On the Problem of Vague Terms: A Glossary of Clearly Stated Assumptions Careful, Patient, Descriptions

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31 October 2008

On the Problem of Vague Terms:

A Glossary of Clearly Stated Assumptions

&

Careful, Patient, Descriptions

For my friend Colin MacIntyre,
an Island survivor who understands the
Value of Relative Insularity[1]
&
The Evolutionary Stable Strategy[2] *of*
The Island Survival Game,[3]

31 October 2008

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Working Paper No. 6
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1 See: *Funk-Zweikampf Formula*

2 See: *Evolutionary Stable Strategy*

3 See *Island Survival Game ; Earth Island Survival Game*

4 Original material, theoretical description, artwork, commentary & personal correspondence.

5 Funk Island…, 60 km east of Fogo Island off the northeast coast of Newfoundland, is home to more than one million common murres, numbers that make it the largest colony of common murre in the western North Atlantic….

As a seabird ecological reserve, Funk Island is now known for its ability to protect seabirds. This was not always the case. In previous centuries, Funk Island was one of the major nesting areas of the Great auk, and people came regularly to hunt the birds and take their eggs…. The Great auk—large, flightless birds—were eventually hunted to extinction.

This loss shows how human activity can result in the extermination of… species. Making Funk Island an ecological reserve has helped other… species recover from similar exploitation and near extirpation….

At 5.2 km^2 (5 km^2 of which is the marine component), the reserve is the smallest seabird ecological reserve in Newfoundland and Labrador, but it's also one of the most important (FI 2008).

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TOUCHSTONE[1]

[**Problem**:] *Economic theory has suffered in the past from a failure to state clearly its assumptions. Economists in building up a theory have often omitted to examine the foundations on which it was erected. This examination is, however, essential not only to prevent the misunderstanding and needless controversy which arise from a lack of knowledge of the assumptions on which a theory is based, but also because of the extreme importance for economics of good judgement in choosing between rival sets of assumptions.*[2]

[**Solution**:] *In… economics the most fruitful work may be that of careful, patient description; indeed this may be by far the largest domain for the present and some time to come….*

Economic problems [have been and are often] not formulated clearly and are often stated in such vague terms as to make mathematical treatment a priori appear hopeless because it is quite uncertain what the problems really are. There is no point in using exact methods where there is no clarity in the concepts and issues to which they are to be applied. Consequently the initial task is to clarify the knowledge of the matter by further careful descriptive work.[3]

1 Every man carries about him a touchstone… to distinguish… truth from appearances [Locke 1706, as cited in Popper 1963, p 3].

2 Coase 1930, p 386

3 Von Neumann & Mogenstern 1944, pp 2-4

GLOSSARY

Academic Prostitution

Survival in academia depends on publications in refereed journals. Authors only get their papers accepted if they intellectually prostitute themselves by slavishly following the demands made by anonymous referees without property rights on the journals they advise. Intellectual prostitution is neither beneficial to suppliers nor consumers. But it is avoidable. The editor (with property rights on the journal) should make the basic decision of whether a paper is worth publishing or not. The referees only give suggestions on how to improve the paper. The author may disregard this advice. This reduces intellectual prostitution and produces more original publications.[1]

Applied Mathematics

(a) The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. The economic problem of society is thus not merely a problem of how to allocate "given" resources-if "given' is taken to mean given to a single mind which deliberately solves the problem set by these "data." It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know. Or, to put it briefly, it is a problem of the utilization of knowledge not given to anyone in its totality. *This character of the fundamental problem has, I am afraid, been rather obscured than illuminated by many of the recent refinements of economic theory, particularly by many of the uses made of mathematics.*[2]

(b) What has gone wrong with the development of economics as a science? Answer: There was a bunch of intelligent people who felt compelled to use mathematics just to tell themselves that they were rigorous in their thinking, that theirs was a science. Someone in a great rush decided to introduce mathematical modelling techniques…without considering the fact that either the class of mathematics they were using was too restrictive for the class of problems they were dealing with, or that perhaps they should be aware that the precision of the language of mathematics could lead people to believe that they had solutions when in fact they had none.[3]

(d) We may also observe that part of the feeling of dissatisfaction with the mathematical treatment of economic theory derives largely from the fact that frequently one is offered not proofs but mere assertions which are really no better than the same assertions given in literary form. Very frequently the proofs are lacking because a mathematical treatment has been attempted of fields which are so vast and so complicated that for a long time to come… there is hardly any reason at all to expect progress more mathematico.[4]

(e) Mathematicians may flatter themselves that they possess new ideas which mere human language is as yet unable to express. Let them make the effort to express these ideas in appropriate words without the aid of symbols, and if they succeed, they will not only lay us laymen under a lasting obligation, but, we venture to say, they will find themselves very much enlightened during the process, and will even be doubtful whether the ideas as expressed in symbols had ever quite found their way out of the equations into their minds.[5]

(f) Civilization advances by extending the number of important operations which we can perform without thinking about them. This is of profound significance in the social field. We make constant use of formulas, symbols, and rules whose meaning we do not understand and through the use of which we avail ourselves of the assistance of knowledge which individually we do not possess. We have developed these practices and institutions by building upon habits and institutions which have

1 Frey 2002, abstract

2 Italics mine, Hayek 1956, pp 519-520

3 Taleb 2001, p 177

4 Von Neumann & Morgenstern 1944, p 5

5 Maxwell 1873, p 400

proved successful in their own sphere and which have in turn become the foundation of the civilization we have built up.[1]

(g) It is an interesting speculation to think what direction the development of Menger's thought would have taken if he had been acquainted with these founders of mathematical analysis. It is a curious fact that, so far as I am aware, he has nowhere commented on the value of mathematics as a tool of economic analysis. There is no reason to assume that he lacked either the technical equipment or the inclination. On the contrary, his interest in the natural sciences is beyond doubt, and a strong bias in favour of their methods is evident throughout his work....He does not even refer to the mathematical method in any of his writings on methodology...Must we conclude that he felt rather sceptical about its usefulness?[2]

(h) In... *Principles*, Marshall confined his use of diagrams and other mathematical notations to footnotes and appendixes so as not to allow his mathematics to detract from his economics. He was interested above all in plain communication—with businessmen as well as with students. Moreover, he was acutely aware that over reliance on mathematics "might lead us astray in pursuit of intellectual toys, imaginary problems not conforming to the conditions of real life: and, further, might distort our sense of proportion by causing us to neglect factors that could not easily be worked up in the mathematic machine" (Ekelund & Hebert 1997, p 341).

Aristotelian Method

The development of thought since Aristotle could, I think, be summed up by saying that every discipline, as long as it used the Aristotelian method of definition, has remained arrested in a state of empty verbiage and barren scholasticism, and that the degree to which the various sciences have been able to make any progress depended on the degree to which they have been able to get rid of this essentialist method. (this is why so much of our 'social science' still belongs to the Middle Ages.) This discussion of this method will have to be a little abstract, owing to the fact that the problem has been so thoroughly muddled by Plato and Aristotle, whose influence has given rise to such deep-rooted prejudices that the prospect of dispelling them does not seem very bright.[3]

Art of Denunciation

One of the most important elements of success in becoming a man of genius is to learn the art of denunciation. You must always denounce in such a way that your reader thinks that it is the other fellow who is being denounced and not himself; in that case he will be impressed by your noble scorn, whereas if he thinks that it is himself that you are denouncing, he will consider that you are guilty of ill-bred peevishness. Carlyle remarked: "The population of England is twenty millions, mostly fools." Everybody who read this considered himself one of the exceptions, and therefore enjoyed the remark. You must not denounce well-defined classes, such as persons with more than a certain income, inhabitants of a certain area, or believers in some definite creed; for if you do this, some readers will know that your invective is directed against them. You must denounce persons whose emotions are atrophied, persons to whom only plodding study can reveal the truth, for we all know that these are other people, and we shall therefore view with sympathy your powerful diagnosis of the evils of the age.[4]

Asteroids

(a) The Earth has a long and violent history of collisions with extraterrestrial bodies such as asteroids and comet nuclei. Several of these impacts have been large enough to produce major environmental changes, causing mass extinctions and severe alterations to weather patterns and geography. There is no reason to suppose that the likelihood of such collisions will be any less in the future and the spread of human settlement, civilisation, and particularly urbanisation, makes it

1 Hayek 1945, pp 519-530
2 Menger & Hayek 1871, p 15
3 Popper 1945, Vol. II, p 9
4 Russell 1932

much more likely that a future impact, even relatively small, could result in the massive loss of human life and property. Despite the fact that the technology exists to predict and to some extent prevent such events, there is currently no co-ordinated international response to this threat.[1]

(b) It is widely believed that meteorites originate in the asteroid belt, but the precise dynamical mechanism whereby material is transported to Earth has eluded discovery. The observational data for the ordinary chondrites, the most common meteorites, impose severe constraints on any proposed mechanism. The ordinary chondrites are not strongly shocked, their cosmic ray exposure ages are typically <20 Myr, their radiants are concentrated near the antapex of Earth's motion and they show a pronounced 'afternoon excess' (for every meteorite which falls in the morning two fall in the afternoon). Wetherill concluded that these data could only be explained by an "unobserved source" of material... His subsequent, more sophisticated investigations have not changed this basic conclusion.... Since asteroidal debris is quite easily injected into this chaotic zone, it could provide Wetherill's 'unobserved source' if chaotic trajectories which begin at asteroidal eccentricities (e<0.2) reach such large eccentricities that Earth's orbit is crossed (e>0.57)... At least some of these chaotic trajectories do have the properties required to transport meteoritic material from the asteroid belt to Earth. Combined with the Monte Carlo calculations which show that the resulting meteorites are consistent with all the observational constraints, *the case for this chaotic route to Earth is fairly strong*.[2]

(b) The greatest natural threat to the long-term survivability of mankind is an asteroid or comet impact with the Earth. SHIELD is an architectural concept for a comprehensive Earth defense system designed to discover, catalogue, calculate orbits of near-Earth objects, and to deflect potential impactors. SHIELD consists of Sentries, Soldiers, and an Earth Control Center. Sentries are spacecraft designed to search and locate NEOs of all types. Sentries maximize the lead-time for a potential impact, which simplifies the task of the Soldiers to deflect the object. Sentry spacecraft determine the orbit of each object, and compare it with the onboard database of known NEOs. The results are kept in a distributed space-Earth database. Soldier spacecraft deflect or disperse the potential impactor. Several mitigation methods have been compared by their specific impulse. Each technique requires some development to be feasible. These techniques can be categorized into "rendezvous" in which the Soldier physically lands on the NEO and "intercept". The required number of Soldiers and their locations has been examined. SHIELD has clearly shown that an Earth-protection system is practical and that a full system could be built within a few years. Indeed, very capable Sentries can be launched today.[3]

Asteroid Tugboat

An Asteroid Tugboat... is a fully controlled asteroid deflection concept using a robotic spacecraft powered by a high efficiency, electric propulsion system (ion or plasma) which docks with and attaches to the asteroid, conducts preliminary operations, and then thrusts continuously parallel to the asteroid velocity vector until the desired velocity change is achieved. Based on early warning, provided by ground tracking and orbit prediction, it would be deployed a decade or more prior to a potential impact.[4]

Austrian Economics

What Mises taught us in his writings, in his lectures, in his seminars, and in perhaps everything he said, was that economics—yes, and I mean sound economics, Austrian economics—is primordially, crucially important. Economics is not an intellectual game. Economics is deadly serious. The very future of mankind—of civilization—depends, in Mises' view, upon widespread understanding of, and respect for, the principles of economics.

This is a lesson, which is located almost entirely outside economics proper. But all Mises' work

1 Tate 2006, abstract

2 Italics mine, Wisdom 1985, abstract

3 Gold 2001, abstract

4 Schweickart et. al., 2003, abstract

depended ultimately upon this tenet. Almost invariably, a scientist is motivated by values not strictly part of the science itself. The lust for fame, for material rewards—even the pure love of truth—these goals may possibly be fulfilled by scientific success, but are themselves not identified by science as worthwhile goals. What drove Mises, what accounted for his passionate dedication, his ability calmly to ignore the sneers of, and the isolation imposed by, academic contemporaries, was his conviction that the survival of mankind depends on the development and dissemination of Austrian economics.

Austrian economics is not simply a matter of intellectual problem solving, like a challenging crossword puzzle, but literally a matter of the life or death of the human race.[1]

Axiom

(a) "Fundamental Ideas"... are the sources of necessary truths (sometimes called "Axioms").[2]
(b) The choice of axioms is not a purely objective task. It is usually expected to achieve some definite aim – some specific theorem or theorems are to be derivable from the axioms – and to this extent the problem is exact and objective. But beyond this there are always other important desiderata of a less exact nature: The axioms should not be too numerous, their system is to be as simple and transparent as possible, and each axiom should have an immediate intuitive meaning by which its appropriateness may be judged directly.... (to strike a proper balance is a matter of practical – and to some extent even esthetic – judgement). In a situation like ours this last requirement is particularly vital, in spite of its vagueness: we want to make an intuitive concept amenable to mathematical treatment and to see as clearly as possible what hypotheses this requires.[3]

Byr **Billion Years**

Biogeography

(a) Biogeography is the study of the distribution and patterns of distribution of plants, animals and other organisms across the globe, on land, in the sea and in the air.[4]
(b) The study of the facts and the patterns of species distribution. It's the science concerned with where animals are, where plants are, and where they are not. On the island of Madagascar, for instance, there once lived an ostrichlike creature that stood ten feet tall, weighed half a ton, it thumped across the landscape on a pair of elephantine legs. Yes, it was a bird. One thousand pounds of bone, flesh, feathers. This 1s no hypothetical monster, no implausible fantasy of Herodotus or Marco Polo. h a ramshackle museum in Antananarivo, I've seen its skeleton; I've seen its two-gallon egg, Palaeontologists know it as *Aepyomzs maximus*. The species summed until Europeans reached Madagascar m the sixteenth century and began hunting it, harrying it, transforming the ecosystem a was part of, scrambling those bounteous eggs. A millennium ago, *Aepyomzs maxzmus* existed only on that single island; now it exists nowhere. To say so is the business of biogeography. As practiced by thoughtful scientists, biogeography does more than ask *Which species?* and *To Where?* It also asks Why? and, what is sometimes even more crucial, Why *not?*[5]
(c) *Godfrey Baldacchino wrote:*

I should be there on Monday... but, if you wish, I can arrange something more 'formal' - with an invitation issued to all members of the Faculty... Even later on during next week - say, Thursday, 2 to 3.30pm - so we don't have to listen to two presentations back to back...

I have asked Matt to consider a presentation comparing development policy in Barbados and Mustique...

Some more good news: we may have a MAIS grad course in island biogeography on offer as from next September. Courtesy of Dr Marina Silva (Dept of Biology).

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1 Kirzner 2006
2 Whewell 1837, reprinted in Butts 1968, p 5
3 Von Neumann & Morgenstern 1944, p 25
4 Spellerberg & Sawyer 1999, p xi.
5 Quammen 1996, p 2.

Matt Funk wrote:

A formal invite to the department would be great; I'd be happy to deliver a Barbados/ Mustique/Sustainable Economic Development seminar....

Very exciting news about the Biogeograpical course offering, by the way, as the more I read about this conceptual tool, the more I understand the basis for Bowman's[1] conjecture: "Since biogeography holds the key to the survival of life, it deserves more attention." But I also believe his conjecture is ultimately incorrect, since I have also become more acutely aware that 'Biogeography' does not exist. And it is in fact unfortunate that there are many who mistakenly believe that it (and every other subject matter) exists. I'm sure you will all recall my emphasis on Popper's contention that subject matters do not exist;[2] please consider this notion yet again in this light:

***"I**t is easy to call for interdisciplinary syntheses, but will anyone respond? Scientists know how to train the young in narrowly focused work; but how do you teach people to stitch together established specialities that perhaps should not have been separated in the first place? Early in this century the specialities of biology and chemistry were joined to form biochemistry; similarly, economics and ecology are now in the process of being combined into ecological economics.*

My first attempt at interdisciplinary analysis led to an essay, "The Tragedy of the Commons." Since it first appeared in Science 25 years ago, it has been included in anthologies on ecology, environmentalism, health care, economics, population studies, law, political science, philosophy, ethics, geography, psychology, and sociology. It became required reading for a generation of students and teachers seeking to meld multiple disciplines in order to come up with better ways to live in balance with the environment.

I did not start out intending to forge an interdisciplinary link, but rather to present a retiring president's address to the Pacific division of the American Association for the Advancement of Science. But even after six revisions, each quite different from the one before, my summary of an ecologist's view of the human overpopulation problem would not crystallize. Repeatedly, I found fault with my own conclusions."[3]

The reason I say that it is unfortunate that "Biogeography" exists, is because its methods are absolutely *essential* to understanding "island studies," and it is very easy to see how many scholars may never dig into this "specialty". It is rather ironic that Spellerberg & Sawyer's[4] *An Introduction to Applied Biogeography* (the best introduction I have been able to discover) reaches the same conclusion (Indeed, it seems rather lucky that I stumbled into it. I've attached Hardin 1998 (which contains the citation above) and Hardin 1968.

Again, *there are only problems, and our urge to solve them*. If we must insist on subject matters, there is only one subject and it is called 'Nature' or perhaps 'Biology,' and all other problems fit into these laws, as even art and even the laws of physics must be held within the biological realm, since biological organisms form, evaluate, and utilize both the laws of physics and works of art.

Remember, Darwin was not a 'evolutionary biologist' or even a 'biologist,' he was a *Naturalist*. One of the most influential books he read while onboard *The Beagle* was a work by a so-called economist (Malthus, whom also happened to influence Lloyd, of which more to follow), and don't forget that *he* borrowed the concept of the survival of the fittest from Adam Smith, not the other way around. How many 'economists' today take time to seek out relevant works in 'evolutionary biology'? How many biologist read economics? True, the answer to both questions is "far more than ten years ago," but, as Hardin noted above (and Popper insisted everwhere), perhaps these 'subjects' *should not have been separated in the first place*. I will also suggest that it is no coincidence that, although 'The Tragedy of the Commons' is cited by economists more often than any other 'specialist,' (Hardin 1968 is also the single-most cited article in so-called 'ecological economics')

1 1994.

2 See: *Scientific Method*

3 Hardin 1998. Also see: *Tragedy of the Commons*

4 1999

and that Hardin was a biologist.

Another important element I will briefly share is this: If a scholar does not completely understand and accept the fundamentals of what we refer to as evolutionary biology, very close to nothing else will be understood, and his or her analysis is likely to demonstrate this deficit. I believe it may be unfortunate that one may be conferred with a PhD in 'Economics' (and every other social science, for that matter) without first (or concurrently) producing a PhD thesis in Biology (and preferably evolutionary biology,[1] or perhaps at the very least, something like 'evolutionary game theory'),[2] as I have discovered that *economics without evolutionary biology is about as effective as letters without a language*. The famous evolutionary geneticist Theodosius Dobzhansky remarked that, "nothing in biology makes sense except in the light of evolution,"[3] but – perhaps as an 'evolutionary geneticist' – he was only able to see the tip of the iceberg, because *nothing on Earth makes sense except in the light of evolution!*

I would like you all to carefully consider the six pages which make up Hardin 1968: I submit that if, for example, we had (1) read and discussed these six pages, and (2) agreed to accept the central thesis, (which I realize may not have occurred) then (3) we would have systematically provided solutions for very close to 100% of the problems which we had grappled with many – if not most – of our seminars for the past year. Yes, it is true that one *may* endeavour to formulate arguments based upon what amount to, essentially, religious grounds (such as a belief in the redistribution of wealth and so-called 'inalienable, global human' rights – of course just who or how the wealth is to be redistributed and how these 'global' rights are to be insured is another story), but the burden of proof will be heavy on their hands, as the empirical evidence in favour of evolutionary biology outweighs the empirical evidence demonstrating the existence of god/s.

If you decide to accept and utilize the arguments I'm submitting, and should find yourself criticized for being a 'Social Darwinist' kindly thank your critic for essentially calling you a 'naturalist,' because what he or she has unwittingly stated is that your argements are *logical, sound, rational*, and founded upon fact, not fiction. You might also want to remark that, since Adam Smith had formulated 'Darwinism' in 1776 (*On the Wealth of Nations*), if there was any name-calling to done along these lines, it is to call Darwin a "Natural Smithian," or, to go with the title of his book instead, a "Natural Wealthiest!"

Finally, please consider [the ABSTRACT], for I have found that the deep roots of religion and 'social norms' may combine to make *nothing more difficult* than to always bear [it] in mind…
And please do consider this carefully, for in this light you will find *cooperative behaviour*, *kin selection*, *reciprocity*, etc, but you will not find *social justice*. For, once again, who do you propose would administer this 'social justice'? The wise owl? The noble lion? Ah, but some will say, 'but we are *different*!' Somehow, one single species on Earth (humans) is different than all of the rest. Well, I'm afraid, once again, the burden of proof in this argument is, once again, on their hands,[4] for, again, the argument is essentially religious/irrational.[5] When Nietzsche said "God is dead," what he was trying to say was God will not protect your nest, God will not collect insects for you, money does not grow on trees, etc. - you must *fight* for survival (including your family's survival,

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1 (a) Among the things that science does know, evolution is about as certain as anything we know (Dawkins 2004). (b) The two basic questions in evolutionary biology are (1) how does evolution occur and (2) why does evolution occur? The first is a question of mechanisms and the second is a question of influences on those mechanisms (Grant 1998, p 1).

