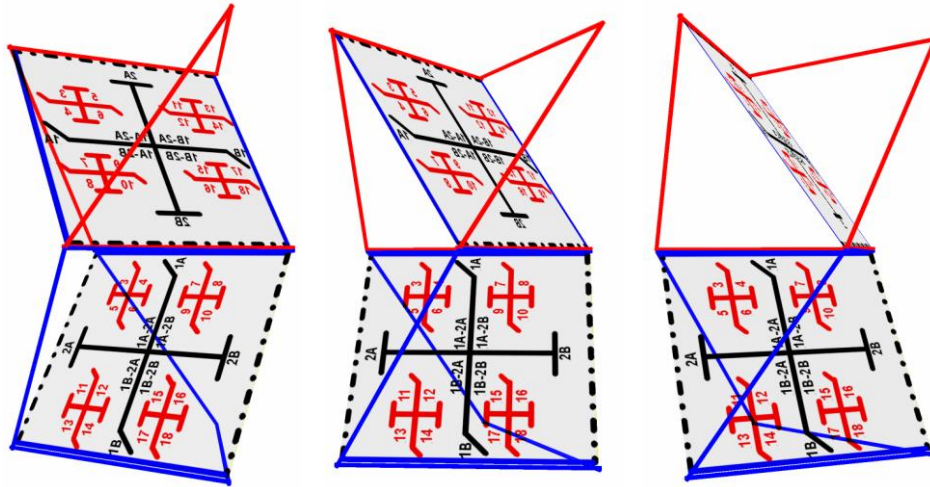
THE SOUND



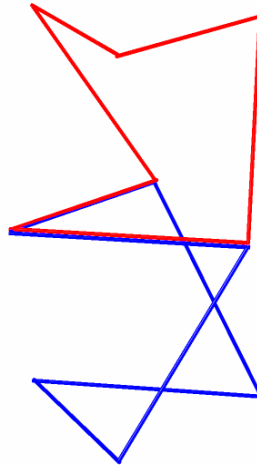
THE NOTE

3. A Sequence Of Notes

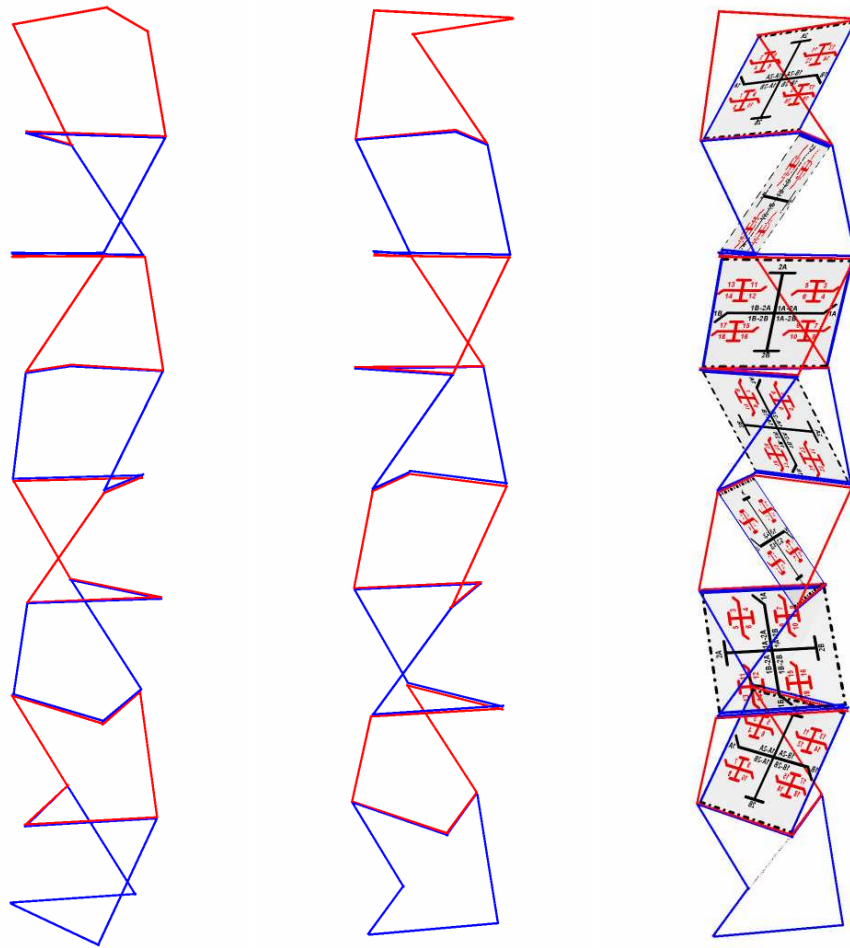
If these circuits are separated from one another, the blue circuit representing “musical performance” and the red circuit representing “anti-music,” they may be aligned along a common angle, as follows.



With this alignment in mind, we may represent a single note as of the following form:

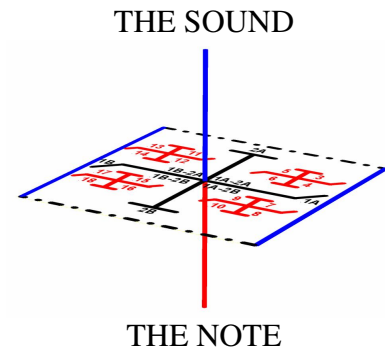


If we further understand that music is composed of many notes played in sequence, we may stack note next to note, as follows:

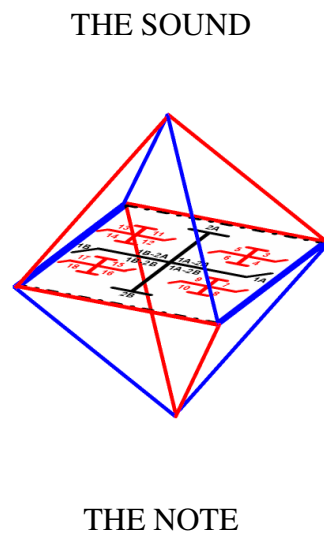


And so we may think of music as “strands” of separate notes, not unlike a strand of DNA composed of so many separate enzymes. The overall impression given by the piece of music however always revolves around the underlying dichotomy between the material “sound” given by the vibrating string and the non-material “note” understood by the audience in the context of the entire piece. Against these two dichotomies of “sound” and “note” we progress towards a harmonic understanding of the whole piece.

In effect, the separate poles of “The Sound” and “The Note” in music

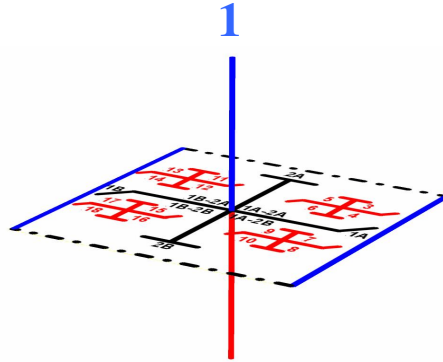


... are joined into a single unit by way of these circuits.

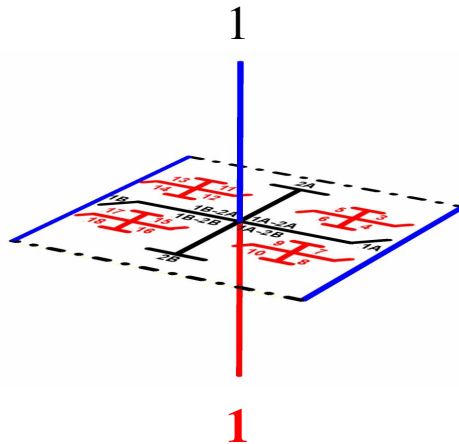


We may further unify these poles mathematically if we use this “Image Axis” to generate a series of numbers which can be used to join these two poles. For example, if we give the number “one” to the first vibration of the piece

First string vibrates.



... we can see that the “note” itself revolves entirely upon the sense that the sound has ended.

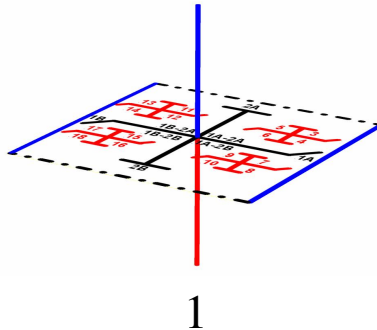


First note is heard.

Once this “note” has ended, a new sound in the melody follows:

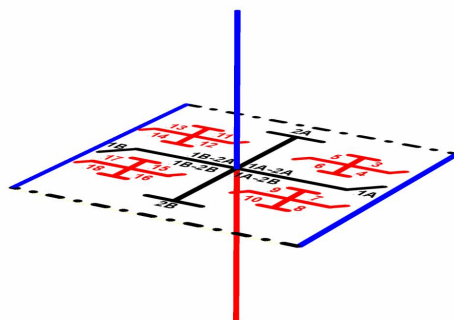
Second string vibrates.

$$1 + 1 = 2$$



The combination of the second sound with the first note is something other than a simple addition of notes. Once the second sound terminates, it creates a new sense of both notes. It brings about a new understanding of the note previously heard in combination with itself.

2



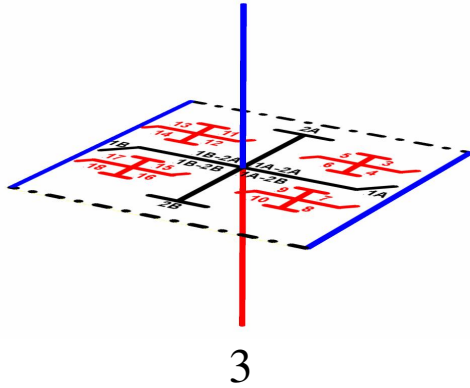
$$2 + 1 = 3$$

Second note is heard.

And then a third sound becomes part of the melody,

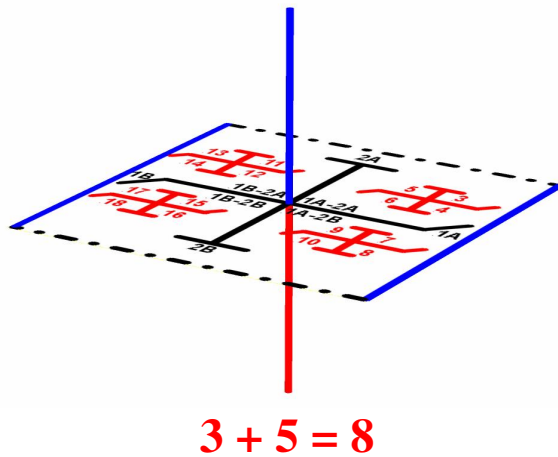
Third string vibrates.

$$2 + 3 = 5$$



And followed, upon its termination, by the understanding of the three notes collectively:

5

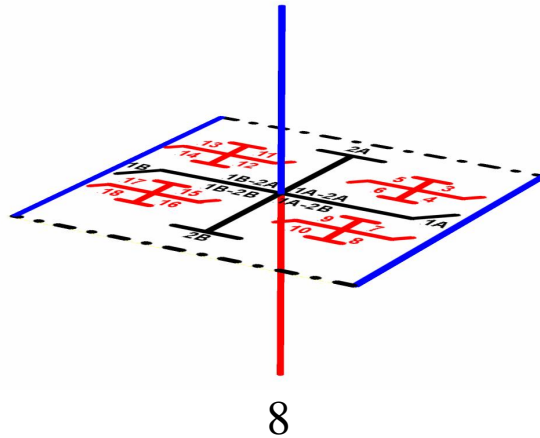


Third note is heard.

And then a fourth note...

Fourth string vibrates.

$$5 + 8 = 13$$



By extending this series of sums into a pattern we have the Fibonacci series, to wit:

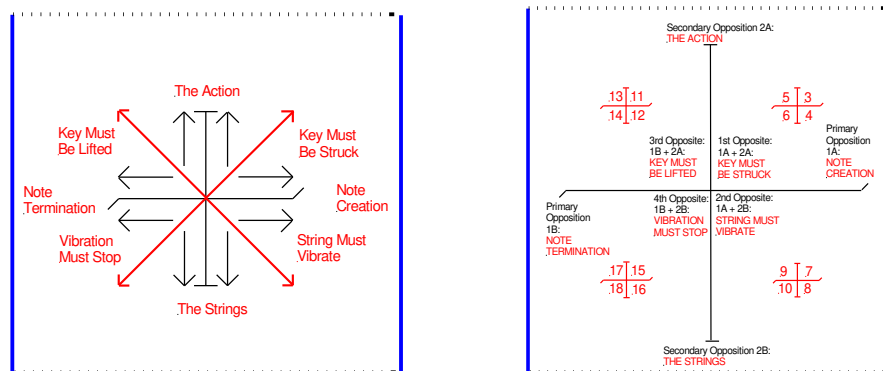
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc.

Joining these numbers into fractions in an effort to determine a common ratio, we have:

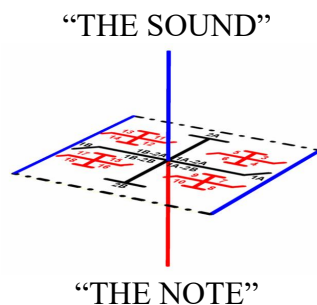
$$\frac{1}{1} \quad \frac{2}{1} \quad \frac{3}{2} \quad \frac{5}{3} \quad \frac{8}{5} \quad \frac{13}{8} \quad \frac{21}{13} \quad \frac{34}{21} \quad \frac{55}{34} \quad \frac{89}{55} \quad \dots$$

This continuing series renders the constant phi = 1.6180...

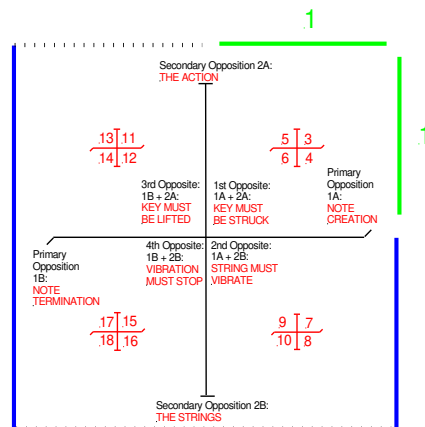
Let us consider for the moment the square of tension which we have considered as the basis for piano itself. This was proposed as:



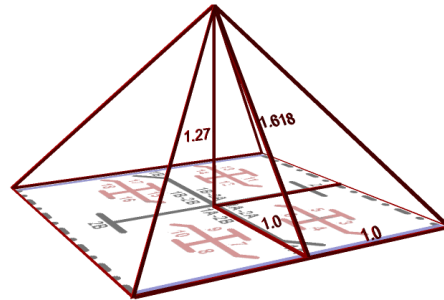
To this model we have added an “Image Axis” representing the ”Sound” and the consideration of that sound as terminated in the “Note.”



Let us set each of the quadrants of piano performance be given as contained by a square with the dimension of 1 x 1.



Taking this as our measure, let us give the number 1.6180 as the relationship between the poles of (1) “Sound Creation” and “Sound Termination,” (2) “The Action,” and “The Strings,” and (3) the merged end points “Sound” and “Note” of the “Image Axis.” Placing the distance 1.618 above the “Sound Creation” ray we have the following figure.



The above figure represents the meaning of the piece of music, as sound combines with note, to join into a finished and understandable whole. But this merger of the two by way of a constant “1.6180...” must finally be resolved by the performance AS SUCH.

In other words, no musician would be content to have music simply as a logical set of static relationships and definitions. Music must actually be played; it must live, it must exist as something heard and enjoyed. The key must actually be struck, the string must actually vibrate, the key must actually be lifted, and the strings actual vibration must cease, one note after the next, in order for music to take place. Charles Rosen writes:

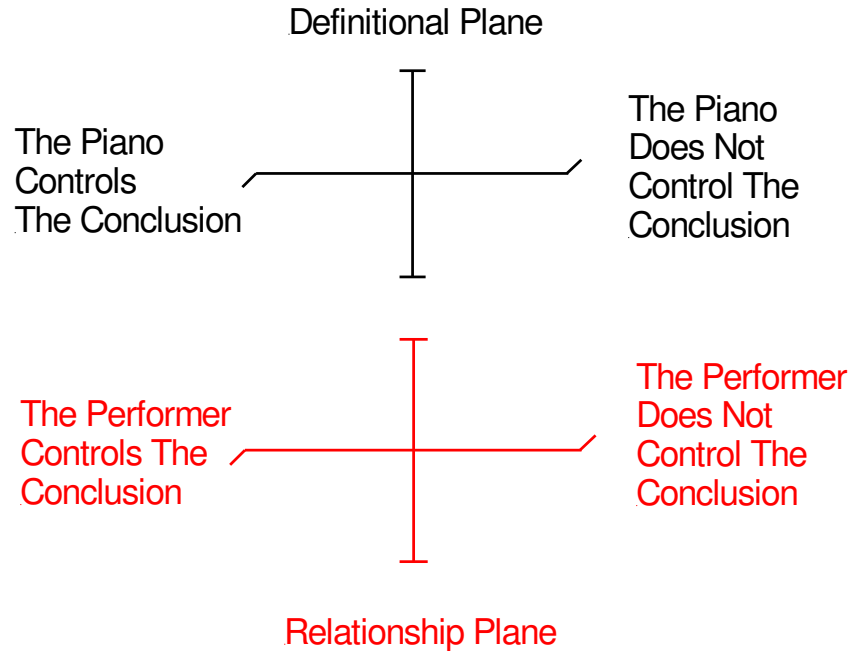
I do not know if new ways of using the piano will be found in the future. ... Music, a basic human need, will of course survive, but whether the piano repertoire in all its variety will go down without interruption to future centuries remains in doubt. ... (T)he survival of the piano repertoire from Bach to Berio will depend essentially not on whether anyone wants to hear it, *but on how many will want to play it and refuse to settle for anything else*. A fervent passion for performing a work of music or on a musical instrument will always find or create an audience. If there are still pianists in the twenty-second century, there will be a public willing to listen to them, but *it is the physical pleasure of playing as well as hearing the piano that holds the key to the future of the music written for it*.¹³⁵

This brings us to the “Conclusion” plane of the above model, actual performance.

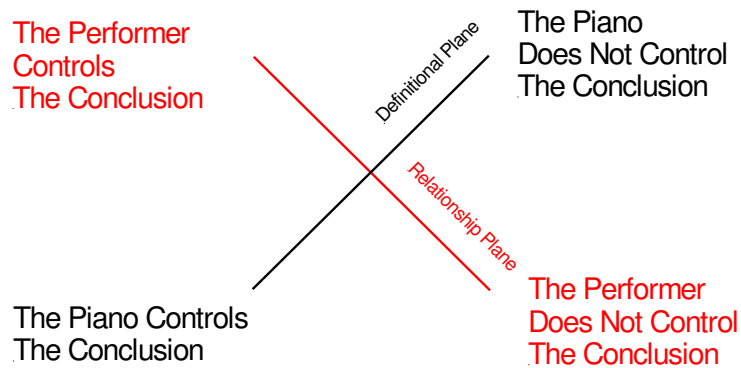
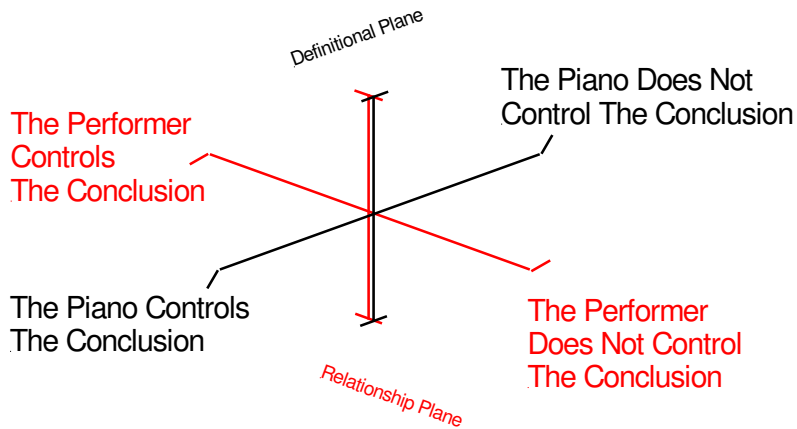
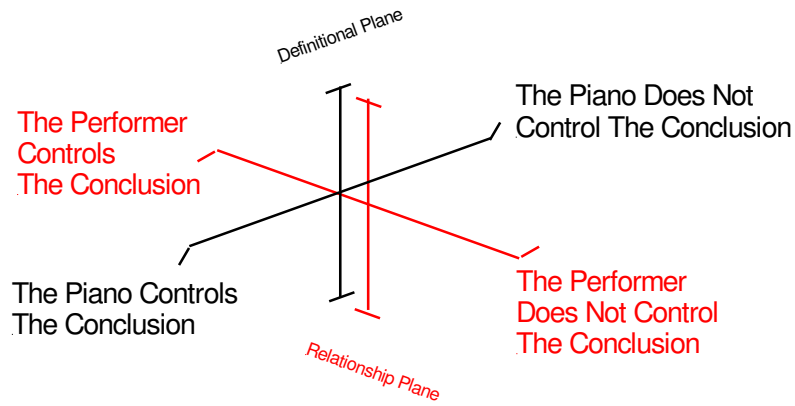
¹³⁵ Id., pp. 234-235.

4. Performance

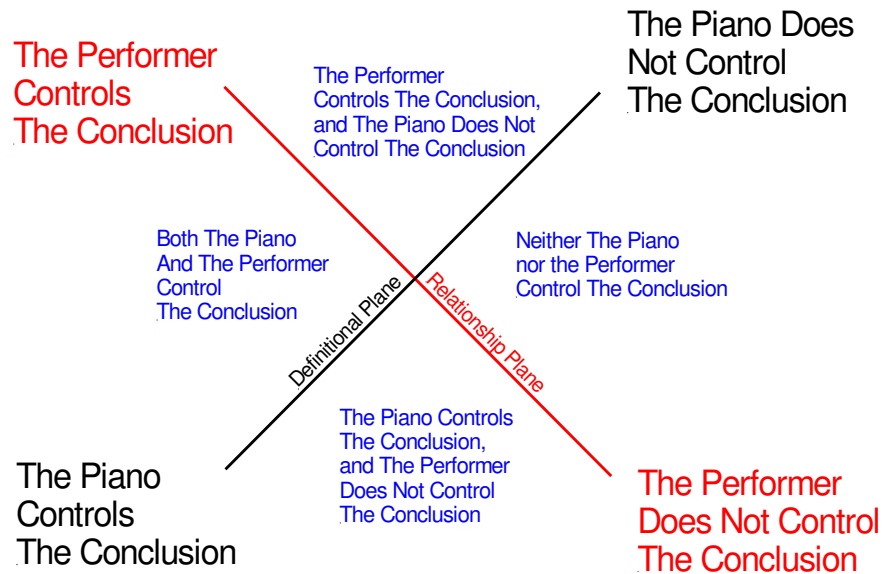
As in the previous essays we combine the "Plane of Definition" with the "Plane of Relationship" along a common axis.



In order actually to play the piano, one assumes that every note played, and every sound heard, in some way are the result of these two planes. The alignment of these concepts can be imagined as follows:



The merger of these two planes is the performance itself, the foundation for the music which is to come forth from the instrument at the hands of the performer.



Every piece of music performed is based upon these four quadrants.

For example, if we ask “Can I play octave glissandi on this piano?” we must consider both the technical capabilities of the performer and the piano in question. Charles Rosen writes:

In the last years of the nineteenth century as pianos were getting bigger and louder, the actions became heavier and stiffer, and pianists had to push the keys down to a greater depth. This demanded more muscle power, as if pianism had not already become sufficiently athletic during the youthful years of Franz Liszt. Nothing reveals the greater stiffness of the modern action more than the octave glissandi written for the piano by Haydn, Beethoven, Weber, and Brahms: easy to execute on the instruments of the period, they now require a special technique and are abnormally difficult on some instruments when the resistance is more than standard. (An octave glissando is played by starting an octave with the sum and fifth finger and then dragging or sliding the hand along the white keys; for practical reasons, right-hand octave glissandi generally go down, left-hand go up.) When my teacher showed me how to do this, he told me to practice it for only ten seconds a day for a week: “more that that,” he said, “and you will get a blister on your fifth finger.”¹³⁶

¹³⁶ Id., p. 81.82.

If we ask, “Why did you choose to perform this piece?” only *the performer* can answer this question.

Pianists should, in the best of all possible worlds, play only the music they love and – this should carry equal weight – to which they think they can bring an interpretation that is deeply personal. ... Choosing repertory because of commercial pressure or intellectual pressure is, in the end, self-defeating. The only true recompense for the awkward living conditions is that you can play the music you love throughout your life and play it at moments as well as you are able.¹³⁷

If we ask, “Is this a good piano?” one may consider the instrument itself solely, and without any reference to a particular performer.

Today, going from a new piano which is somewhat stiff and often voiced for harsh brilliance to an older piano with a much looser response and a more mellow quality is like changing from a Mack truck to a Ferrari. The advantage of always playing the same instrument cannot be overestimated. A piano on which one has played a dozen times is an old friend, even if that piano has other friends as well: back on the 1960s, a whole generation of American pianists recorded on the same instrument, Steinway No. 199. It was used by Gary Graffman, Jacob Lateiner, Leon Fleisher, and myself. There must have been others as well. It was a beautiful instrument with a long decay of sound, and a sonority that combined warmth and brilliance. When the action finally wore out, the piano was sold, although if the company had really had heart, they would have rebuilt it.¹³⁸

Finally, if we ask, “Will the public like this music?” we have a question that *neither* the piano nor the performer can answer with certainty.

A first prize is generally accompanied by a guaranteed series of engagements for one year, and some of the prestige will hand on for another year or two. After that, all too often, the prizewinner is left out in the cold, as it if were necessary to start again from scratch. It is at this point that the formation of an image has to occur, an image that will make the individual pianist part to be a necessary part of the world of music. Even the cleverest publicist can give nothing more than a limited or temporary help, and the pianist has to call now upon all the resources of his experience of music from the earliest years. The conservatory prepared him for the competitions, and the stylistic demands of the competitions have now become irrelevant. Much of what he had to do to gain the diploma and win the prize has ceased to have any interest. The part of his education that is not suited to this personal view of music has to be cast away like a carapace from an earlier stage of life.¹³⁹

¹³⁷ Id., 113-114.

¹³⁸ Id., p. 81.

¹³⁹ Id., at 115.

Such questions arise constantly in the world of piano performance, as the following example suggests.

On one occasion, a teacher on the jury (whom we will call Ingrid because that is not her name) had a student in the competition (who will be renamed Igor for convenience). Another pianist had played the *Appassionata*, and afterward Ingrid said to me, “One shouldn’t use pedal in the second variation of the slow movement.”

“Why ever not?” I asked.

“The score reads *senza pedale*,” she replied.

“No, it doesn’t,” I said; “Schnabel’s edition reads *senza pedale*, but the original score has no instructions about the pedal there.”

“Do you think one should use pedal in the second variation?” Ingrid asked me.

“I don’t care as long as it is interesting, moving, and keeps my attention.”

That evening I had dinner in a Chinese restaurant with a local professor who had Igor in his composition class. “Ingrid has gone off her head,” he told me.

“What do you mean?”

“She just Igor’s parents and left a message: ‘Tell Igor to use pedal in the *Appassionata*.’”¹⁴⁰

The use of the pedal deserves special mention in the performance of music. Let us begin our understanding of piano performance with this important adjunct to our model.

¹⁴⁰ Id., pp. 110-111.

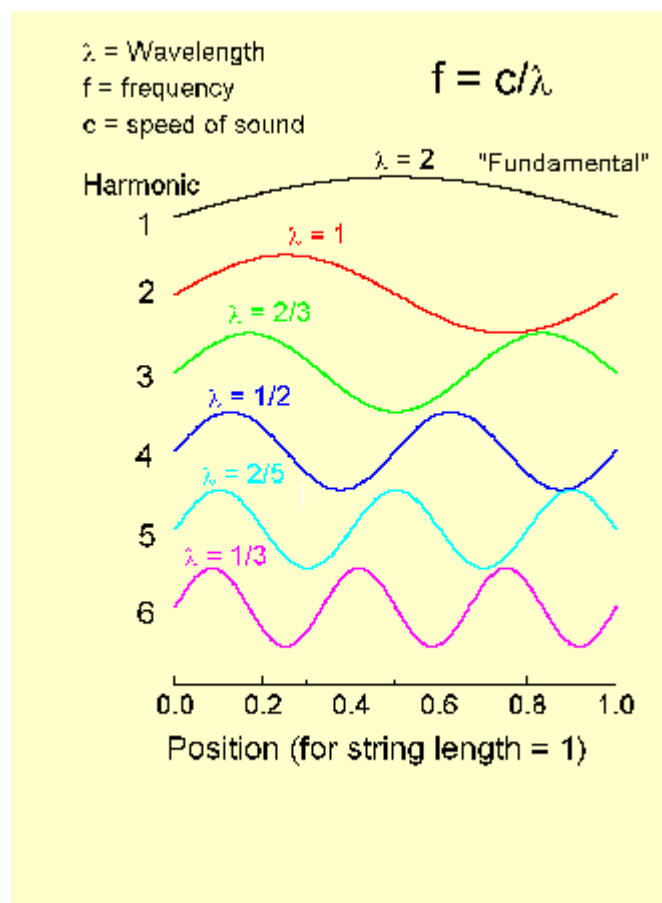
5. Sympathetic Vibration

When a string vibrates, the high point of the vibration stretches the string to a new point of tension, creating two subsequent vibrations of half the original length of the string. Consequently a Middle C will vibrate at not only at the tone of Middle C, but also an octave above Middle C, as well as G, and E, etc. This series of tones is important to understand in any performance of the piano.

Overtone Series

To understand how the scale arises from the overtone series, imagine vibrations on a string of fixed length, which is fixed at both ends (e.g. a piano string). The actual vibration may be very complicated, but can be broken down into basic units called "modes" of oscillation, each of which is a sine wave.

Since the string is fixed at both ends, so too must each of the possible modes. Hence, only sine waves which do not oscillate at the ends of the strings are allowed. The possibilities are shown in the figure below.



The fixed ends of the string will allow only certain wavelength modes to appear. If the wave speed is a constant ... and, for the sake of an example, we take the frequency of the fundamental mode to be that of C3 (the C below middle C, 131

Hz), the overtones are harmonically related (they are integer multiples of the fundamental) and are given in the following table.

Harmonic	Freq. Hz	Note	Comments
1	131	C3	Fundamental
2	262	C4	1 Octave Higher
3	393	G4	A Fifth above C4
4	524	C5	2 Octaves above fund. and a fourth above G4
5	655	E5	A Third above C5
6	786	G5	A Fifth above C5 Harms. 4, 5 & 6 form a major chord
7	917	almost B5b	An overtone to avoid

Since notes can be translated by an octave by multiplying or dividing the frequency by 2, these overtones of one fundamental define the notes C, E, and G. If we now make another string with a fundamental frequency corresponding to E3 ($655/4 = 163.75$ Hz) and look at its overtones, we define the notes B, and Ab. Starting with G3 (196.5 Hz), one gets an overtone defining D. Starting with D, the notes A and F# are overtones. Continuing the process, the notes of the scale are produced.¹⁴¹

“Sympathetic vibration” occurs when the vibration of one string sets off a lesser but still very noticeable vibration in a different string.

When a sound wave of one frequency strikes a body that will vibrate naturally at the same frequency, the vibration of the body is called sympathetic vibration. A reinforcement of sound resulting from sympathetic vibration is called resonance. When the vibrations of a sound-producing body cause another body to vibrate in the same frequency, not normally its own, the vibration is known as forced vibration.¹⁴²

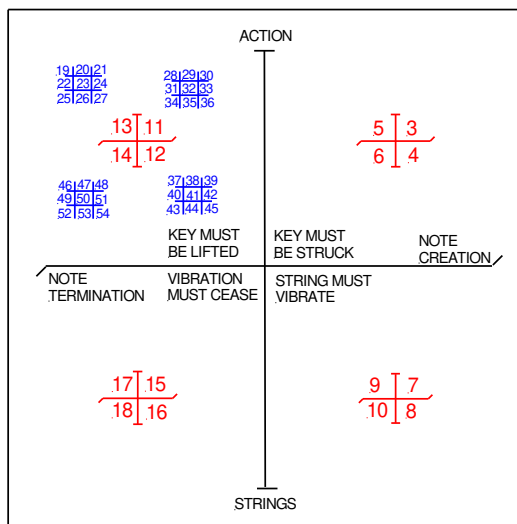
¹⁴¹ <http://www.phy.mtu.edu/faculty/info/suits/overtone.html>

¹⁴² <http://www.factmonster.com/ce6/sci/A0850799.html>

The piano takes advantage of this physics. The right-most pedal, the “damper pedal,” lifts the dampers off the strings themselves, thereby permitting the sympathetic vibration of the strings to occur over the entire range of the strings.

Much of the tonal beauty of the piano today must be ascribed to the pedal which allows the sympathetic vibrations of the whole instrument to act. Beginning with the 1830s, the almost continuous use of the pedal became the rule in piano playing (although Liszt and his school were more sparing, with a somewhat drier sound). This has had a disastrous effect on the interpretation of Haydn and Beethoven, for whom the pedal was a special effect. Beethoven, in particular, exploited the contrast of a heavily pedaled sonority alternating with dry unpedaled passages.¹⁴³

When the damper pedal is held down, lifting one’s finger from the key has no impact at all on the termination of the sound. When the performer’s foot is not on the pedal, when the pedal is not held down, the dampers fall into place upon the strings and the vibration ceases upon the lifting of the finger from the key. This “uncertainty” – this disconnect between the lifting of the finger from the key and its effect upon the piece as dependent upon whether the damper pedal used or not used – might be drawn, as in previous essays, as follows:



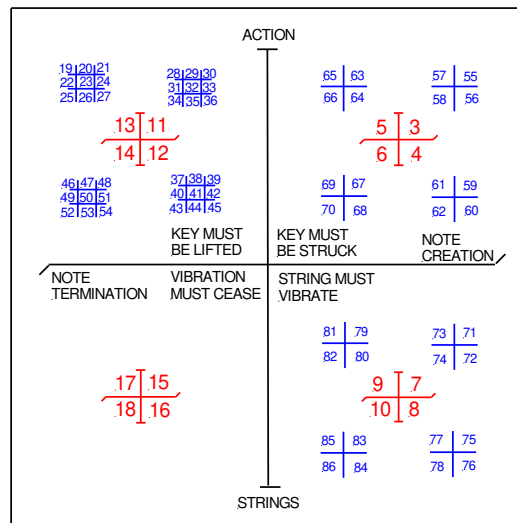
¹⁴³ Id., p. 30.

6. The Attack

On the other hand, there is no inherent uncertainty in the act of striking the key and the necessity of string vibrating in turn.

“(M)usic is not just sound or even significant sound. ... *There has to be a genuine love simply of the mechanics and difficulties of playing, a physical need for the contact with the keyboard, a love and a need which may be connected with a love of music but are not by any means totally coincidental with it. This inexplicable and almost fetishistic need for physical contact with the combination of mental, wood, and ivory (now more often plastic) that make up the dinosaur that the concert piano has become is, indeed, conveyed to the audience and becomes necessarily part of the music, just as the audience imagines that the graceful and passionate gyrations of the conductor are an essential component of musical significance. ... For all of us, music is bodily gesture as well as sound, and its primitive connection with dance is never entirely distilled away.*¹⁴⁴

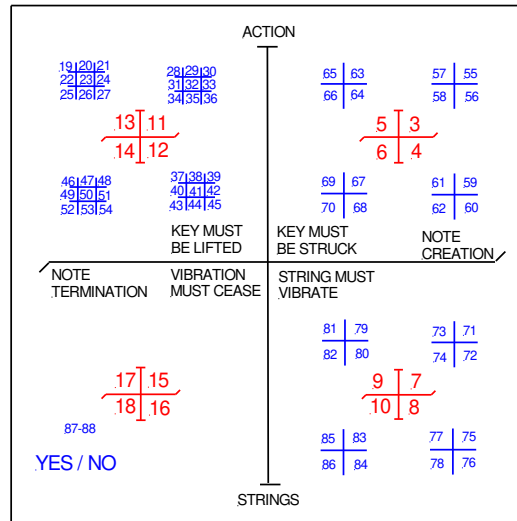
In other words, there is no inherent uncertainty as to when the key is struck and when the string begins its vibration.



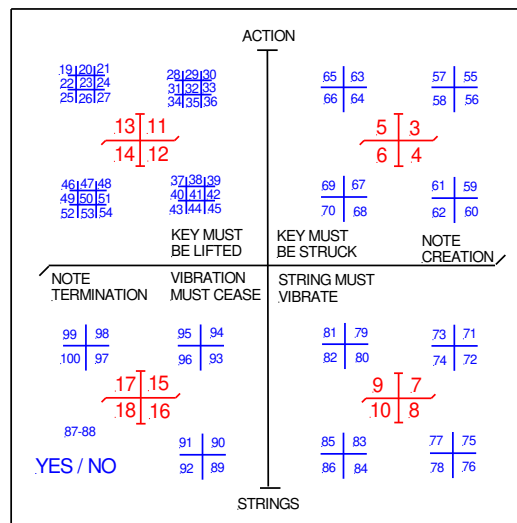
¹⁴⁴ Id., p. 10-11

7. The Decay of Sound

On the other hand, the vibration of the string has a rather arbitrary quality about it. The vibration either IS, or IS NOT, affecting the piece.



As long as the vibration exists, it affects every other aspect of the piece. If the string is not vibrating, its affect on the piece is largely terminated.



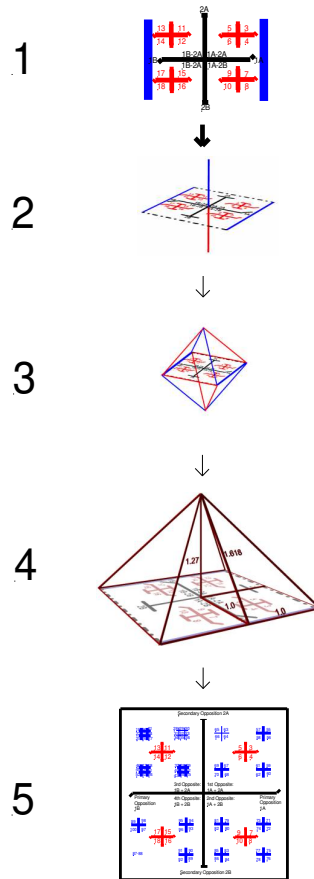
The fullness of the piano and piano performance is always something which merges each of the actions described – the striking of the keys, the string’s vibration, the lifting of the key, the termination of the vibration – into a single unified whole. One way to sustain the sound for as long as possible is to permit the interior of the piano capture the resonance of the string even after the vibration has ended.

Many aspects of the quality of the sound of a piano can be altered. What cannot be changed is the decay of sound: this comes from the sounding-board, and is, to my mind, what defines the intrinsic beauty of an instrument. The initial impact of a note is always strong and slightly percussive, even with a soft note: on a machine that measure decibels, the needle will jump instantly to the right as the note is struck and fall immediately back toward the center of the dial. It will then, if the note is sustained, move slowly and gradually back to zero. It is the second drop that determines the decay of sound: the longer the note can be sustained before it finally disappears, the greater will be the singing capacity of the instrument. The decay on a concert grand tends to be longer than that on the smaller instruments: for this reason the belief that it is possible to play more softly on a smaller instrument is false. Played so softly that the note just sounds or “speaks,” a long decay of sound will sustain this minimal sonority with great effect within a soft cantabile melody. With a shorter decay, on the other hand, one must give the note more of a thump to make sure it will carry over and make a sustained melodic line. With the larger instrument, therefore, one can often play more softly: the sound will carry in a very large hall with good acoustics no matter how softly one plays if the piano will sustain a soft sound.¹⁴⁵

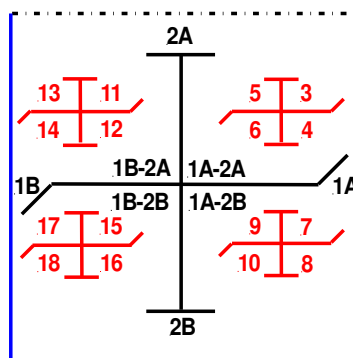
¹⁴⁵ Rosen, pp. 70-71.

CONCLUSION

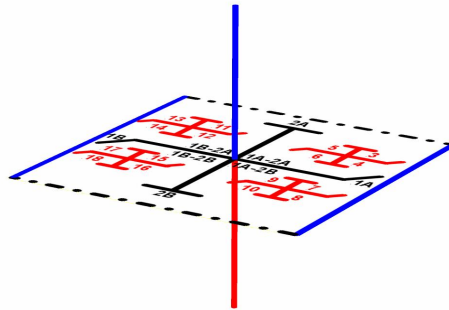
And so we have an analysis for piano performance, to wit:



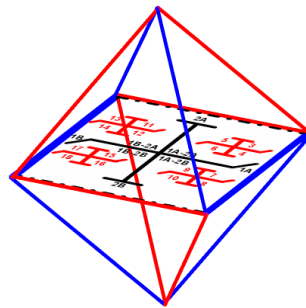
1. The first step identified the central tensions which exist as The Instrument and The Performer meet in the performance. The interactions of these two roles – non-living and living – led to the following diagram of their oppositions.



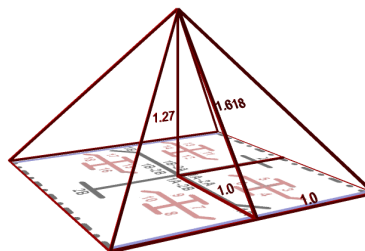
2. The second step described the significance of “Sound” and “Note.” This led to the development of an “Image Axis” whereby these two opposing poles could be considered separately.



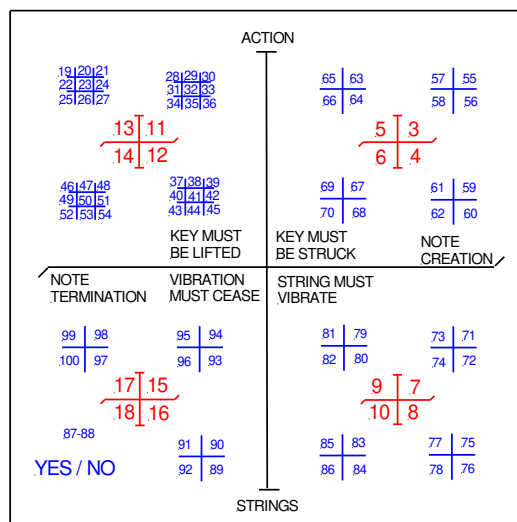
3. The third step identified a circuit of relationships which acted to combine “The Sound” with “The Note.” This circuit permits us to merge, rather than to irrevocably separate, opposites; it describes a set of fixed relationships between the on-going “Sound” and the concluded “Note” both of which are central to any understanding of music.



4. The fourth step recognized the importance of the merger of “Sound” and “Note” in a single piece of music, one which anticipates scores of similar “Sounds” and “Notes,” each of which continually impact on the harmonic understanding of the piece of music itself. The merger of the Fibonacci series, (1, 1, 2, 3, 5, 8, 13, 21, 34, 55, etc.) into a single, unified distance $\phi = 1.6180\dots$ was portrayed visually as a distance taken from the point of this merger between “The Sound” and “The Note” as it related to the piece of music.



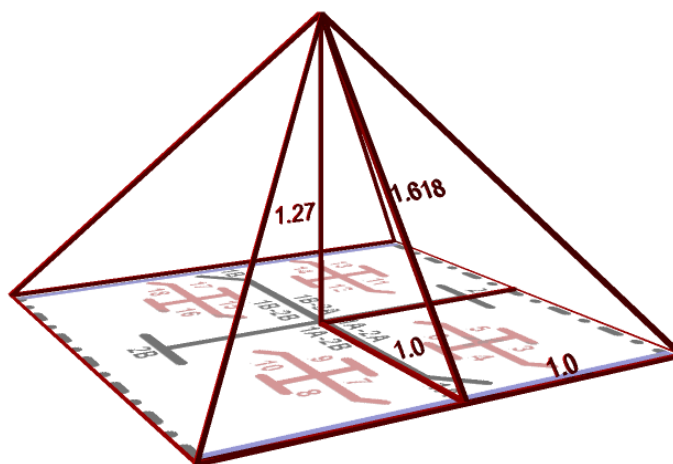
5. The fifth step resolved the dichotomy between “The Sound” and “The Note” in a 100-part “System of Movement representing the performance itself.



The foregoing analysis of piano performance is intended to serve as a parable of biology. Piano performance combines the non-living piano with the living performer in an art form which is meant to be heard and enjoyed.

Biology considers the merger of the non-living chemistry and anatomy of the physical body with the spirit animating this body in a study of the life of the organism.

Taking the physical body of a biologic organism to be “like the piano,” and its life-force to be “like the performer,” we have in a piano performance a simple analogy for the study life as music itself.



Essay Six: Economics

Peace and not war is the father of all things.

Ludwig von Mises

ABSTRACT

Aims: To demonstrate the efficacy of this model in the realm of calculable quantities, specifically those of macroeconomics.

Study design: Philosophic presentation of the necessary principles underlying economics. .

Place and Duration of Study: Library research.

Methodology: Using the work of Ludwig von Mises we explore the uses of the foregoing patterns and their connections with the first five essays. In particular the mathematic constants pi and phi are demonstrated in the context of this discussion

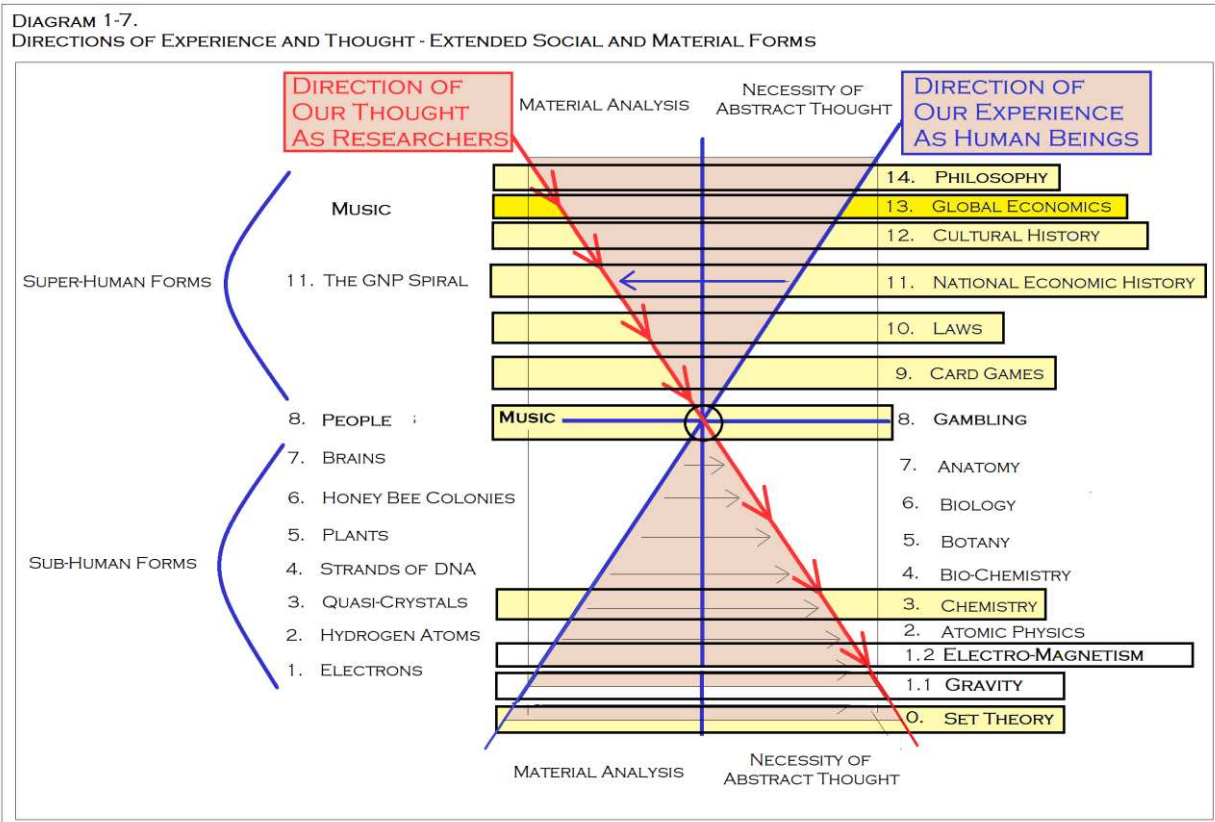
Conclusions: We conclude that the model presented is persuasive in the realm of economics

Introduction.

If the logical distinctions made in the previous essay on Oppositional Analysis actually exist in the world around us, we should be able to notice their operation. In order to demonstrate the efficacy of this approach we turn to the highest level of reality laid out in the Introduction, the world of global economics. In particular we look at the categories, interrelationships and phenomena explored by well-known and competent professional economists as these pertain to a field which engulfs us all, the world of trade.

In short, in this essay we apply the approach of Oppositional Analysis directly towards and understanding of Economics. We do this through an exposition of the chief proponent of the Austrian school of economic thought, Ludwig von Mises and his book *Human Action*.

I propose that the System of Movement pattern explored to this point may be understood more thoroughly, and be made more useful, if we approach Economics from the point of view of biologic complexity. My aim in this section is not to endorse any particular economic point of view. I aim solely to take the ideas presented by von Mises and place them in the patterns described in this book. I then demonstrate that the essential ratios which were explored in the first five essays of this collection are entirely consistent with the arguments put forward by von Mises.



1. Ludwig von Mises and Human Action

If we look for texts in economics which might support our approach we might consider the work of Ludwig von Mises. In his book *Human Action: A Treatise on Economic* von Mises presents economics as the outgrowth of inevitable types of human activity.

Von Mises divides economics into two psychologically opposing "orbits." These orbits are (1) the production and distribution of goods and services via a market, and (2) the valuation of these goods and services via money prices. He searches for the laws controlling prices and markets in a general theory of human action or "praxeology." These "orbits" might be viewed as the opposing poles of a Primary Opposition, not unlike the Principle of Non-Contradiction.



That is, an object can not exist in a market and be priced with certainty simultaneously. Once purchased in a market at a price agreed upon between persons buying and selling the object, the good or service disappears from the market.

So long as the good is purchased at a price set, it is no longer on the market. So long as the good is on the market awaiting purchase, or sought within the market for purchase, its price can not be known with certainty. These two aspects of any economic object are closely related however. Von Mises summarizes the study of economics as follows:

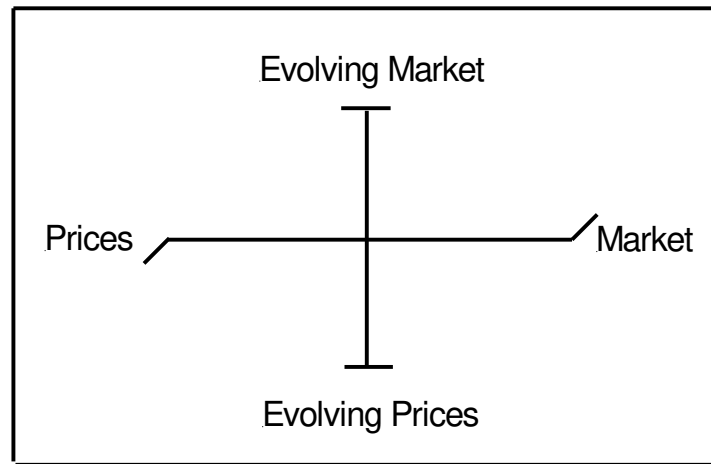
All that can be contended is this: Economics is mainly concerned with the analysis of the determination of money prices of goods and services exchanged on the market. In order to accomplish this task it must start from a comprehensive theory of human action. Moreover, it must study not only the market phenomena, but no less the hypothetical conduct of an isolated man and of a socialist community. Finally, it must not restrict its investigations to those modes of action which in mundane speech are called "economic" actions, but must deal also with actions which are in a loose manner of speech called "uneconomic."

The scope of praxeology, the general theory of human action, can be precisely defined and circumscribed. The specifically economic problems, the problems of economic action in the narrower sense, can only by and large be disengaged from the comprehensive body of praxeological theory.

... Market exchange and monetary calculation are inseparably linked together. A market in which there is a direct exchange only is merely an imaginary construction. On the other hand, money and monetary calculation are conditioned by the existence of the market.¹⁴⁶ (p. 234-235)

¹⁴⁶ Id. pp. 234-235.

The demands of consumers for goods and services make themselves felt over time. Likewise over time the prices of various goods and services evolve in the market. This second "time" element creates a second dichotomy, a Secondary Opposition similar to that of the Principle of Contradiction. That is, a basic tension exists between the markets and the price structures of any group or nation as these adjust themselves to one another over time.