2 See Cressman 1996, Kolstad 2007, Sigmund & Nowak 1999, Stumpf 2001, Vincent 1996, and many excellent works by Weibull.

3 Wilson 2006, p 1479.

4 I am aware that the conclusions arrived at in this work will be denounced by some as highly irreligious; but he who denounces them is bound to shew why it is more irreligious to explain the origin of man as a distinct species by descent from some lower form, through the laws of variation and natural selection, than to explain the birth of the individual through the laws of ordinary reproduction (Darwin 1883, p 1242).

5 Those whom we called brutes had their revenge when Darwin shewed us that they are our cousins (Shaw 1903, ln 129).

your community's survival, your nation's survival, etc.). For those not fortunate enough to have studied the 'subject' of 'evolutionary biology', the *inalienable survival instinct* is known and universally accepted (with the exception of those whom failed in this course of study) as *The Ground Zero Premise,*[1] which, even Bertrand Russell, perhaps the greatest logician of the past century, was not able to fully grasp.[2] And yes, more organisms will perish than will survive (and this holds true for *every* species, including ants, bees, birds, humans, hogs, fish, dragonflies, etc.).

I would also like to suggest that *Tragedy of the Commons* serve as a required text for the Introduction to Island Studies course, as this phrase serves as useful shorthand when it is fully understood, and may help accelerate the learning process when it comes to understanding islands, and thus, understanding the world in which we live.

I Hope you all find this more interesting than tedious; I'm interested and open to any comments and criticisms you may have to offer (including comments or criticisms from Dr Silva and/or other members of our biology department!). I've also CC'd Faiz since I value his criticism and suspect he may strongly disagree; if someone is brave enough to forward to Ariana (I do not have her email), I suspect she may disagree even more adamantly…

Hope to see you all on Monday…Matt

PS: I have attached a third Hardin paper (1974) which may also brew interesting discussions over coffee, as well as an excellent PNAS paper(which I have found to be the single best source for my research purposes) from last week, which, I believe demonstrates how relevant Hardin is yet today. Note the first citation in this PNAS paper is Hardin 1968. I will also add that this citation is *incorrect*, or, at the very least, inadequate, since Hardin did *not* in fact first formulate "The Tragedy of the Commons." - Hardin's work was based upon a much earlier finding by Oxford economist, WF Lloyd (1833), whose work I have also attached; Lloyd's promethean vision was extraordinary.[3]

Bullshit

(a) One of the most salient features of our culture is that there is so much bullshit. Everyone knows this. Each of us contributes his share. But we tend to take the situation for granted. Most people are rather confident of their ability to recognize bullshit and to avoid being taken in by it. So the phenomenon has not aroused much deliberate concern, nor attracted much sustained inquiry. In consequence, we have no clear understanding of what bullshit is, why there is so much of it, or what functions it serves. And we lack a conscientiously developed appreciation of what it means to us. In other words, we have no theory.[4]

(b) Another worthwhile source is the title essay in *The Prevalence of Humbug* by Max Black [(1985)]. Am uncertain just how close in meaning the word *humbug* is to the word *bullshit*. Of course, the words are not freely and fully interchangeable; it is clear that they are used differently. But the difference appears on the whole to have more to do with considerations of gentility, and certain other rhetorical parameters, than with the strictly literal modes of significance that concerns me most.. It is more polite, as well as less intense, to say "Humbug!" than to say "Bullshit!" For the sake of this discussion, I shall assume that there is no other important difference between the two.[5]

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1 See: *Ground Zero Premise*

2 Our instinctive apparatus consists of two parts -- the one tending to further our own life and that of our descendants, the other tending to thwart the lives of supposed rivals. The first includes the joy of life, and love, and art, which is psychologically an offshoot of love. The second includes competition, patriotism, and war. Conventional morality does everything to suppress the first and encourage the second. True morality would do the exact opposite. Our dealings with those whom we love may be safely left to instinct; it is our dealings with those whom we hate that ought to be brought under the dominion of reason. In the modern world, those whom we effectively hate are distant groups, especially foreign nations. We conceive them abstractly, and deceive ourselves into the belief that acts which are really embodiments of hatred are done from love of justice or some such lofty motive (Russell 1928, p 13).

3 Funk 2008c, appendix iv

4 Frankfurt 2005, p 1

5 Ibid, pp 4-6

Cognative Dissonance

(a) The strongest guard is placed at the gateway to nothing… because the condition of emptiness is too shameful to be divulged.[1]

(b) Also see Festinger 1957.

Consilience

(a) Of the two major methods for inferring history from single configurations, consilience calls upon a greater range of evidence. This word, coined by William Whewell in 1840, means "jumping together." By this term, Whewell referred to proof by coordination of so many otherwise unrelated consequences under a single causal explanation that no other organization of data seems conceivable. In a sense, consilience defines the larger method underlying all Darwin's inference from historical records In a more specific context, I use consilience… for Darwin's principal tactic of bringing so many different points of evidence to bear on a single subject, that history wins assent as an explanation by overwhelming confirmation and unique coordination.[2]

Cultural Evolution

(a) Theoretical models of cultural transmission and observations of the development of societies suggest that patterns in cultural evolution do occur.… Cultural change, like genetic evolution, can follow theoretically derived patterns.[3]

(b) It may be that cultural process will often mimic genetic ones; but there is one distinction which needs to be made between kinds of cultural inheritance. First, consider a case in which all children acquire some trait by imitating their mothers, and in which mothers pass n the trait by imitating their mothers, and in which mothers pass on the trait which they themselves acquired. In the evolution of such traits, 'fitness' would be measured by the Darwinian fitness of mothers; those traits would increase which enabled their possessors to survive and have more children. At the opposite extreme, suppose that each child acquires some trait by imitating a mentor who is not a parent, but who is judged to be 'successful' by some criterion. Traits will then increases which ensure 'success', however that is measured. Since the criteria of success are themselves to some degree culturally determined, a much more complex, but perhaps more realistic, process is involved.[4]

Darwinian Fitness

(a) The term Darwinian fitness refers to the capacity of a variant type to invade and displace the resident population in competition for available resources (Demetrius & Ziehe 2007, *abstract*).[5]

(b) Darwinian fitness of a biological trait refers to the contribution to successive generations made by individuals possessing the trait. This contribution depends on the age-specific fecundity and mortality of the individuals in the population. …For human populations, …two [examples] of Darwinian fitness [measurements are] *the Malthusian parameter*, which describes the rate of increase of the actual population size, and *entropy* which describes the rate of increase of the effective population size (Demetrius et. al. 1984, *abstract*).[6]

(c) Imagine that two… [people] are contesting a resource of value *V*. By 'value', I mean that the Darwinian fitness of an individual obtaining the resource would be increased by *V*. Note that the individual which does not obtain the resource need not have zero fitness. Imagine, for example, that the 'resourse' is a territory in a favourable habitat, and that there is adequate space in a less favourable habitat in which losers can breed. Suppose, also, that animals with a territory in a

1 Fitzgerald 1934, p 60
2 Gould 2002, p 104
3 Rogers & Ehrlich 2008, p 3416.
4 Maynard Smith 1982, p 172.
5 Demetrius & Ziehe 2007, *abstract*
6 Demetrius et. al. 1984, *abstract*

favourable habitat produce, on average, 5 offspging, and that those breeding in the less favourable habitat produce 3 offspring. Then *V* would equal 5-3=2 offspring. Thus *V* is the *gain* in fitness to the winner, and losers do not have zero fitness.[1]

(d) Evolutionary game theoretic models may often be given both a biological and a cultural evolutionary interpretation. In the biological interpretation, the numeric quantities which play a role analogous to "utility" in traditional game theory correspond to the fitness (typically Darwinian fitness) of individuals. How does one interpret "fitness" in the cultural evolutionary interpretation?

In many cases, fitness in cultural evolutionary interpretations of evolutionary game theoretic models directly measures some objective quantity of which it can be safely assumed that (1) individuals always want more rather than less and (2) interpersonal comparisons are meaningful. Depending on the particular problem modeled, money, slices of cake, or amount of land would be appropriate cultural evolutionary interpretations of fitness (SEP 2002).

(e) In traditional game theory, a strategy's fitness was measured by the expected utility it had for the individual in question. Yet evolutionary game theory seeks to describe individuals of limited rationality (commonly known as "boundedly rational" individuals), and the utility theory employed in traditional game theory assumes highly rational individuals. Consequently, the utility theory used in traditional game theory cannot simply be carried over to evolutionary game theory. One must develop an alternate theory of utility/fitness, one compatible with the bounded rationality of individuals, that is sufficient to define a utility measure adequate for the application of evolutionary game theory to cultural evolution (SEP 2002).

Denaturalization of Economics

[During] the late eighteenth century and the mid-nineteenth, … economic theorists [came] to posit and identify an economy as a distinct entity and maintain that it was subject, not to natural processes, but to the operation of human laws and agency. …Until the mid-nineteenth century, economic theorists regarded the phenomena of their discourse as part of the same natural work studied by natural philosophers. *Not only were economic phenomena understood mostly by drawing analogies to natural phenomena, but they were also viewed as contiguous with nature*. Economic discourse was, in short, considered to be part of natural philosophy and not, as we would now deem it, a *social* or *human* science. It did not then address an autonomous sphere as it does today.

How and why political economists came to see the economic domain as severed from the physical world, as the product of human action, human deliberation, and human institutions, …[is] the… *denaturalization* of the economic order.[2]

Economic Power

(a) *Economic power, unlike military power, is not primary, but derivative.* Within one State, it depends on law; in international dealings it is only on minor issues that it depends on law, but *when large issues are involved it depends upon war or the threat of war*. It has been customary to accept economic power without analysis, and this has led, in modern times, to an undue emphasis upon economics, as opposed to war and propaganda, in the causal interpretation of history.

Apart from the economic power of labour, all other economic power, in its ultimate analysis, consists in being able to decide, by the use of armed force if necessary, who shall be allowed to stand upon a given piece of land and to put things into it and take things from it.[3]

(b) The very nature of economics is rooted in nationalism….It would never have been developed except in the hope of throwing light upon questions of policy, but policy means nothing unless there is authority to carry it out, and authorities are national.[4]

(c) Power Projection: The ability of a nation to apply all or some of its elements of national power - political, economic, informational, or military - to rapidly and effectively deploy and sustain forces

1 Italics Maynard Smith's, 1982, pp 11-12.

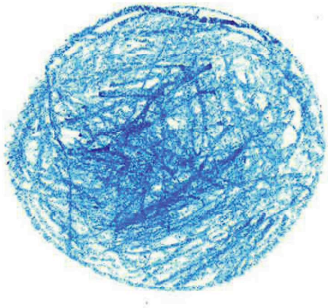
2 Italics mine, Schabas 2005, p 2.

3 All italics mine, Russell 1928, p 95

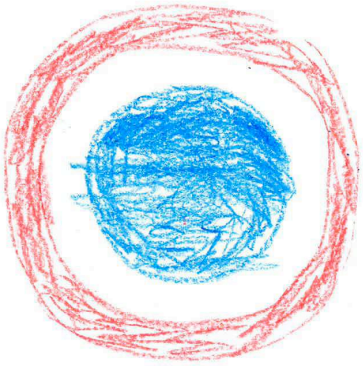
4 Robinson 1962, p 117

in and from multiple dispersed locations to respond to crises, to contribute to deterrence, and to enhance regional stability.[1]
(d) Also see: *Land Power*

The Earth



The beautiful[2] orb represents the theoretical framework of so-called "ecological economics." The blue represents the Earth, the biosphere and all of its inter-connected systems, which are, naturally, beholden to the second law of thermodynamics. Although practicioners 'ecological economics' refer to this as a 'whole-systems,' approach; as you will see in the next figure, they 'forgot' two mission-critical levels of uncertainty in their 'system' See: UNIVERSAL THEORY OF VALUE: Axioms I-III.[3]



This beautiful[4] orb represents the theoretical framework of sound analysis informed by our universal theory of value based upon relative insularity. Note that, in addition to the axioms represented in the previous artwork (the beautiful, but *unprotected* blue orb), this framework *also* recognizes two additional, fundamental assumptions: (1) *political uncertainty* (white), and (2) *planetary uncertainty* (red). As you can see, this is the 'bigger picture,' or truly 'whole systems analysis' so to speak. See: UNIVERSAL THEORY OF VALUE: AXIOMS I-VI.[5]

1 The United States Department of Defense 2001.
2 Artwork courtesy of William Matthew Funk © 2008.
3 See APPENDIX I.
4 Artwork courtesy of William Matthew Funk © 2008.
5 See APPENDIX I.

EISG **Earth Island Survival Game**

This asymmetric, non-cooperative game[1] models *The Problem of Sustainable Economic Development* on Earth, and, theoretically any/all inhabitable planets. Thus our master island set includes all known planets capable of supporting human life. To date this set includes a single element, the island of Earth: $\{I_1\}$. All bio-geo-politico regions on Earth are distinguishable by various degrees of relative insularity, and thus, all regions on Earth – islands, continents, and oceans alike – make up the 'island' sub-set: $\{i_1, i_2, i_{3,\ldots}i_n\}$. In other words: $\{i_1, i_2, i_{3,\ldots}i_n\} \subseteq \{I_1\}$.

Our Axioms, UTV, and the *Funk-Zweikampf Formula* offer the 'Rules of he Game.'

We animate our axioms by modelling sustainable economic development by playing the game: We divide earth into geo-political island 'players': P_1: *Relatively Insular States* (RIS, i.e. high I_R), and P_2: *Global Economic Military Superpowers* (GEMS, i.e. low I_R). In light of the inherent and inescapable political and planetary uncertainties outlined in our axioms, our UTV reveals divergent, optimizing strategies (ESS) for GEMS and RIS economic development. We discover pure GEMS and pure RIS ESS are antithetical, yet also discover these naturally opposing, ESS represent the most tenable, rational solution-set possible (for the earth): GEMS = S_1: (*Maximum Economic Development),* and RIS = S_2: (*Maximum Ecological Preservation)*. We note our solution represents the Prisoner's Dilemma. We also note, that, ceteris paribus, based upon revealed 20th and 21st century preferences, RIS strategy has been sub-optimal/irrational (S_1). A stable, strategic equilibrium is attained when players pursue respective rational, opposing evolutionary stable economic development strategies (ESS); this equilibrium offers optimal windfall: surplus value is created (RIS-driven *ecological* protection and GEMS-driven *planetary* protection). In essence, this non-cooperative, strategic equilibrium paves the way for rational, mutually beneficial, cooperative behaviour, and yields higher ecological and planetary insularities, and thus surplus economic and biologic value: RIS maximize self-interests by maximizing their sustainable economic development opportunities by cooperating, forming coalitions, and struggling for greater *ecological and economic insularity* (ecological and economic preservation); GEMS maximize self-interests by maximizing their sustainable economic development opportunities by fighting for *globalized economic development* ('globalization') *and planetary insularity* (global defence, extraterrestrial exploration, and extra-planetary threat mitigation, such as the finance, R&D, and deployment of NEO deflectors, SHIELDS, Asteroid Tugboats, etc.). Surplus value is maximized through strategic transparency: *If* (1) all players recognize the value of respective, opposing, and antithetical, rational strategies, and employ the ESS, *then* (2) all players maximize Darwinian fitness, interact and negotiate more rationally, more efficiently, more peacefully, *and* (3) maximum global sustainable economic development is achieved and human survival prospects are maximized. Darwinian fitness is measured on a global level by the collective ability to (1) protect and sustain natural resources *and* (2) protect and sustain the planet from nuclear exchange and extra-planetary threats. We demonstrate our solution is as powerful at local and individual levels as it is at the national and regional levels, including its use as a tool for strategic decision-making under uncertainty and variable insularity. Furthermore, our game illuminates a deeply entrenched, systemic RIS strategic error which reflects the false application of generally misunderstood economic principles and fundamental constitutional flaws which promote *The Tragedy of the Commons.* As we play the game, we discover our UTV promotes maximum global insularity, and thus offers a tenable solution to *The Problem of Sustainable Development.*

1 Although haste may bring one to a premature conclusion that our game could 'be' or 'become' cooperative, it is in inevidably non-cooperative, as we are (1) unable to 'communicate' with the future (i.e. planetary uncertainties), and (2) 'communicate' with other nation's *intentions* (i.e. political uncertainties). See: *non-cooperative game*

Einfühlung

The initial stage, the act of conceiving or inventing a theory, seems to me neither to call for logical analysis nor to be susceptible of it. The question how it happens that a new idea occurs to a man—whether it is a musical theme, a dramatic conflict, or a scientific theory—may be of great interest to empirical psychology; but it is irrelevant to the logical analysis of scientific knowledge. This latter is concerned not with questions of fact (Kant's quid facti?), but only with questions of justification or validity (Kant's quid juris?). Its questions are of the following kind. Can a statement be justified? And if so, how? Is it testable? Is it logically dependent on certain other statements? Or does it perhaps contradict them? In order that a statement may be logically examined in this way, it must already have been presented to us. Someone must have formulated it, and submitted it to logical examination.

Accordingly I shall distinguish sharply between the process of conceiving a new idea, and the methods and results of examining it logically. As to the task of the logic of knowledge—in contradistinction to the psychology of knowledge—I shall proceed on the assumption that it consists solely in investigating the methods employed in those systematic tests to which every new idea must be subjected if it is to be seriously entertained.

Some might object that it would be more to the purpose to regard it as the business of epistemology to produce what has been called a 'rational reconstruction' of the steps that have led the scientist to a discovery—to the finding of some new truth. But the question is: what, precisely, do we want to reconstruct? If it is the processes involved in the stimulation and release of an inspiration which are to be reconstructed, then I should refuse to take it as the task of the logic of knowledge. Such processes are the concern of empirical psychology but hardly of logic. It is another matter if we want to reconstruct rationally the subsequent tests whereby the inspiration may be discovered to be a discovery, or become known to be knowledge. In so far as the scientist critically judges, alters, or rejects his own inspiration we may, if we like, regard the methodological analysis undertaken here as a kind of 'rational reconstruction' of the corresponding thought processes. But this reconstruction would not describe these processes as they actually happen: it can give only a logical skeleton of the procedure of testing. Still, this is perhaps all that is meant by those who speak of a 'rational reconstruction' of the ways in which we gain knowledge.

It so happens that my arguments in this book are quite independent of this problem. However, my view of the matter, for what it is worth, is that there is no such thing as a logical method of having new ideas, or a logical reconstruction of this process. My view may be expressed by saying that every discovery contains 'an irrational element', or 'a creative intuition', in Bergson's sense. In a similar way Einstein speaks of the 'search for those highly universal laws . . . from which a picture of the world can be obtained by pure deduction. There is no logical path', he says, 'leading to these . . . laws. They can only be reached by intuition, based upon something like an intellectual love ('Einfühlung') of the objects of experience.'[1]

Equilibrium

(a) The notion of an equilibrium point… yields a generalization of the concept of the solution of a two-person…game. It turns out that the set of equilibrium points of a two-person…game is simply the set of all pairs of opposing "good strategies."[2]

(b) A Nash equilibrium is defined as a strategy combination with the property that every player's strategy is a *best reply* to the other players' strategies. This of course is true also for Nash equilibria in *mixed* strategies. But in the latter case, besides his mixed *equilibrium strategy,* each player will also have infinitely many *alternative* strategies that are his *best replies* to the other players' strategies. This will make such equilibria potentially unstable.[3]

1 Popper 1959, pp 7-9.

2 Nash 1950, p 286.

3 Harsanyi 1994, p 167.

Evolutionary Game Theory

(a) Evolutionary theorizing has a long tradition in economics. Only recently has this approach been brought into the framework of noncooperative game theory. Evolutionary game theory studies the robustness of strategic behavior with respect to evolutionary forces in the context of games played many times in large populations of boundedly rational agents. This new strand in economic theory has… opened up doors to other social sciences.[1]

(b) Nowadays it almost seems to be obvious that the correct application of Darwinism to problems of social interaction among animals requires the use of non-cooperative game theory, but when this idea was first conceived it was a revolutionary great insight.[2]

ESS **Evolutionary Stable Strategy**

(a) Maynard Smith and Price (1973) introduced the concept of an evolutionarily stable strategy (ESS). Initially they were not aware of the relationship between the concept of an ESS and that of a Nash equilibrium. Rational game theory looked at mixed strategies as produced by conscious randomization. Nash's interpretation of a mixed equilibrium as a mass action phenomenon was buried in his unpublished dissertation and not found in textbooks on game theory. In biology the mass action interpretation is very natural and guided the work on evolutionary stability already from its beginning.… They defined an ESS as a strategy prescribed by a symmetric equilibrium point.[3]

(b) One of the great discoveries of game theory came in the early seventies, when the biologists John Maynard Smith and George Price realized that strategic equilibrium in games and population equilibrium in the living world are defined by the same equations. Evolution be it genetic or memetic – leads to strategic equilibrium.[4]

(c) The first explicit use of game theory terminology in this context was by Hamilton (1967), who sought for an 'unbeatable strategy' for the sex ratio when there is local competition for mates. Hamilton's 'unbeatable strategy' is essentially the same as an ESS as defined by Maynard Smith & Price (1973).[5]

(d) An ESS is a strategy such that, if all the members of a population adopt it, then no mutant strategy could invade the population under the influence of natural selection.[6]

(e) A theoretical analysis is made of the evolution of behavioural strategies in contest situations. It is assumed that behaviour will evolve so as to maximize individual fitness. If so, a population will evolve an 'evolutionarily stable strategy', or ESS, which can be defined as a strategy such that, if all members of a population adopt it, no 'mutant' strategy can do better. A number of simple models of contest situations are analysed from this point of view. It is concluded that in 'symmetric' contests the ESS is likely to be a 'mixed' strategy; that is, either the population will be genetically polymorphic or individuals will be behaviourally variable. *Most real contests are probably asymmetric, either in pay-off to the contestants, or in size or weapons, or in some 'uncorrelated' fashion; i.e. in a fashion which does not substantially bias either the pay-offs or the likely outcome of an escalated contest. An example of an uncorrelated asymmetry is that between the 'discoverer' of a resource and a 'late-comer'*. It is shown that the ESS in asymmetric contests will usually be to permit the asymmetric cue to settle the contest without escalation. Escalated contests will, however, occur if information to the contestants about the asymmetry is imperfect.[7]

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1 Weibull 2002, abstract.
2 Selten 1994, p 168.
3 Selten 1994, p 168.
4 Aumann 2005, p 352
5 Maynard Smith 1982, p 2
6 Ibid, p 10
7 Italics mine, Maynard Smith & Parker 1976, abstract

Fortuna, Fortune

(1) She was to be found on the back of many Roman coins, holding a cornucopia in one hand and a rudder in the other. She was beautiful and usually wore a light tunic and a coy smile. Her name was Fortune. She had originated as a fertility goddess, the firstborn of Jupiter, and was honoured with a festival on the 25th of May and with temples throughout Italy, visited by the barren and farmers in search of rain. But gradually her remit had widened, she had become associated with money, advancement, love and health. The cornucopia was a symbol of her power to bestow favours, the rudder's course, maintaining an imperturbable smile as she watched us choke to death on a fishbone or disappear in a landslide.

(b) Because we are injured most by what we do not expect, and because we must expect everything ('There is nothing which Fortune dies not dare'), we must, proposed Seneca, hold the possibility of disaster in mind at all times. No one should undertake a journey by car, or walk down the stairs, or say goodbye to a friend, without an awareness, which Seneca would have wished to be neither gruesome nor unnecessarily dramatic, of fatal possibilities (Botton 2000, p 87).

(c) When a wise man is told that his suitcase has been lost in transit, he will resign himself in seconds to the fact. Seneca reported how the founder of Stoicism had behaved upon the loss of his possessions:

When Zeno received news of a shipwreck and heard that all his luggage had been sunk, he said, 'Fortune bids me to be a less encumbered philosopher' (Ibid, p 108).

(d) Seneca's wisdom was more than theoretical. Exiled to Corsica, he found himself abruptly stripped of all luxuries. The island had been a Roman possession since 238 BC, but it had not enjoyed the benefits of civilization. The Romans on the island rarely settled outside two colonies on the east coast, Aleria and Mariana, and it was unlikely that Seneca was allowed to inhabit them, for he complained of hearing only 'barbaric speech' around him, and was associated with a forbidding building near Luri at the northing tip of the island known since ancient times as 'Seneca's Tower'.

Conditions must have contrasted painfully with life in Rome. But in a letter to his mother, the former wealthy statesman explained that he had managed to accommodate himself to his circumstances, thanks to years of morning [] and periods of thin soup:

> Never did I trust Fortune, even when she seemed to be offering money, public office, influence – I relegated to a place from which she could take them back without disturbing me. Between them and me, I have kept a wide gap, and so she has merely *taken* them, not *torn* them from me (Ibid, p 99).

(e) [The wise] will start each day with the thought… Fortune gives us nothing which we can really own. Nothing, whether public or private, is stable; the destinies of men, no less than those of cities, are in a whirl. Whatever structure has been reared by a long sequence of years, at the cost of great toil and through the great kindness of the gods, is scattered and dispersed in a single day. No, he who has said 'a day' has granted too long a postponement to swift misfortune; an hour, an instant of time, suffices for the overthrow of empires. How often have cities in Asia, how often in Achaia, been laid low by a single shock of earthquake? How many towns in Syria, how many in Macedonia, have been swallowed up? How often has this kind of devastation laid Cyprus in ruins? We live in the middle of things which have all been destined to die. Mortal have you been born, to mortals have you given birth. Reckon on everything, expect everything (Botton 2000, p 91).

Funk-Zweikampf Formula

Our formula is derived from the logical and theoretical implications of our unified theory of value, based upon our observation that *Value* (V) is a derivative function of *relative insularity* (I_R): $V=f'(I_R)$.

I_R is determined with multiple regression analysis of: *Military Power (GDP + population + annual defense spending + soldiers + NPT Treaty status),*[1] *Land Area (km²), Distance from nearest Continent (km),*

1 The main metrics of world power… are gross domestic product (GDP), population, defense spending, and a less precise factor that includes innovation in technology. Power is summed as a percentage of total global power: Fourteen nations hold at least a 1 percent share. The United States holds about 20 percent of global power; the

Distance from nearest Neighbour (km), Nearest Neighbour Military Power, Nearest Neighbour Land Area (km^2), Elevation (m), Renewable Water Resources (m^3/person/year), Food Imports (%), Population Density (p/km^2), Exclusive Economic Zone (km^2), International Airports (n), Deep Water Harbours (n), Marine Links, (n) Land Links (n), Forests (% km^2), Fishery (Kg/person/year) Commercial Agriculture (% km^2), Organic Agriculture (% km^2), Nature Preserve (%k m^2), Tourist Visits (Land Area/n), Irrigation I (m^3/person/year) Irrigation II (% km^2), Industrial Water Consumption (m^3/person/year), Organic Water Pollutants (Land Area/ grammes/p/day), and Cultural Homogeneity (%). Depending upon research objectives (especially with relatively small islands), two additional qualitative inputs – Sovereign Status and Constitutional balance – may be considered. Our formula's multiple regression output offers Darwinian fitness – the economic and biologic value for each corresponding politico-biogeographic 'island.'[1] This value suggests *resource holding power* (RHP) – the ability for citizens of each, corresponding politico-biogeopraphic 'island' to protect, maintain, and hold (by *Land Power* and sustainable harvest practices alike, for example), *property rights* (Land Area, EEZ, Forests, Renewable Water Resources, Nature Preserves, etc.).

Although the scope of our inquire is limited to human interests, a reformulation for other species may be derived with modest alterations – *military power*, for example, is re-formulated as *hunting power* (*size* + *population*), and all non purely biogeographic values (EEZ, land links, airports, etc.) are merely excluded.

Game

First, one must distinguish between the abstract concept of a game, and the individual plays of that game. The game is simply the totality of the rules which describe it. Every particular instance at which the game is played – in a particular way – from beginning to end, is a play.

Second, the corresponding distinction should be made for the moves, which are the component elements of the game. A move is the occasion of a choice between various alternatives, to be made either by one of the players, or by some device subject to chance, under conditions precisely prescribed by the rules of the game. The move is nothing but this abstract "occasion," with the attendant details of description – i.e. a component of the game. The specific alternative chosen in a concrete instance – i.e. in a concrete play – is the choice. Thus the moves are related to the choices in the same way as the game is to the play. The game consists of a sequence of moves, and the play of a sequence of choices.

Finally, the rules of the game should not be confused with the strategies of the players... The distinctions which we stress must be clear from the start. Each player selects his strategy – i.e. the general principles governing his choices – freely. While any particular strategy may be good or bad – provided that these concepts can be interpreted in an exact sense – it is within the player's discretion to use or to reject it. The rules of the game, however, are absolute commands. If they are infringed, then the whole transaction by definition ceases to be the game described by those rules.[2]

Game Theory

(a) It is conventional to call these situations "games" when they are being studied from an abstract mathematical viewpoint. Here the original situation is reduced to a mathematical description, or model. In the abstract "game" formulation only the minimum quantity of information necessary for

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European Union (considered as a unified actor) and China, about 14 percent each. India holds about 9 percent. Brazil, South Korea, and Russia hold about 2 percent each. In moving toward 2015, the United States will first gain power, then decline somewhat, ending up at about where it is now. The EU, however, will lose power, as will all non-U.S. members of the G-8. The gainers will be China and India. The assessment identifies possible alliances that could match the power of the United States acting alone or with its traditional allies. It also examines the most likely locations for future conflict. Asia is by far the most dangerous region, with six of the eight conflict-prone bilateral balances involving China (Treverton & Jones 2005).

1 See *Island*

2 Von Neumann & Morgenstern 1944, p 49

the solution is retained. What the actual alternative courses of action are among which the individuals must choose is not regarded as essential information. These alternatives are treated as abstract objects without special qualities and are called "strategies." Only the attitudes (like or dislike) of the two individuals towards the ultimate results of the use of the various possible opposing pairs of strategies are considered.[1]

(b) A game is non-cooperative if it is impossible for the players to communicate or collaborate in any way (Ibid, pp 128-129).

(c) Game theory is a theory of *strategic interaction*. That is to say, it is a theory of *rational behavior* in social situations in which each player has to choose his moves on the basis of what he thinks the other players' *countermoves* are likely to be.

After preliminary work by a number of other distinguished mathematicians and economists, game theory as a systematic theory started with von Neumann and Morgenstern's book, *Theory of Games and Economic Behavior,* published in 1944. One source of their theory was reflection on *games of strategy* such as chess and poker. But it was meant to help us in defining rational behavior also in *real-life* economic, political, and other social situations.[2]

(d) Game theory concerns the behaviour of decision makers whose decisions affect each other. Its analysis is from a rational rather than a psychological or sociological viewpoint. It is indeed a sort of umbrella theory for the rational side of social science, where 'social' is interpreted broadly, to include human as well as non-human players (computers, animals, plants). Its methodologies apply in principle to all interactive situations, especially in economics, political science, evolutionary biology, and computer science. There are also important connections with accounting, statistics, the foundations of mathematics, social psychology, law, business, and branches of philosophy such as epistemology and ethics.[3]

GEMS **Globalized Economic Military Superpowers**

Presently, the USA represents the only true player in this arena, but our definition includes all five signatory members of the UK-USA agreement (UK, USA, Canada, Australia, and New Zealand), often referred to as AUSCANZUKUS, and six other nations which have developed, detonated, and presently maintain nuclear weapons (Russia, France, China, India, Pakistan, and North Korea).

Ground-Zero Premise

(i) Survival and reproduction is the basic, continuing, inescapable problem for all living organisms; life is at bottom a survival enterprise. It follows that survival is the… "problem" for human societies as well; it is a prerequisite for any other, more exalted objectives. Although the term "adaptation" is also familiar to social scientists, until recently it has been used only selectively, and often very imprecisely….Our economic and social life (and the motivations behind our revealed preferences and subjective utility assessments), not to mention the actions of modern governments… [is] either directly or indirectly related to the meeting of our basic survival needs.[4]

Hecatomb

"Hecatomb," an unfamiliar word in English, should enter the vocabulary of all evolutionists as a wonderfully appropriate description for this key aspect of Darwinism. A hecatomb I, literally, an offering of a hundred oxen in sacrifice. Yet, even in Homer, the word had come to designate any large number of deaths incurred as a sacrifice for some intended benefit – a good description of natural selection. And hecatomb trips so much more lightly off the tongue than "substitutional load."[5]

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1 Nash 1953, p 128

2 All italics Harsanyi's 1994, p 136

3 Aumann 2008

4 Corning 2000, abstract

5 Gould 2002, p 122

Historicism

(1) It will be enough if I say here that I mean by 'historicism' an approach to the social sciences which assumes that historical prediction is their principal aim, and which assumes that this aim is attainable by discovering the 'rhythms' or the 'patterns', the 'laws' or the 'trends' that underlie the evolution of history. Since I am convinced that such historicist doctrines of method are at bottom responsible for the unsatisfactory state of the theoretical social sciences…, my presentation of these doctrines is certainly not unbiased.[1]

Hollywood Economics

Hayek (1991) lamented the difficulty in distinguishing between economics and excrement, and Hemingway (1958) noted "The most essential gift for a good writer is a built-in, shock-proof, bullshit detector." In this spirit and within the context of Frankfurt's (2004) *Theory of Bullshit*, we have constructed a bullshit detector for economics. This apparatus is carefully calibrated to detect the Seven Deadly Sins of 'Hollywood Economics': Hubris, Intellectual Dishonesty, Greed, Mathematical Mania, Physics Fetishes, Conditions of Emptiness, and Sunspots. We trace the philosophical and methodological origin of these traits to its source, *The Problem of Induction*, then illustrate with examples from Plato to the present, including detailed analysis from the illuminating cases of Long Term Capital Management and William Stanley Jevons' sunspot theory.

Furthermore, we demonstrate the contemporary effectiveness of this apparatus by detecting hereto undetected economic bullshit, namely Arthur de Vany's (2004) *Hollywood Economics: How Extreme Uncertainty Shapes the Film Industry*. In the process, we falsify de Vany's '*Nobody knows anything*' theory and advance our replacement theory: *George Lucas*[2] *knows something*.[3]

Hyperbolic Discounting

It is well known from the literature that hyperbolically discounting agents tend to postpone actions into the future from an ex ante point of view, as declining discount rates imply a change of the relative weight of benefits and losses. It is also well known that naive agents tend to further procrastinate actions from an ex post point of view, as they are not aware of the time-inconsistency problem and that this outcome may be inefficient (e.g., Ackerlof 1991, O'Donoghue and Rabin 1999). Yet, the interesting result derived from the exposition so far is that, no matter whether agents are sophisticated or naive, they will never invest in environmental protection if agent 1 does not invest (Winker 2006, p 13).

I_n / i_n **Island**

(a) Islands are synecdoches: their understanding facilitates a 'coming to grips' with a more complex whole. They also act as advance indicators or extreme reproductions of what is future elsewhere. Crucial, new insights into evolutionary theory, and the realization of so much species differentiation on islands in modern zoogeography, are primarily due to the unwitting and haphazard stumbling of what, at first sight, may have appeared to be inconsequential, island-based, island-specific fieldwork. This includes such investigations as the study of Darwin's finches on the Galapagos Islands (Darwin 1859…) or Alfred Wallace's study of birds-of-paradise on the Aru Islands (Wallace,

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1 Popper 1957, p 17

2 I came to the conclusion after 'American Graffiti' that what's valuable for me is to set standards, not to show people the world the way it is…around the period of this realization…it came to me that there really was no modern use of mythology…The Western was possibly the last generically American fairy tale, telling us about our values. And once the Western disappeared, nothing has ever taken its place. In literature we were going off into science fiction…so that's when I started doing more strenuous research on fairy tales, folklore, and mythology, and I started reading Joe's books. Before that I hadn't read any of Joe's books…It was very eerie because in reading 'The Hero with a Thousand Faces' I began to realize that my first draft of 'Star Wars' was following classic motifs…so I modified my next draft [of 'Star Wars'] according to what I'd been learning about classical motifs and made it a little bit more consistent…I went on to read 'The Masks of God' and many other books (Larsen & Larsen, 2002, p 541).

3 Funk 2007a, abstract.

1880)… The forays of Bronislaw Malinowski amongst the Trobriand… Islanders of Papua New Guinea (1922), Margaret Mead to Samoa… (1928; 1934) and Raymond Firth to Tikopia (1936).[1]
(b) The foundation to our game theoretical approach to comparative island studies rests on the principles of set theory, and our primary island set includes all known planets capable of supporting human life. To date this set includes a single element, the island of Earth: $\{I_1\}$. All biogeographical regions on Earth are distinguishable to various degrees of relative insularity, and thus, *all* regions on Earth – islands, continents, and oceans alike – make up the sub-set: $\{i_1, i_2, i_{3, \ldots}i_n\}$. Thus, the 'islands' of Earth are a subset Earth Island: $\{i_1, i_2, i_{3, \ldots}i_n\} \subseteq \{I_1\}$.

ISG **Island Survival Game**

(a) An asymmetric, cooperative sub-game of the Earth Island Survival Game which models *The Problem of Sustainable Economic Development* on RIS. Darwinian fitness is measured by Resource Holding Power (RHP), the ability to achieve sustainable economic development by protecting and sustaining property and natural resource rights through time, and thus battling *The Tragedy of the Commons*. RIS are elements of the island set: $\{i_1, i_2, i_{3, \ldots}i_n\}$, and, like GEMS, are a sub-set of the island of Earth: $\{I_1\}$. In other words: $\{i_1, i_2, i_{3, \ldots}i_n\} \subseteq \{I_1\}$. Our Axioms (See Funk 2008e) offer the "Rules of he Game." Also see: *Earth Island Survival Game.*
(b) From: colin macintyre, To: Matt Funk, Date: Monday, July 21, 2008 03:22 pm
Hey Matt, Just finished reading the piece you wrote… Here are my thoughts…. Was the final answer that relative insularity promotes control over land use policies, which equates to ecological and economic health? [Yes Colin, *exactly*, sorry that wasn't clear!]

I liked the example of the Island Survival Games. Yes, the farmer would want to sustain and protect their farm for genetic survival. I never thought of it in terms of PEI's founder population decreasing, therefore it is an evolutionary unstable strategy driving the founder population extinct. (I am the founder population, and yes we are going extinct!). *I liked how you explained: Drastic reduction in relative insularity represents unstable evolutionary strategy*, and then used the Bridge as an example. *I agree Islanders evolved to live with the niches of insularity, because I feel it*. People from away feel that they are really far away from everything when they are here. Islanders don't feel like they are on the outskirts, because the Island feels like the center of the world. *It was a great Island Studies example, explaining how the problem of the Bridge represent the universal worldwide problem. PEI should conduct a carrying capacity study.* I didn't know about that point. Very interesting. *I think it is great that Mustique is the only known instance of ecologically planned development. It is excellent that you found out about it, and I am with you 100% ecological heath = economic health.*[2]
(c). Here's an example (rough-draft, keep in mind) of my introduction to the application of John Maynard Smith's *Evolution and Theory of Games* (1982) to the assessment of the quality of life on PEI. This analysis focuses on the quality of life on Prince Edward Island at the evolutionary level, and it presents a particular challenge since, as Richard Dawkins noted, "our brains are built to deal with events on radically different *timescales* from those that characterize evolutionary change" [1]. Indeed, analysis requires the adoption of the Iroquois Confederation concept of the *Seventh Generation*: that it takes seven generations of data to offer meaningful economic analysis when it comes to *The Problem of Sustainable Economic Development*. And although we might initially object that 'we' have even inhabited PEI for seven generations, or that even several thousand years of human life would be inadequate for analysis on an evolutionary time scale, our analysis of the evolutionary stability of the strategies which have and which continue to direct the quality of life on Prince Edward Island begins more than 10,500 years ago, and, we will demonstrate, offers a valuable portal for discovery. Building upon the foundation set by John von Neumann & Oscar Morgenstern's *Theory of Games and Economic Behaviour*, John Nash's early development of non-cooperative game theory, and many other notable game theorists , Smith & Price (1973) introduced the concept of an *Evolutionary Stable Strategy* (ESS), which John Maynard Smith fully developed in seminal *Evolution and Theory of Games*

1 Baldacchino 2007a, p 9.
2 MacIntyre 2008

(1982). This useful tool has much to offer economic analysis, the economic analysis of islands and other relatively insular states in particular. Moreover, once the relatively complex mathematical models have been digested and properly discarded, the ESS concept, and, moreover, it's applicability to PEI is very clear.

A 'stable' stragegy (we'll add the "evolutionary" element shortly) is, quite simply, an unbeatable strategy, a strategy which always results in victory. Children quickly learn, for example, that a stable strategy may be readily deployed in the game of tic-tack-toe by the player with the first move. In the game of chess, however, a stable strategy has eluded every Grand Master from Bobby Fischer to Boris Spassky. But, as it turns out, in many ways, the lives of humans, *especially those whom live on islands*, are not nearly as complex as the game of chess. This is primarily due to the fact that humans insulate themselves into distinct political communities (nations, states, provinces), and often further insulate themselves into biogeographical communities (such as islands, alpine regions, and even deserts). In short, our analysis is "easier on islands than on continents, because islands are [and/or have been] relatively free from the ebb and flow of genes."

Now we'll add the 'evolutionary' element to an illustration which may clarify the meaning of an ESS.