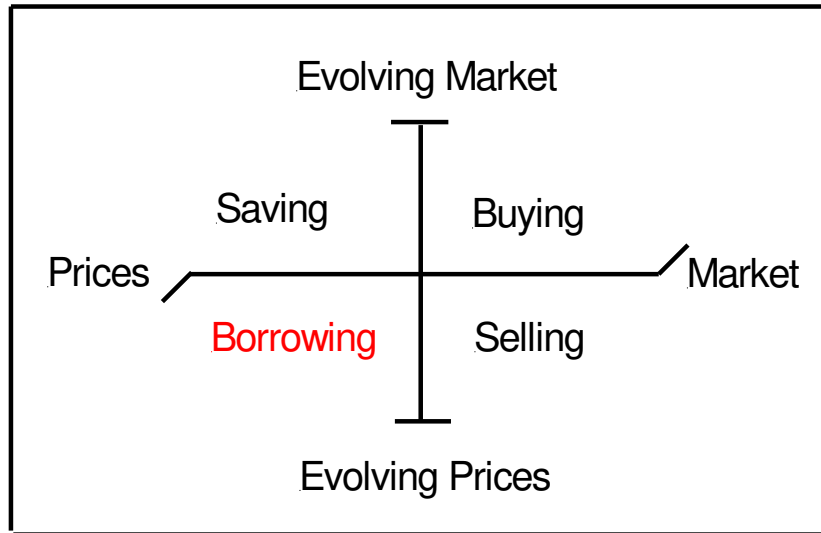
Von Mises writes:

The economic process is a continuous interplay of production and consumption. Today's activities are linked with those of the past through the technological knowledge at hand, the amount and the quality of the capital goods available, and the distribution of the ownership of these goods among various individuals. They are linked with the future through the very essence of human action; action is always directed toward the improvement of future conditions. In order to see his way in the unknown and uncertain future man has within his reach only two aids: experience of past events and his faculty of understanding. Knowledge about past prices is a part of this experience and at the same time the starting point of understanding the future.¹⁴⁷

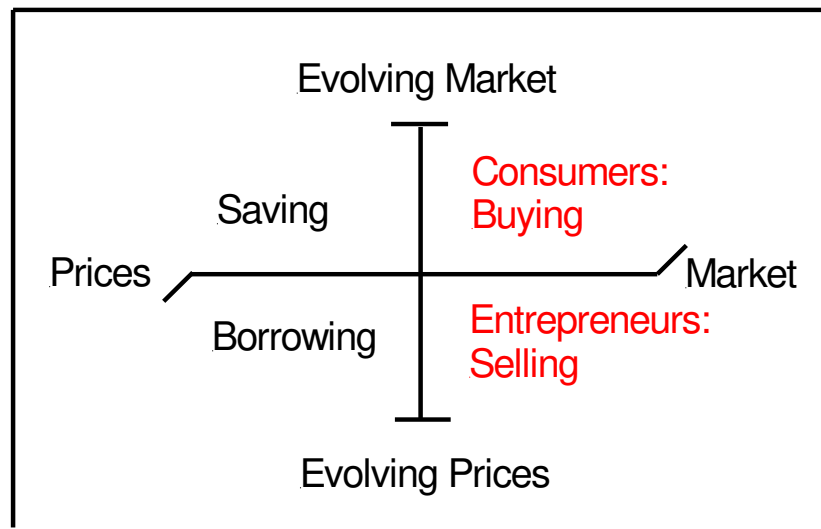
Under the principles discussed in earlier chapters, these basic dichotomies result in the creation of four essential "activities" within the realm of economics. These are the actions of buying, selling, saving and borrowing.

¹⁴⁷ Id. p. 334.

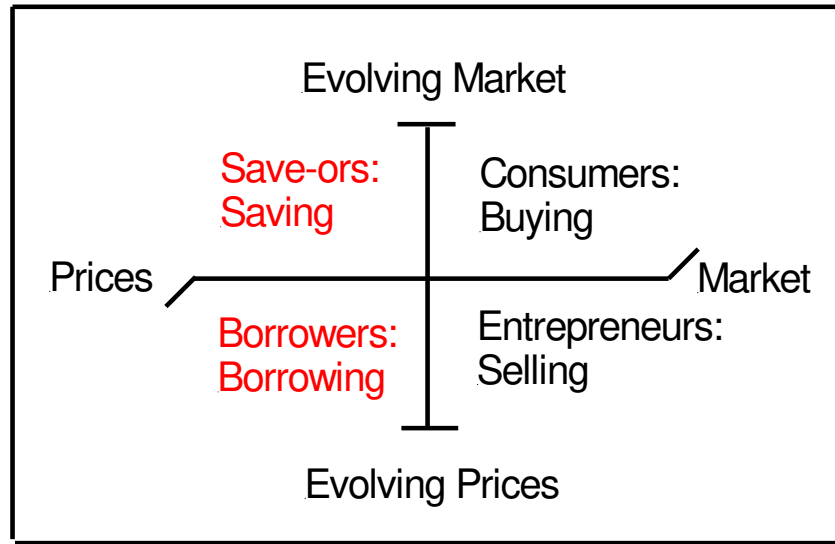
The fundamental drive of any economic system is the desire to buy. The opposite of buying is selling. The negation of buying - "not-buying" - is saving. And the opposite of saving is borrowing.



Von Mises describes these activities using different terminology. He describes these activities as (1) evolving markets seeking to meet the changing demands of consumers, and (2) evolving prices demanded by entrepreneurs as they seek to meet these demands for production within the framework of costs, liabilities and profit motivations of business.

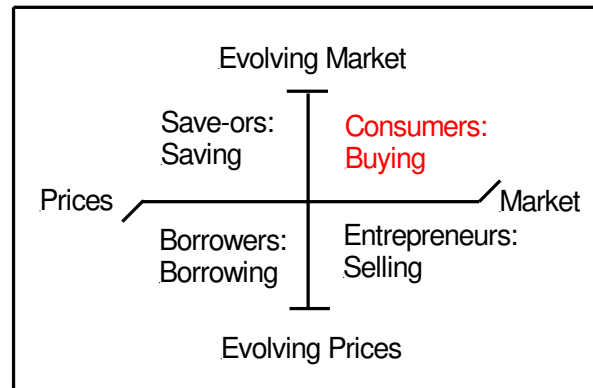


These aspects of the market are contrasted with (3) the desire to save cash (rather than to consume) for extended periods of time, or (4) the need to borrow cash upon credit re-payable over a period of time. These economic activities create the basis for a monetary sector.



Consumers

According to von Mises, the first and foremost group within the economy are the consumers. Professor von Mises refers to this first group as follows:



4. The Sovereignty of the Consumers

The captain (of the market society) is the consumer. Neither the entrepreneurs nor the farmers nor the capitalists determine what has to be produced.

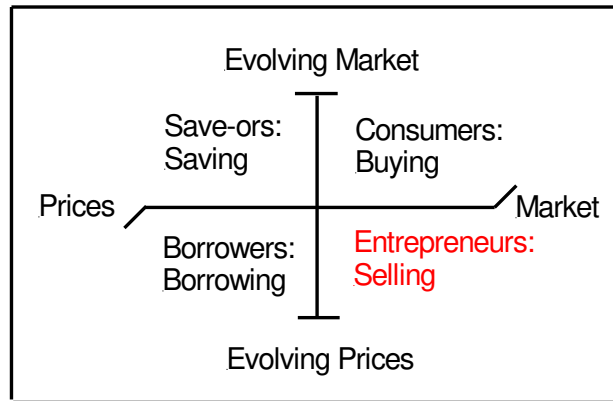
The consumers do that. If a businessman does not strictly obey the orders of the public as they are conveyed to him by the structure of market prices, he suffers losses, he goes bankrupt, and is thus removed from his eminent position at the helm. Other men who did better in satisfying the demand of the consumers replace him.

The consumers patronize those shops in which they can buy what they want at the cheapest price. Their buying and their abstention from buying decides who should own and run the plants and the land. They make poor people rich and rich people poor. They determine precisely what should be produced, in what quality, and in what quantities. They are merciless egoistic bosses, full of whims and fancies, changeable and unpredictable. For them nothing counts other than their own satisfaction. They do not care a whit for past merit and vested interests. If something is offered to them that they like better or that is cheaper, they desert their old purveyors. In their capacity as buyers and consumers they are hard-hearted and callous, without consideration for other people.¹⁴⁸

¹⁴⁸ Id., p. 270.

Entrepreneurs

Regarding "entrepreneurs" von Mises provides the following description.



The direction of all economic affairs is in the market society a task of the entrepreneurs. Theirs is the control of production. They are at the helm and steer the ship. ...

Only the sellers of goods and services of the first order are in direct contact with the consumers and directly depend on their orders.

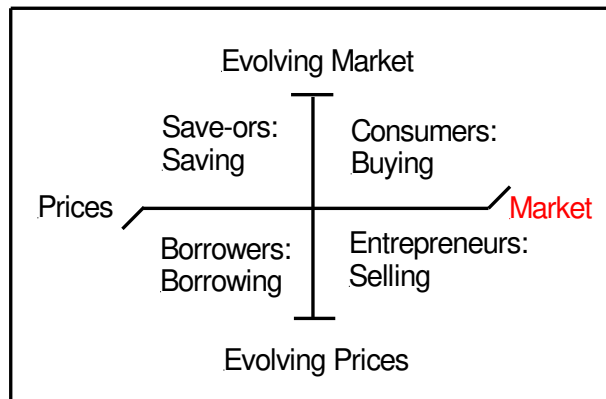
But they transmit the orders received from the public to all those producing goods and services of the higher orders. For the manufacturers of consumers' goods, the retailers, the service trades, and the professions are forced to acquire what they need for the conduct of their own business from those purveyors who offer them at the cheapest price. If they were not intent upon buying in the cheapest market and arranging their processing of the factors of production so as to fill the demands of the consumers in the best and cheapest way, they would be forced to go out of business. More efficient men who succeeded better in buying and processing the factors of production would supplant them. The consumer is in a position to give free rein to his caprices and fancies. The entrepreneurs, capitalists, and farmers have their hands tied; they are bound to comply in their operations with the orders of the buying public. Every deviation from the lines prescribed by the demand of the consumers debits their account. The slightest deviation, whether willfully brought about or caused by error, bad judgment, or inefficiency, restricts their profits or makes them disappear. A more serious deviation results in losses and thus impairs or entirely absorbs their wealth.

Capitalists, entrepreneurs, and landowners can only preserve and increase their wealth by filling best the orders of the consumers. They are not free to spend money which the consumers are not prepared to refund to them in paying more for the products. In the conduct of their business affairs they must be unfeeling and stonyhearted because the consumers, their bosses, are themselves unfeeling and stonyhearted.¹⁴⁹

¹⁴⁹ Id., p. 271.

Market

By a "market" Professor von Mises means the creation of a social relationship between consumers and entrepreneurs in which the arbitrary demands for goods and services on the part of consumers are met by the efforts of entrepreneurs to produce these goods for sale. The demands of entrepreneurs for money in return for these goods results in a monetary system of market exchange on the basis of money prices. Conversely the demands of consumers for goods in exchange for money results in the production of these goods.



Professor von Mises notes the following:

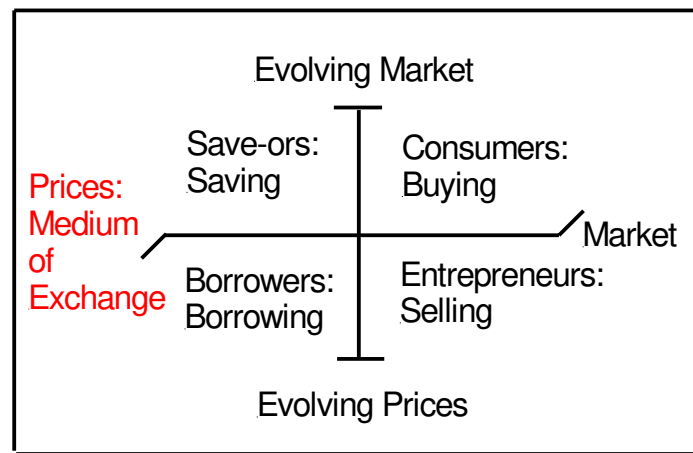
The market is a social body; it is the foremost social body. The market phenomena are social phenomena. They are the resultant of each individual's active contribution. But they are different from each such contribution. They appear to the individual as something given which he himself cannot alter. He does not always see that he himself is a part, although a small part, of the complex of elements determining each momentary state of the market. Because he fails to realize this fact he feels himself free, in criticizing the market phenomena, to condemn with regard to his fellow men a mode of conduct which he considers as quite right with regard to himself. He blames the market for its callousness and disregard of persons and asks for social control of the market in order to "humanize" it. He asks on the one hand for measures to protect the consumer against the producers. But on the other hand he insists even more passionately upon the necessity of protecting himself as a producer against the consumers. ...

However, producers and consumers are identical. Production and consumption are different stages in acting. Catallactics (the study of the market) embodies these differences in speaking of producers and consumers. But in reality they are the same people. It is, of course, possible to protect a less efficient producer against the competition of more efficient fellows. Such a privilege conveys to the privileged the benefits which the unhampered market provides only to those who succeed in best filling the wants of the consumers. But it necessarily imparts the satisfaction of the consumers. If only one producer or a small group is privileged, the beneficiaries enjoy an advantage at the expense of the rest of the people. But if all producers are privileged to the same extent,

everybody loses in his capacity as consumer as much as he gains in his capacity as a producer. Moreover all are injured because the supply of products drops if the most efficient men are prevented from employing their skill in that field in which they could render the best services to the consumers.¹⁵⁰

Prices

Describing the quadrants on the left hand side of our system Professor von Mises beings with the concept of a "medium of exchange," the foundation of any monetary component in a market economy.



A medium of exchange is a good which people acquire neither for their own consumption nor for employment in their own production activities, but with the intention of exchanging it at a later day against those goods which they want to use either for consumption or for production.

Money is a medium of exchange. It is the most marketable good which people acquire because they want to offer it in later acts of interpersonal exchange. Money is the thing which serves as the generally accepted and commonly used medium of exchange. This is its only function. All the other functions which people ascribe to money are merely particular aspects of its primary and sole function, that of a medium of exchange.

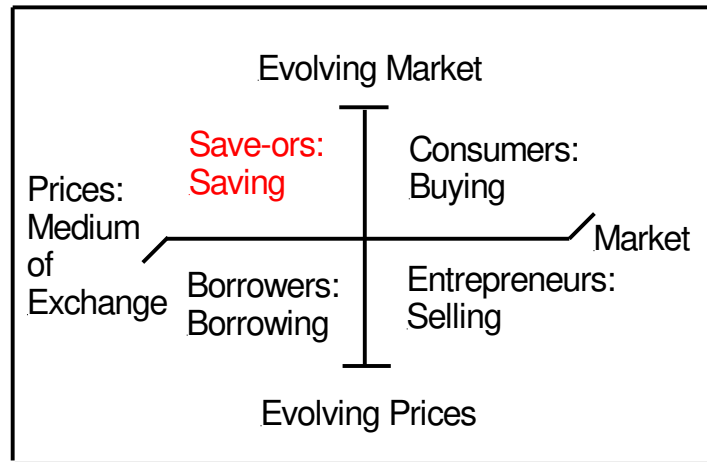
Media of exchange or economic goods. They are scarce; there is a demand for them. There are on the market people who desire to acquire them and are ready to exchange goods and services against them. Media of exchange have value in exchange. People make sacrifices for their acquisition; they pay "prices" for them. The peculiarity of these prices lies merely in the fact that they cannot be expressed in terms of money. In reference to the vendible goods and services we speak of prices or of money prices. In reference to money we speak of its purchasing power with regard to vendible goods.¹⁵¹

¹⁵⁰ Id., pp. 312.

¹⁵¹ Id., pp. 398-399.

Save-ors

As the results of a monetary sector, two additional groups emerge. These are persons who abstain from consuming goods and services and thus save their cash assets (save-ors) and those who borrow cash to meet their economic goals or requirements (borrowers).



Regarding the creation of cash savings, von Mises notes the following:

There exists a demand for media of exchange because people want to keep a store of them. Every member of a market society wants to have a definite amount of money in his pocket or box. A cash holding or cash balance of a definite height. Sometimes he wants to keep a larger cash holding, sometimes a smaller; in exceptional cases he may even renounce any cash holding. At any rate, the immense majority of people aim not only to own various vendible goods; they want no less to hold money. Their cash holding is not merely a residuum, an unspent margin of their wealth. It is not an unintentional remainder left over after all intentional acts of buying and selling have been consummated. Its amount is determined by a deliberate demand for cash. And as with all other goods it is the changes in the relations between demand for and supply of money that bring about changes in the exchange ratio between money and the vendible goods. ...

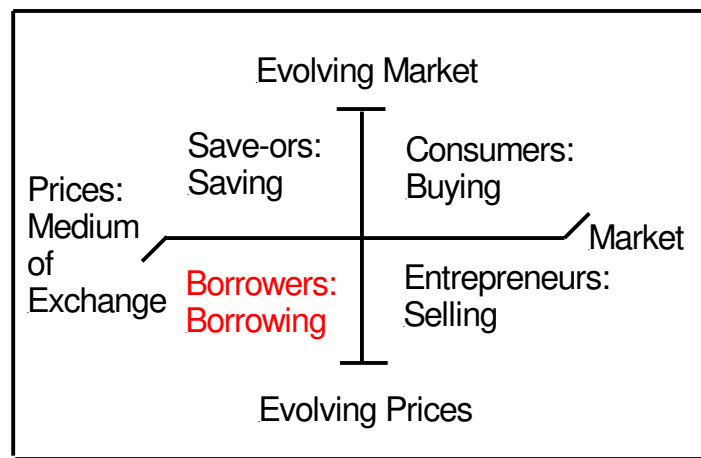
Every piece of money is owned by one of the members of the market economy. The transfer of money from the control of one actor into that of another is temporally immediate and continuous. There is no fraction of time in between in which the money is not a part of an individual's or firm's cash holding, but just in "circulation." It is unsound to distinguish between circulating and idle money.

It is no less fault to distinguish between circulating money and hoarded money. What is called hoarding is a height of cash holding which- according to the personal opinion of an observer- exceeds what is deemed normal and adequate. However, hoarding is cash holding. Hoarded money is still money and it serves in the hoards the same purposes which it serves in cash holdings called normal. He who hoards money believes that some special conditions make it expedient to accumulate a cash holding which exceeds the amount he himself

would keep under different conditions, or other people keep, or an economist censuring his action considers appropriate. That he acts in this way influences the configuration of the demand for money in the same way in which every "normal" demand influences it.¹⁵²

Borrowers

The availability of cash savings for loan to persons willing to pay the price (interest) to obtain the benefits of cash creates a fourth class of actors within the economy, the borrowers. Professor von Mises discusses this group in relation to the interest rate paid, and the credit requirements necessary, to enjoy this privilege.



Thus the incentive of a rate of interest brings into being the desire to amass money in the form of savings available for loan, just as the presence of a wage paid to labor brings into being the goods and services on the market.

16. Interest Rates and the Money Relation

Money plays in credit transactions the same role it plays in all other business transactions. As a rule loans are granted in money, and interest and principal are paid in money. The payments resulting from such dealings influence the size of cash holding only temporarily. The recipients of loans, interest, and principal spend the sums received either for consumption or for investment. They increase their cash holdings only if definite considerations, independent of the inflow of the money received, motivate them to act in this way.

The final state of the market rate of interest is the same for all loans of the same character. Differences in the rate of interest are caused either by differences in the soundness and trustworthiness of the debtor or by differences in the terms of the contract. Differences in interest rates which are not brought about by these differences in conditions tend to disappear. The applicants for credits approach

¹⁵² Id., pp. 399-400.

the lenders who ask a lower rate of interest. The lenders are eager to cater to people who are ready to pay higher interest rates. Things on the money market are the same as on all other markets.¹⁵³

The comparison between the demand for money and the demand for goods and services is noted by von Mises in the following comment.

Economists have tried to enumerate the factors which within the whole economic system may increase or decrease the demand for money. Such factors are: the population figure; the extent to which the individual households provide for their own needs by autarkic production and the extent to which they produce for other people's needs, selling their products and buying for their own consumption on the market; the distribution of business activity and the settlement of payments over the various seasons of the year; institutions for the settlement of claims and counterclaims by mutual cancellation, such as clearinghouses. All these factors indeed influence the demand for money and the height of the various individuals' and firms' cash holding. But they influence them only indirectly by the role they play in the considerations of people concerning the determination of the amount of cash balances they deem appropriate. What decides the matter is always the value judgments of the men concerned. The various actors make up their minds about what they believe the adequate height of their cash holding should be. They carry out their resolution by renouncing the purchase of commodities, securities, and interest-bearing claims and by selling such assets or conversely by increasing their purchases. With money, things are not different from what they are with regard to all other goods and services. The demand for money is determined by the conduct of people intent upon acquiring it for their cash holding.¹⁵⁴

Regarding the importance of money and the flow of money to an economy von Mises notes the following.

Money is neither an abstract numeraire nor a standard of value of prices. It is necessarily an economic good and as such it is valued and appraised on its own merits, i.e., the services which a man expects from holding cash. On the market there is always change and movement. Only because there are fluctuations is there money. Money is an element of change not because it "circulates," but because it is kept in cash holdings. Only because people expect changes about the kind and extent of which they have no certain knowledge whatsoever, do they keep money.

While money can be thought of only in a changing economy, it is in itself an element of further changes. Every change in the economic data sets it in motion and makes it the driving force of new changes. Every shift in the mutual relation of the exchange ratios between the various nonmonetary goods not only

¹⁵³ Id., pp. 455-456.

¹⁵⁴ Id., p. 401.

brings about changes in production and in what is popularly called distribution, but also provides changes in the money relations and thus further changes. Nothing can happen in the orbit of vendible goods without affecting the orbit of money, and all that happens in the orbit of money affects the orbit of commodities.

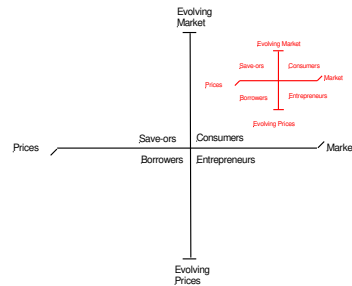
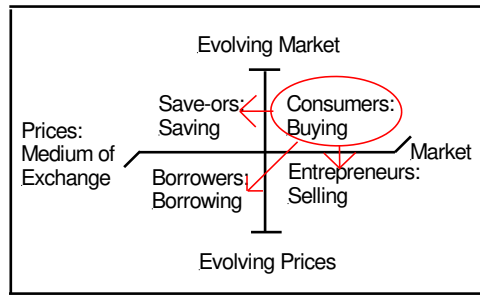
The notion of neutral money is no less contradictory than that of a money of stable purchasing power. Money without a driving force of its own would not, as people assume, be a perfect money; it would not be money at all.¹⁵⁵

Von Mises states that "Nothing can happen in the orbit of vendible goods without affecting the orbit of money, and all that happens in the orbit of money affects the orbit of commodities."¹⁵⁶ This interaction between sectors leads us to see the four quadrants given above as reflected upon themselves.

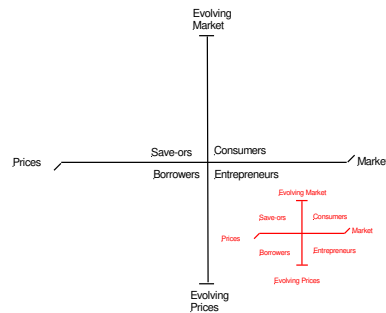
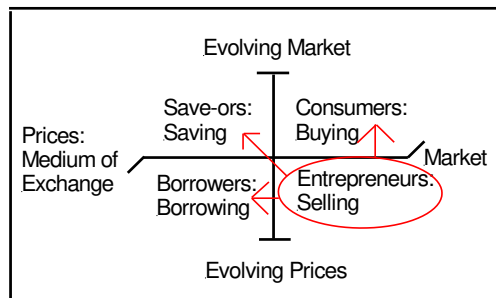
¹⁵⁵ Id., pp. 414-415.

¹⁵⁶ See Footnote 11.

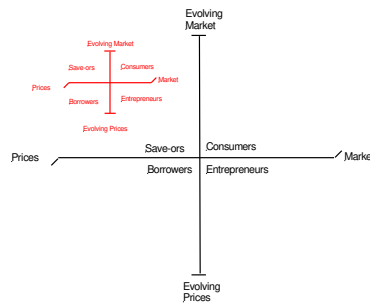
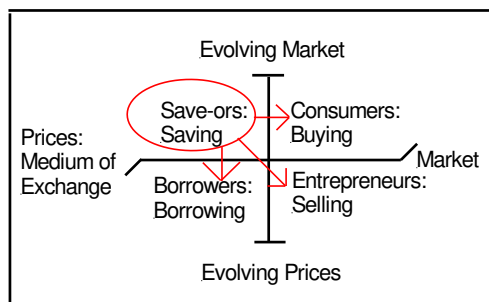
Thus consumers have a relationship to other consumers, to entrepreneurs, to save-ors and to borrowers...



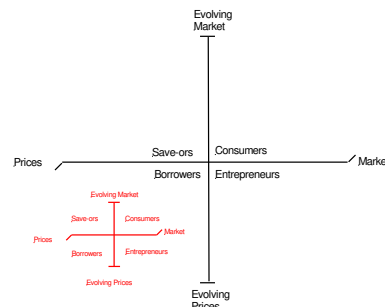
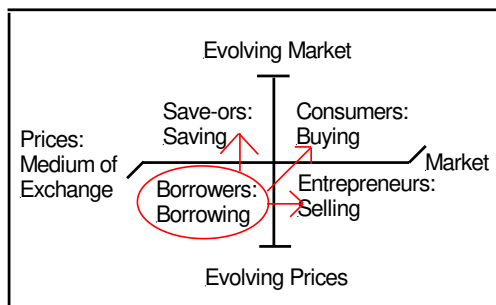
Entrepreneurs have a different set of relationships to themselves (other entrepreneurs), to consumers, to save-ors, and to borrowers ...



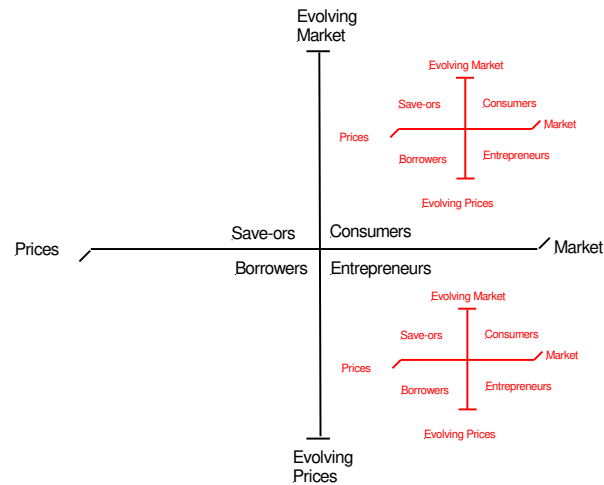
The same holds true for save-ors ...



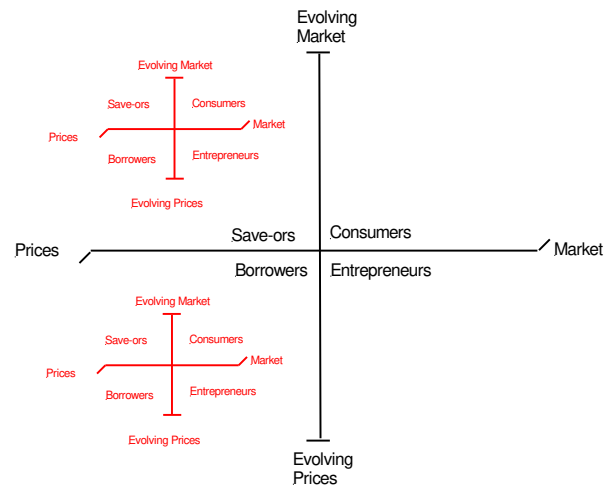
The same is true of borrowers...



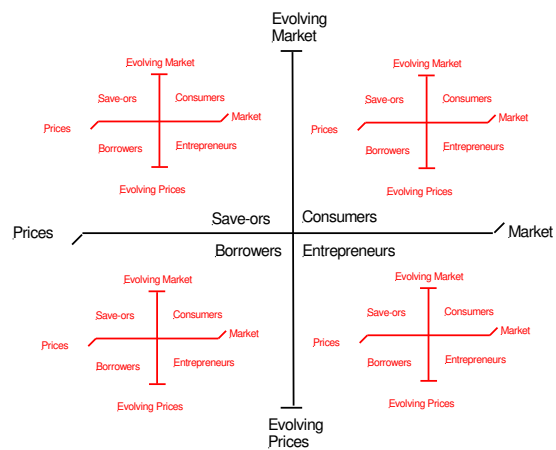
Regarding the relationships which go into a market, we have:



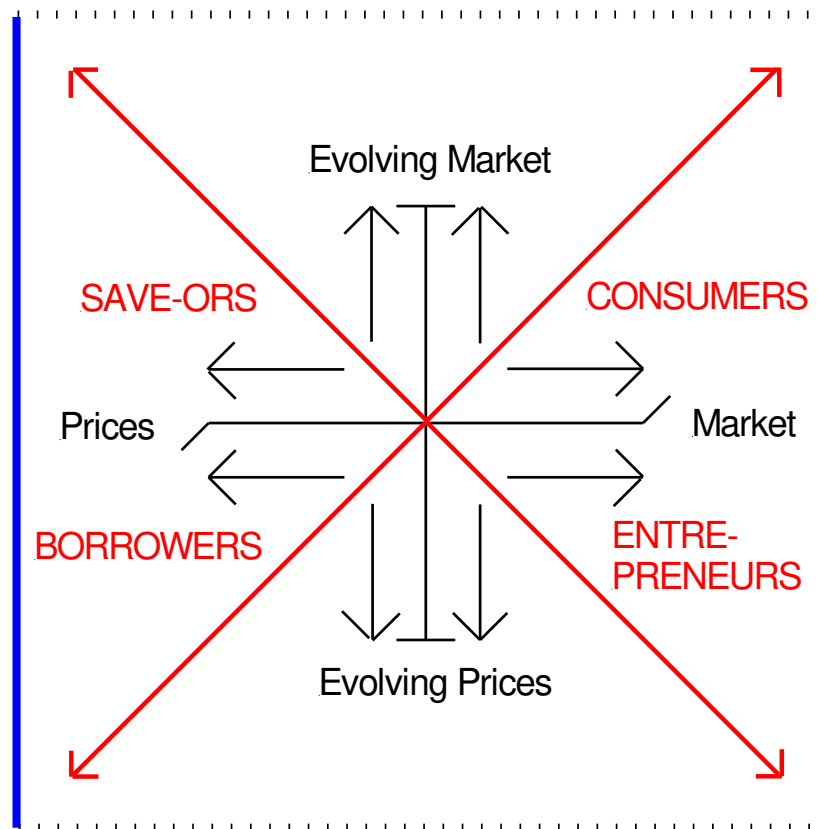
and those which create a monetary sector:



The full set of relationships which make up the economy are:



The creation of these categories renders the following economic forces upon any economy:

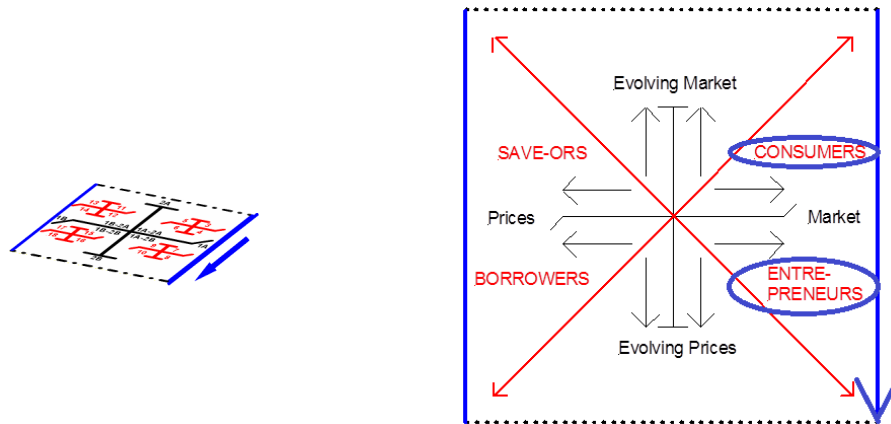


As we consider the possibility of an image axis which might be found in economics, we are presented with the simple fact that the only tools which are at our disposal are the above dichotomies.

These dichotomies may be fashioned into a circuit through which we can explore the way in which the ontological and the epistemological aspects of the economy evolve over time.

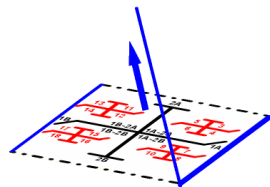
The “Primary Opposition” of economics – the struggle between consumers and entrepreneurs – is that struggle which creates a market. An “Image Axis” may be found within the economy through the following “circuit of logical relationships.”

1) The demands of the Consumers imposes upon Entrepreneurs a set of expectations and choices which in turn lead to the creation of sales of goods. In aggregate these state the GNP of the society...



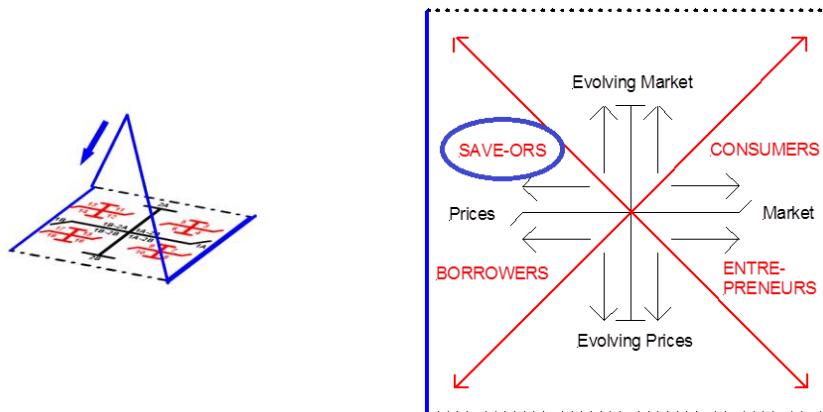
2) ...which forms the ontologic basis for the economy itself. .

THE ONTOLOGIC BASIS OF THE ECONOMY



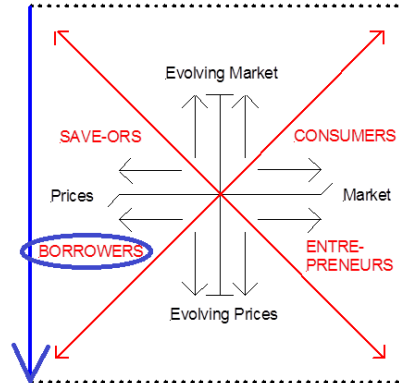
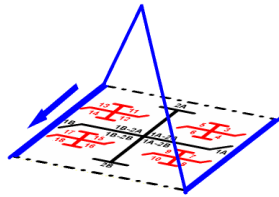
3) The epistemologic basis for the economy, the manner in which it is known, is brought about by the fact that Savers in the economy evaluate the economy...

THE ONTOLOGIC BASIS OF THE ECONOMY



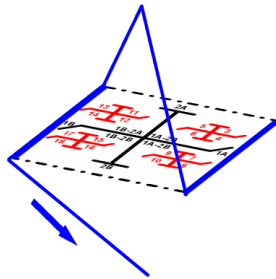
4) ... and thereby state the terms under which the Borrowers of the economy will obtain loans.

THE ONTOLOGIC BASIS OF THE ECONOMY



5) This in turn places limits upon the extent to which Consumers may impose their choices upon the economy because their understanding of the economy constrains them, their choices and the uses which might be made of the things purchased.

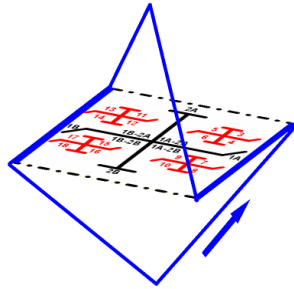
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

- 6) These considerations – the understanding of the economy itself – in turn gives rise to demands which are upon Consumers as they play their part in the economy. .

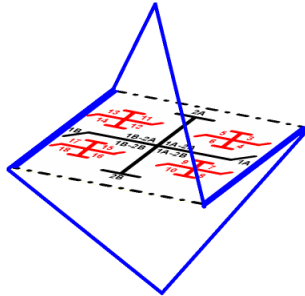
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

- 7) Each part of this dynamic represents a circuit of relationships, as follows.

THE ONTOLOGIC BASIS FOR THE ECONOMY

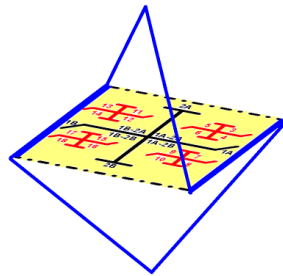


THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

This model is of three planes:

(1) a plane of dichotomies, one which defines the basic things which must occur if any form of economic activity is to take place,

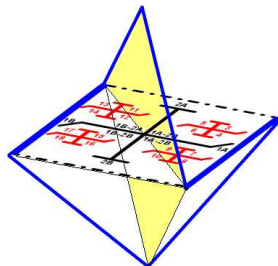
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

2) a plane connecting the creation of the entrepreneur to those who are saving their money, and

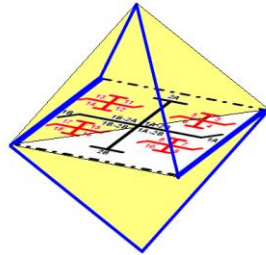
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

3) a plane connecting the borrowers of the economy to those who consume.

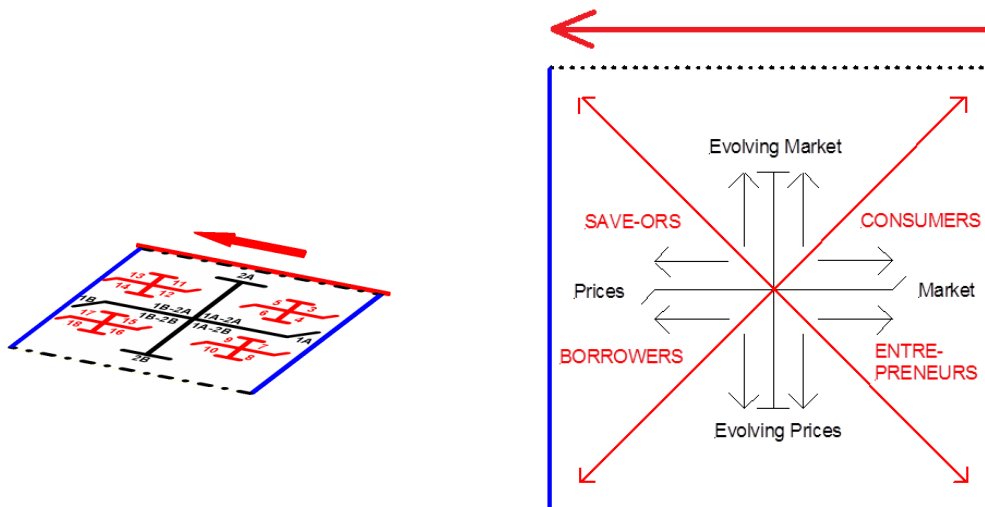
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

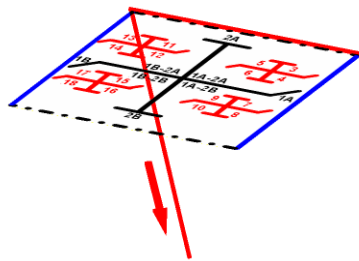
In the above, a circuit has been designed based upon the tension which arises between “consumers vs entrepreneurs” and “savers vs. borrowers” as described previously by Von Mises. which incorporates the blue lines by way of their connection to the creation of something.

But a different set of tensions is found in the distinction between the choice between choosing to buy something, or on the other hand, to forego a purchase, save the money and move on to different opportunities. This tension is that of the Primary Opposition which decrees that one can not spend money and save money simultaneously. The distinction between those goods which encourage people to buy vs. people to save their economic resources and do not buy ...



9) lays the basis for the understanding of the economic decisions which are made throughout the economy, ...

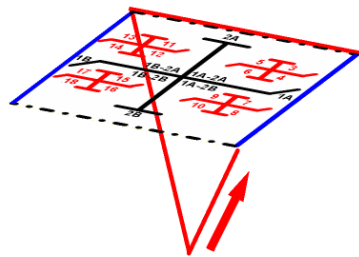
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

(10) thereby indicating to entrepreneurs that which is desired in the economy and that which is not desired (and therefor not sold) in the economy.

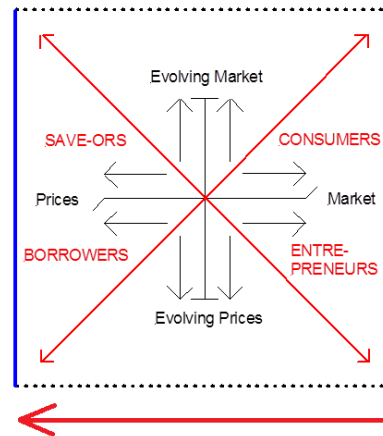
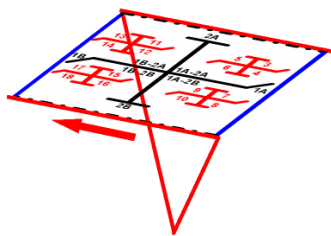
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

(11) In turn, a second tension arises between those who sell things (entrepreneurs) and those who buy things on credit (borrowers) in that the willingness to purchase over time may indeed affect the sale of the entrepreneur dramatically.

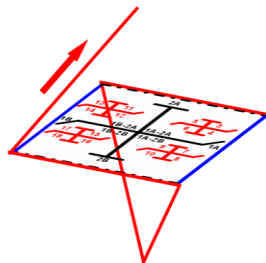
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

(12) The encouragement of entrepreneurs to borrowers to purchase goods over time and thereby go into debt provides a second basis for understanding the ontological nature of the economy ...

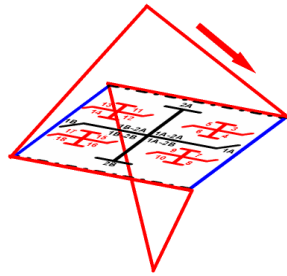
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

(13) and has a dramatic effect upon the nature of consumers as they make decisions to buy or to save.

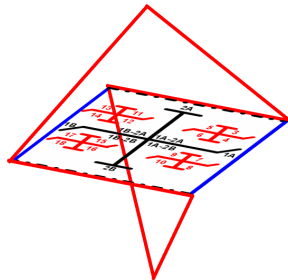
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

(14) This red circuit constitutes a sort of “other method” of economic growth, one wherein the notion of borrowing directly effects the behavior of consumers.

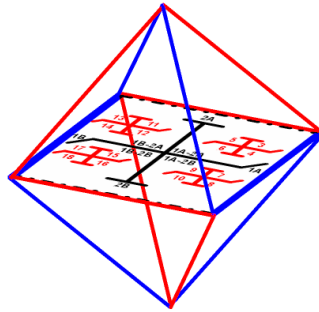
THE ONTOLOGIC BASIS FOR THE ECONOMY



THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

(15) Taking the blue circuit which might be defined as “consumers vs. entrepreneurs, savers vs. borrowers,” and contrasting this with the red circuit which might be defined as a sort of “consuming vs. saving, selling vs. borrowing,” we have the following two circuits simultaneously.

THE ONTOLOGIC BASIS FOR THE ECONOMY

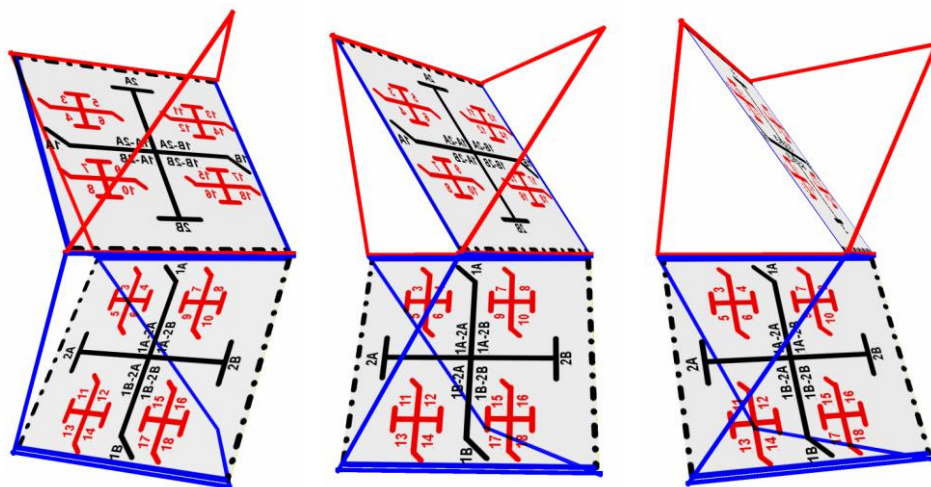


THE EPISTEMOLOGIC UNDERSTANDING OF THE ECONOMY

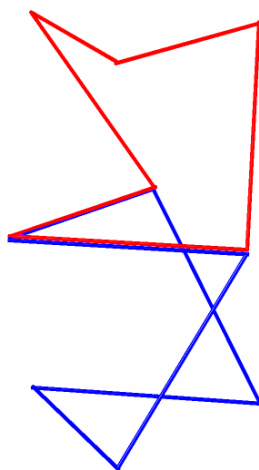
3. A Sequence Of Notes

If these circuits are separated from one another, the blue circuit representing the first set of oppositions “consumers vs. entrepreneurs, savers vs. borrowers”

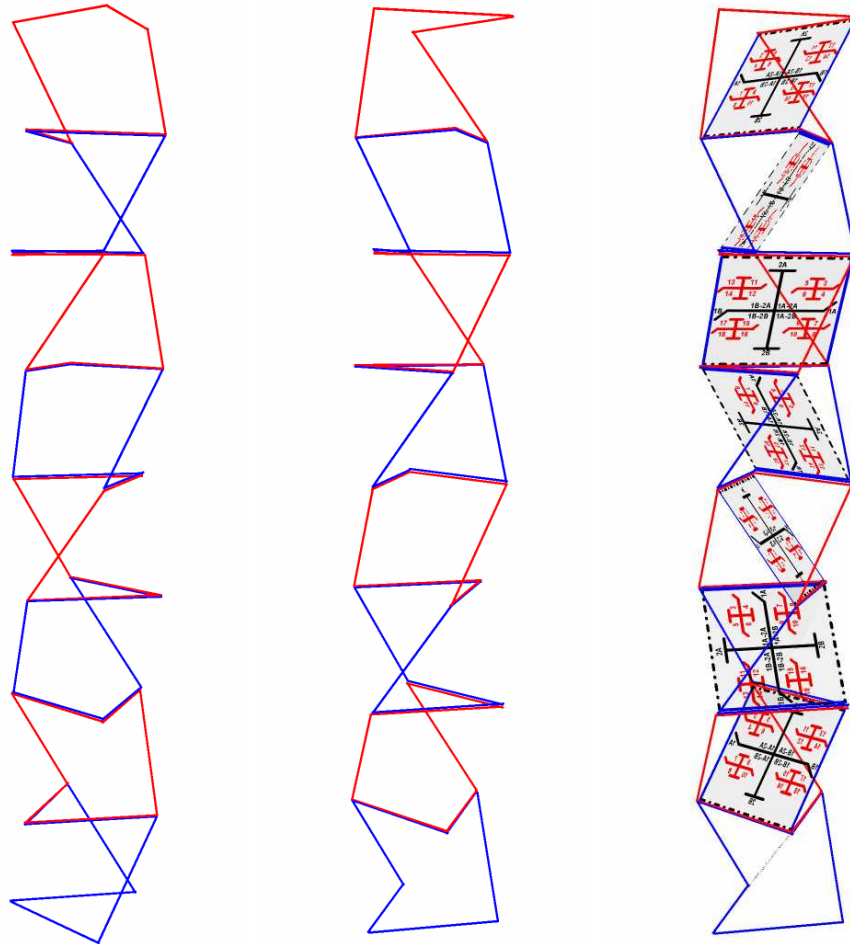
and the red circuit representing the second set of oppositions “consuming vs. saving, selling vs. borrowing” may be aligned along a common angle, as follows.



With this alignment in mind, we may represent an economic decision in the following form:



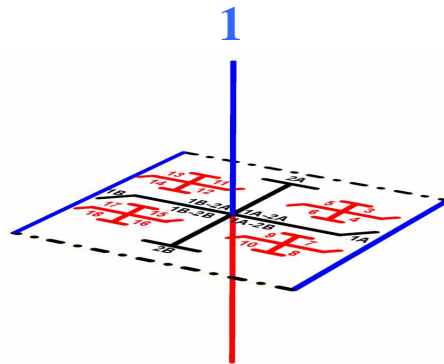
If we further understand that the economy is composed of millions of such decisions linked together, we may order them chronologically as follows:



And so we may think of the economy as a strand of separate decisions, not unlike a strand of DNA composed of so many separate enzymes.

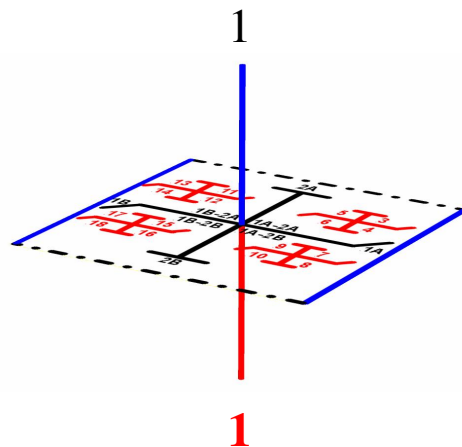
We may further unify these poles mathematically if we use this “Image Axis” to generate a series of numbers which can be used to join these two poles. For example, if we give the number “one” to the first “Ontologic Existence” of the economy, the first economic decision,

Ontologic Existence of the Economy



... we can see that the decision vibrates upon itself beginning with the sense that the economic decision has been understood.

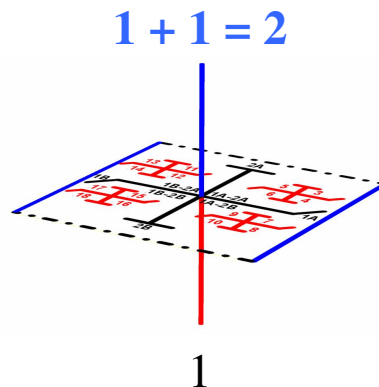
Ontologic Existence of the Economy



Epistemologic Understanding of the Economy

This understanding in turn impacts upon the actual existence of the economic decision itself.

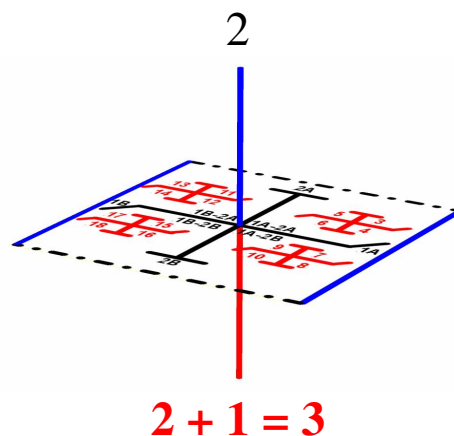
Ontologic Existence Changed with the Understanding of that Decision



Epistemologic Understanding of the Economy

The combination of the ontological change with a new epistemology is something beyond the simple addition of these various poles.

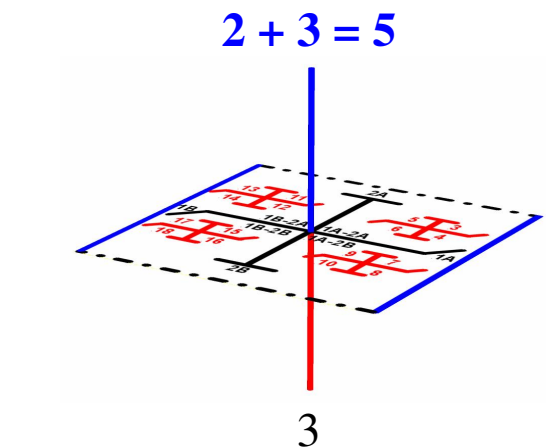
Ontologic Existence Changed with the Understanding of that Decision



Epistemologic Understanding Changed with the Change in the Ontology

The ramifications of each decision upon the entirety of the economy has an impact upon them all.