Imagine an uninhabited, one million acre island. On another island on the opposite side of the Atlantic, a king divides this island into ten, 100,000 acre farms, allots each farm to a single women from his vast (genetically speaking) kingdom, ships them across the Atlantic to the one million acre island, then lets the game of life begin. At this point, the 'game' begins, and play is observed at two levels: at the individual farm level, and island-wide as well . Each player "wins" or "loses" based upon their abilities to (1) survive and (2) resist 'invaders.'

From 8,600 B.C. to the 17th century various nomadic hunters, gatherers, and fishermen inhabited this island on a seasonal basis, but for simplicity's sake we'll refer to this group as the Mi'kmaq. During this period, although the natural resource base remained well below the island's carrying capacity, it would be incorrect to conclude that the Mi'kmaq executed an ESS, because an ESS for the sustainable economic development of islands requires it must thrwart *invasion* - and by "invasion" we mean we must be able to hold the resource.

Kuhnian

(a) *The Structure of Scientific Revolutions* by Thomas Kuhn was the most influential book on the nature of science in the second half of the twentieth century – and arguably, the entire twentieth century. Nevertheless, a reminder of the book's contents immediately makes this fact rather surprising. *Structure* purports to provide a general account of scientific change in 200 non-technical, lightly referenced pages, in the manner of an extended encyclopaedia entry, as the book was in fact originally conceived.[1]

(b) For Kuhn, science is simply good at solving its self-defined problems, whose purely technical nature led him to dub them 'puzzles'. But far from demoting the physical sciences, Kuhn was actually trying – as a latter-day Plato might – to insulate them from responsibility for real world effects, entanglement in which has historically prevented the social and biological science from taking full control of their inquiries.[2]

(c) -----Original Message-----

Greetings Dr Doherty....I am researching a theory that the rejection of Karl Popper's logic and methods and general acceptance (in a popular sense) of Thomas Kuhn's logic and methods have been detrimental to science, especially social sciences such as economics.

Nearly a dozen Nobel Laureates have thanked Popper and acknowledged his great influence upon their work: most notably, of course, is F.A. von Hayek's Sveriges Riksbank Prize Lecture and, perhaps the most notable example in your field may be revealed in Eccles' Nobel biography.

I have only been able to discover one Nobel Laureate who acknowledged Kuhn's influence and,

1 Fuller 2003, pp18-19.

2 Ibid, p69.

curiously, this noble individual (whom of course is you!) acknowledged both Popper and Kuhn: "I was influenced early on by reading Arthur Koestler and Edward de Bono, and more recently by the writings of Karl Popper and Thomas Kuhn."

So, naturally, I'm very curious to know if, after nearly a decade, the balance of this influence or your opinions regarding these two philosophers of science has changed?

I thank you very much for your time and consideration regarding this matter, as I am inclined to believe the long-term prospects of human survival may hang in the balance to the ultimate answer to this debate.

Any words of wisdom you are able to offer on this topic would be greatly appreciated.

Sincerely...Matt Funk[1]

From: Peter C. Doherty, Department of Immunology, St Jude Children's Research Hospital 332 North Lauderdale, Memphis TN 38105, Tel 901-495-3470, Fax 901-495-3107, also at: pcd@unimelb.edu.au,

To:Mfunk@upei.ca, Date:10/28/07 11:58 pm

Subject: Re: Thomas Kuhn & Karl Popper:

-----Original Message-----

A long time since I've read either. Popper's views re falsification of a null hypothesis seem correct to me. Much of the world's worst science is done by people who are determined to prove a point. Kuhn's idea of the paradigm shift is spot on.

(d) The Kuhn-Popper debate, strictly speaking, refers to an encounter that took place at the former Bedford College, University of London on 13 July 1965, as part of the International Colloquium in the Philosophy of Science. It was designed to pit a relatively young theorist of science (Kuhn, aged 43) whose 1962 book, *The Structure of Scientific Revolutions*, was touted as the latest word from the Unite States, against a relatively old theorist of science (Popper, aged 63) whose seminal book, *The Logic of Scientific Discovery*, had been translated into English on in 1959, a quarter-century after it first appeared in German (Fuller 2003, p10)

(e) This brings me to the... source of the debate's continuing significance. Kuhn and Popper tapped into long-simmering, deep-rooted disagreements that went well beyond the pages of their major works on science.... Sometimes behind such scholastic fodder that frames philosophical debate lie opponents who are not so different from each other after all.... But sometimes the stereotype, for all its crudeness, *does* [italics Fuller's] capture differences in sensibility that become deeper the more one looks. This is certainly the case with Popper and Kuhn (Ibid, pp14-15).

(f) The clash between Popper and Kuhn is not about a mere technical point in epistemology. It concerns our central intellectual values, and has implications not only for theoretical physics but also for the underdeveloped social sciences and even moral and political philosophy (Lakatos 1978, vol 1, p 9).

(a) I uphold the ancient theory of truth... according to which truth is the agreement with the facts of what is being asserted. Kuhn's views on this fundamental question seem to me affected by relativism; more specifically, by some for of subjectivism and of elitism, as proposed for example by Polanyi. Kuhn seems to me also affected by Polanyi's fideism: the theory that a scientist *must* have faith in the theory he proposes (while I think that scientists--like Einstein in 1916 or Bohr in 1913--often realize that they are proposing conjectures that will, sooner or later, be superseded). There are many other such points of difference, of which perhaps the most important is my emphasis on objective rational criticism: I regard as characteristic of ancient and modern science the critical approach towards theories, from the point of view of whether they are true or false. Another important point seems to me that Kuhn does not seem to see the great importance of the many purely scientific revolutions that are *not* connected with *ideological* revolutions [all italics Popper's] (pp xxxi-xxxii).

1 Funk 2007d

Land Power

Landpower is the ability—by threat, force, or occupation—to promptly gain, sustain, and exploit control over land, resources, and people. Landpower includes the ability to:

★ Impose the Nation's will on adversaries—by force if necessary—in diverse and complex terrain.

★ Establish and maintain a stable environment that sets the conditions for a lasting peace.

★ Address the consequences of catastrophic events—both natural and manmade—to restore infrastructure and re-establish basic civil services.

★ Support and provide a base from which forces can influence and dominate the air and sea dimensions of the joint operational area.[1]

Meditations on Hunting

Meditations on Hunting is the most quoted book in sporting literature. It is the finest work on the essence and ethics of hunting. Today when both hunting and fishing are often condemned, *Meditations* takes on an even greater significance. Ortega points out that life is a dynamic interchange between man and his surroundings. He explains that hunting is part of man's very nature, that:

> hunting is a universal and impassioned sport…it is the purest form of human happiness. The essence of hunting or fishing involves a complete code of ethics of the most distinguished design. The sportsman who accepts the sporting code of ethics keeps his commandments in the greatest solitude with no witnesses or audience other than the sharp peaks of the mountain, the stern oak, and the passing animal [Bodio's 2007 introduction to Gasset 1972].

Menger, Carl (1840 - 1921)

(a) Founder of the Austrian School of economics, famous for contributing to the development of the theory of marginal utility. This refuted the labor theory of value developed by the classical economists Adam Smith and David Ricardo….

During the course of his newspaper work he noticed a discrepancy between what the classical economics he was taught in school said about price determination and what real world market participants believed. In 1867 Menger began a study of political economy which culminated in 1871 with the publication of his *Principles of Economics* (*Grundsätze der Volkswirtschaftslehre*), thus becoming the father of the Austrian School of economic thought. It was in this work that he challenged the classical labor theory of value with his theory of marginality. At the time *Principles* was largely ignored….

Ensconced in his professorship he set about refining and defending the positions he took and methods he utilized in Principles, the result of which was the 1883 publication of *Investigations into the Method of the Social Sciences with Special Reference to Economics* (*Untersuchungen über die Methode der Socialwissenschaften und der politischen Oekonomie insbesondere*). The book caused a firestorm of debate, during which members of the Historical School of economics began to derisively call Menger and his students the 'Austrian School' to emphasize their departure from mainstream economic thought in Germany. In 1884 Menger responded with the pamphlet *The Errors of Historicism* in German Economics and launched the infamous Methodenstreit, or methodological debate, between the Historical School and the Austrian School (Menger & Hayek 1871, pp. 14-15).

(b) The following account of his impression by a young American economist who attended Menger's lectures in the winter 1892–93 may be reproduced here as representative: "Professor Menger carries his fifty-three years lightly enough. In lecturing he rarely uses his notes except to verify a quotation or a date. His ideas seem to come to him as he speaks and are expressed in language so clear and simple, and emphasized with gestures so appropriate, that it is a pleasure to follow him. The student feels that he is being led instead of driven, and when a conclusion is reached it comes into his mind not as something from without, but as the obvious consequence of

1 DOD 2005, p 1-1

his own mental process. It is said that those who attend Professor Menger's lectures regularly need no other preparation for their final examination in political economy, and I can readily believe it. I have seldom, if ever, heard a lecturer who possessed the same talent for combining clearness and simplicity of statement with philosophical breadth of view. His lectures are seldom 'over the heads' of his dullest students, and yet always contain instruction for the brightest.

All his students retain a particularly vivid memory of the sympathetic and thorough treatment of the history of economic doctrines, and mimeographed copies of his lectures on public finance were still sought after by the student twenty years after he had retired, as the best preparation for the examinations. His great gifts as a teacher were, however, best shown in his seminar where a select circle of advanced students and many men who had long ago taken their doctor's degree assembled. Sometimes, when practical questions were discussed, the seminar was organized on parliamentary lines with appointed main speakers pro and contra a measure. More frequently, however, a carefully prepared paper by one of the members was the basis of long discussions. Menger left the students to do most of the talking, but he took infinite pains in assisting in the preparations of the papers (Ibid, p 35).

Mind-Body Problem

The nature of the subject… makes its first task the most important and the most difficult: clearly to state the problem to which it will attempt an answer. We shall have moved a considerable distance towards the solution of our problem when we have made its meaning precise and have shown what kind of statement could be regarded as a solution.

The traditional heading under which our problem has been discussed in the past is that of the 'relation' between mind and body, or between mental and physical events. It can also be described by the questions of 'What is mind?' or 'What is the place of mind in the realm of nature?' But while these expressions indicate a general field of inquiry, they do not really make it clear what it is that we want to know. Before we can successfully ask how two kinds of events are related to each other (or connected with each other), we must have a clear conception of the distinct attributes by which they can be distinguished. The difficulty of the any fruitful discussion of the mind-body problem consists largely in deciding what part of our knowledge can properly be described as knowledge of mental events as distinguished from our knowledge of physical events.[1]

Mt **Million Tons**

Myr **Million Years**

Mustique

Since Mustique is a small island under single ownership…, development will be inherently expensive. But it will also offer the opportunity of preserving an especially high quality of environment ….

Although we have found some indications from the regional demands and projections, it is the nature of the island itself that must determine the actual quality and quantity of the potential demands that should be accommodated, firstly in terms of environment, secondly in terms of service problems and costs….

The charm of Mustique derives largely from its hilly topography. These hills, acted upon by the sea and the prevailing winds have divided the island's 1400 acres into a number of distinctly different microclimates, and have given rise to a curving coastline that is long (12 miles) in relation to the area it encloses….

The variety of these separate places, with their interplay of forest, rocky headland, sandy bay and turquoise sea, creates an impression that makes the island seem much larger than it actually is. The hills also afford fine views of the white beaches and out over the neighbouring islands….

In order to discover the most suitable use for the land and achieve the best fit between the

1 Hayek 1952, p I

activities of man and the natural systems, an ecological survey was undertaken..., for it is obvious that the varied geology, vegetation and wild life of Mustique and the sea around are crucial to the attractiveness of the island....

The aim of this study was to identify areas of special interest for conservation, and to find ecological indicators for the degree of intensity and type of use for which the land is best suited....

It is necessary to ensure that no unique species or features of outstanding natural beauty are destroyed by development. Similarly the extent and variety of the vegetation on Mustique contributes greatly to the- charm of the island, and must be preserved.....

Mustique is an extremely beautiful island and one which is very rich biologically. At the same time, the natural resources of the island are in limited supply or extremely sensitive to development. The challenge that must be met by the developers is to utilize its charm and habitat richness whilst maintaining its delicately balanced ecosystems in as natural a state as possible....

Several primary physical features of the island combine to determine the range of possibilities for development. These are, most notably, the availability of water, the pronounced alternation of wet and dry season, the physical make-up of soils, wind velocity, salt spray and soil salinity. These same features also determine the kind and distribution of the naturally renewable resources of plant and animal communities and, at the same time, determine their response to various kinds of development. Careful exploitation and management will be required to ensure that the biological habitat-types represented in the island's ecosystems continue to contribute to the beauty and interest of the environment...

The biotic component of the island's ecosystems is seen as a resource in its own right. It contributes to the quality of the landscape and contains plants and animals in a little-disturbed, semi-natural environment which justify conserving in their own right. It is difficult to make an assessment of the conservation status of Mustique from a scientific point of view without a more extensive survey of neighbouring islands and literature. However, it is clear that some individual species obviously deserve protection and these include the turtles and iguana. More important, in the context of the proposed future development, and as an important contribution to the island's character, is the conservation of a range of habitat types and these should include more mature areas of forest, coastal scrub, sea-grape communities, and mangrove swamp...

There appears to be universal agreement that the scenery on Mustique is superb and this beauty is derived from an interplay of forest, rocky headland, sandy bay and turquoise sea. The quality is partly the result of the small scale of this heterogeneity and the feeling of being on a small, secluded island and yet one so little exploited that an excursion to any beach or headland requires a half-day expedition. This sensation of being on both a very small and a very big and varied island is important to preserve.

Secondly there is a smaller scale of beauty and interest. This is totally attributable to biological components of the environment such as the widely distributed solitary cacti, the palm plantations, epiphytic plants, windswept distorted trees, and the occasional tortoise, humming-bird or butterfly. Thirdly there is interest that derives from past and present forms of land-use. Relics of the past include an abandoned village, Fort Shandy, Carib remains, a solitary cannon, a sugar-cane press, old wells and water-tanks. Present day activities also contribute to the interest of the landscape and most visitors will appreciate seeing cattle and ponies, fields of pigeon pea and cassava, scattered mangoes and tamarinds. citrus groves and banana plantations....

The case for maintaining and developing the agriculture of the island partly rests on the importance of preserving the feeling for the visitor of being part of a functioning system as well as to open-up views and increase diversity in the landscape....

Most visitors would appreciate interpretative facilities to enable them to understand more of the variety and richness of the flora, fauna and history of the island. We suggest that an information centre be provided and short, self-guided nature trails from natural focal points such as beaches and the lagoon. These should not be *too* arduous and should provide an alternative route back to the starting point....

Mustique is a special and unusual place. The natural resources of this beautiful island must be safeguarded, and all development carefully designed to complement the landscape. We have tried in this report to create a planning framework of which the principles are comprehensible as a kind of

language of "the way things are done here".[1]

In this report we have particularly concerned ourselves with the relationship between peoples and places. We feel that for the charm of the present day Mustique to grow into a special identity that can be comprehended by people arriving on the island, the development of tourism must be seen to enhance the landscape and benefit the local islanders. Only if the planning framework is administered by people who care about this, will visitors wish to belong there and participate in the island's plan for growth. For when people belong to a place and feel that they can interact with it, the place will grow fruitfully. We hope that the principles outlined in this report, both physical and methodological, will help ensure a harmonious and profitable future for Mustique.[2]

Non-cooperative Game

A game is non-cooperative if it is impossible for the players to communicate or collaborate in any way (Nash 1953, pp 128-129).

Normative

These days, one commonly asserted imperfection in the science-policy interface is that some so-called "science" is imbued with policy preferences. Such science may be labelled as normative and it is potentially an insidious kind of scientific corruption. By normative science, I mean "information that is developed, presented, or interpreted based on an assumed, usually unstated, preference for a particular policy or class of policy choices." In some forms, normative science is not obviously normative to policy makers or even to many scientists. Such "science" has become a serious problem. I believe that use of normative science is stealth policy advocacy. Science, of course, is not value free because it is a human enterprise, but this fact does not make all science normative. Policy-neutral science is a way of learning about the world and it is characterized by transparency, reproducibility, and independence. Consider the simple but fundamental difference between scientific "is" and the policy "ought." Science deals with the "is" world (and the "was" and "will be" states of the world) as does the policy world, but the policy world also deals with the "oughts" and "shoulds." Science is, or should be, bounded in the "is" world.[3]

Politician

(a) The successful politician owes his power to the fact that he moves within the accepted framework of thought, that he thinks and talks conventionally. It would be almost a contradiction in terms for a politician to be a leader in the field of ideas. His task in a democracy is to find out what the opinions held by the largest number are, not to give currency to new opinions which may become the majority view in some distant future.[4]

(b) Politicians do not find any attractions in a view which does not lend itself to party declamation, and ordinary mortals prefer views which attribute misfortune to the machinations of their enemies. Consequently people fight for and against quite irrelevant measures, while the few who have a rational opinion are not listened to because they do not minister to any one's passions.[5]

Prisoner's Dilemma

(a) Al Tucker was on leave at Stanford in the Spring of 1950 and, because of the shortage of offices, he was housed in the Psychology Department. One day a psychologist knocked on his door and asked what he was doing. Tucker replied: "I'm working on game theory.", and the psychologist asked if he would give a seminar on his work. For that seminar, Al Tucker invented the Prisoner's Dilemma as an example of game theory.[6]

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1 Reprinted from Funk 2008a.

2 Llewelyn-Daviel et. al. 1970, pp 7 – 43.

3 Lackey 2004, p 2

4 Hayek 1982.

5 Russell 1928, p3.

6 Kuhn 1994, p 161. Also see: Tucker 1950.

(b) 5 June 2005 Eric Rasmusen (erasmuse@indiana.edu) notes…

Albert Tucker, "A Two- Person Dilemma," unpublished notes (May 1950)

When I was writing the first edition of Games and Information back in the 1980's I was confused by the varying citations give for The Prisoner's Dilemma. I asked Lloyd Shapley about it, since he was there at the founding, and he referred me to Albert Tucker. Professor Tucker replied with this letter [next page] telling me about his Stanford handout [on the page following the letter] and the article by Straffin that tells the story, Philip Straffin, "The Prisoner's Dilemma," UMAP Journal. 1: 101-103 (1980). I republished both in Readings in Games and Information.[1]

Princeton University
~~DEPARTMENT OF MATHEMATICS~~
~~FINE HALL, BOX~~ 37 Lake Lane
PRINCETON, NEW JERSEY 08540

2/25/87

Dear Professor Rasmusen,

Here is a copy of the reprint which was published in 1980 UMAP, page 101, along with a copy of the accompanying article by Philip Straffin. In 1949-50 I was at Stanford on sabbatical leave, and became a consultant at Rand.

I expect Lloyd Shapley did not want to become involved because Merrill Flood, a mutual friend, seems to feel that he and Rand colleagues did not get the credit they deserved. Lloyd was a Princeton graduate student at the time and became my Ph.D. student when I returned.

Anyhow, I claim no active part in the matter except inventing the prisoner story. I have always tried for catchy examples in my talks.

Excuse this rough reply, but I am 81 and hobbled by arthritis.

Sincerely,

A.W. Tucker

1 Rasmusen 2005

See UMAP Journal 1 (1980) 101–103.

A TWO*PERSON DILEMMA

Two men, charged with a joint violation of law, are held separately by the police. Each is told that

(1) if one confesses and the other does not, the former will be given a reward of one unit and the latter will be fined two units,

(2) if both confess, each will be fined one unit.

At the same time each has good reason to believe that

(3) if neither confesses, both will go clear.

This situation gives rise to a simple symmetric two-person game (not zero-sum) with the following table of payoffs, in which each ordered pair represents the payoffs to I and II, in that order:

		II: confess	II: not confess
I	confess	(-1, -1)	(1, -2)
I	not confess	(-2, 1)	(0, 0)

Clearly, for each man the pure strategy "confess" dominates the pure strategy "not confess." Hence, there is a unique equilibrium point* given by the two pure strategies "confess." In contrast with this non-cooperative solution one sees that both men would profit if they could form a coalition binding each other to "not confess."

The game becomes zero-sum three-person by introducing the State as a third player. The State exercises no choice (that is, has a single pure strategy) but receives payoffs as follows:

		II: confess	II: not confess
I	confess	2	1
I	not confess	1	0

*see J. Nash, PROC. NAT. ACAD. SCI. 36 (1950) 48-49.

Stanford, May 1950

A. W. Tucker

(c) The Prisoner's Dilemma... is a game where two players have the option to cooperate or to defect. If both cooperate they receive the reward, *R*. If both defect they receive the punishment, *P*. If one cooperates and the other defects, then the cooperator receives the sucker's payoff, S, while the defector receives the9 temptation, *T*. The Prisoner's Dilemma is defined by the ranking

$T>R>P>S$.