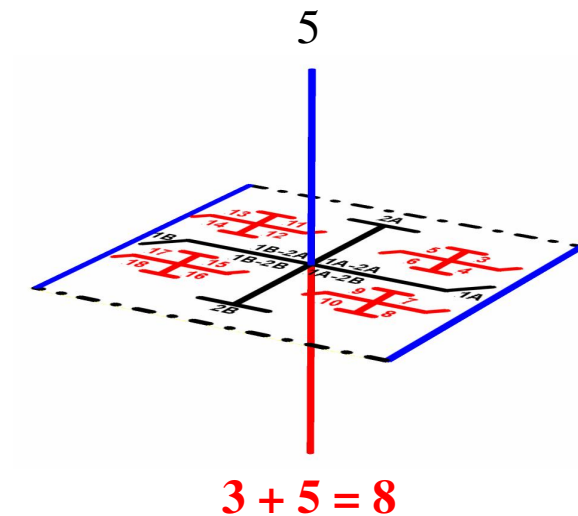
Ontologic Existence Changed with the Understanding of that Decision



Epistemologic Understanding Changed with the Change in the Ontology

And also upon the understanding of them all.

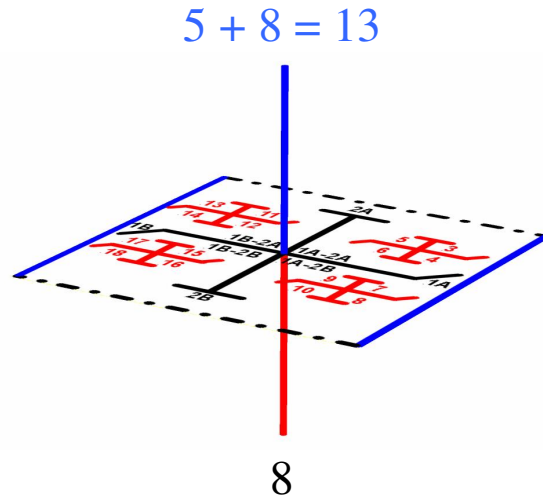
Ontologic Existence Changed with the Understanding of that Decision



Epistemologic Understanding Changed with the Change in the Ontology

And so forth...

Ontologic Existence Changed with the Understanding of that Decision



Epistemologic Understanding Changed with the Change in the Ontology

By extending this series of sums into a pattern we have the Fibonacci series, to wit:

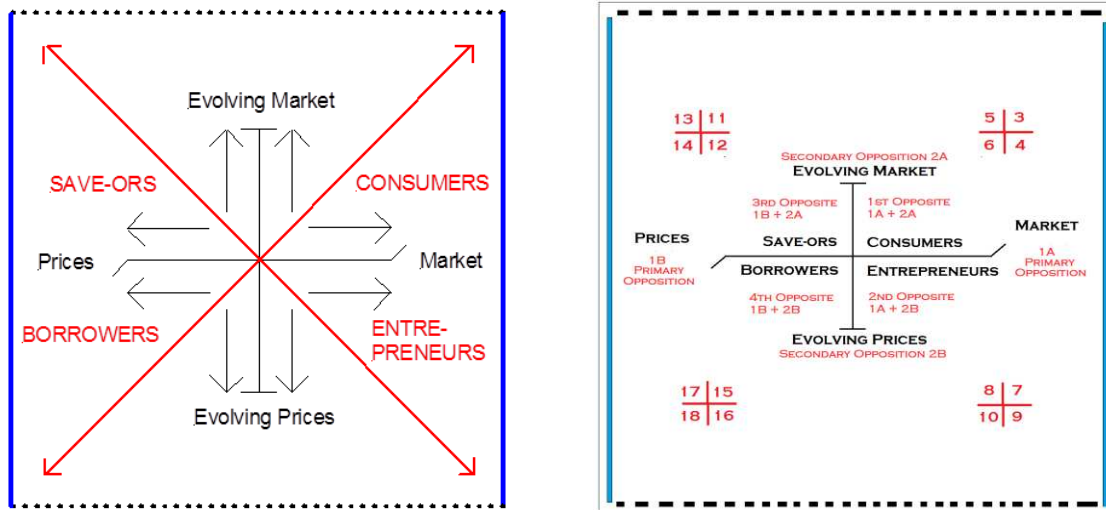
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc.

Joining these numbers into fractions in an effort to determine a common ratio, we have:

$$\frac{1}{1} \quad \frac{2}{1} \quad \frac{3}{2} \quad \frac{5}{3} \quad \frac{8}{5} \quad \frac{13}{8} \quad \frac{21}{13} \quad \frac{34}{21} \quad \frac{55}{34} \quad \frac{89}{55} \quad \dots$$

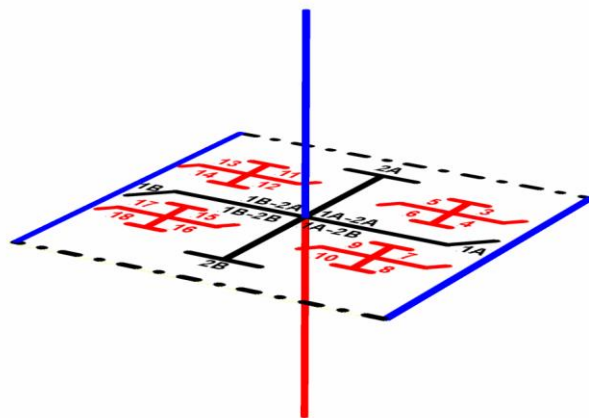
This continuing series renders the constant $\phi = 1.6180\dots$

Let us consider for the moment the square of tension which we have considered as the basis for economy itself. This was proposed as:



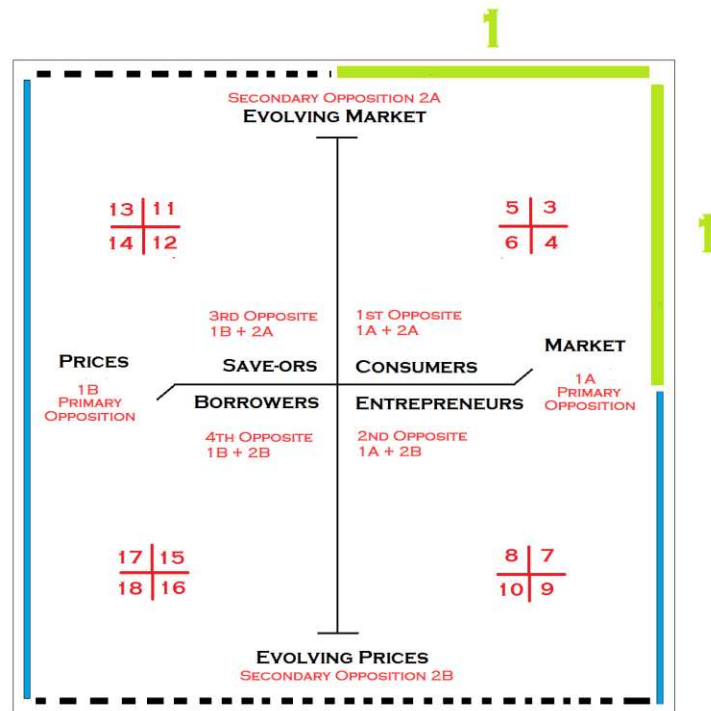
To this model we have added an “Image Axis” representing the “Ontologic Existence” and the “Epistemologic Understanding” of that existence as related to economic matters.

Ontologic Existence Changed with the Understanding of that Decision

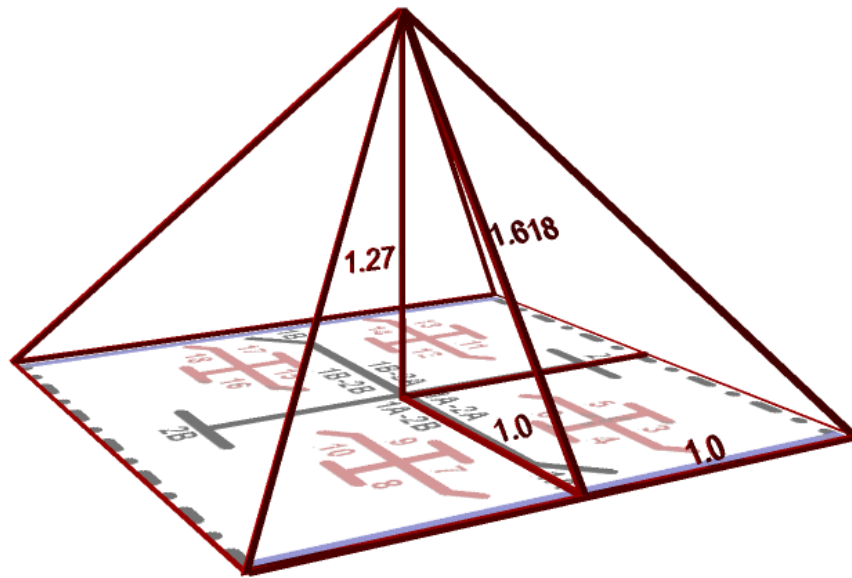


Epistemologic Understanding Changed with the Change in the Ontology

If we consider the tensions of these economic oppositions as equivalent, we may place geometric lengths within this model to thereby determine the interrelationships at world. Let us set each of the quadrants of “Consumers” to be contained by a square with the dimension of 1 x 1.



Taking this as our measure, let us give the number 1.6180 as the relationship between the poles of (1) Market and Prices (2) Evolving Market and Evolving Prices and (3) the merged end points The Ontologic Existence of the Economy and the Epistemologic Understanding of the Economy. Placing the distance 1.618 above the “Market” we have the following figure.



The Image Axis of Economics

2. The Uncertainty of Savings

Note that unlike "production," in which actual goods are placed upon the market for sale, the "monetary" sector is controlled through the ability to create "money" or some other medium of exchange. The power of governments to "roll the printing presses" and thereby create large amounts of cash for distribution affects dramatically the resulting purchasing power of "savings." As a result, the concept of "safety" when discussing cash savings becomes a very uncertain affair.

Professor von Mises discusses the difficulty in establishing the safety of pure cash savings in "Interest, Credit Expansion and the Trade Cycle," Chapter 20.

It is in influencing this primordial function of the rate of interest that the driving force of money can become operative in a particular way. Cash-induced changes in the money relation can under certain circumstances affect the loan market before they affect the prices of commodities and of labor. The increase or decrease in the supply of money (in the broader sense) can increase or decrease the supply of money offered on the loan market and thereby lower or raise the gross market rate of interest although no change in the rate of original interest has taken place. If this happens, the market rate deviates from the height which the state of ordinary interest and the supply of capital goods available for production would require. Then the market rate of interest fails to fulfill the function it plays in guiding entrepreneurial decisions. It frustrates the entrepreneur's calculation and diverts his actions from those lines in which they would in the best possible way satisfy the most urgent needs of consumers.

Then there is a second important fact to realize. If, other things being equal, the supply of money (in the broader sense) increases or decreases and thus brings about a general tendency for prices to rise or to drop, a positive or negative price premium would have to appear to raise or lower the gross rate of market interest. But if such changes in the money relation affect first the loan market, they bring about just the opposite changes in the configuration of the gross market rates of interest. While a positive or negative price premium would be required to adjust the market rates of interest to the changes in the money relation, gross interest rates are in fact dropping or rising. This is the second reason why the instrumentality of the price premium cannot entirely eliminate the repercussions of cash-induced changes in the money relation upon the content of contracts concerning deferred payments. Its operation begins too late, it lags being the changes in purchasing power, as has been shown above. Now we see that under certain circumstances the forces that push in the opposite direction manifest themselves sooner on the market than the price premium.¹⁵⁷

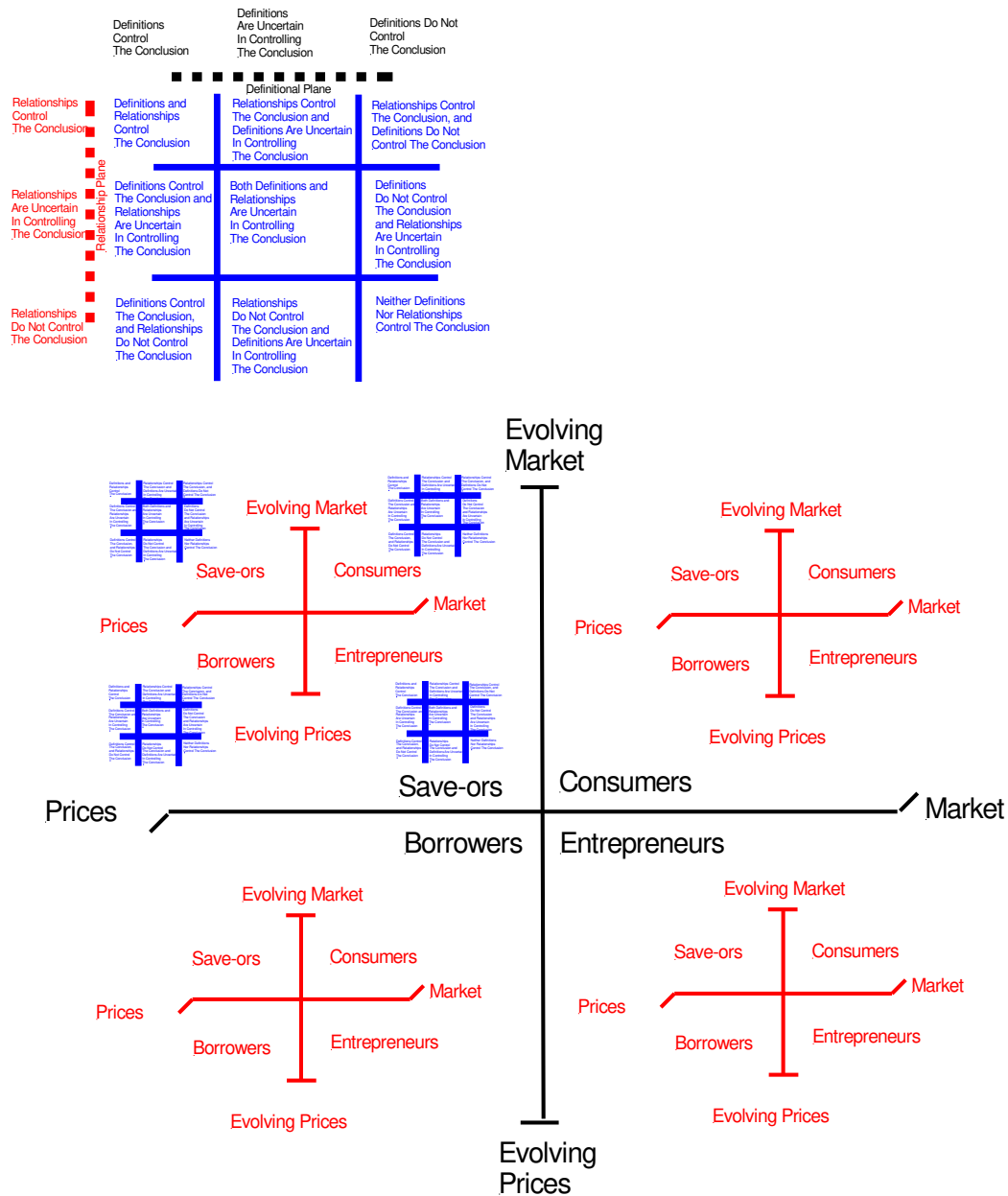
¹⁵⁷ Id., at 544-545.

Professor von Mises notes periods of history in significant and arbitrary increases in the supply of money through government action have dramatically affected the entire structure of an economy.

Public opinion has definite ideas about a "normal" rate (of interest), something between 3 and 5 per cent. When the market rate rises about this height or when the market rates- without regard to their arithmetical ratio- are rising about their previous height, people believe that they are right in speaking of high or rising interest rates. As against these errors, it is necessary to emphasize that under the conditions of a general rise in prices (drop in the monetary unit's purchasing power) the gross market rate of interest can be considered as unchanged with regard to conditions or a period of a by and large unchanging purchasing power only if it includes a by and large adequate positive price premium. In this sense, the German Reichsbank's discount rate of 90 per cent was, in the fall of 1923, a low rate - indeed a ridiculously low rate - as it considerably lagged behind the price premium and did not leave anything for the other components of the gross market rate of interest. Essentially the same phenomenon manifests itself in every instance of a prolonged credit expansion. Gross market rates of interest rise in the further course of every expansion, but they are nonetheless low as they do not correspond to the height required by the expected further general rise in prices.¹⁵⁸

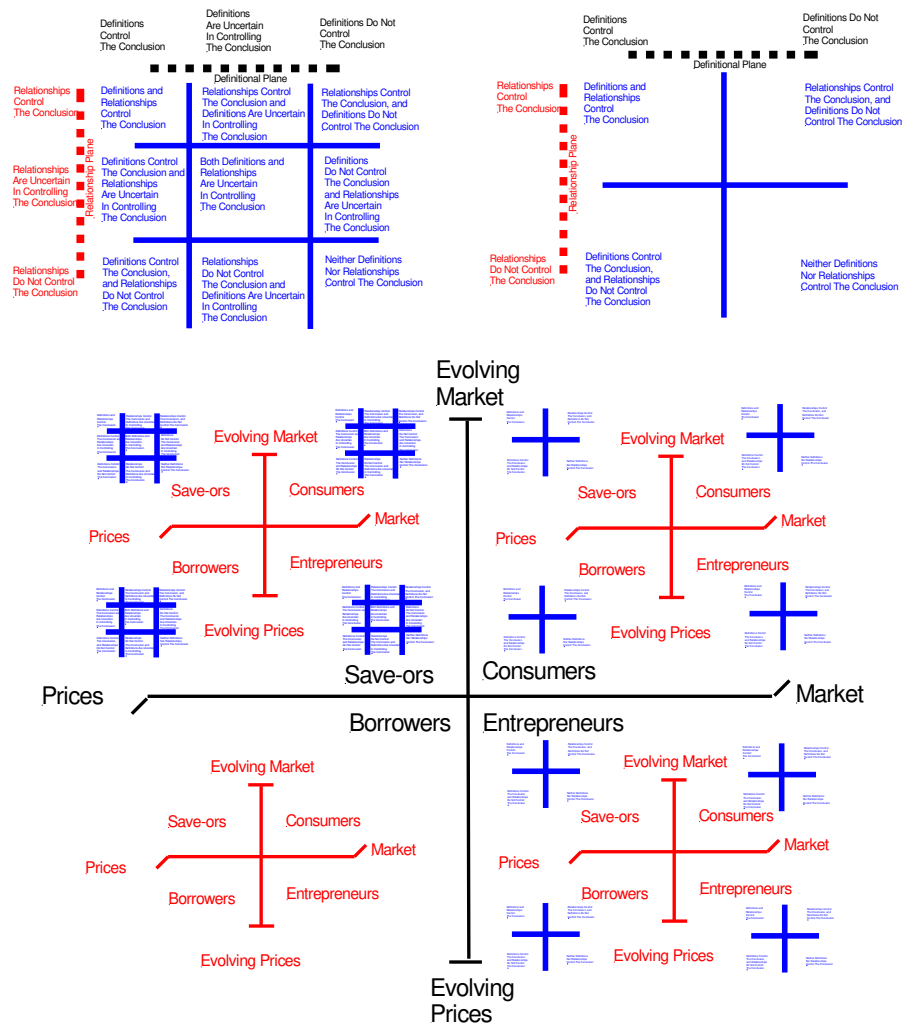
¹⁵⁸ Id., at 549.

The notion that “a drop in the monetary unit's purchasing power” might be occasioned by a rise in prices brought on by a government-induced credit expansion considerably undermines the security of assets held entirely within the framework of that monetary unit, i.e. cash. In seeking to understand the controls necessary to ensure the security of savings we again have conclusions which repeat the uncertainty mentioned in the previous essays.

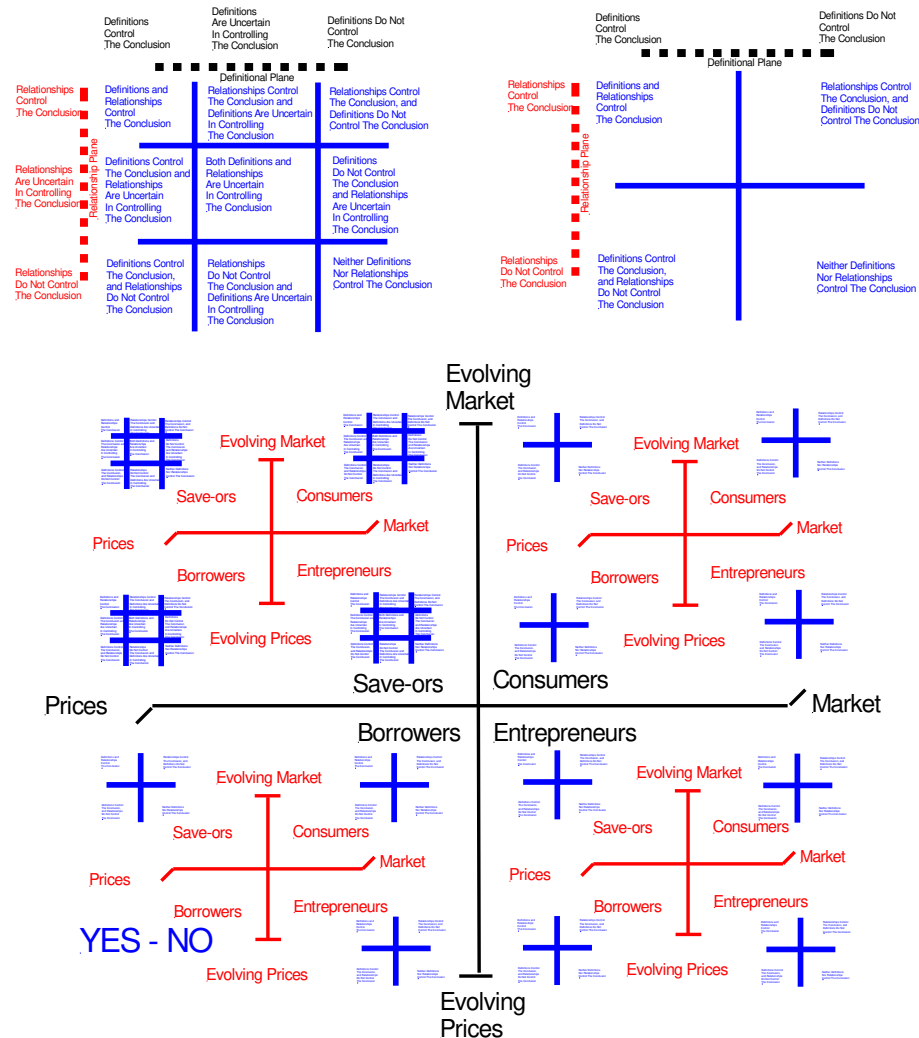


The relationship between consumer demand and entrepreneurial effort is a rather straightforward affair and may be summed up in two words: “Profit” and “Loss.”

The entrepreneurial function, the striving of entrepreneurs after profits, is the driving power in the market economy. Profit and loss are the devices by means of which the consumers exercise their supremacy on the market. The behavior of the consumers makes profits and losses appear and thereby shifts ownership of the means of production from the hands of the less efficient into those of the more efficient. It makes a man the more influential in the direction of the business activities the better he succeeds in serving the consumers. In the absence of profit and loss the entrepreneurs would not know what the most urgent needs of the consumers are. If some entrepreneurs were to guess it, they would lack the means to adjust production accordingly. (p. 297)

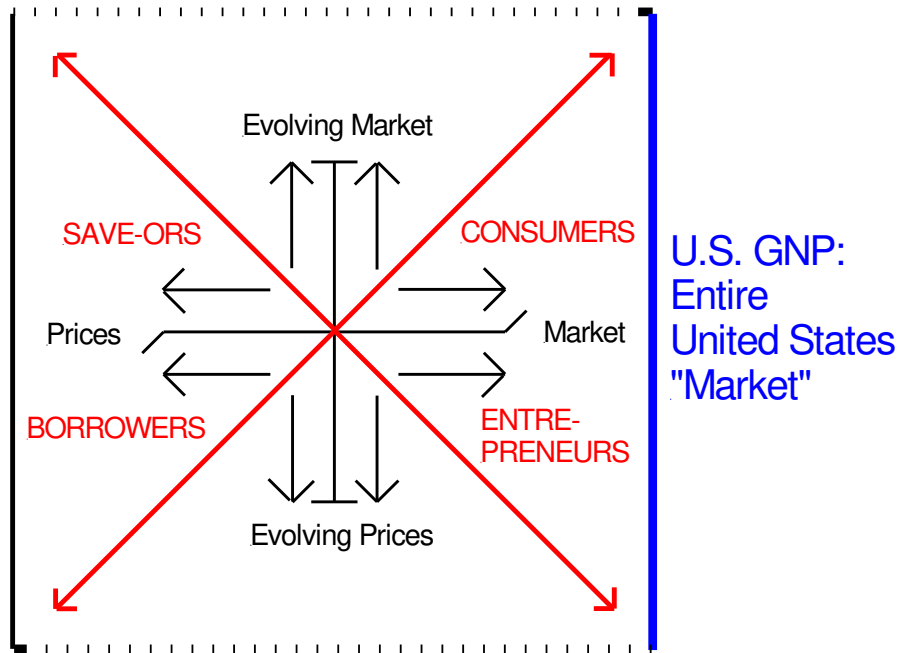


Regarding the concept of "borrowers" however note that the relationship of borrowers to consumers, to entrepreneurs and to save-ors is rather well defined. On the other hand the existence of credit differs from almost every other form of good in that it is available only upon approval of the borrower's trust-worthiness in repaying the principal with interest. This creates a separate "yes-no" relationship as the availability of credit is directed towards a particular case. Once this decision has been reached, the rest of the relationships fall into place without inherent ambiguity.

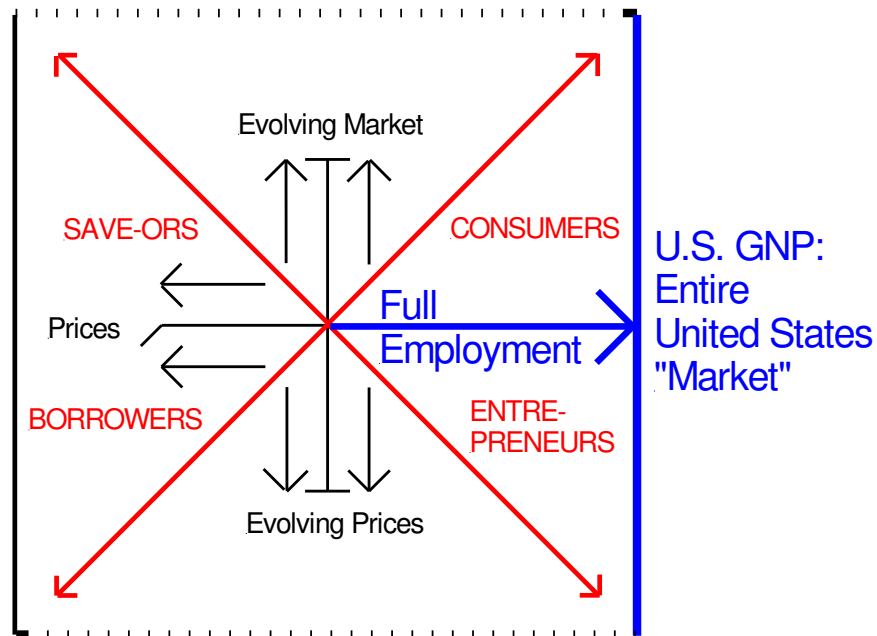


4. Okun's Law and the LM Curve in Economics

To consider the above pattern as it generates economic behavior, Let the Market side of the square of tension represent the GNP of the United States for any given year.



... and then Let the horizontal line on the right, represent a full employment of the people in the United States bringing into being this market.



Von Mises notes the following regarding the Labor component of the economy.

8. Wage Rates as Affected by the Vicissitudes of the Market

Labor is a factor of production. The price which the seller of labor can obtain on the market depends on the data of the market. The quantity and the quality of labor which an individual is fitted to deliver is determined by his innate and acquired characteristics. The innate abilities cannot be altered by any purposeful conduct. They are the individual's heritage with which his ancestors have endowed him on the day of his birth. He can bestow care upon these gifts and cultivate his talents, he can keep them from prematurely withering away; but he can never cross the boundaries which nature has drawn to his forces and abilities. He can display more or less skill in his endeavors to sell his capacity to work at the highest price which is obtainable on the market under prevailing conditions; but he cannot change his nature in order to adjust it better to the state of the market data. It is good luck for him if market conditions are such that a kind of labor which he is able to perform is lavishly remunerated; it is chance, not personal merit if his innate talents are highly appreciated by his fellow men. Miss Greta Garbo, if she had lived a hundred years earlier, would probably have earned much less than she did in this age of moving pictures. As far as her innate talents are concerned, she is in a position similar to that of a farmer whose farm can be sold at a high price because the expansion of a neighboring city converted it into urban soil.

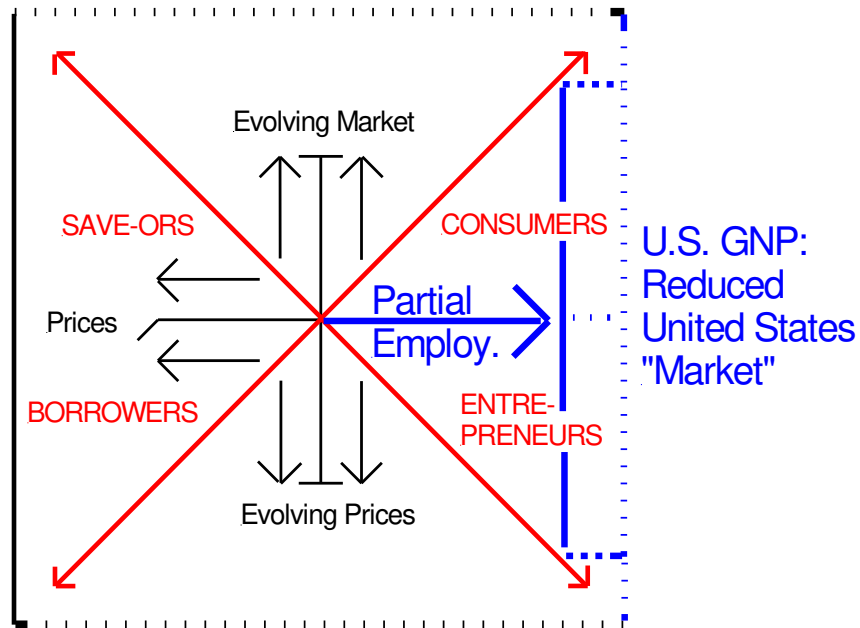
Within the rigid limits drawn by his innate abilities, a man's capacity to work can be perfected by training for the accomplishment of definite tasks. The individual- or his parents- incurs expenses for a training the fruit of which consists in the acquisition of the ability to perform certain kinds of work. Such schooling and training intensify a man's one-sidedness; they make him a specialist. Every special training enhances the specific character of a man's capacity to work. The toil and trouble, the disutility of the efforts to which an individual must submit in order to acquire these special abilities, the loss of potential earnings during the training period, and the money expenditure required are laid out in the expectation that the later increment in earnings will compensate for them. These expenses are an investment and as such speculative. It depends on the future state of the market whether or not they will pay. In training himself the worker becomes a speculator and entrepreneur. The future state of the market will determine whether profit or loss results from his investment.

Thus the wage earner has vested interest in a twofold sense as a man with definite innate qualities and as a man who has acquired definite special skills.¹⁵⁹

¹⁵⁹ Id., pp. 619-620.

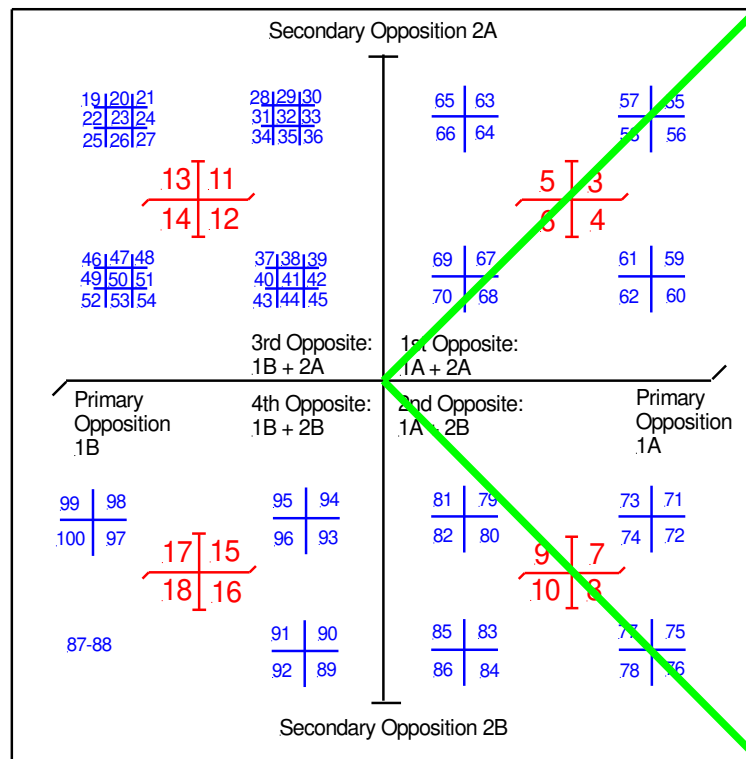
The prime position of labor in the production process creates a direct relationship between the level of employment of labor with the amount of goods and services available on the market. The greater the number of people efficiently employed, the greater the number of services and goods upon the market for sale to the consumer and at the disposition of the entrepreneur.

This relationship might be imagined by imagining that “Full Employment” “brings into being” the broadest possible United States GNP. It would follow then, from the above diagram, that a decline of $x\%$ in the employment rate would lead to a $2x\%$ decline in the GNP.



This 2:1 ratio between changes in the GNP and Employment is referred to as Okun's Law. The predictability of this relationship makes it one of the earliest and most important mathematic relationships in a market economy.

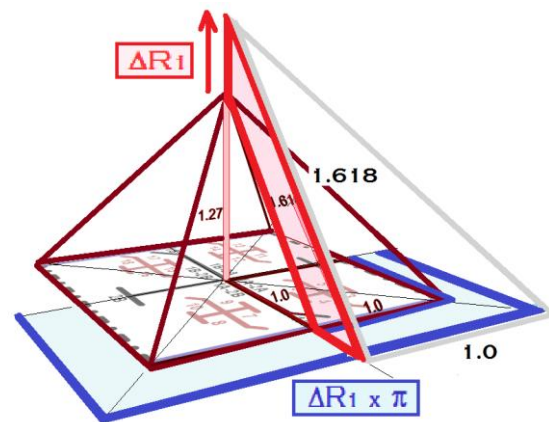
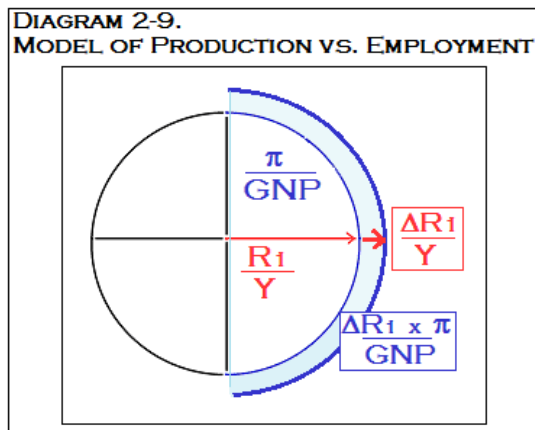
It is important to note that there is no uncertainty on this side of our model, and this predictability is to be expected. This is wholly unlike the monetary sector where the uncertainty of savings, and the arbitrary availability of credit, inject an entirely different set of concerns into the opposite side of the model.



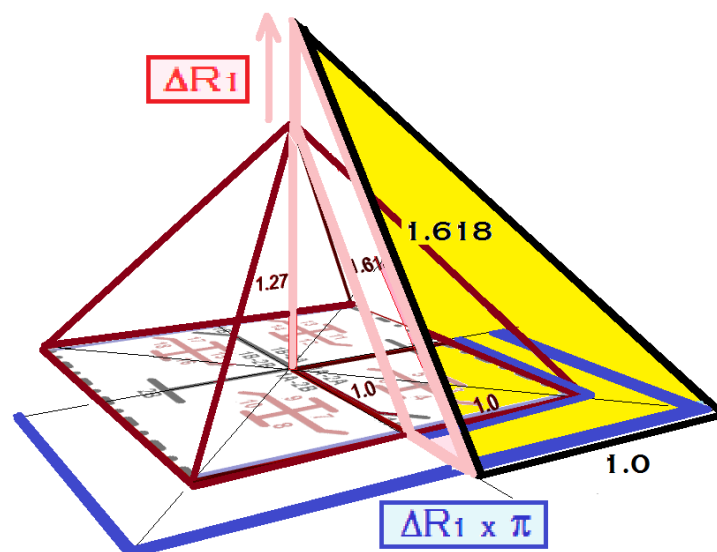
We may use the model presented in Oppositional Analysis to analyze the mathematic trends which must emerge from these relationships.

The height of the pyramid is the square root of $1.618... = 1.27...$. The unit 1.0 has been given as $1/8^{\text{th}}$ the circumference of the base square. If we divide 8 by the height of the pyramid, we have $8 / 1.27 = 6.2992...$. Dividing this by 2, we have $6.2992 / 2 = 3.1496$, a rough approximation of π .

In this fashion, the entire circumference of the base square approximates the circumference of a circle (2π). The increase in the height of the pyramid may be compared with an increase in the radius of the circle. As the height / radius increases by one unit, half the circumference of the circle and half the length of the base square of the pyramid increase by π units, approximately. We may compare this mathematic arrangement to the discussion of Okun's Law presented in Essay Two.



The ratio of one eighth the base to the relative length of the slope of the pyramid, its apothem, remains in a $1:\phi$ relationship throughout these alterations of height. Identical proportions were given in the first five essays for the relationship in the economy of the United States between change in unemployment and growth, both annually and over time.



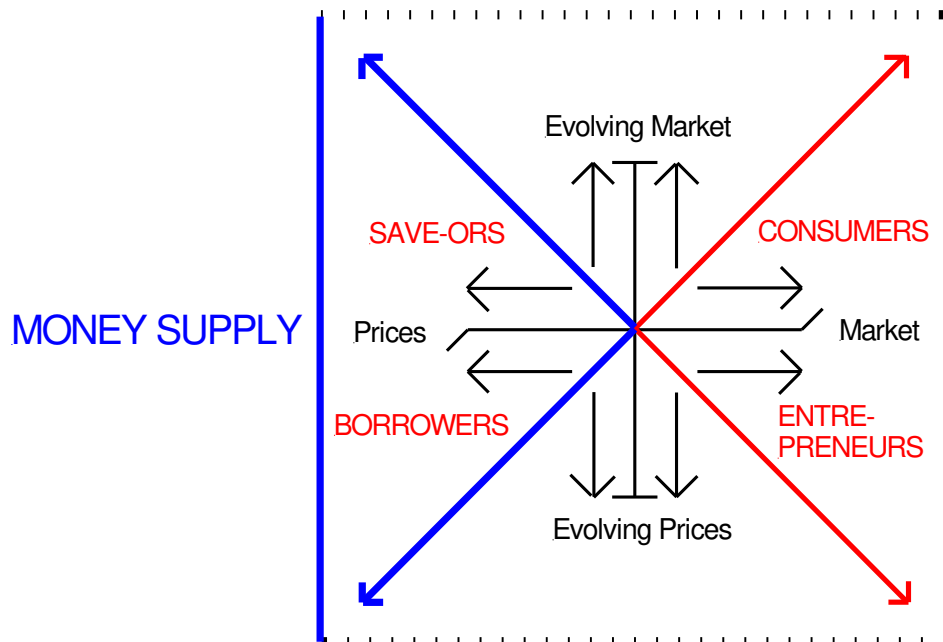
5. The LM curve

What of the monetary side of our analysis?

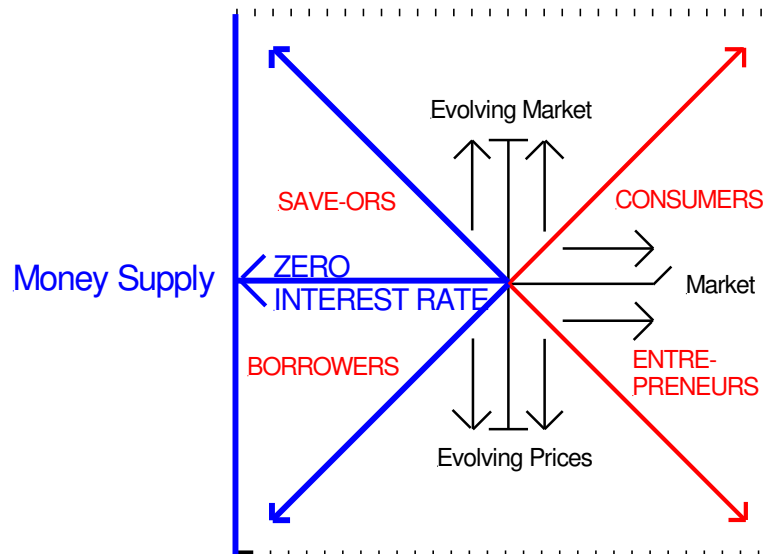
The motivating force for any buyer to save is that of the return upon invested capital in the money markets, i.e. the interest rate. We would see then that the interest paid upon invested capital serves a function analogous to that of labor in that it "brings into being" a central quadrant of the modern economy, i.e. the savings of a society.

Let us imagine the willingness of savers to save stationed upon a 45 degree angle cutting the difference between the evolving production of an economy and the attractions of purely monetary holdings. Conversely let us imagine the willingness of borrowers to borrow as a similar 45 degree angle between the evolving monetary demands upon them and the prevailing monetary conditions of the day.

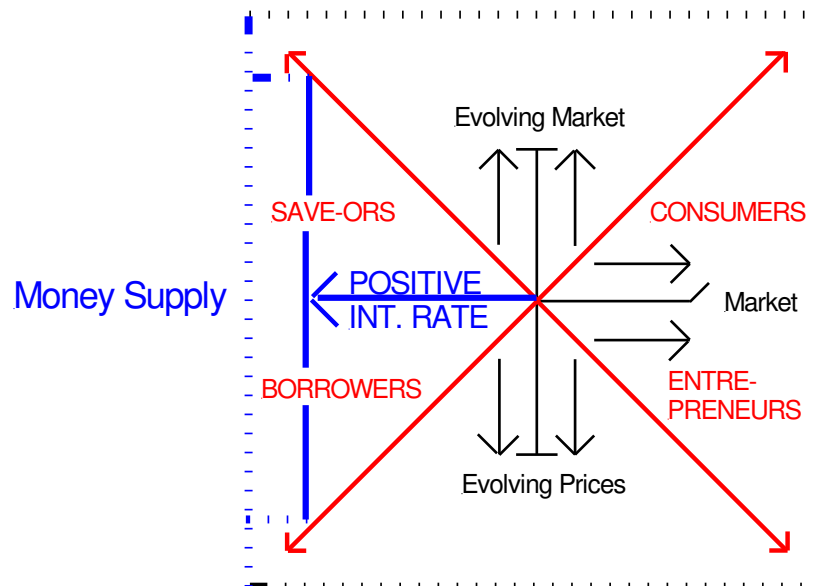
We have then:



Next, we should see that when the Interest rate is zero, save-ors have no reason to keep their money in the bank, and borrowers have no trouble spending the money available to them. Under this assumption, we would have the largest money supply possible, as well as the most rampant, largest, highest prices in proportion to the vertical Money Supply.

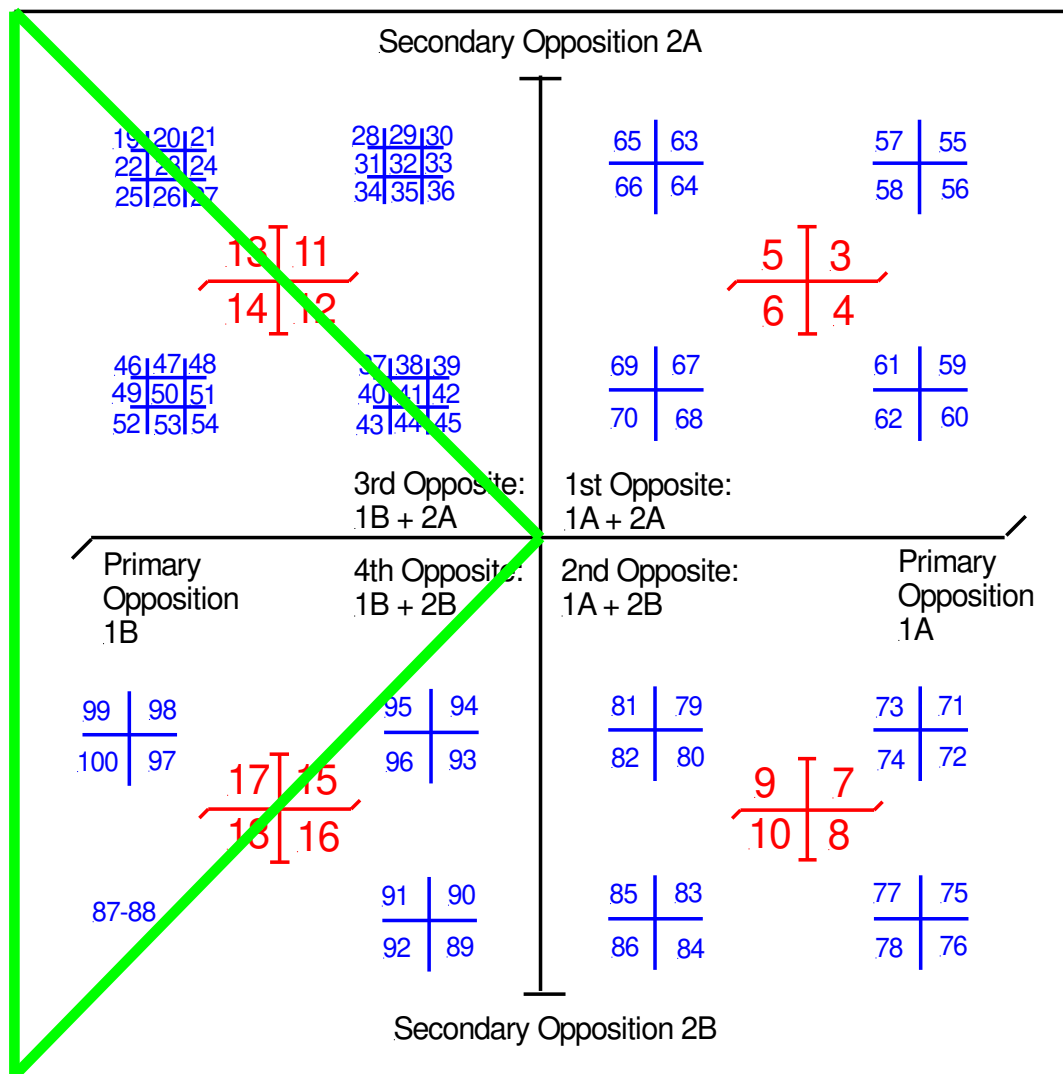


On the other hand, if the amount borrowed must be paid back with interest, we have a contraction of the money supply as save-ors bring their money to the bank for a return on investment, and as borrowers become less inclined to borrow. We would then expect a contract in the money supply, and in prices as well.

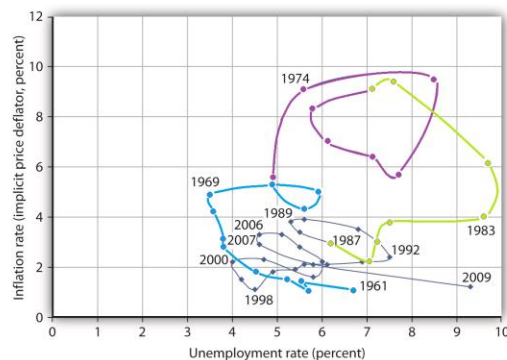
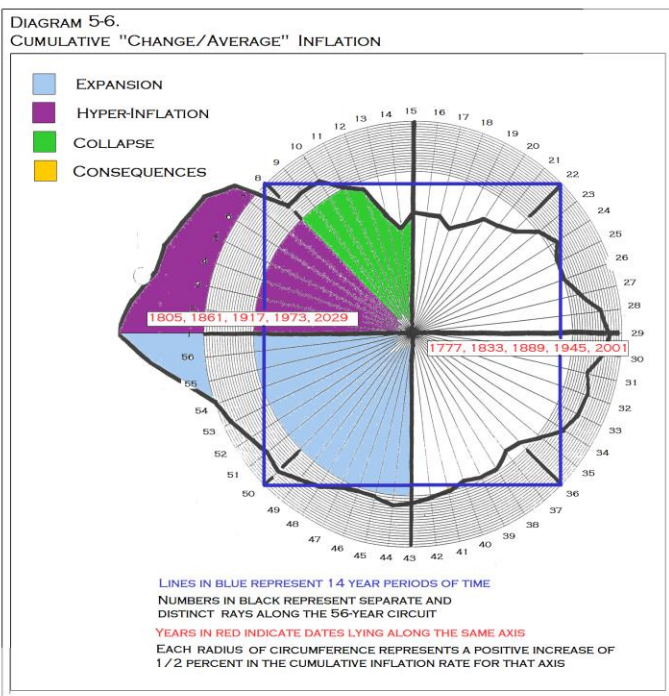


We would see in this increase in the interest rate a proportionate fall in the money supply. The decrease in the money supply will be in direct proportion to the amount of the increase in the interest rate: the greater the increase, the more dramatic effect upon the supply of money available to the economy.

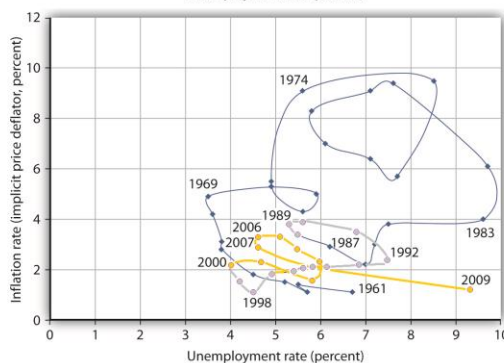
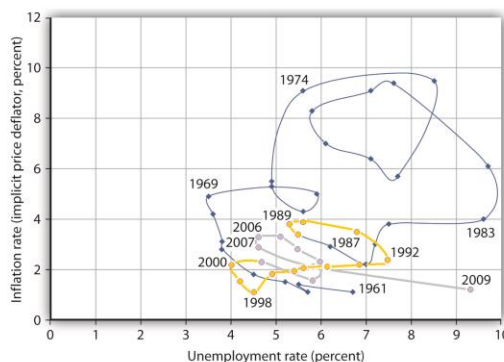
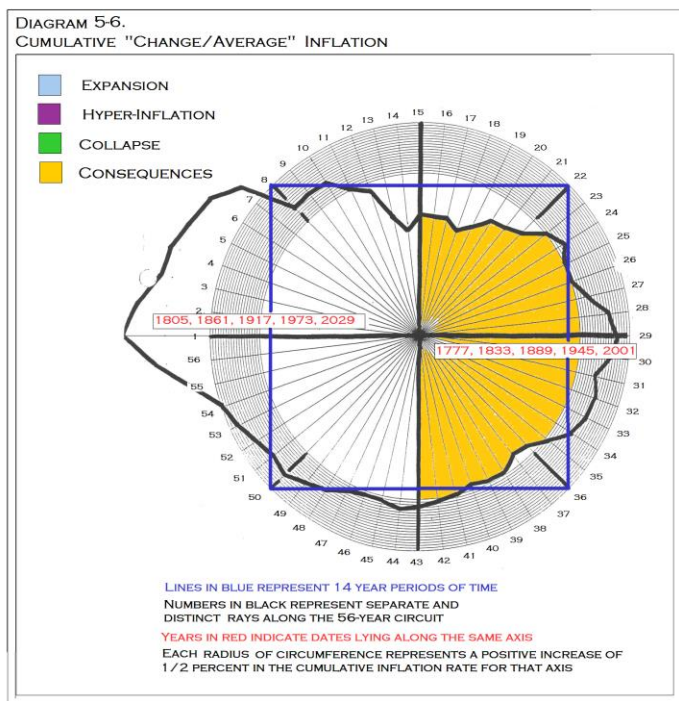
This relationship is known as the LM curve, the effect of an increase in the interest rate tending to decrease the amount of money within the system. It is not an easy graph to chart, because it deals with the left-hand side of our model, a place where both uncertainty and arbitrariness are found.



On the other hand, if we consider the extent to which inflation dominates the historic period, we may chart the Phillips curve wherein inflation and unemployment are juxtaposed. Placing these figures in the same color coding used previously to differentiate the logical divisions of the Political Economy Curve, we have the following:



Or in contrast the years of consolidation and their effect upon the rate of inflation and the unemployment rate.