Would you cooperate or defect? Assuming the other person will cooperate it is better to defect, because $T>R$. Assuming the other person will defect it is better to defect, because $P>S$. *Hence, no matter what the other person will do it is best to defect. If both players analyze the game in this rational way then they will end up defecting. The dilemma is that they both could have received a higher payoff if they had chosen to cooperate. But cooperation is irrational.*[1]

(d) This "collective-risk social dilemma" exists in various social scenarios, the globally most challenging one being…climate change.[2]

The Problem of Chaotic Behaviour

There are several physical situations in the solar system where chaotic behaviour plays an important role. Saturn's satellite Hyperion is currently tumbling chaotically. Many of the other irregularly shaped satellites in the solar system had chaotic rotations in the past. There are also examples of chaotic orbital evolution. Meteorites are most probably transported to Earth from the asteroid belt by way of a chaotic zone. Chaotic behaviour also seems to be an essential ingredient in the explanation of certain non-uniformities in the distribution of asteroids. The long-term motion of Pluto is suspiciously complicated.[3]

Problem of Induction[4]

(a) [Problem:] Our foregoing method of reasoning will easily convince us, that *there can be no demonstrative arguments to prove, that those instances, of which we have had no experience, resemble those, of which we have had experience.*[5]

[Solution:] According to a widely accepted view… the empirical sciences can be characterized by the fact that they use 'inductive methods', as they are called. According to this view, the logic of scientific discovery would be identical with inductive logic, i. e. with the logical analysis of these inductive methods. It is usual to call an inference 'inductive' if it passes from singular statements (sometimes also called 'particular' statements), such as accounts of the results of observations or experiments, to universal statements, such as hypotheses or theories. Now it is far from obvious, from a logical point of view, that we are justified in inferring universal statements from singular ones, no matter how numerous; for any conclusion drawn in this way may always turn out to be false: no matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white.

The question whether inductive inferences are justified, or under what conditions, is known as the problem of induction. The problem of induction may also be formulated as the question of the validity or the truth of universal statements which are based on experience, such as the hypotheses and theoretical systems of the empirical sciences….

Scientific statements can only attain continuous degrees of probability whose unattainable upper and lower limits are truth and falsity' [Reichenbach, Erkenntnis 1, 1930, p. 186]. At this stage I can disregard the fact that the believers in inductive logic entertain an idea of probability that I shall later reject as highly unsuitable for their own purposes. I can do so because the difficulties mentioned are not even touched by an appeal to probability. For if a certain degree of probability is to be assigned to statements based on inductive inference, then this will have to be justified by invoking a new principle of induction, appropriately modified. And this new principle in its turn will have to be justified, and so on.

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1 Italics ours, May & McLean, 2007, p 8. Also see APPENDIX II, Cressman 1996, Hauert 2006, Weibull & Salomonsson 2006

2 Milinski et. al. 2008, p 2291.

3 Wisdom 1987, abstract.

4 Also see Cournot 1838, Reichenbach 1930, 1966, Reichenbach et. al. 1971, Russell 1903, 1908, 1913, 1919, 1948,Ludwig et. al. 1993, and Wittgenstein 1969. Most works by Popper address this problem from various angles and within variable contexts.

5 Italics ours, Hume 1739, Book I, Vol I, p 137.

Nothing is gained, moreover, if the principle of induction, in its turn, is taken not as 'true' but only as 'probable'. In short, like every other form of inductive logic, the logic of probable inference, or 'probability logic', leads...to an infinite regress.[1]

(b) Liebig (in *Induktion und Deduktion*, 1865) was probably the first to reject the inductive method from the standpoint of natural science; his attack is directed against Bacon. Duhem (in *La théorie physique, son objet et sa structure*, 1906; English translation by P. P. Wiener: *The Aim and Structure of Physical Theory*, Princeton, 1954) holds pronounced deductivist views. (*But there are also inductivist views to be found in Duhem's book, for example in the third chapter, Part One, where we are told that only experiment, induction, and generalization have produced Descartes's law of refraction; cf. the English translation, p. 34.) So does V. Kraft, *Die Grundformen der Wissenschaftlichen Methoden*, 1925; see also Carnap, Erkenntnis 2, 1932, p. 440.[2]

The Problem of Ohmic Decay

The mechanism by which the Earth and other planets maintain their magnetic fields against ohmic decay is among the longest standing problems in planetary science. Although it is widely acknowledged that these fields are maintained by dynamo action, the mechanism by which the dynamo operates is in large part not understood. Numerical simulations of the dynamo process in the Earth's core have produced magnetic fields that resemble the Earth's field, but it is unclear whether these models accurately represent the extremely low values of viscosity believed to be appropriate to the core.[3]

The Problem of Solar Flux

There has been life on Earth for at least 3,500 Myr but the assumption that a comparable future lies ahead may not be justified. Main sequence stars appear to increase their burning rate as they age. Thus the Sun, if a typical star, can be predicted to have increased its output by 30% since the Earth's origin 4,500 Myr ago. The maintenance of an equable climate since life began probably required some means of planetary thermo-stasis. The Gaia hypothesis proposed by Lovelock and Margulis included an unspecified biological means for climate control. Walker... suggests an abiological automatic thermostasis in which the atmospheric abundance of CO2, a greenhouse gas, adjusts to resist the warming tendency of the increased solar flux. It is clear that whatever the mechanism, atmospheric CO2 is now close to its lower limit of partial pressure, so the biosphere may soon, in geological terms, be exposed without protection to the predicted progressive increase of solar luminosity.[4]

Problem Solving

All things living are in search of a better world.

Men, animals, plants, even unicellular organisms are constantly active. They are trying to improve their situation, or at least to avoid its deterioration. Even when asleep, the organism is actively maintaining the state of sleep: the depth (or else the shallowness) of sleep is a condition actively created by the organism, which sustains sleep (or else keeps the organism on the alert). Every organism is constantly preoccupied with the task of solving problems. These problems arise from its own assessments of its condition and of its environment; conditions which the organism seeks to improve.

An attempted solution often proves to be misguided, in that it makes things worse. Then follow further attempts at solution – further trial and error movements.

We can see that life – even at the level of the unicellular organism - brings something completely new into the world, something that did not previously exist: problems and active attempts to solve them; assessments, values: trial and error.

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1 Popper 1959, pp 31-35

2 Ibid, p 35

3 Kuang & Bloxham 1997, abstract.

4 All italics mine, Lovelock & Whitfield 1982, abstract.

It may be supposed that, under the influence of Darwin's natural selection, it is the most active problem solvers, the seekers and the finders, the discoverers of new worlds and new forms of live, that undergo the greatest development.

Each organism also strives to stabilize its internal conditions of life and to maintain it's individuality – an activity whose results biologists call 'homoeostasis'. Yet this too is an internal agitation, an internal activity: an activity that attempts to restrict the internal agitation, a feedback mechanism, a correction of errors. The homoeostasis must be incomplete. It must restrict itself. Were it completely successful, it would mean the death of the organism, or, at the very least, the temporary cessation of all its vital functions. Activity, agitation, search are essential for life, for perpetual restlessness, perpetual imperfection; for perpetual seeking, hoping, evaluation, finding, discovering, improving, for learning and for the creation of values; but also for perpetual error…

Darwinism teaches that organisms become adapted to the environment through natural selection. And it teaches that they are passive throughout this process. But it seems to me far more important to stress that the organisms find, invent and reorganize new environments in the course of their search for a better world…

All organisms are fully occupied with problem-solving. Their first problem is survival. But there are countless concrete problems that arise in the most diverse situations. And one of the most important problems is the search for better living conditions: for greater freedom; for a better world.

According to this optimistic interpretation, it is through natural selection and (we may suppose) through an external selection pressure that a strong internal selection pressure comes into being at a very early stage; a selection pressure exerted by the organisms upon their environment. This selection pressure manifests itself as a kind of behavior that we may interpret as searching for a new ecological niche. Sometimes it is even the construction of a new ecological niche.

This pressure from within results in a choice of niches; that is, in forms of behavior that may be regarded as a choice of lifestyles and of surrounding. This must be taken to include choice of friends, symbiosis, and above all, perhaps most importantly… the choice of a mate…"

Pyrrho

Sceptic: A seeker of truth. One who, like Pyrrho and his followers in Greek antiquity… holds that there are no adequate grounds for certainty as to the truth of any proposition… Those who deny the competence of reason, or the existence of a justification for certitude, outside the limits of experience. The difference between the two usages becomes clearer when considering 'sceptic's' Latin origin (scepticus): inquiring, reflective, assumed by the disciples of Phyrrho as their distinctive epithet… to look out (OED 1997).

Ratoinal Unity of Mankind

The fact that the rationalist attitude considers the argument rather than the person arguing is of far-reaching importance. It leads to the view that we must recognize everybody with whom we communicate as a potential source of argument and of reasonable information ; it thus establishes what may be described as the 'rational unity of mankind'[1]

RIS **Relatively Insular States**

This category includes sovereign island nations, sub-national island jurisdictions, insular provinces (i.e. Newfoundland & Labrador), states (i.e. Hawaii), municipalities (i.e. Vancouver Island), and relatively insular jurisdictions (i.e. The Alpine Convention region) We divide geopolitical regions based upon relative insularity, designating two players (1) RIS and (2) GEMS, but in reality, naturally, the true relative insularity of each region lies along a sliding scale with a true GEMS at one end (the United States) and a true RIS, such as the big island of Hawaii at the other.[2]

1 Popper 1992, p225

2 Funk 2008a

RHP **Resource Holding Power**

(a) The view is examined that the adaptive value of conventional aspects of fighting behaviour is for assessment of relative RHP (resource holding power) of the combatants. Outcomes of aggressive disputes should be decided by each individual's fitness budget available for expenditure during a fight (determined by the fitness difference between adoption of alternative strategies, escalation or withdrawal without escalation) and on the rate of expenditure of the fitness budget if escalation occurs (determined by the RHPs of the combatants). Thus response thresholds for alternative strategies ("assessments") will be determined by natural selection on a basis of which opponent is likely to expend its fitness budget first, should escalation occur. This "loser" should retreat (before escalation) and the winner should stay in possession of the resource. Many aggressive decisions depend on whether one is a resource holder, or an attacker. Assuming the RHP of the combatants to be equal, there are many instances of fitness pay-off imbalances between holder and attacker which should weight the dispute outcome in favour of one or other opponent by allowing it a greater expendable fitness budget. Usually the weighting favours the holder; the attacker therefore needs a correspondingly higher RHP before it may be expected to win. This is not invariably the case, and much observed data fits the predictions of this sort of model. If assessments are perfect and budget expenditure rates exactly predictable, then there would never seem to be any case for escalation. Escalation can be explained in terms of injury inflictions (expenditures) occurring as discrete events; i.e. as "bouts" won or lost during fighting. Assessment can give only a probabilistic prediction of the outcome of a bout. A simple model is developed to investigate escalation situations. Each combatant assesses relative RHP; this correlates with an absolute probability of winning the next bout (cabs). The stake played for is infliction of loss of RHP and is determined by the fitness budgets of the opponents. (Each individual plays for the withdrawal of its opponent.) This defines a critical probability of winning (ccrit) for each combatant, above which escalation is the favourable strategy (cabs > ccrit) and below which withdrawal is favourable (cabs < ccrit). Escalation should occur only where cabs-ccrit is positive for both combatants. This model gives predictions compatible with the observations, indicating that RHP loss alone can be adequate to explain withdrawal: escalation behaviour. Withdrawal tendency will be increased by low searching costs. Escalations should be restricted to closely matched RHP opponents if RHP disparity is the major imbalance. Outside the "escalation range" of a given individual, the higher RHP individual wins and the lower one loses (i.e. it should withdraw after conventional display). RHP disparity and holder: attacker imbalance should both interact to shape the observed pattern, though their relative importances will depend on species and situation. In some instances selection may favour immediate withdrawal from an occupied territory even without assessment of RHP (Parker 1974, abstract).

(b) Also see Parker & Knowlton 1980 ; Maynard Smith 1982

(c) The Great Law of the Iroquois Confederacy[1] is often cited by environmentalists as one of the best examples of a previous, indigenous population far more skilled in the art of sustainable development than we are today. But the Iroquois were far from able to 'sustain' economic development' because they *lost* nearly 100% of their resources, they did not possess the RHP (and thus did not have an ESS) for sustainable economic development because they were not ultimately able to *protect* and *hold* their land, just as the islanders on Newfoundland lost their ability to protect their 'land' (in this case, their land was 'the sea' – their primary natural resource – the cod fishery) when they relinquished its protection to the Canadian confederacy.

And although – in the most extreme measure – *Land Power* is obtained and maintained by war or the threat of war, of course military threat is not necessary in most cases, but the element of coercion is necessary, which of course requires some type of material advantage. In Canada, for example, Quebec has effectively coerced Ottawa to grant asymmetric rights to Canada's largest Province, and, more recently Premier Danny Williams has done likewise for Newfoundland & Labrador, effectively reclaiming and regaining RHP (accomplished largely in the same manner as Quebec – their relatively newfound leverage was and remains significant off-shore oil and natural gas resources) which this island province unwittingly relinquished upon joining confederation. And

1 In our every deliberation, we must consider the impact of our decisions on the next seven generations.

RHP is, ultimately, by far the best test of Darwinian fitness, since RHP is equally measurable and applicable for all organisms, including *humans and nations*! I believe I may have captured the essence in a recent communiqué:

> -------- Original Message -------- Subject: Independence! Date: Mon, 25 Aug 2008 21:56:32 -0300
> From: Matt Funk <matt@funkisland.org> To: premier@gov.nl.ca
>
> Greetings from Prince Edward Island, Mr Premier!
>
> You can't imagine how happy I was for you and your province when it came across the newswire in April that you were 'ushering in an era of unprecedented economic *independence* for Newfoundland and Labrador,' as the dependent nature of Atlantic Canada has been on my mind (and the focus of my research) since I arrived from my home in the United - yet very independent - States of America!
>
> To my point: I have attached a piece of recent research which I conducted and co-authored for a deputy minister here on PEI, and I have included a link to an in-depth, rather exhaustive comparative study of the dependent island on which I am now a landed immigrant, and the evolutionary stable, highly insular, independent island of Mustique, which shaped and informed a rather original universal theory of value based upon relative insularity, which, I might add, provides a tenable solution to the most fundamental, long-standing, open problem in economics. I delivered this paper at the Aland International Institute of Comparative Islands Studies in Finland in May, and they have generously published the paper on their website:
> http://www.aicis.ax/images/stories/pdf/mattfunkpaper3.pdf.
>
> I believe you may find my work rather intriguing, and, in fact I hope you may find it so intriguing that you may want to enlist my assistance for your worthy cause in Newfoundland and Labrador. My wife, a native Prince Edward Islander, has served as an registered nurse at the QEH here on PEI for the past five years, and I have no doubt her skills would be of use as well. And, as you may have noticed from the name of our fledgling research institute,[1] we're rather fond of a few of your uninhabited islands which presently serve as an illuminating, cautionary tale of the evolutionary unstable loss of relative insularity (which, for previous inhabitants of the Funk Islands – *the Great auks* – resulted in their extinction!). Of course I'm sure you may be aware that the islands take their name from the strong scent which the auks left on the rocks and have nothing to do with my German heritage). The important lesson here, as the people of Newfoundland learned the hard way in 1992, is that humans must preserve and fight for relative insularity as fiercely as any other species, including auks (and in Newfoundland's case, that meant fighting to preserve the insularity of the cod fishery (from foreigners and fellow Canadians alike).
>
> In any case, if you have further interests in my abilities and are curious to hear how I think I may be of service to you and, in turn, to your province, I would be happy to outline a proposal; I would also be very pleased to forward a CV, references, or other

1 Funk Island…, 60 km east of Fogo Island off the northeast coast of Newfoundland, is home to more than one million common murres, numbers that make it the largest colony of common murre in the western North Atlantic….

As a seabird ecological reserve, Funk Island is now known for its ability to protect seabirds. This was not always the case. In previous centuries, Funk Island was one of the major nesting areas of the Great auk, and people came regularly to hunt the birds and take their eggs…. The Great auk—large, flightless birds—were eventually hunted to extinction.

This loss shows how human activity can result in the extermination of… species. Making Funk Island an ecological reserve has helped other… species recover from similar exploitation and near extirpation….

At 5.2 km^2 (5 km^2 of which is the marine component), the reserve is the smallest seabird ecological reserve in Newfoundland and Labrador, but it's also one of the most important [Italics mine, Newfoundland & Labrador 2008].

'island' and/or 'economics' related research samples (including an intriguing study of the Gaspe peninsula). I have much to offer and hope to hear from you soon!

In any case, Mr Premier, I congratulate and salute you for holding your course - it is comforting to know that Quebec is not the only province in Canada willing to fight for independence!

Bidding you Godspeed…Matt Funk

I might also note that, not only will I be following Newfoundland's newfound independence, self-reliance, RHP, and relative insularity with great interest, I may also have the opportunity to participate.[1]

Scientific Method

(a) As a rule, I begin my lectures on Scientific Method by telling my students that scientific method does not exist. I add that I ought to know, having been, for a time at least, the one and only professor of this non-existent subject within the British Commonwealth.

It is in several senses that my subject does not exist, and I shall mention a few of them.

First, my subject does not exist because subject matters in general do not exist. *There are no subject matters; no branches of learning—or, rather, of inquiry: there are only problems, and the urge to solve them*. A science such as botany or chemistry (or say, physical chemistry, or electrochemistry) is, I contend, merely an administrative unit. University administrators have a difficult job anyway, and it is a great convenience to them to work on the assumption that there are some named subjects, with chairs attached to them to be filled by the experts in these subjects. I do not agree: even serious students are misled by the myth of the subject. And I should be reluctant to call anything that misleads a person a convenience to that person.

So much about the non-existence of subjects in general. But Scientific Method holds a somewhat peculiar position in being even less existent than some other non-existent subjects.

What I mean is this. The founders of the subject, Plato, Aristotle, Bacon and Descartes, as well as most of their successors, for example John Stuart Mill, believed that there existed a method of finding scientific truth. In a later and slightly more sceptical period there were methodologists who believed that there existed a method, if not of finding a true theory, then at least of ascertaining whether or not some given hypothesis was true; or (even more sceptical) whether some given

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1 -------- Original Message -------- Subject: Response to your e-mail to the PremierDate: Fri, 19 Sep 2008 14:37:09 -0230

From: Skinner, Shawn <shawnskinner@gov.nl.ca>To: <matt@funkisland.org>

Dear Mr. Funk:

Thank you for your correspondence of August 25, 2008 to Premier Williams regarding your report, Quality of Life on Prince Edward Island. Your letter has been forwarded to this department for a response….

We have a number of initiatives underway to explore and help improve the quality of life in Newfoundland and Labrador, including our Poverty Reduction Strategy which has received nation-wide recognition for its progressive and comprehensive approach. Further information about this strategy can be found at: www.hrle.gov.nl.ca/hrle/poverty/default.htm. I would also like to direct you to our Community Accounts (www.communityaccounts.ca) maintained by the Newfoundland and Labrador Statistics Agency. The Community Accounts is a world recognized data and information dissemination website that provides community level data for quality of life indicators. I have taken the liberty of forwarding your report to appropriate persons responsible for each of these initiatives for their information.

Your report provides valuable and interesting information concerning the quality of life and cost of living. These issues are becoming evermore important in our changing economy, in this province and throughout the world. I wish you success in advancing this research in the future.

Sincerely

SHAWN SKINNER, Minister, Department of Human Resources, Labour and Employment

cc: Office of the Premier, Aisling Gogan, Director, Poverty Reduction Strategy, Robert Reid, Director (A), NLSA

hypothesis was at least 'probable' to some ascertainable degree.

I assert that no scientific method exists in any of these three senses. To put it in a more direct way:

(1) There is no method of discovering a scientific theory.

(2) There is no method of ascertaining the truth of a scientific hypothesis, i.e., no method of verification.

(3) There is no method of ascertaining whether a hypothesis is 'probable', or probably true.[1]

(b) (i) The method of the social sciences, like that of the natural sciences, consists in trying out tentative solutions to those problems from which our investigations start. Solutions are proposed and criticized. If a proposed solution is not open to objective criticism, then it is excluded as unscientific, although perhaps only temporarily.

(ii) If the proposed solution is open to objective criticism, then we attempt to refute it; for all criticism consists in attempts at refutation.

(iii) If a proposed solution is refuted through our criticism we propose another solution.

(iv) If it withstands criticism, we accept it temporarily; and we accept it, above all, as worthy of further discussion and criticism.

(v) Thus the method of science is one of the tentative attempts (or brain-waves) to solve our problems which are controlled by the most severe criticism. It is a critical development of the method of 'trial and error'.