6. Von Mises' Philosophy

Von Mises presents his views on economics as a subset of the study of "praxeology," the study of human action as such, using economic insights to peer into the underlying basis of human action, human consciousness. He writes:

The discovery of the inescapable interdependence of market phenomena overthrew (previous economic) opinion. Bewildered, people had to face a new view of society. They learned with stupefaction that there is another aspect from which human action might be viewed other than that of good and bad, of fair and unfair, of just and unjust. In the court of social events there prevails a regularity of phenomena to which man must adjust his action if he wishes to succeed. It is futile to approach social facts with the attitude of a censor who approves or disapproves from the point of view of quite arbitrary standards and subjective judgments of value. One must study the laws of human action and social cooperation as the physicist studies the laws of nature. Human action and social cooperation seen as the object of a science of given relations, no longer as a normative discipline of things that ought to be- this was a revolution of tremendous consequences for knowledge and philosophy as well as for social action.¹⁶⁰

Webster's dictionary defines "praxeology" as "the study of human action." We find in von Mises' "praxeology" a study of human consciousness as applied to the broadest concepts of economics.

Praxeology is a theoretical and systematic, not historical, science. Its scope is human action AS SUCH (emphasis supplied), irrespective of all environmental, accidental, and individual circumstances of the concrete acts. Its cognition is purely formal and general without reference to the material content and the particular features of the actual case. It aims at knowledge valid for all instances in which the conditions exactly correspond to those implied in its assumptions and inferences. Its statements and propositions are not derived from experience. They are, like those of logic and mathematics, *a priori*. They are not subject to verification or falsification on the ground of experience and facts. They are both logically and temporally antecedent to any comprehension of historical facts. They are a necessary requirement of any intellectual grasp of historical events. Without them we should not be able to see in the course of events anything else than kaleidoscopic change and chaotic muddle.¹⁶¹

¹⁶⁰ Id., p. 2

¹⁶¹ Id., p. 32.

Von Mises believes that the definitions, relationships and conclusions of "praxeology" are not found within a mindless universe, but rather are basic to the actions of human beings themselves by way of the human consciousness underlying and motivating human actions.

The fundamental logical relations are not subject to proof or dis-proof. Every attempt to prove them must presuppose their validity. It is impossible to explain them to a being who would not possess them on his own account. Efforts to define them according to the rules of definition must fail. They are primary propositions antecedent to any nominal or real definition. They are ultimate unanalyzable categories. The human mind is utterly incapable of imagining logical categories at variance with them. No matter how they may appear to superhuman beings, they are for man inescapable and absolutely necessary. They are the indispensable prerequisite of perception, apperception and experience.¹⁶²

Von Mises' believes human beings operate - in aggregate and as individuals - within the parameters of fixed, unalterable and eternal categories. These categories are as valid for the study of economics today as for the economics of the Roman Empire. He makes this point with particular reference to the universal notion of a form of money or medium of exchange. His point is that any society set up by the human mind must evolve categories (for example, some medium of exchange) which will be analogous to every other category or medium of exchange evolved throughout the world – or the universe - *due to the inherent nature of the human mind itself*.

The starting point of praxeology is not a choice of axioms and a decision about methods of procedure, but reflection about the essence of action. There is no action in which the praxeological categories do not appear fully and perfectly. There is no mode of action thinkable in which means and ends or costs and proceeds cannot be clearly distinguished and precisely separated. There is nothing which only approximately or incompletely fits the economic category of an exchange. There are only exchange and nonexchange; and with regard to any exchange all the general theorems concerning exchanges are valid in their full rigidity and with all their implications. There are not transitions from exchange to nonexchange or from direct exchange to indirect exchange. No experience can ever be had which would contradict these statements.

Such an experience would be impossible in the first place for the reason that all experience concerning human action is conditioned by the praxeological categories and becomes possible only through their application. If we had not in our mind the schemes provided by praxeological reasoning, we should never be in a position to discern and to grasp any action. We would perceive motions, but neither buying nor selling, nor prices, wage rates, interest rates, and so on. It is only through the utilization of the praxeological scheme that we become able to have an experience concerning an act of buying and selling, but then independently of the fact of whether or not our sense concomitantly perceive any motions of men and of nonhuman elements of the external world.

¹⁶² Id., p. 34.

Unaided by praxeological knowledge we would never learn anything about media of exchange. If we approach coins without such preexisting knowledge, we would see in them only round plates of metal, nothing more. Experience concerning money requires familiarity with the praxeological category MEDIUM OF EXCHANGE.

Experience concerning human action differs from that concerning natural phenomena in that it requires and presupposes praxeological knowledge. This is why the methods of the natural sciences are inappropriate for the study of praxeology, economics and history.¹⁶³

The reader might distinguish the effort of building economics upon a mind-less “classical” physics (referred to in the following quote), and the effort herein to build physics and indeed all reality upon the patterns inherent in consciousness itself.

(T)he sciences of human action differ radically from the natural sciences. All authors eager to construct an epistemological system of the science of human action according to the pattern of the natural sciences err lamentably.

The real thing which is the subject matter of praxeology, human action, stems from the same source as human reasoning. Action and reason are congeneric and homogeneous; they may even be called two different aspects of the same thing. That reason has the power to make clear through pure ratiocination the essential features of action is a consequence of the fact that action is an offshoot of reason. The theorems attained by correct praxeological reasoning are not only perfectly certain and incontestable, like the correct mathematical theorems. They refer, moreover with the full rigidity of their apodictic certainty and incontestability to the reality of action as it appears in life and history. Praxeology conveys exact and precise knowledge of real things.¹⁶⁴

Von Mises undertakes to describe the “praxeological” relationships of economics. Von Mises does not endorse the view that classical physics is to be taken as the paradigm for economics. He does endorse however the idea that economics should strive for the same objectivity found in physics.

The first task of every scientific inquiry is the exhaustive description and definition of all conditions and assumptions under which its various statements claim validity. It is a mistake to set up physics as a model and pattern for economic research.... The main question that economics is bound to answer is what the relations of its statements is to the reality of human action whose mental grasp is the objective of economic studies.¹⁶⁵

¹⁶³ Id., pp. 38 - 40.

¹⁶⁴ Id., p. 39.

¹⁶⁵ Id., p. 6.

There are hints within *Human Action* of a link or at least a similarity between modern economics and modern “quantum” physics.

The *a priori* sciences- logic, mathematics, and praxeology- aim at a knowledge unconditionally valid for all beings endowed with the logical structure of the human mind. The natural sciences aim at a cognition valid for all those beings which are not only endowed with the faculty of human reason but with human senses. The uniformity of human logic and sensation bestows upon these branches of knowledge the character of universal validity. Such at least is the principle guiding the study of the physicists. *Only in recent years have they begun to see the limits of their endeavors and, abandoning the excessive pretensions of older physicists, discovered the "uncertainty principle." They realize today that there are unobservables whose unobservability is a matter of epistemological principle.*¹⁶⁶

The fundamental advantage obtained by a consideration of economic behavior lies in the association of social ideas, groups, functions etc. with specific numbers, numbers which might prove or disprove the model itself. Whether these numbers relate to employment figures, inflation rates, dollars in circulation, prices, total output, etc. these numbers present a picture of the working of an economy, an economy which is itself controlled by the principles presented in this model. As we ourselves are a part – a very small part – of economic behavior, so are we able to view this model’s working “from the inside,” from the viewpoint of a player within the phenomenon, as a part of the whole, a part of the system under investigation.

This is contrasted with the behavior analyzed by the physical sciences. As we investigate the physical sciences, we, ourselves, are located “outside” the topic investigated, and therefore outside the model itself. In considering the physical sciences, the scientist is not a part of the topic considered; therefore the scientist of physical phenomena may find it more difficult to accept the principles of this model.

¹⁶⁶Id., p. 57, in turn citing A. Eddington, *The Philosophy of Physical Science*, New York, 1939, pp. 28-48.

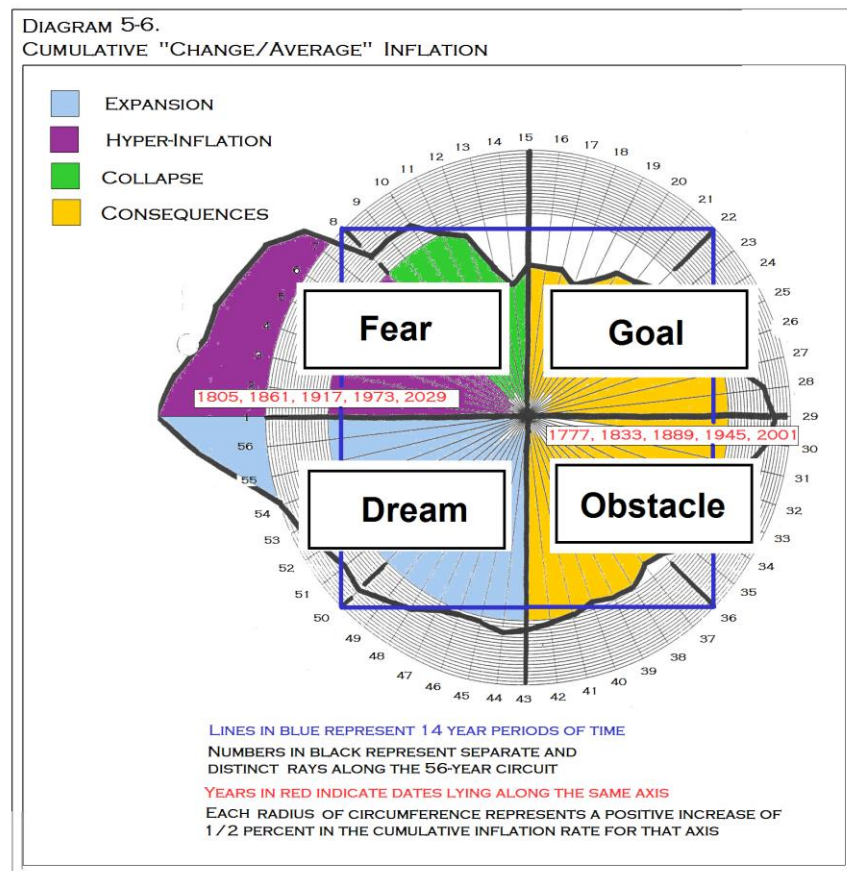
CONCLUSION

Under our analysis we would expect to discover the constant $\phi = 1.6180\dots$ as the relationship between the “image” of the economy, its productive capacity and its price structure. We would further expect to see the constant $\pi = 3.14159\dots$ as an integral part of the economy.

Moreover, assuming that the reader is satisfied that the foregoing essays have provided an insight into the social world which operates as fractals to one another in clear and predictable ways, it might serve as well to follow up on von Mises’ suggestion that the principle of electron uncertainty bears a striking resemblance to his notions of economics.

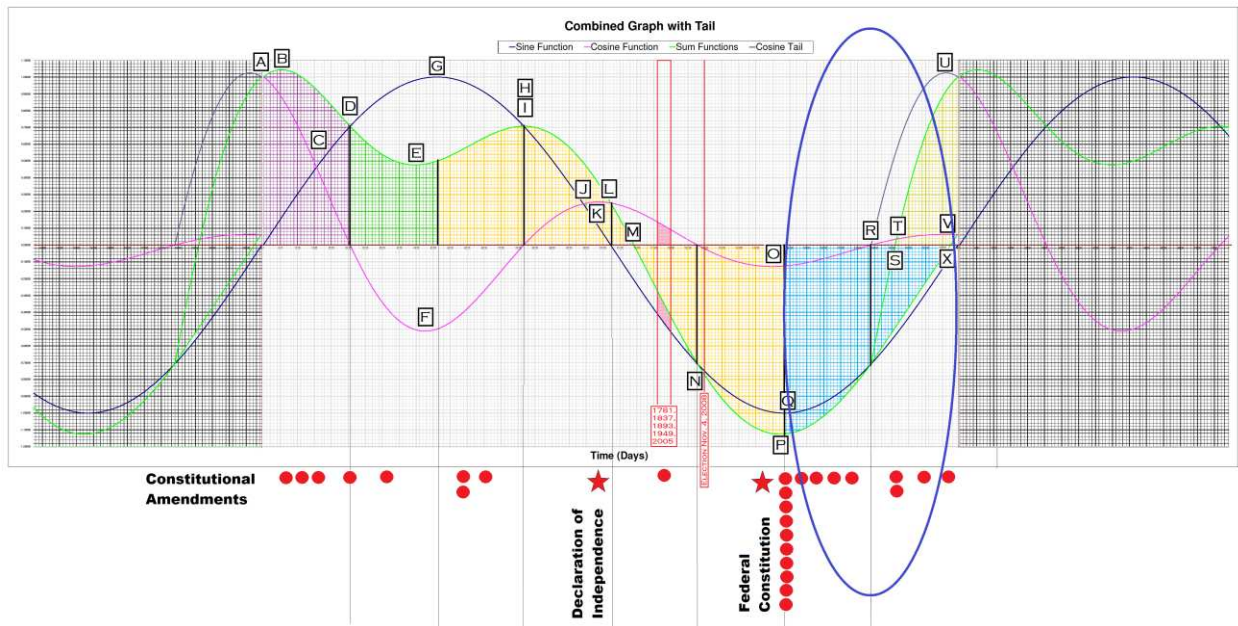
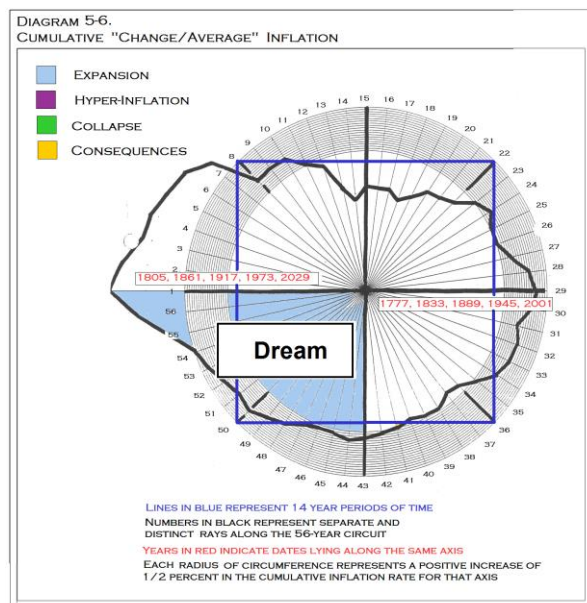
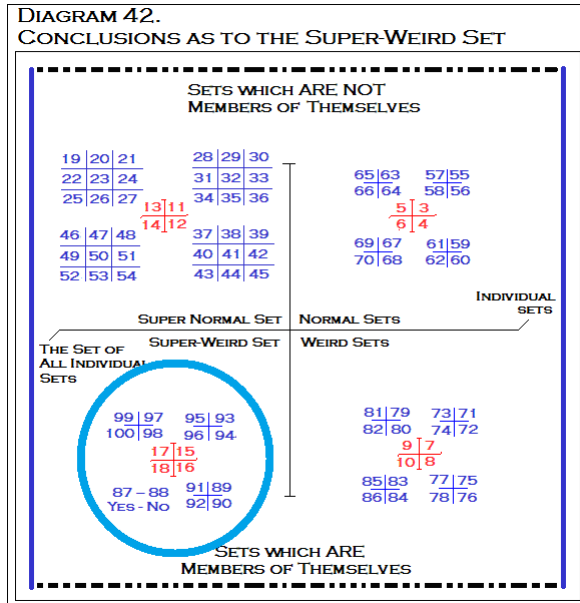
Oppositional Analysis, as applied to the political economy of the United States, suggests that we find in the upper-right period of history – the top right quadrant – a “self.” After considering the various historical events of these periods, I suggest that upper right quadrant portion of time during American economy history is one during which certain “Goals” are fashioned.

The opposite of a Goal is an “Obstacle”; the negation of a Goal is a “Fear”; and the Negation of a Fear is a “Dream”.

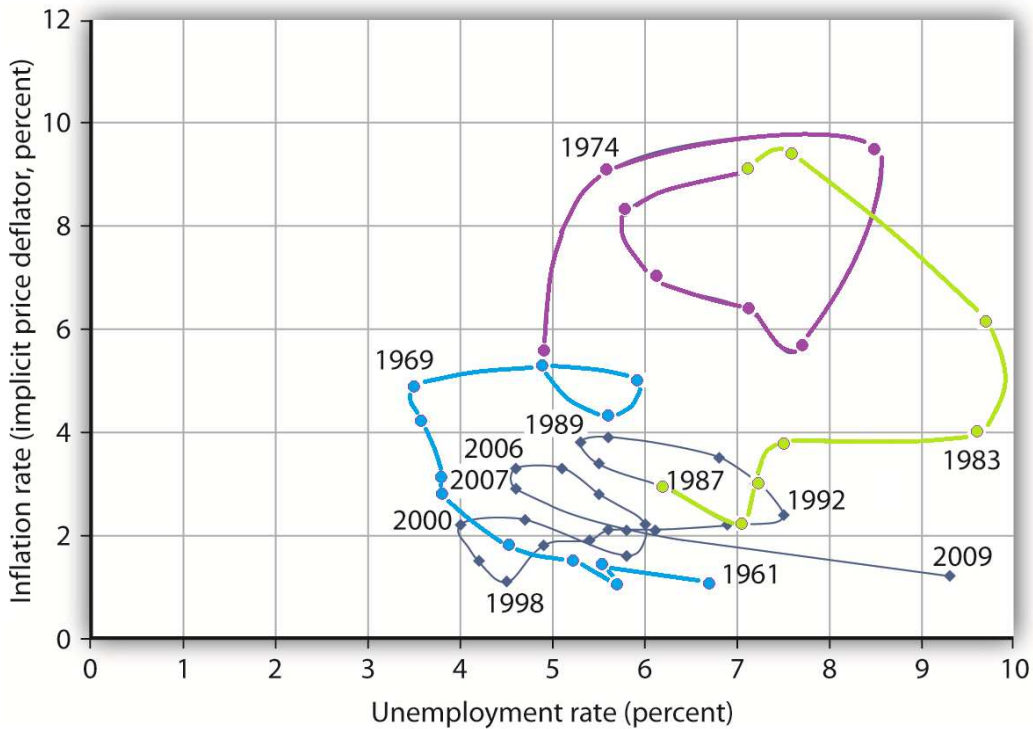


These psychologic impulses which are well known to citizens are expressed over time in the public activity of the United States.

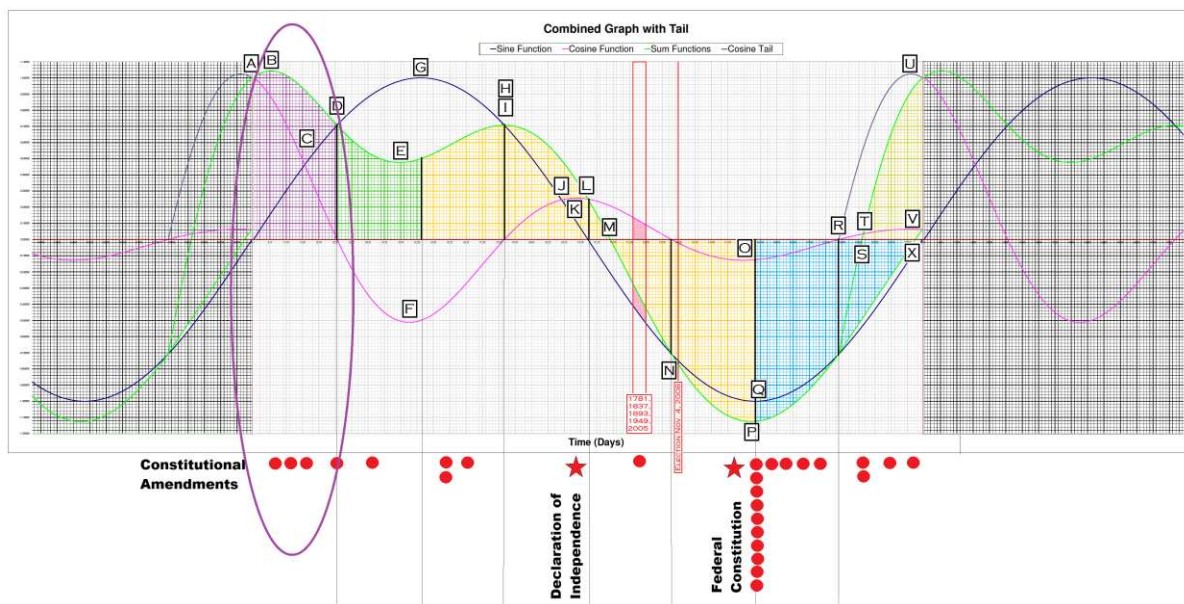
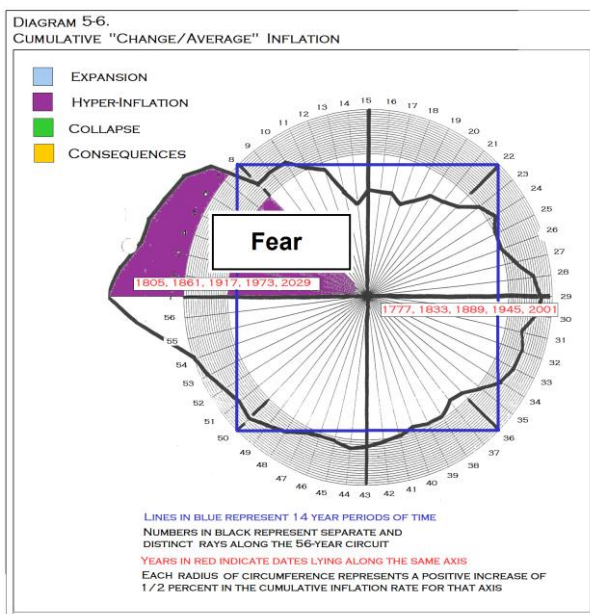
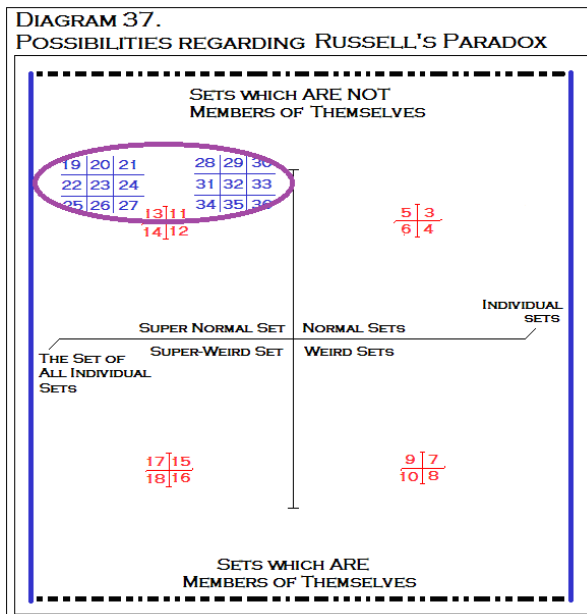
As these periods of time are associated with the patterns presented in Oppositional Analysis we can see that these various psychologic points of view are connected to various ways of thinking through problems. Note most recently the 1966 speech by Martin Luther King Jr. the most memorable phrase of which is “I have a dream.” This occurs during an historic period of time wherein the “Yes-No” characteristic of the lower-left quadrant would be typical.



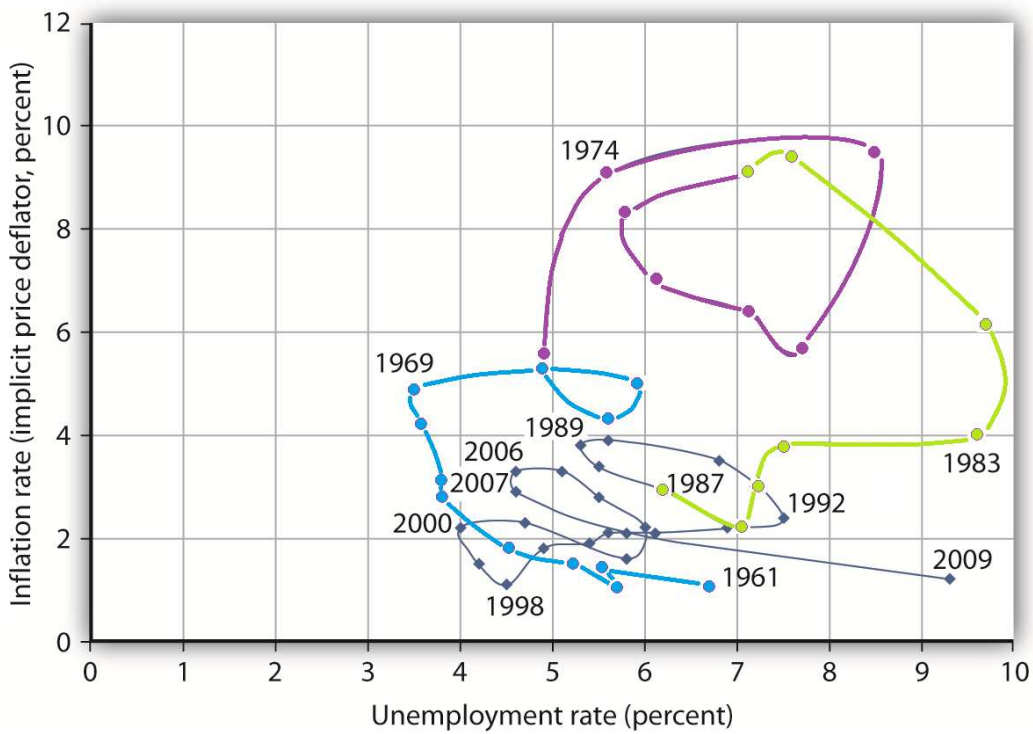
Typical of this period is a steady increase in the inflation rate which is consistent with a citizenry which is ever more involved with the determination and active change in its circumstances. During this period the largest number of constitutional amendments have been ratified, and also during this period a general upswing in radical activity takes place.



The most recent fear found within the upper left had quadrant appears to be connected to the statements of President Richard Nixon as to the Watergate Scandal and the role his office played in illegal wire-tapping. Prior periods of time correlate with the American Civil War and the entry of the United States into World War I.



The uncertainty of this period is markedly different from the previous period. During this section of American economic history a distinctly different tone sets in, one drives the economy to new heights of inflation.



The second-half of this quadrant represents an uncertainty wherein the collapse of the economy begins to occur. Most recently this has taken place with the rise of Ronald Reagan and the Republican war on organized labor, a traditional voting block of the Democratic Party.