(vi) The so-called objectivity of science lies in the objectivity of the critical method; that is, above all, in the fact that no theory is exempt from criticism, and further, in the fact that the logical instrument of criticism – the logical contradiction – is objective.[2]

(c) Whether educational research should employ the 'scientific method' has been a recurring issue in its history. Hence, textbooks on research methods continue to perpetuate the idea that research students ought to choose between competing camps: 'positivist' or 'interpretivist'. In reference to one of the most widely referred to educational research methods textbooks on the market-namely Research Methods in Education by Cohen, Manion, and Morrison-this paper demonstrates (1) the misconception of science in operation and (2) the perversely false dichotomy that has become enshrined in educational research. It then advocates a new approach, and suggests that the fixation with 'science' versus 'non-science' is counterproductive, when what is actually required for good inquiry is a critical approach to knowledge claims.[3]

(d) Scientific discovery must ever depend upon some happy thought, of which we cannot trace the origin; — some fortunate cast of intellect rising above all rules. No precepts will elevate a man of ordinary endowments to the level of a man of genius: nor will an inquirer of truly inventive mind need to come to the teacher of inductive philosophy to learn how to exercise the faculties which nature has given him. (Whewell 1849, reprinted under the title 'Mr Mill's Logic' in Butts 1968, p. 117).

(e) Scientific interest in social and political questions is hardly less old than scientific interest in cosmology and physics; and there were periods in antiquity (I have Plato's political theory in mind, and Aristotle's collection of constitutions) when the science of society might have seemed to have advanced further than the science of nature. But with Galileo and Newton, physics became successful beyond expectation, far surpassing all the other sciences; and since the time of Pasteur, the Galileo of biology, the biological sciences have been almost equally successful. But the social sciences do not as yet seem to have found their Galileo. In these circumstances, students who work in one or another of the social sciences are greatly concerned with problems of method; and much of their discussion of these problems is conducted with an eye upon the methods of the more flourishing sciences, especially physics.[4]

(f) Also see: *Kuhnian* and *Historicism*

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1 Popper 1956, pp 5-6.

2 Popper 1992, pp 66-67.

3 Rowbottom & Aiston 2006, abstract.

4 Popper 1957, p 15

Scientific Worldview

My goal is to defend what one might call a scientific *worldview* -- defined broadly as a respect for evidence and logic, and for the incessant confrontation of theories with the real world; in short, for reasoned argument over wishful thinking, superstition and demagoguery. And my motives for trying to defend these old-fashioned ideas are basically *political*. I'm worried about trends in the American Left -- particularly here in academia -- that at a minimum *divert* us from the task of formulating a progressive social critique, by leading smart and committed people into trendy but ultimately empty intellectual fashions, and that can in fact *undermine* the prospects for such a critique, by promoting subjectivist and relativist philosophies that in my view are inconsistent with producing a realistic analysis of society that we and our fellow citizens will find compelling.

David Whiteis, in a recent article, said it well:

> Too many academics, secure in their ivory towers and insulated from the real-world consequences of the ideas they espouse, seem blind to the fact that non-rationality has historically been among the most powerful weapons in the ideological arsenals of oppressors. The hypersubjectivity that characterizes postmodernism is a perfect case in point: far from being a legacy of leftist iconoclasm, as some of its advocates so disingenuously claim, it in fact … plays perfectly into the anti-rationalist -- really, anti-*thinking* -- bias that currently infects "mainstream" U.S. culture.
>
> Now of course, no one will admit to being against reason, evidence and logic -- that's like being against Motherhood and Apple Pie. Rather, our postmodernist and poststructuralist friends will claim to be in favor of some new and *deeper* kind of reason, such as the celebration of "local knowledges" and "alternative ways of knowing" as an antidote to the so-called "Eurocentric scientific methodology" (you know, things like systematic experiment, controls, replication, and so forth).[1]

Searchlight Theory of Science

The situation can be best described by comparison with a searchlight (the 'searchlight theory of science', as I usually call it in contradistinction to the 'bucket theory of the mind'). What the searchlight makes visible will depend upon its position, upon our way of directing it, and upon its intensity, colour, etc. ' although it will, of course, also depend very largely upon the things illuminated by it. Similarly, a scientific description will depend, largely, upon our point of view, our interests, which are as a rule connected with the theory or hypothesis we wish to test ; although it will also depend upon the facts described. Indeed, the theory or hypothesis could be described as the crystallization of a point of view.[2]

Semantics

One of the three branches into which semiotics is usually divided: the study of meaning of words, and the relation of signs to the objects to which the signs are applicable. In formal studies, a semantics is provided for a formal language when an interpretation or model is specified. However, a natural language comes ready interpreted, and the semantic problem is not that of specification but of understanding the relationship between terms of various categories (names, descriptions, predicates, adverbs…) and their meanings. An influential proposal is that this relationship is best understood by attempting to provide a truth definition for the language, which will involve giving a full description of the systematic effect terms and structure of different kinds have on the truth conditions of sentences containing them. See also inferential role semantics, possible world semantics, reference, truth.

SHIELD

The greatest natural threat to the long-term survivability of mankind is an asteroid or comet impact

1 Sokal 1996b

2 Popper 1945, vol. II, p 260

with the Earth. SHIELD is an architectural concept for a comprehensive Earth defense system designed to discover, catalogue, calculate orbits of near-Earth Object, and to deflect potential impactors (Gold 2001, abstract).

Social Dilemma

(a) Life's toughest choices are not between GOOD AND BAD, but between BAD AND WORSE. We call these *choices between lesser evils*. We know that whatever we choose, something important will be sacrificed. Whatever we do, someone will get hurt. Worst of all we HAVE to choose. We cannot wait for better information or advice or some new set of circumstances. We have to decide NOW, and we can be sure that there will be a price to pay. If we do not pay it ourselves, someone else will (Ignatieff 2004, *preface*).

(b) An interactive decision in which individual interests are at odds with collective interests, the pursuit of individual self-interest by every decision maker leaving everyone worse off than if each had acted co-operatively. In empirical studies, social dilemmas are presented in one of three general forms, called N-person Prisoner's Dilemmas , public goods dilemmas , and resource dilemmas, and they have been used to model problems of inflation and voluntary wage restraint, conservation of scarce natural resources, environmental pollution, arms races and multilateral disarmament, mob behaviour, and many other social problems involving cooperation and trust. The Prisoner's Dilemma game is a social dilemma restricted to two interacting decision makers. See also [The Tragedy of the Commons]… So called because it is an extension of the Prisoner's Dilemma game and models social problems.[1]

Socratic Wisdom

(a) I am wiser than this man, for neither of us appears to know anything great and good; but he fancies he knows something, although he knows nothing; whereas I, as I do not know anything, so I do not fancy I do. In this trifling particular, then, I appear to be wiser than he, because I do not fancy I know what I do not know. [2]

(b) [Do not] believe *anything* that I suggest! Please do not believe a word! I know that that is asking too much, as I will speak only the truth, as well as I can. But I warn you: I know *nothing*, or *almost nothing*. We all know nothing or almost nothing. I *conjecture* that that is a basic fact of life. We know nothing, we can only conjecture: we guess.[3]

(c) Ever since the beginning of modern science, the best minds have recognized that 'the range of acknowledged ignorance will grow with the advance of science.' Unfortunately, the popular effect of this scientific advance has been a belief, seemingly shared by many scientists, that the range of our ignorance is steadily diminishing and that we can therefore aim at more comprehensive and deliberate control of all human activities. It is for this reason that those intoxicated by the advance of knowledge so often become the enemies of freedom.[4]

(d) All the great… scientists were intellectually modest; and Newton speaks for them all when he says: 'I do not know what I may appear to the world, but to myself I seem to have been only a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.'"

Moreover, all the great scientists realized that every solution to a scientific problem raises many new and unsolved problems. Our knowledge of our ignorance, becomes increasingly conscious, detailed and precise, the more we learn about the world. Scientific research is the best method we have for obtaining information about ourselves and about our ignorance. It leads us to the important insight that there may be great differences between us with regard to minor details of what we may perhaps know, yet we are all equal in our infinite ignorance.[5]

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1 Colman 2006

2 Socrates *c.* 399 B.C.

3 All italics Popper's 1999, p 37

4 Hayek1945

5 Popper 1992, p 40.

(e) The Socratic maxim that the recognition of our ignorance is the beginning of wisdom has profound significance for our understanding of society.... This fundamental fact of man's unavoidable ignorance of much on which the working of civilization rests has received little attention. Philosophers and students of society have generally glossed it over and treated this ignorance as a minor imperfection which could be more or less disregarded.... Perhaps it is only natural that the scientists tend to stress what we do know; but in the social field, where what we do not know is often so much more important, the effect of this tendency may be very misleading (Hayek 1960, pp 22-23).

Strategic Equilibrium

What do I mean by "strategic equilibrium"? Very roughly, the players in a game are said to be in *strategic equilibrium* (or simply *equilibrium*) when their play is *mutually optimal*: when the actions and plans of each player are rational in the given strategic environment – i.e., when each knows the actions and plans of the others. For formulating and developing the concept of strategic equilibrium, John Nash was awarded the 1994 Prize in Economics Sciences in Memory of Alfred Nobel, on the fiftieth anniversary of the publication of John von Neumann and Oskar Morgenstern's *Theory of Games and Economic Behavior*.[1]

Super-Eruptions

(a) In the past 2 Myr, there have been, on average, two super-eruptions every hundred millennia, the last of which shattered the crust of New Zealand's north island 26,500 years ago. To date, no mechanisms have been discovered for predicting these events; thus an eruption of this magnitude (VE8) is possible within this decade and likely within 50,000 years (see below). Post-eruption human survival is unlikely; even smaller eruptions (VE4, VE5, VE6) present extraordinary challenges.

(b) The largest explosive volcanic eruptions (supereruptions) produce >1000 km3 of ejected material and ≥1000 Mt (1015 g) of submicron atmospheric aerosols and dust. These eruptions may be capable of creating global climatic disturbances sufficient to cause severe problems for world agriculture and modern civilization. Supereruptions are estimated to occur on average about every 50,000 years, which is about twice the frequency of impacts by comets and asteroids ≥1 km diameter predicted to cause similar climatic effects. Prediction, prevention, and mitigation of global volcanic climatic disasters may be potentially more difficult than planetary protection from the threat of large impacts, so that explosive volcanism might limit the longevity of technological civilizations.[2]

(c) The greatest explosive eruption in the past few hundred thousand years was the Toba (Sumatra) event of ~73,500 years ago... This event produced at least 2,800 km^3 of magma... and is estimated to have created from 1,000 to 10,000 Mt of stratospheric dust and sulfuric acid aerosols.... The Toba aerosols apparently persisted for up to 6 years in the upper atmosphere... Based on scaling up from smaller eruptions and computer models, stratospheric aerosol loading of ~1000 Mt is predicted to have caused a "volcanic winter," with a global cooling of 3 to 5°C for several years, and regional coolings up to 15°C... Such a cooling is estimated to have drastically affected tropical and temperate vegetation and ecosystems... All above-ground tropical vegetation would have been killed by sudden hard freezes, and a 50% die-off of temperate forests is predicted from hard freezes during the growing season... This probable climatic and ecologic disaster may have impacted humans. Evidence from human genetic studies have been interpreted as indicating a severe human population bottleneck—a near extinction—with reductions to a total population as small as a few thousand at a time just prior to ~60,000 years ago... This is roughly the same interval as the great Toba eruption, and a cause and effect relationship with Toba has been proposed... and is supported by the predicted severe ecological effects of the eruption.

1 All italics Aumann's 2005, p 352

2 Rampino 2002, abstract.

Television

(a) Watching TV is a major human activity. Because of its immediate benefits at negligible immediate marginal costs it is for many people tempting to view TV rather than to pursue more engaging activities. As a consequence, individuals with incomplete control over, and foresight into, their own behavior watch more TV than they consider optimal for themselves and their well-being is lower than what could be achieved. We find that heavy TV viewers, and in particular those with significant opportunity cost of time, report lower life satisfaction. Long TV hours are also linked to higher material aspirations and anxiety (Frey et. al.2005).

(b) Watching TV is a very important activity, carried out by most people in the majority of countries. In many countries nowadays, watching TV occupies almost as much time as working. As it is a totally voluntary, freely chosen activity, it seems obvious that people enjoy it, because they would not do it otherwise. They are more satisfied with having the opportunity to watch TV to the extent they do rather than watching less TV or none at all.

This implication is shared by standard neoclassical economic theory. Individuals are assumed to know best what provides them with utility and are free to choose the amount of TV consumption that suits them best. By revealed preference, it follows from the fact that individuals watch so much TV as has been empirically observed that it provides them with considerable utility.

Recent developments, particularly in behavioral economics, cast doubt on this conclusion. The theory of revealed preference has been questioned (see, for instance, Sen 1982; 1995): it is, in general, not possible to infer the utility produced by observing behavior, because individuals do not always act rationally. More concretely, anomalies and biases in behavior have been identified (e.g. Thaler 1992), which undermine the direct link between observed behavior and the utility gained. Individuals may also be subject to habits which they do not have fully under control. They may consume some goods, such as drugs, alcohol or tobacco to a greater extent than they find to be good for themselves. They are subject to a self-control problem (e.g. Schelling 1984), again interfering with the direct relationship proposed by revealed preference theory. As Gruber and Mullainathan (2002) empirically show, predicted smokers, according to their own evaluation, consider themselves to be better off if smoking was restricted by a tax. Finally, individuals may systematically mispredict the utility derived from future consumption (e.g. Loewenstein and Schkade 1999; Loewenstein et al. 2003). In particular, happiness research (for a survey, see Frey and Stutzer 2002b) has empirically shown that individuals overestimate the utility of future income (e.g. Easterlin 2001), at the same time as they underestimate the utility of personal interactions (Frey and Stutzer 2004). The consumption decisions made by individuals are systematically distorted according to their own evaluations.

This paper argues that TV viewing is a case in which the theory of revealed preference does not fully apply: many people watch more TV than they consider good for themselves. The extent of TV viewing is not generally utility maximizing. Many individuals are subject to a self-control problem, mainly induced by the fact that watching TV offers immediate benefits (e.g. entertainment and relaxation) at very low immediate marginal costs. Many costs (e.g. not enough sleep, underinvestment in social contacts, education or career) are only experienced in the future. Individuals with time inconsistent preferences are therefore unable to adhere to the amount of TV viewing they planned or which, in retrospect, they would consider optimal for themselves. This tendency is aggravated when people mispredict future costs because they underestimate utility from socializing and neglect changes in preference due to TV consumption. Extensive TV viewing is thus understood to be the result of mispredicting utility and a self-control problem, lowering individuals' well-being (Ibid, pp 2-3).

(c) A certain Canadian city was unable to receive any TV signals up until 1973, due to its location in a steep valley. Otherwise, it was similar to two cities in the vicinity used as control cases. A study by Williams (1986) suggests that the introduction of TV crowded out other activities, in particular those outside the home, such as sports' activities and visiting clubs. It also reduced the reading abilities and creative thinking of children and fostered more aggressive behavior and stereotyped ideas about gender roles. TV also reduced the problem solving capacities of adults (Ibid, p8).

(d) Popper was… very concerned about the mass media, especially television, which exercised

'unlimited power without responsibility'. Indeed, the last text he published before his death was a pamphlet called *Una patente per fare TV* (A Licence to Make TV), which, far from being just a sterile denunciation, proposed a solution for the safeguarding of democracy and, above all, for the protection of young children and those least able to defend themselves from the aggressiveness of images and messages appearing on the small screen. What he suggested was to establish an organization similar to a professional body, which would train its members in certain values and have the power to issue reprimands for breaches of the rules (Corvi 1996, p 11)

(4) [Popper:] At present the greatest danger to the educational effort is television. Education just cannot go on if you let the television do what it likes. It is impossible for education to work against television unless television recognizes that it also has an educational task which overrules our mere entertainment. Otherwise we cannot have education. From the democratic point of view television must be controlled because of its potential political power which is almost unlimited. If you get hold of television, you can do whatever you like. And such power must be controlled. My proposal is to look at the problem of controlling television as a task similar to that of control of medical people. Medical people have to be controlled too, and they do it very largely themselves. For example, they have to have a certain education. The same applies to the system of control of lawyers, who have their own organization which controls them. Thanks to these systems of control the lawyers do not steal the money from their clients and doctors do not kill their patients. And you have to control all people who work for television in some kind of organization. They would have to be [admitted to] such an organization [only] on the basis of some [special] education, after passing appropriate examinations testing their awareness of the educational tasks, and their sense of responsibility. They would have to learn that their influence is very great and that their responsibility is equally great (Jarvie, 1999, p 36).

Theory

(a) Every scientific theory is a system of sentences…or ASSERTED STATEMENTS or, for short, simple STATEMENTS.[1]

(b) The empirical sciences are systems of theories. The logic of scientific knowledge can therefore be described as a theory of theories.

Scientific theories are universal statements. Like all linguistic representations they are systems of signs or symbols. Thus I do not think it helpful to express the difference between universal theories and singular statements by saying that the latter are 'concrete' whereas theories are merely symbolic formulae or symbolic schema; for exactly the same may be said of even the most 'concrete' stateements.

Theories are nets cast to catch what we call 'the world': to rationalize, to explain, to master it. We endeavour to make the mesh finer and finer.[2]

(c) Hypotheses are nets: only he who casts will catch.

—NOVALIS[3]

Tragedy of the Commons

(a) A situation in which individual competition reduces the resource over which individuals compete, resulting in lower overall fitness for all members of a group or population.[4]

(b) William Forster Lloyd (1794-1852)… made a lasting if long unrecognized mark in economics… From 1832 to 1837 Lloyd held the Drummond chair of political economy at the University of Oxford. A collection of his lectures… were first published in 1833 in Oxford under the title *Two Lectures on the Checks to Population*…. The chief original contribution in Lloyd's discussion of population issues is his recognition and incisive analysis of the deleterious consequences that ensue "when the constitution of society is such that as to diffuse the effects of individual acts throughout

1 Tarski 1941, p 3.

2 Popper 1959, pp 37-38

3 Ibid, *inscription*

4 Rankin *et. al.,* p 1.

the community at large, instead of appropriating them to the individuals, by whom they are respectively committed." Lloyd's discussion of this problem... [is] best known to modern readers through Garrett Hardin's influential 1968 article... *"The Tragedy of the Commons"*.[1]

(c) It should be clear by now that the idea of the commons did not suddenly arise out of nothing in the year 1968. Passing references to the problem occur as far back as Aristotle, and Lloyd certainly saw it clearly in 1833. H. Scott Gordon's work in 1954 saw the beginning of a new concern with the problems presented by this politico-economic system. Yet the fact remains that a widespread recognition of these problems did not develop until after 1968. Why the delay? Two reasons are apparent. First, a favourable climate of opinion was needed for remarks about the commons to be noticed. This was created in the 1960's by the rapid growth of the environmental movement, which alerted people to the consequences of distributional systems. Second, it was necessary that the properties of the commons be stated in no uncertain terms if people were to consider the matter seriously. It was necessary that the human tragedy of adhering to a commons-type distribution be emphasized. A good, solid fortissimo minor chord had to be sounded. Before 1968 most of the sounds were either mere grace notes or extended passages played pianissimo. The down-playing was for good reason, of course: the clear message of the commons threatened cherished beliefs and practices. Abandoning any traditional practice requires a political upset (though revolution may be too strong a word).[2]

(d) It is fair to say that most people who anguish over the population problem are trying to find a way to avoid the evils of overpopulation without relinquishing any of the privileges they now enjoy.[3] They think that farming the seas or developing new strains of wheat will solve the problem -- technologically. I try to show here that the solution they seek cannot be found. The population problem cannot be solved in a technical way, any more than can the problem of winning the game of tick-tack-toe (Hardin 1968).

(e) The tragedy of the commons... provides a useful analogy allowing us to understand why shared resources, such as fisheries or the global climate, tend to undergo human overexploitation. The analogy, which dates back over a century before Hardin's original paper, describes the consequences of individuals selfishly overexploiting a common resource. The tragedy of the commons was originally applied to a group of herders grazing cattle on common land. Each herder only gains a benefit from his own flock, but when a herder adds more cattle to the land to graze, everyone shares the cost, which comes from reducing the amount of forage per cattle. If the herders are driven only by economic self-interest, they will each realize that it is to their advantage to always add another animal to the common: they sacrifice the good of the group (by forgoing sustainable use of the resource) for their own selfish gain. Thus, herders will continue to add animals, eventually leading to a 'tragedy' in which the pasture is destroyed by overgrazing. The difficulties inherent in protecting shared common resources, such as marine stocks or clean air, are well known: whereas everyone benefits from an intact resource, there is an individual-level

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1 Population Council 1980, p 473

2 Hardin 1977, p 1.

3 To keep downtown shoppers temperate in their use of parking space we introduce parking meters for short periods, and traffic fines for longer ones. We need not actually forbid a citizen to park as long as he wants to; we need merely make it increasingly expensive for him to do so. Not prohibition, but carefully biased options are what we offer him. A Madison Avenue man might call this persuasion; I prefer the greater candor of the word coercion.

Coercion is a dirty word to most liberals now, but it need not forever be so. As with the four-letter words, its dirtiness can be cleansed away by exposure to the light, by saying it over and over without apology or embarrassment. To many, the word coercion implies arbitrary decisions of distant and irresponsible bureaucrats; but this is not a necessary part of its meaning. The only kind of coercion I recommend is mutual coercion, mutually agreed upon by the majority of the people affected.

To say that we mutually agree to coercion is not to say that we are required to enjoy it, or even to pretend we enjoy it. Who enjoys taxes? We all grumble about them. But we accept compulsory taxes because we recognize that voluntary taxes would favor the conscienceless. We institute and (grumblingly) support taxes and other coercive devices to escape the horror of the commons (Hardin 1968).

temptation to cheat (e.g. to overexploit or pollute), because cheating brings economic advantages to the individual, whereas costs are distributed among all individuals. The lesson drawn from these studies is that solving the dilemma often requires negotiation and sanctions on disobedient individuals. This changes the payoffs, so that group-beneficial behaviour also becomes optimal for the individual: an example would be imposing heavier taxes on polluting industries. Hardin's own main solution to the tragedy of the commons was state governance and privatization of the resource in question; in general, social norms as well as individual morality have been considered good candidates for preventing overexploitation of common resources.[1]

(f) Hardin's original analogy, involves individuals selfishly exploiting a common resource until the resource is reduced to the point that the individuals no longer can persist on it. Examples include simple competition for food, but reproductive traits, such as high virulence in parasites and laying larger clutches in an attempt to out-reproduce others, can also be involved. Although it has been suggested that only competition over an extrinsic resource should be viewed as a tragedy of the commons, evolutionary biologists have applied the term to a Hardin's original essay dealt with both pollution and human overpopulation, but the main point of his article was that a common resource would always be overexploited when utilized by self-interested individuals. Pollution, climate change and overexploitation of fisheries all involve public goods suffering from the free-rider problem, and are thus examples of the tragedy of the commons. For example, the collapse of North Atlantic cod shows how easily common resources can be overexploited. People tend to value their own short-term self-interests over the long-term good of the planet, so it is difficult to solve environmental problems by appealing to individual goodwill only. Public awareness of resource limitation can even hasten overexploitation: endangered species are traded at higher prices when their perceived rarity increases. Convincing participants to behave in a group-beneficial way requires that individuals trust that the desired outcome is reachable and that free-riders will not benefit. Such trust is difficult to create whenever data and experience show otherwise. A flipside of the tragedy of the commons is that avoiding it can often be beneficial to the players involved, and can be described as win–win situations if policies are improved. For example, right whales often become entangled in lobster fishing gear. Although fishermen are not keen to reduce their income, a comparison of Canadian and American lobster fisheries shows that reducing the risk of entanglement can be achieved with no economic cost: reducing fishing effort leads to improved yield of lobsters per recruit. Similarly, despite considerable resistance and cynicism, marine reserves (areas where fishing is prohibited) can benefit all fishermen, even over the short-term. Policy negotiations are difficult in these situations, because people distrust others, but also because long-term benefits are rarely given sufficient weight. Without extensive education, such benefits are met with scepticism. For example, the population dynamic arguments that relate catch effort to expected yield in fisheries are not intuitively obvious. Easily perceived individual benefits would help to solve these problems. For example, using people's desire to improve their social reputation could prevent exploitation of the common good, as is seen in experimental 'climate games' in which participants improve their reputation by investing publicly to sustain the global climate. *What is striking is that organisms with little cognitive ability are frequently able to resolve the tragedy with little or no cognitive or communicative abilities*. With our advantage of communication and foresight, solutions to human tragedies of the commons should be within reach, but they are best solved, as Hardin advocated, using 'mutual coercion, mutually agreed upon'.[2]

(g) Scientific certainty and consensus in itself would not prevent overexploitation and destruction of resources. Many practices continue even in cases where there is abundant scientific evidence that they are ultimately destructive. An outstanding example is the use of irrigation in arid lands. Approximately 3000 years ago in Sumer, the once highly productive wheat crop had to be replaced by barley because barley was more salt-resistant. The salty soil was the result of irrigation. E. W. Hilgard pointed out in 1899 that the consequences of planned irrigation in California would be similar. His warnings were not heeded. Thus 3,000 years of experience and a good scientific

1 Rankin *et. al.,* p 643.

2 Italics ours, bid, p 644.

understanding of the phenomena, their causes, and the appropriate prophylactic measures are not sufficient to prevent the misuse and consequent destruction of resources. [1]

(h) Will a group of people reach a collective target through individual contributions when everyone suffers individually if the target is missed? This ''collective-risk social dilemma'' exists in various social scenarios, the globally most challenging one being the prevention of dangerous climate change. Reaching the collective target requires individual sacrifice, with benefits to all but no guarantee that others will also contribute. It even seems tempting to contribute less and save money to induce others to contribute more, hence the dilemma and the risk of failure. Here, we introduce the collective-risk social dilemma and simulate it in a controlled experiment: Will a group of people reach a fixed target sum through successive monetary contributions, when they know they will lose all their remaining money with a certain probability if they fail to reach the target sum? We find that, under high risk of simulated dangerous climate change, half of the groups succeed in reaching the target sum, whereas the others only marginally fail. When the risk of loss is only as high as the necessary average investment or even lower, the groups generally fail to reach the target sum. We conclude that one possible strategy to relieve the collective-risk dilemma in high-risk situations is to convince people that failure to invest enough is very likely to cause grave financial loss to the individual. Our analysis describes the social window humankind has to prevent dangerous climate change. [2]

(i) Finally, I will also note that there was another important, insightful, largely unacknowledged pre-1968 work which clearly details this problem on the public lands of great American West: Stewart 1925. The black and white photographs in this work lend aesthetic, historical, and visual weight to the well-crafted argument.

(j) *commons dilemma* n. A type of resource dilemma interpreted as a problem of overgrazing on a common pasture, illustrated by the following simple example. Three farmers each own a single cow weighing 1,000 kg and have access to a common that can sustain a maximum of three cows without deterioration. They all want to increase their wealth by adding a further cow to the common, but for each additional cow on the common the weight of every cow decreases by 200 kg. If one farmer adds a cow, then that farmer's personal wealth increases from 1,000 kg (one 1,000 kg cow) to 1,600 kg (two 800 kg cows); if two farmers add a cow each, then the wealth of each increases from 1,000 kg to 1,200 kg (two 600 kg cows); and if all three add a cow each, then the wealth of each decreases from 1,000 kg to 800 kg (two 400 kg cows), and each farmer is poorer than if each had acted cooperatively by not adding a further cow to the common. It is always in a farmer's individual self-interest to acquire an additional cow, whether or not one or more of the others does so, but if they all pursue individual self-interests in this way, then each ends up poorer than if they all cooperate, which means that the problem is a social dilemma... So called because of a reference in 1833 in an essay on population growth by the English economist William Forster Lloyd (1795 – 1852) to the 'tragedy of the commons'—the overgrazing of the commons in 14th-century England, which led to the enclosures and the eventual disappearance of many of the commons. [3]

(k) Game theory is rarely used to deal with the overuse and misuse of tourism resources. When it happens, the issue is normally explained within a non-cooperative setting in which, because of the free riding option, a problem emerges as the socially irrational outcome of an individually rational behaviour (social dilemma). In some cases, the assumptions upon which this explanation rests risk lacking both descriptive accuracy and predictive power. Since tourism is the encounter of a stable (residents) with a changing (tourists) population, the paper asserts that, in many cases, the issue may be better investigated within a strategic game in which the players do not know an aspect of their environment that is important for their choice (Bayesian game). Building on this, the paper demonstrates why an unsustainable path may emerge even when both players prefer preservation to exploitation and no free ride incentive exists (Bimonte forthcoming, *abstract*).

(l) Investment in a common resource shared by all players is difficult to evolve despite higher

1 Ludwig et. al. 1993.

2 Milinski *et. al* 2008, abstract ; also see Hauert 2006

3 Colman 2006

returns because a non-investor (free-rider) always receives more than an investor (altruist). This situation is referred to as the Tragedy of the Commons and is often observed in various biological systems including environmental problems of human society.[1]

(m) As a final note, despite the assertion of a very confused Director of an Institute of Island studies, Hardin 1968 has not been "discredited" by "every biologist." In fact, in 2004, in-depth citation analysis[2] clearly demonstrated that Hardin 1968 is by far *the most cited, most influential paper in ecology!*

Truth

(a) Knowledge consists in the search for truth – the search for objectively true, explanatory theories…

It is not the search for certainty. To err is human. *All human knowledge is fallible and therefore uncertain. It follows that we must distinguish sharply between truth and certainty* [italics mine]. That to err is human means not only that we must constantly struggle against error, but also that, even when we have taken the greatest care, we cannot be completely certain that we have not made a mistake.

In science, a mistake we make – an error – consists essentially in our regarding as true a theory that is not true… to combat the mistake, the error, means therefore to search for objective truth and to do everything possible to discover and eliminate falsehoods. This is the task of scientific activity. Hence we can say: our aim as scientists is objective truth; more truth, more interesting truth, more intelligible truth. We cannot reasonably aim at certainty. Once we realize that human knowledge is fallible, we realize also that we can *never* be *completely certain* that we have not made a mistake.[3]

(b) This problem had been seen and solved long before; first, it appears, by Xenophanes, and then by Democritus, and by Socrates… The solution lies in the realization that all of us may and often do err, singly and collectively, but that this very idea of error and human fallibility involves another one-the idea of objective truth: the standard which we may fall short of. Thus the doctrine of fallibility should not be regarded as part of a pessimistic epistemology. This doctrine implies that we may seek for truth, for objective truth, though more often than not we may miss it by a wide margin. And it implies that if we respect truth, we must search for it by persistently searching for our errors: by indefatigable rational criticism, and self-criticism.[4]

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1 Wako 2007, abstract

2 We assessed the degree of influence of selected papers and books in ecological economics using citation analysis. We looked at both the internal influence of publications on the field of ecological economics and the external influence of those same publications on the broader academic community. We used four lists of papers and books for the analysis: (1) 92 papers nominated by the Ecological Economics (EE) Editorial Board; (2) 71 papers that were published in EE and that received 15 or more citations in all journals included in the Institute for Scientific Information (ISI) Citation Index; (3) 57 papers that had been cited in EE 15 or more times; and (4) 77 monographs and edited books that had been cited in EE 15 or more times. In all, we analyzed 251 unique publications. For each publication, we counted the total number of ISI citations as well as the total number of citations in EE. We calculated the average number of citations per year to each paper since its publication in both the ISI database and in EE, along with the percentage of the total ISI citations that were in EE. Ranking the degree of influence of the publications can be done in several ways, including using the number of ISI citations, the number of EE citations or both. We discuss both the internal and external influence of publications and show how these influences might be considered jointly. We display and analyze the results in several ways. By plotting the ISI citations against the EE citations, we can identify those papers that are mainly influential in EE with some broader influence, those that are mainly influential in the broader literature but have also had influence on EE and other patterns of influence. There are both overlaps and interesting lacunae among the four lists that give us a better picture of the real influence of publications in ecological economics vs. perceptions of those publications' importance. By plotting the number of citations vs. dates of publication, we can identify those publications that are projected to be most influential (Costanza et. al. 2004).

3 Italics Popper's 1992 p. 4

4 Popper 1963, p 21

UTV **Universal Theory of Value**
See Funk 2008a ; Funk 2008c ; Funk 2008d ; Funk 2008f

War
In one of the greatest speeches of all time – his second inaugural – Abraham Lincoln said: "Both parties deprecated war; but one would make war rather than let the nation survive; and the other would accept war rather than let it perish. And the war came." It is a big mistake to say that war is irrational. We take all the ills of the world – wars, strikes, racial discrimination – and dismiss them by calling them irrational. They are not necessarily irrational. Though it hurts, they may be rational. *If war is rational, once we understand that it is, we can at least somehow address the problem. If we simply dismiss it as irrational, we can't address the problem.*[1]

1 Italics mine, Aumann 2005, p 351

Wasted Time

Most people…complain about the meanness of nature, because we are born for a brief span of life, and because this spell of time that has been given to us rushes by so swiftly and rapidly that with very few exceptions life ceases for the rest of us just when we are getting ready for it. Nor is it just the man in the street and the unthinking mass of people who groan over this - as they see it - universal evil: the same feeling lies behind complaints from even distinguished men. Hence the dictum of the greatest of doctors: 'Life is short, art is long.' Hence too the grievance, most improper to a wise man, which Aristotle expressed when he was taking nature to task for indulging animals with such long existences that they can live through five or ten human lifetimes, while a far shorter limit is set for men who are born to a great and extensive destiny. *It is not that we have a short time to live, but that we waste a lot of it. Life is long enough, and a sufficiently generous amount has been given to us for the highest achievements if it were all well invested* [italics mine]. But when it is wasted in heedless luxury and spent on no good activity, we are forced at last by death's final constraint to realize that it has passed away before we knew it was passing. So it is: we are not given a short life but we make it short, and we are not ill-supplied but wasteful of it. Just as when ample and princely wealth falls to a bad owner it is squandered in a moment, but wealth however modest, if entrusted to a good custodian, increases with use, so our lifetime extends amply if you manage it properly.

Why do we complain about nature? She has acted kindly: *life is long if you know how to use it* [italics mine]. But one man is gripped by insatiable greed, another by a laborious dedication to useless tasks. One man is soaked in wine, another sluggish with idleness. One man is worn out by political ambition, which is always at the mercy of the judgment of others. Another through hope of profit is driven headlong over all lands and seas by the greed of trading. Some are tormented by a passion for army life, always intent on inflicting dangers on others or anxious about danger to themselves. Some are worn out by the self-imposed servitude of thankless attendance on the great. Many are occupied by either pursuing other people's money or complaining about their own. Many pursue no fixed goal, but are tossed about in ever-changing designs by a fickleness which is shifting, inconstant and never satisfied with itself. Some have no aims at all for their life's course, but death takes them unawares as they yawn languidly – so much so that I cannot doubt the truth of that oracular remark of the greatest poet: 'It is a small part of life we really live.'[1]

1 Seneca c. A.D. 60, pp 1-2

SELECTED BIBLIOGRAPHY

Amir, S. (1994). The role of thermodynamics in the study of economic and ecological systems. *Ecological Economics, 10*(2), 125-142.

Andsersen, Henning (1995) 'Research on Islands: Classic, Recent and Prospective Approaches' in P. M. Vitousek, L. Loope & H. Adsersen, eds. Islands: Biological Diversity and Ecosystem Function, New York, Springer-Verlag, pp. 7-21.

Anckar, D & Anckar, C. (1995) 'Size, Insularity and Democracy', Scandinavian Political Studies, Vol. 18, No. 4, pp. 211-229.

Aumann, R. J. (2008). 'Game theory': *The new palgrave dictionary of economics*. Eds. Steven N. Durlauf and Lawrence E. Blume, Palgrave Macmillan, 2008, The New Palgrave Dictionary of Economics Online, Palgrave Macmillan. 21 August 2008, DOI:10.1057/9780230226203.0615

Aumann, R.J. (2005). *War and peace*. Sveriges Riksbank Prize Lecture. December 8, 2005. Center for the Study of Rationality, and Department of Mathematics, The Hebrew University, Jerusalem, Israel.

Axelrod, R., & Hamilton, W. (1981). The evolution of cooperation. *Science*. 211:1390-1396 (March 1981).

Bailey, R. (2002). The rise and eventual fall of ideological environmentalism. Introction to: Global warming and other eco-myths: how the environmental movement uses false science to scare us to death. Random House: U.S.A.

Baldacchino, G. (2007). Fixed links and the engagement of islandness: reviewing the impact of the Confederation Bridge. *The Canadian Geographer/Le Géographe Canadien, 51*(3), 323-336.

Baldacchino, G. (2007). *A world of islands : an island studies reader*. Charlottetown, P.E.I.; Malta: Institute of Island Studies; Miller House.

Baldacchino, G., Baldacchino, G., MacDonald, E., Baldacchino, G., & Spears, A. (2007). *Bridging islands : the impact of fixed links*. Charlottetown, P.E.I.: Acorn Press.

Baldacchino, G., Greenwood, R., MacKinnon, W. E., Bartmann, B., & UPEI. IIS. (1998). *Competing strategies of socio-economic development for small islands*. Charlottetown, P.E.I.: IIS, UPEI.

Barlow, R. (2006). King juan carlos 1, hugo chavez 0. htttp://www.sailnet.com.

Bartmann, B. (1991). *A world made safe for small states*. Charlottetown: Institute of Island Studies.

Baumgärtner, S., Becker, C., Faber, M., & Manstetten, R. (2006). Relative and absolute scarcity of nature. Assessing the roles of economics and ecology for biodiversity conservation. *Ecological Economics, 59*(4), 487-498.

Black, F., & Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*. May/June 1973, Vol. 81, No. 3: pp. 637.

Beaulier, S., & Caplan, B. (2007). Behavioral Economics and Perverse Effects of the Welfare State. *Kyklos, 60*(4), 485-507.

Begley, L. (1993). *Crossing that bridge : a critical look at the PEI fixed link*. Charlottetown, PEI: Ragweed Press.

Benz, M., & Frey, B. S. (2008). Being independent is a great thing. *Economica*.

Benson, V. S., VanLeeuwen, J. A., Sanchez, J., Dohoo, I. R., & Somers, G. H. (2006). Spatial analysis of land use impact on ground water nitrate concentrations. *Journal of environmental quality, 35*(2), 421-432. doi:35/2/421 [pii]; 10.2134/jeq2005.0115 [doi]

Berninghaus, S., & Schwalbe, U. (1996). Evolution, interaction, and Nash equilibria. *Journal of Economic Behavior & Organization, 29*(1), 57-85.

Biagini, E., & Hoyle, B. S. (1999). *Insularity and development : international perspectives on islands*. London ; New York: Pinter.

Bimonte, S. (forthcoming). The "tragedy of tourism resources" as the outcome of a strategic game: a new analytical framework. Department of Political Economy, University of Siena, Piazza San Francesco 7, 53100 Siena, Italy. Article history: Received 17 September 2007 Received in revised form 18 December 2007 Accepted 18 December 2007

Blaikie, P. M., & Brookfield, H. C. (1987). *Land degradation and society*. London ; New York: Methuen.

Botton, A. de. (2001). *The consolations of philosophy* (1st Vintage International ed.). New York: Vintage Books

Brubaker, E., & 20 Atlantic Institute for Market Studies. (1995). *Making the oceans safe for fish : how property rights can reverse the destruction of the atlantic fisheries*. Halifax, NS: Atlantic Institute for Market Studies.

Capra, F. (2007). *The science of Leonardo : inside the mind of the great genius of the Renaissance* (1st ed.). New York: Doubleday.

Cairns, D. K. (1992). *Fisheries management on Prince Edward Island : insular autonomy or Pax Ottawa?*. Charlottetown: Institute of Island Studies.

Canada. (1970). Canada. Dept. of Regional Economic Expansion, & Prince Edward Island. (1970). *Development plan for Prince Edward Island : A 15 year federal-provincial program for social and economic advancement, 1970*. Helen C. Abell Collection, UPEI, 1970.

- - - . (1971). Canada. Dept. of Regional Economic Expansion, & Prince Edward Island. (1971). *Agreement covering development plan for Prince Edward Island, between the government of Canada and the government of Prince Edward Island March 7, 1969, amended by Amendment no.1 of June 21, 1971*. Ottawa: Information Canada.

- - - . (1975). Canada. Dept. of Regional Economic Expansion & Agricultural and Rural Development Act. *Developement Plan for Prince Edward Island, Dept. of Regional Economic Expansion and the Province of Prince Edward Island, 1975*. 1975: Helen C. Abell Collection: UPEI.

Carlquist, S. J. (1974). *Island biology*. New York: Columbia University Press.

- - - . (1965). *Island life: a natural history of the islands of the world* (1st ed.). Garden City, N.Y.: Published for the American Museum of Natural History by the Natural History Press.

Carson, R. (1962). *Silent spring*. Boston: Houghton Mifflin.

Cellino, A., Somma, R., Tommasi, L., Paolinetti, R., Muinonen, K., Virtanen, J., et al. (2006). NERO: General concept of a Near-Earth object Radiometric Observatory. *Advances in Space Research, 37*(1), 153-160.

Church, T. (2007). Spain calls halt to building on Ibiza. 8 November, 2007 | 10.38AM. http://www.beatportal.com/feed/item/spain-calls-halt-to-building-on-ibiza/

Clark, J. M. (1918). *Readings in the economics of war*. Chicago, IL: The University of Chicago Press.

Clow, F. R. (1893). Our Commercial Relations with the Hawaiian Islands. *The Journal of Political Economy, 1*(2), 280-284.

Coase, R. H. (1937). The nature of the firm. *Economica, 4*(16), 386-405.

Colman, A., M. (2006) "commons dilemma" ; "semantics" ; "social dilemma" *A dictionary of psychology.* Oxford University Press. Oxford Reference Online.

Copernicus, N. (1543). *On the revolutions of the heavenly spheres* [De revolutionibus orbium caelestium (literal translation: The revolutions of celstrial orbs).] (A. M. Duncan Trans.). (1976th ed.). Newton Abbot Eng.; New York: David & Charles; Barnes & Noble.