DIAGRAM 37.
POSSIBILITIES REGARDING RUSSELL'S PARADOX

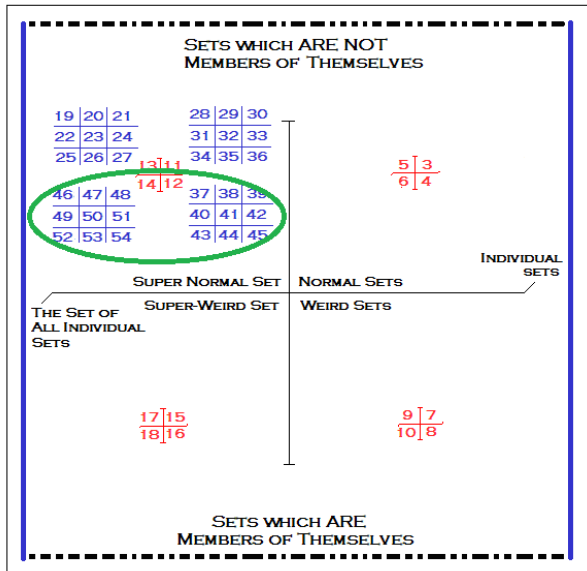
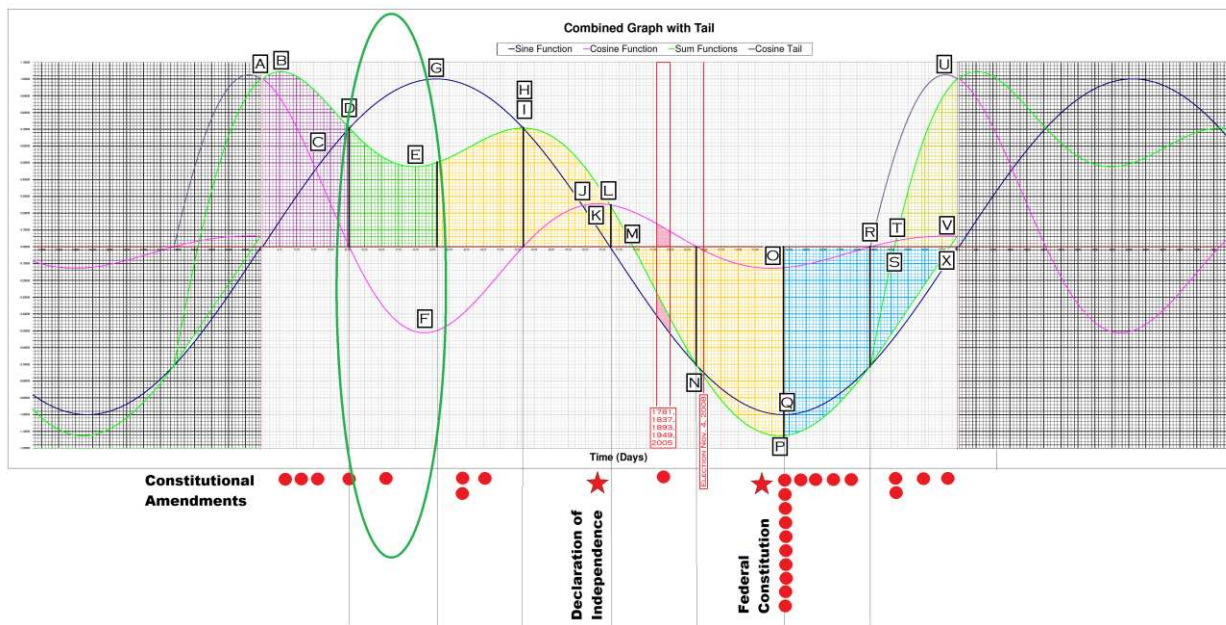
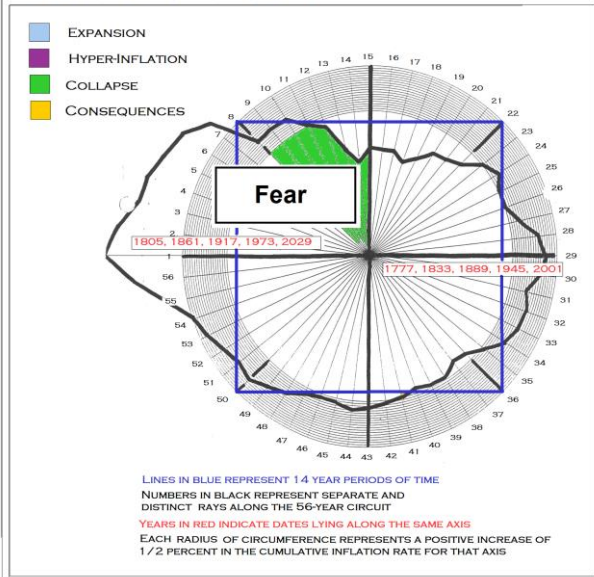
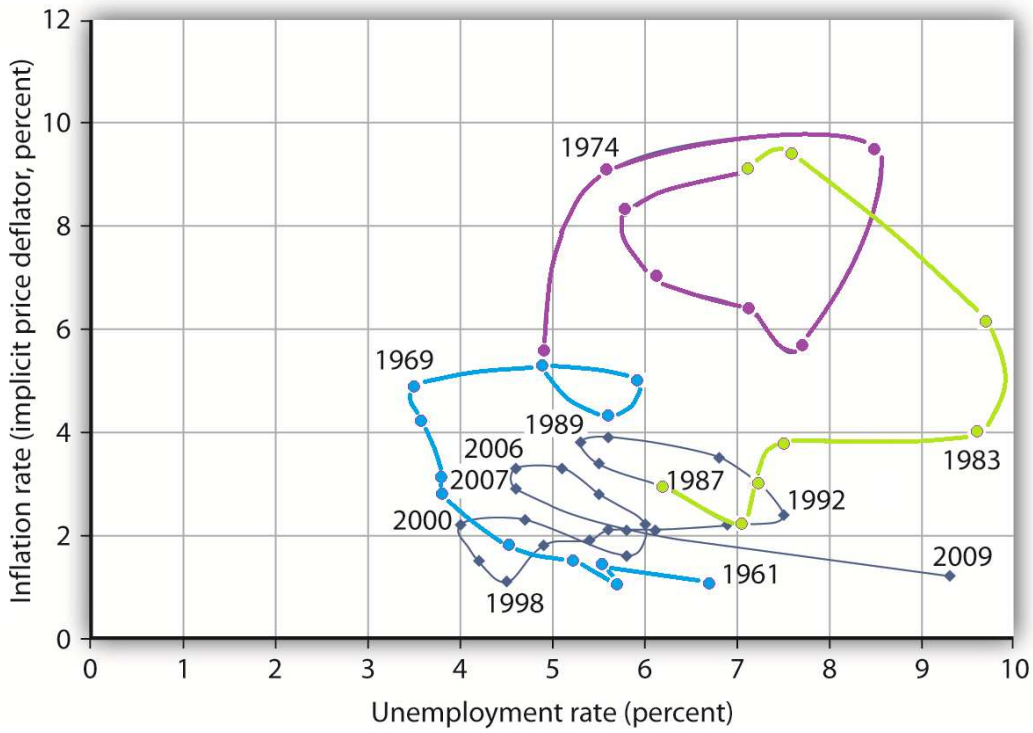
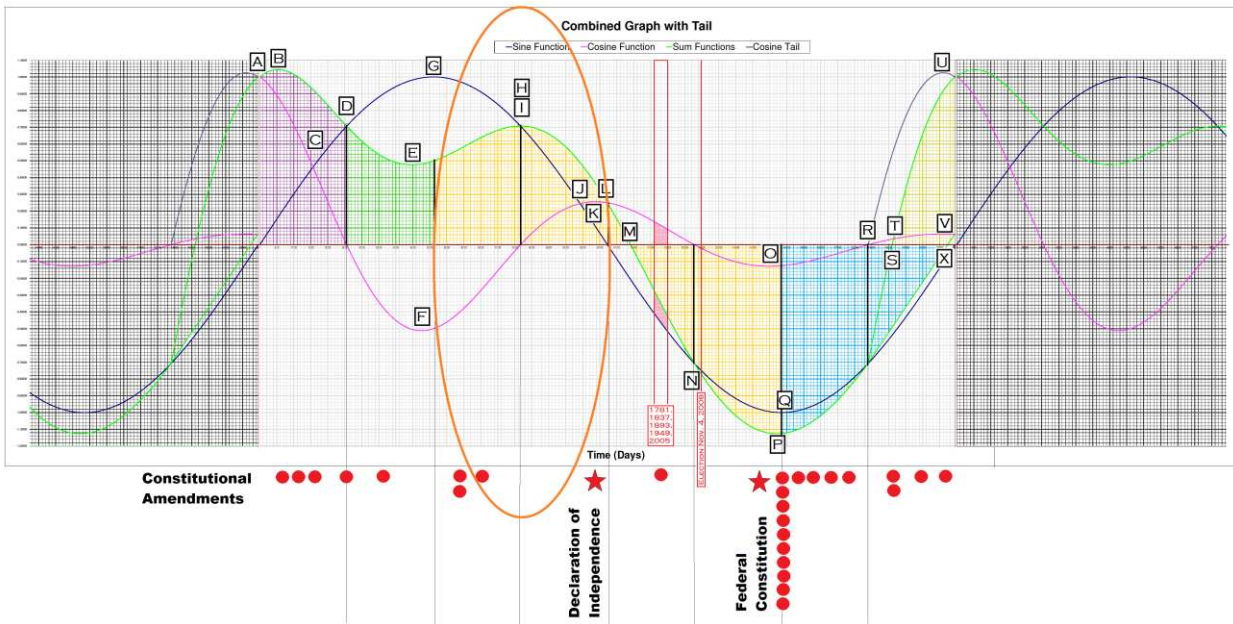
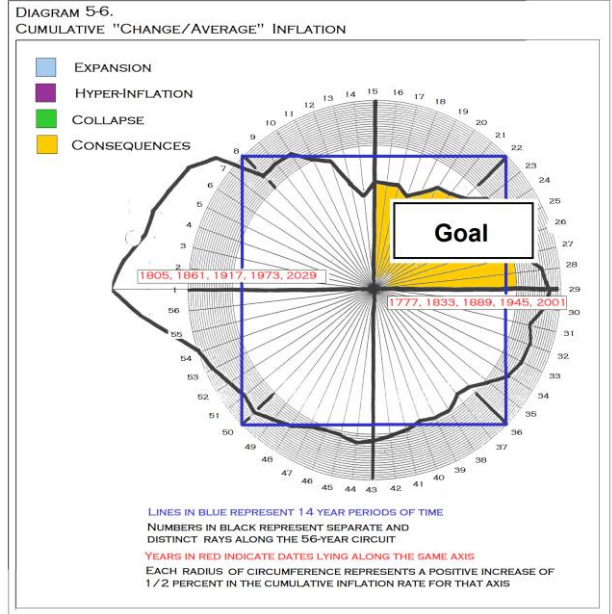
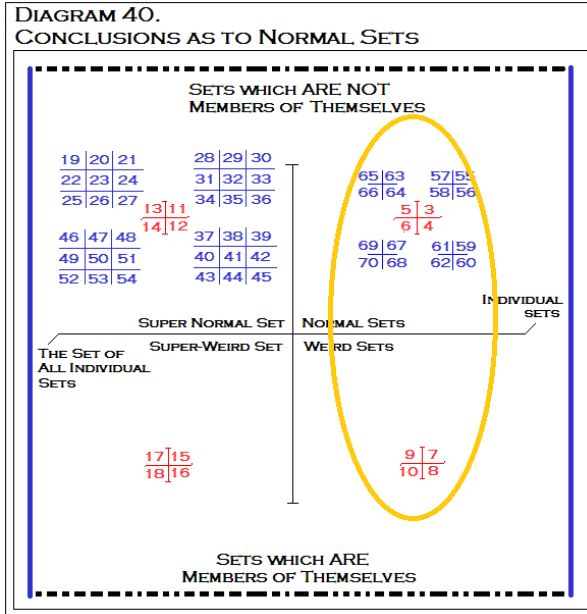


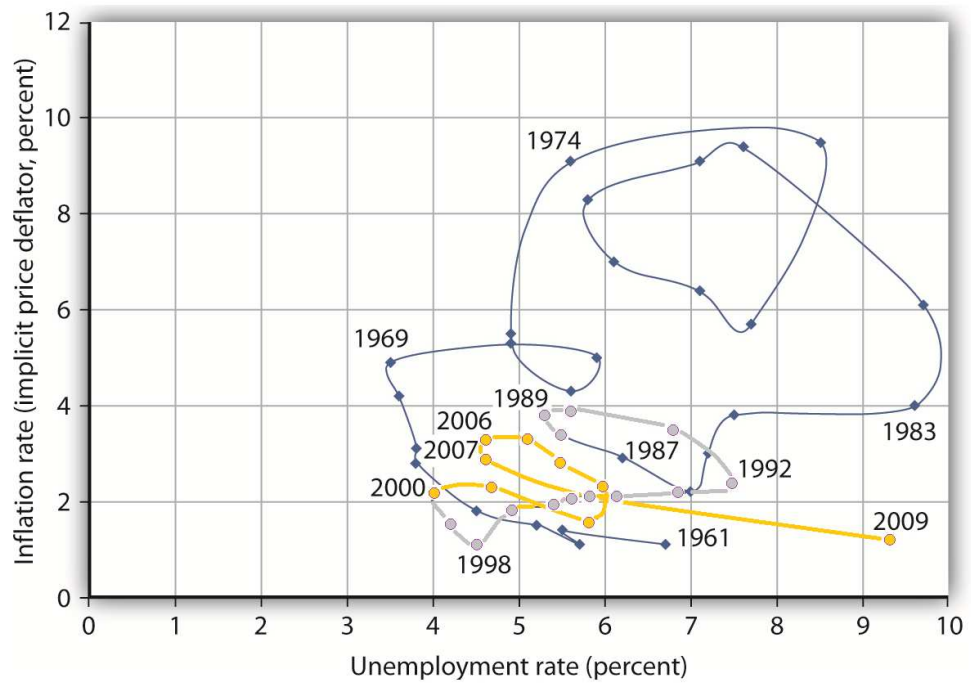
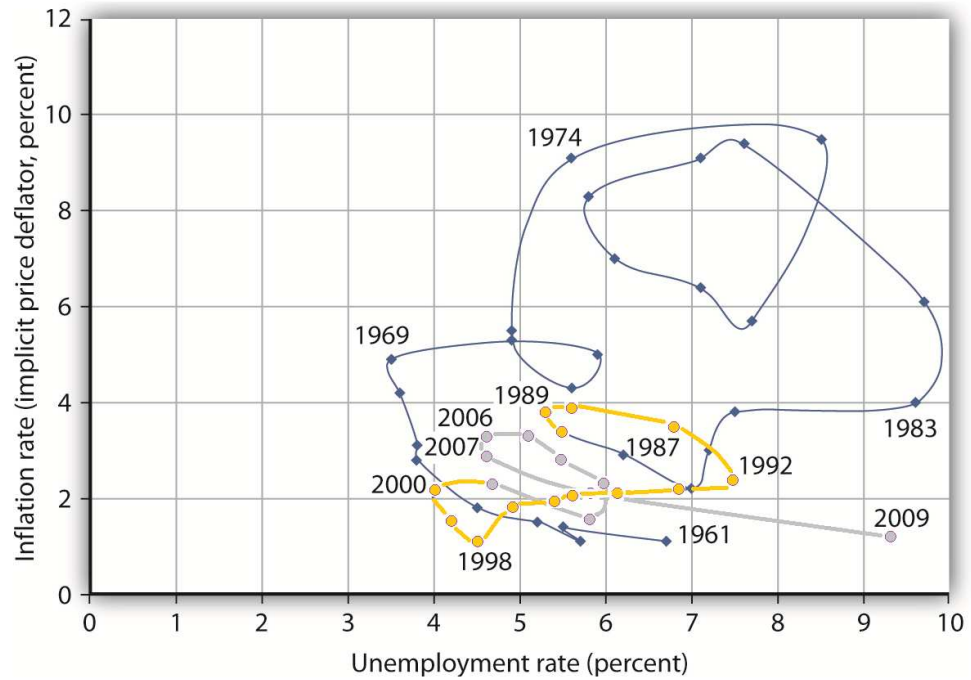
DIAGRAM 5-6.
CUMULATIVE "CHANGE/AVERAGE" INFLATION





The most recent goal of American seems is found in the Republican “Contract With America” of 1994. The pyschologic state of the United States during this period of time has not been characherized by the inherent uncertainty of the preceding period. Consequently the inflation rate has receded and the unemployment rate stabilized.





Following a period of setting goals the United States historically has entered into an aggressive and expansive posture. Formerly the periods of post-World War II and the tenure of G. W. Bush have been associated with a dominant American presence in the world acting without the need for consultation with others. The most pressing obstacle facing these goals is the financial meltdown of 2008 and its aftermath.

DIAGRAM 4-1.
CONCLUSIONS AS TO WEIRD SETS

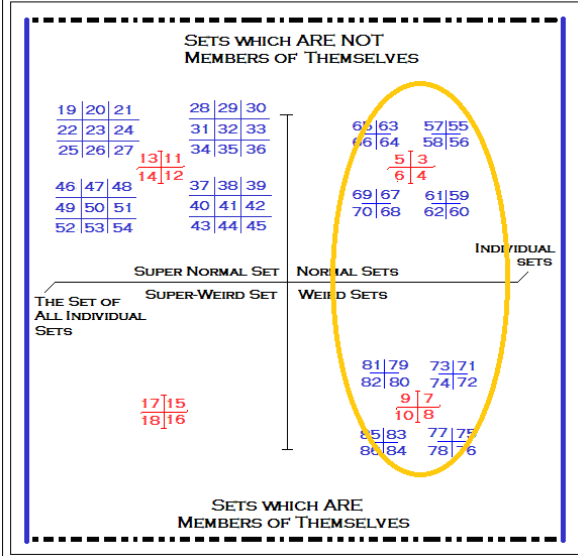
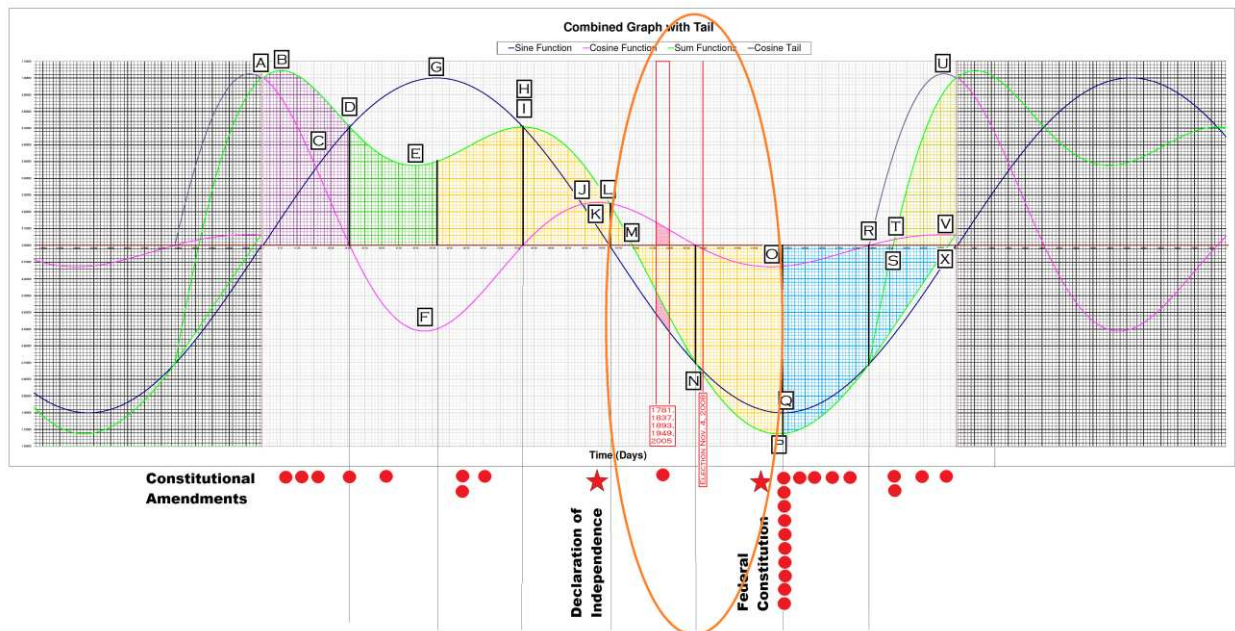
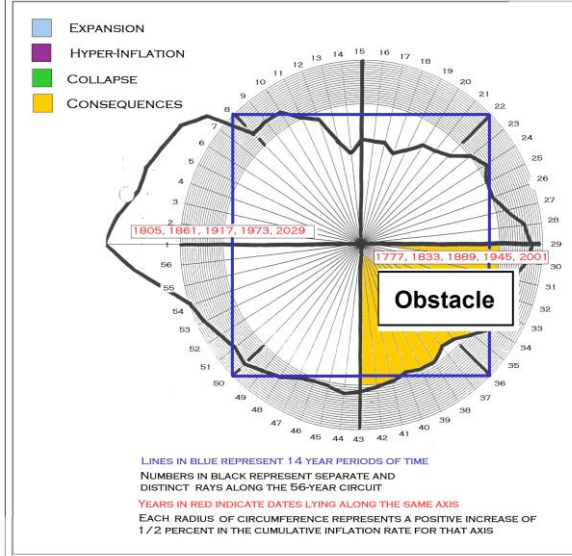
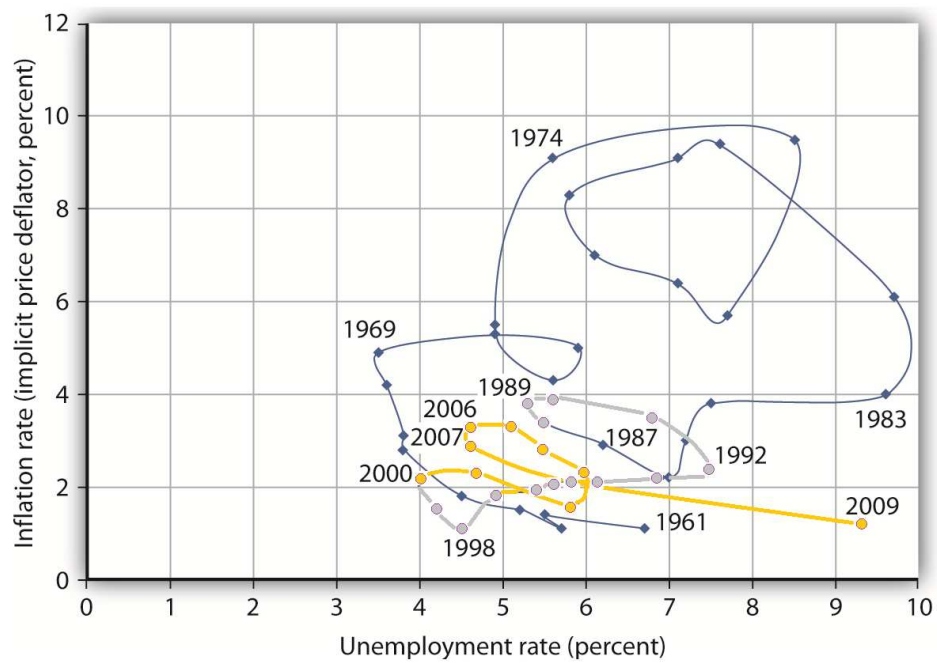
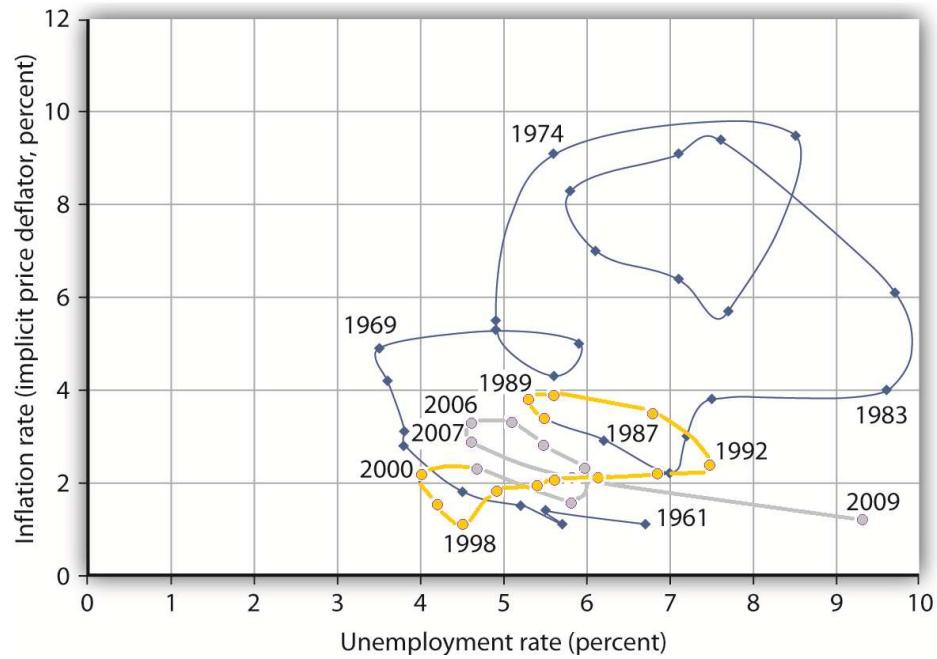
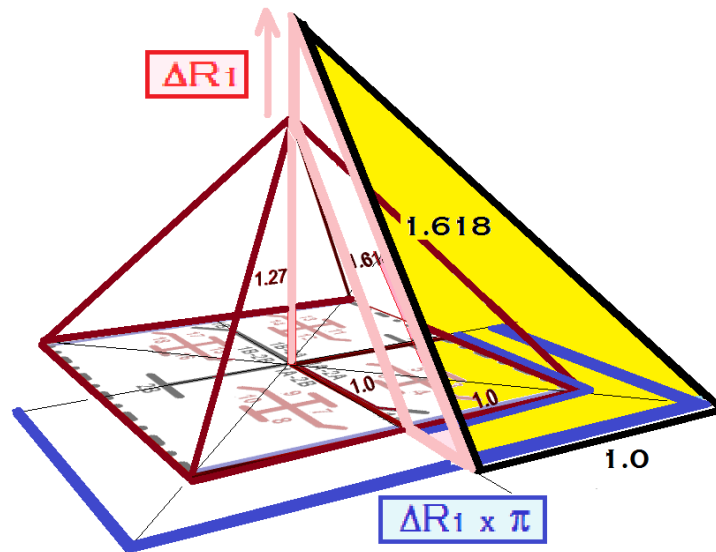


DIAGRAM 5-6.
CUMULATIVE "CHANGE/AVERAGE" INFLATION





These models propose that a fifth dimension within the economy of the United States balances the political, economic and social fabric of American Society such that the ratios of $1: \pi$ and $1:\phi$ take place over the long term.



The presence of this fifth dimension within the context of the economic and social history of the United States provides a basis for investigating a number of physical phenomena presently unexplored by science.

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