Costanza, R., Stern, D., Fisher a, B., He, L., Ma, C. (2004). *Influential publications in ecological economics: a citation analysis* Robert Gund Institute of Ecological Economics, The University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT 05405-0088, USA Department of Economics, Rensselaer Polytechnic Institute, Troy, NY 12180-3590, USA Received 25 July 2003; received in revised form 3 June 2004; accepted 4 June 2004 Available online 1 October 2004

Corvi, R. (2006). *Introduction to the thought of karl popper.* Florence, KY, USA: Routledge.

Cournot, A. A. (1838). *Researches into the mathematical principles of the theory of wealth*. New York; London: Macmillan; Macmillan.

Cressman, R. (1996). Evolutionary Stability in the Finitely Repeated Prisoner 's Dilemma Game. *Journal of Economic Theory, 68*(1), 234-248.

Czárán, T. (1999). Game theory and evolutionary ecology: Evolutionary Games & Population Dynamics by J. Hofbauer and K. Sigmund, and Game Theory & Animal Behaviour, edited by L.A. Dugatkin and H.K. Reeve. *Trends in Ecology & Evolution, 14*(6), 246-247.

Danielsson, J. (2007). *The emperor has no clothes: Limits to risk modelling.*

Darwin, C. (1845). *Journal of the researches into the natural history and geology of the countries visited during the voyage of h.m.s. beagle round the world*. From so simple a beginning: the four great books of charles darwin. Introduction, Afterword, and General Index by E.O. Wilson, 2006, 1st ed.). New York: W. W. Norton.

- - - . (1859a). *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (A facsimile of the first edition by Wildside Press, Holicong, PA, U.S.A., 2003 ed.). London: John Murray, Albermarle Street.

- - - . (1859b). *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*. From so simple a beginning: the four great books of charles darwin. Introduction, Afterword, and General Index by E.O. Wilson, 2006, 1st ed.). New York: W. W. Norton.

- - - . (1871). *The descent of man, and selection in relation to sex*. From so simple a beginning: the four great books of charles darwin. Introduction, Afterword, and General Index by E.O. Wilson, 2006, 1st ed.). New York: W. W. Norton.

- - - . (1872). *The expressions of the emotions in man and animals.* From so simple a beginning: the four great books of charles darwin. Introduction, Afterword, and General Index by E.O. Wilson, 2006, 1st ed.). New York: W. W. Norton.

- - - ., Herschel, J. F. W., Hoisington, H. R., Hoisington, H. R., & The British Admiralty. (1849). *A Manual of scientific enquiry; : prepared for the use of Her Majesty's navy : and adapted for travellers in general.* London: J. Murray.

- - - ., & Wilson, E. O. (2006). From so simple a beginning : the four great books of Charles Darwin (1st ed.). New York: W. W. Norton.

Descartes, R. (1637). *Discourse on the method of rightly conducting the reason, and seeking truth in the sciences.* (F.E. Sutcliffe English Translation, 1968). Penguin Books Ltd, Middlesex, England.

Dasgupta, P. (2007). Nature and the Economy, Journal of Applied Ecology,, 44(3), 475-487.

- - - . (2005). "Bottlenecks" (review of *Collapse: How Societies Choose to Fail or Survive*, by Jared Diamond), *London Review of Books*, 27(10), 19 May, 21-22.

- - - . (2005b). Common Property Resources: Economic Analytics, Economic and Political Weekly, 2005, 40(16) (April 16-22), 1610-1622. Reprinted in R. Ghate, N. Jodha, and P. Mukhopadhyay, eds., Promise, Trust, and Evolution (Oxford: Oxford University Press), forthcoming, 2008.

- - - . (2005c). Uncertainty and Hyperbolic Discounting (with E.S. Maskin), American Economic Review, 2005, 95(4), 1290-1299.

- - - . (2002a). Economic Growth, Carrying Capacity, and the Environment (with K.J. Arrow, B. Bolin, R. Costanza, C. Folke, C.S. Holling, B.-O. Jansson, S. Levin, K.-G. Mäler, C. Perrings, and D. Pimentel), Science, 1995, 268(5210), 28 April, 520-1. Reprinted in Ecological Economics, 1995, 15(2), 91-95; in Ecological Applications, 1996, 6(1), February, 13-15; in Environment and Development Economics, 1996, 1(1), 104-110; and in R. Kerry Turner, K.J. Button and P. Nijkamp, eds., Ecosystems and Nature (Cheltenham: Edward Elgar).

- - - . (2002b). Food Production, Population Growth, and Environmental Security (with G. Daily, B. Bolin, P. Crosson, J. du Guerny, P. Ehrlich, C. Folke, A.-M. Jansson, B.-O. Jansson, N. Kautsky, A. Kinzig, S. Levin, K.-G. Mäler, P. Pinstrup-Andersen, and B. Walker), Science, 1998, 281, 1291-1292. Reprinted in W. Krull, ed.,

Debates on Issues of Our Common Future (Velbruck Wissenschaft).

- - - . (1999). The Nature of Value and the Value of Nature (with G. Daily, T. Soderqvist, S. Aniyar, K.J.Arrow, P. Ehrlich, A.M. Jansson, B.O., Jansson, N. Kautsky, S. Levin, J. Lubchenco, K.-G. Mäler, D. Simpson, D. Starrett, D. Tilman, B. Walker, Science, 289 (21 July), 395-396.

Dawkins, R. (2006). *The God Delusion.* New York. Houghton Mifflin Co. 406 pages.

- - - . (1998). *Unweaving the rainbow : science, delusion and the appetite for wonder*. Boston: Houghton Mifflin Co.

- - - . (1995). *A river out of eden: a darwinian view of life*. New York: Basic Books. 172 pages.

- - - . (1985). *The blind watchmaker* (1st ed.). New York: Norton.

- - - . (1982). *The extended phenotype : the gene as the unit of selection*. Oxford Oxfordshire ; San Francisco: Freeman.

- - - . (1976). *The selfish gene*. 30th anniversary edition (2006) with a new introduction by Richard Dawkins, and the original introductions from both 1st and 2nd editions.

Demetrius, L., & Ziehe, M. (1984). *The Measurement of Darwinian Fitness in Human Populations.* Proceedings of the Royal Society of London.Series B, Biological Sciences, 222(1226), 33-50. Retrieved from http://www.jstor.org.rlproxy.upei.ca/stable/36037

Demetrius, L., & Gundlach, V. M. (2000). *Game theory and evolution: finite size and absolute fitness measures.* Mathematical Biosciences, 168(1), 9-38.

Demetrius, L., Matthias Gundlach, V., & Ziehe, M. (2007). Darwinian fitness and the intensity of natural selection: Studies in sensitivity analysis. Journal of Theoretical Biology, 249(4), 641-653.

Demetrius, L., & Ziehe, M. (2007). Darwinian fitness. Theoretical Population Biology, 72(3), 323-345.

Denslow, J. S. (2001). The ecology of insular biotas. Trends in Ecology & Evolution, 16(8), 423-424. The Ecology of Insular Biotas conference was held at Victoria University of Wellington, New Zealand, from 12–16 February 2001.

Dewailly, É, Ayotte, P., Lucas, M., & Blanchet, C. (2007). Risk and benefits from consuming salmon and trout: A Canadian perspective. Food and Chemical Toxicology, 45(8), 1343-1348.

DOD. (2001). Joint Publication 1-02 Department of defense dictionary of military and associated terms (JP 1-02). 12 April 2001 (As Amended Through 04 March 2008).

DORN, D., FISCHER, J., KIRCHGA, G., SOUSA-POZA, A. *Is it culture or democracy? - the impact of democracy, income, and culture on happiness.* Swiss Institute for International Economics and Applied Econonomic Research (SIAW). University of St. Gallen

Eastern Caribbean Natural Area Management Program, Putney, A. D., Caribbean Conservation Association, & University of Michigan. School of Natural Resources. (1980). *Survey of conservation priorities in the Lesser Antilles ... preliminary data atlas*. St. Croix, U.S. V.I.: The Program.

Economic Geography. (1925). Economic Geography, 1(1).

Einstein, A. (1954). *Ideas and opinions : Based on mein weltbild*. New York: Crown Publishers.

- - - . (1939). Letter to F.D. Roosevelt, President of the United States. Dated: August 2nd, 1939. Public Domain.

Ekelund, R. B., & Hébert, R. F. (1997). *A history of economic theory and method* (4th ed.). New York: McGraw-Hill.

Fehr, E., & Fischbacher, U. (2004). Third-party punishment and social norms. *Evolution and Human Behavior, 25*(2), 63-87.

Fehr, E., & Rockenbach, B. (2004). Human altruism: economic, neural, and evolutionary perspectives. *Current Opinion in Neurobiology, 14*(6), 784-790.

Fehr, E., & Schmidt, K. M. (1999). A Theory Of Fairness, Competition, and Cooperation*. *Quarterly Journal of Economics, 114*(3), 817-868.

Fehr, E., & Fischbacher, U. (2004). Social norms and human cooperation. *Trends in Cognitive Sciences, 8*(4), 185-190.

Fehr, E., & Gachter, S. (2000). *Fairness and retaliation: the economics of reciprocity,* Journal of Economic Perspectives, Volume 14, number 3, summer 2000, pp 159-181.

Fitzgerald, F. S. (1934). *Tender is the night, a romance*. New York: C. Scribner's sons.

Fosberg, F. R., & 20 National Academy of Sciences. (1970). *Man's place in the island ecosystem; a symposium*. Honolulu: Bishop Museum Press.

Frey, B. S. (1983). *Democratic economic policy : a theoretical introduction*. New York: St. Martin's Press.

- - - . (1997). *Not just for the money : an economic theory of personal motivation*. Cheltenham, UK ; Brookfield, Vt.: Edward Elgar Pub.

- - - . (2000). *Why Economists Disregard Economic Methodology*. Institut für Empirische Wirtschaftsforschung, Universität Zürich.

- - - . (2002). *Publishing as Prostitution? Choosing Between One's Own Ideas and Academic Failure*. Published in: Public Choice Vol. 116, 2003, 205-223: Institut für Empirische Wirtschaftsforschung, Universität Zürich.

- - - ., Benesch, C., & Stutzer, A. (2005). Does watching tv make us happy? *Journal of Economic Psychology, 28*(3), 283-313.

- - - ., & Eichenberger, R. (1992). *The Political economy of stabilization programmes in developing countries*. Paris: OECD Development Centre.

- - - ., & Bohnet, I. (1997). Identification in democratic society. *Journal of Socio-Economics, 26*(1), 25-38.

- - - ., & Stutzer, A. (2000). Happiness, Economy and Institutions. *The Economic Journal, 110*(466), 918-938.

Fuller, S. (2003). *Kuhn vs. Popper*. Cambridge, UK: Icon Books, Ltd.

Funk, M. (2008a). *On the Problem of Sustainable Economic Development I - The Funk-Zweikampf Solution to this Prisoner's Dilemma - Introducing a Unified Theory of Value for the Biological and Social Sciences in an Open Letter to the Åland International Institute of Comparative Island Studies.* AICIS. Published online 8 June 2008: http://www.aicis.ax/index.php?option=com_content&task=view&id=6&Itemid=18

- - - . (2008b). On the Problem of Connectivity: Branding Insularity. A seminar delivered 11 June 2008, 1:00 p.m., at the Åland International Institute of Comparative Island Studies 2nd Annual Conference, "Islands of Competence: Branding Identities in a Globalized World", The Parliamentary Building, Mariehamn, Åland.

- - - . (2008c). On the Problem of Sustainable Economic Development II - The Funk-Zweikampf Solution to this Prisoner's Dilemma: Introducing a Unified Theory of Value for the Biological and Social Sciences in an Open Letter to Partha Dasgupta. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 4.

- - - . (2008d). On the Problem of The Island of Earth - Introducing a Unified Theory of Value for the Biological and Social Sciences in an Open Letter to the President of the United States. Dated 4 July 2008, mailed via FEDEX 26 July 2008, from The Union League Club, Room 1602, Chicago, IL, 60604, The United States of America. Delivered 12:25, 29 July 2008 and signed for by J. Casey. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 5.

- - - . (2008f). *On the problem of vague terms: A glossary of clearly stated assumptions & careful, patient descriptions*. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 6.

- - - . (2008g). On the Problem of Sustainable Economic Development III – An Evolutionary Stable Strategy for The King of Spain & the President of the Balaeric Islands. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 7.

- - - . (2007a). On the problem of hollywood economics: de vany's error—george lucas knows something. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 1.

- - - . (2007b). *On the problem of global warming: a brief history of a new & unpopular theory in an open letter to john gillis*. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 2.

- - - . (2007c). *On the problem of dependent people: natural resource valuation errors in atlantic canadian island jurisdictions.*

Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 3.

- - - . (2007d). *Personal Correspondence.* From: Matt Funk <Mfunk@upei.ca>, To: Doherty, Peter, Sent: Sun Oct 28 20:44:21 2007, Subject: Thomas Kuhn & Karl Popper:

- - - . (forthcoming). On the problem of global warming: a solution for william funk, albert gore and richard branson. Funk Island Instutite of Theoretical Nonlinear Dynamics. Working paper No. 8.

Girvan, N., Unicef, & Consortium Graduate School of Social Sciences. (1997). *Poverty, empowerment and social development in the Caribbean*. Kingston, Jamaica: Canoe Press University of the West Indies.

Gold, E., Letalik, N. G., Mitchell, C. L., & 20 Dalhousie Ocean Studies Programme. (1982). *Problems of development and ocean management in the Eastern Caribbean : economic, legal, environmental and planning aspects : proceedings of an international seminar held in Kingstown, St. Vincent and the Grenadines, West Indies, May 11-13, 1981*. Halifax: Dalhousie Ocean Studies Programme.

Gold, R. E. (2001). SHIELD: a comprehensive earth-protection architecture. *Advances in Space Research, 28*(8), 1149-1158.

Goldsmith, F. B. (1973). The ecologist's role in development for tourism: a case study in the Caribbean. *Biological Journal of the Linnean Society, 5*(3), 265-287.

Gordon, H. S. (1954). The economic theory of a common-property resource: The Fishery. *The Journal of Political Economy, 62*(2), 124-142.

Gorman, M. (1979). How many species? *Island Ecology*, London, Chapman and Hall, pp. 22-32.

Gould, S. J. (2002). *The structure of evolutionary theory*. Cambridge, Mass.: Belknap Press of Harvard University Press.

- - - . (1977). Ever since Darwin : reflections in natural history (1st ed.). New York: Norton.

Greenwood, R. (1998). *Dependency and Development in Prince Edward Island*, a chapter from *Competing strategies of socio-economic development for small islands*. Charlottetown, P.E.I.: IIS, UPEI.

Grant, P. R., & Royal Society. Discussion Meeting. (1998). *Evolution on islands*. Oxford ; New York: Oxford University Press.

Gray, A. M. (1989). *Warfighting*. MCDP 1. 1997 edition with introduction by C. C. Krulak, General, U.S. Marine Corps, Commandant of the Marine Corps. DISTRIBUTION: 142 000006 00.

Greenleaf S. S., and Kremen, C. (2006). Wild bees enhance honey bees' pollination of hybrid sunflower. Published online on August 29, 2006, 10.1073/pnas.0600929103 |PNAS | September 12, 2006 | vol. 103 | no. 37 | 13890-13895. Greenleaf: Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544; and Kremin: Department of Environmental Science, Policy, and Management, University of California, 137 Mulford Hall, #3114, Berkeley, CA 94720. Edited by Pamela A. Matson, Stanford University, Stanford, CA, and approved July 19, 2006 (received for review February 3, 2006).

GREHAN, J. (2001). Biogeography and evolution of the Galapagos: integration of the biological and geological evidence. Biological Journal of the Linnean Society, 74(3), 267-287.

Grossman, L. S. (1998). *The political ecology of bananas : contract farming, peasants, and agrarian change in the eastern Caribbean*. Chapel Hill: University of North Carolina Press.

Hagen, E., & Hammerstein, P. (2006). Game theory and human evolution: A critique of some recent interpretations of experimental games. *Theoretical Population Biology, 69*(3), 339-348.

Haldane, J. B. S. (1932). *The causes of evolution*. London: Longman.

Hammerstein, P. (1994). Darwinian adaptation, population genetics and the streetcar theory of evolution. *Journal of Mathematical Biology,* in press.

- - - ., & Hagen, E. H. (2005). The second wave of evolutionary economics in biology. Trends in Ecology & Evolution, 20(11), 604-609.

Abstract: Several core issues in economics and biology overlap substantially. At the theoretical level, these include analogies and differences among rational choice, learning, genetic evolution and cultural evolution. At the empirical level, they include the structure of decision making, its neural basis and, more generally, human nature.

- - - ., and R. Selten. (1994). Game theory and evolutionary biology. In *Handbook of game theory with economic applications,* vol. 2, edited by R. J. Aumann, and S. Hart, 929 - 993. Amsterdam: Elsevier.

Hardin, G. (1968). The tragedy of the commons. Science 162, 1243-1248.

Hardin, G. (1998). Extensions of "The tragedy of the commons." Science 280: 682-683.

Hawking, S. W. (2008). TED. *Stephen hawking: Asking big questions about the universe.* Recorded February 2008.

- - - . (1988). *A brief history of time : from the big bang to black holes*. Toronto ; New York: Bantam Books.

- - - ., & Shiga, D. (2008). Stephen hawking calls for moon and mars colonies. NewScientist.com. Posted: 23:56 21 April 2008.

Hayek, F. A. von. (1982). *Law, legislation and liberty : A new statement of the liberal principles of justice and political economy*. London: Routledge and Kegan Paul.

- - - . (1979). *The counter-revolution of science : studies on the abuse of reason* (2nd ed.). Indianapolis: Liberty Press.

- - - . (1974a). *Sveriges Riksbank Prize Banquet Speech,* December 10, 1974. Nobel.org.

- - - . (1974b). *The pretense of knowledge.* Sveriges Riksbank Prize Lecture. Nobel.org

- - - . (1960). *The constitution of liberty* (1978 ed.). London: Routledge.

- - - . (1945). The Use of Knowledge in Society. *The American Economic Review, 35*(4), 519-530.

- - - . (1944). *The road to serfdom* (2001 ed.). London ; New York: Routledge Classics.

- - - . (1944). Scientism and the Study of Society. Part II. *Economica, 11*(41), 27-39.

- - - . (1943a). Scientism and the Study of Society. Part I *Economica, 10*(37), 34-63.

- - - . (1943b). The Facts of the Social Sciences. *Ethics, 54*(1), 1-13.

- - - . (1941). The Counter-Revolution of Science. *Economica, 8*(29), 9-36.

- - - . (1934). Carl Menger. *Economica, 1*(4), 393-420.

- - - . (1933). The Trend of Economic Thinking. *Economica,* (40), 121-137.

- - - ., Bartley, W., & Kresge, S. (1991). *The trend of economic thinking : Essays on political economists and economic history*. University of Chicago.

- - - ., & Bartley, W. (1988). *The fatal conceit : the errors of socialism*. London: Routledge.

Hector, A., & Bagchi, R. (2007). Biodiversity and ecosystem multifunctionality. Vol 448, 12 July 2007, doi:10.1038/nature05947.

Helferich, G. (2004). *Humboldt's cosmos : Alexander von Humboldt and the Latin American journey that changed the way we see the world*. New York: Gotham Books.

Hess, C. (2000). "Is There Anything New Under the Sun? A Discussion and Survey of Studies on New Commons and the Internet." Presented at "Constituting the Commons: Crafting Sustainable Commons in the New Millenium", the Eighth Conference of the International Association for the Study of Common Property, Bloomington, Indiana, USA, May 31-June 4.

Hines, W. G. S., & Smith, J. M. (1979). Games between relatives. Journal of Theoretical Biology, 79(1), 19-30.

Hinterland. (2008). *Hinterland who's who - caribou.* Retrieved 8/13/2008, 2008, from http://www.hww.ca/hww2.asp?id=85

Hitchens, C. (2007). God is not great: how religion poisons everything Twelve Books Published May 1, 2007,

Hardcover.

Hofbauer, J., & Weibull, J. (1996). Evolutionary Selection against Dominated Strategies. *Journal of Economic Theory, 71*(2), 558-573.

Huang, X., Hites, R. A., Foran, J. A., Hamilton, C., Knuth, B. A., Schwager, S. J., et al. (2006). Consumption advisories for salmon based on risk of cancer and noncancer health effects. Environmental Research, 101(2), 263-274.

Hume, D. (1739). *A Treatise of human nature: being an attempt to introduce the experimental method of reasoning into moral subjects*.

Ignatieff, M. (2004). *Political ethics in the age of terror: the lesser evil*. Princeton, New Jersey: Princeton University Press.

Isaacson, W. (2007). *The world needs more rebels like einstein: how nonconformity, not rote learning, unlocked his genius.*

Jarvis, D. I., Brown, A. H. D., Cuong, P. H., Collado-Panduro, L., Latournerie-Moreno, L., Gyawali S., Tanto, T., Sawadogo' M., Mar, Istvan., Sadiki, M., Thi-Ngoc Hue, N., Arias-Reyes, L., Bajracharya, D. J., Castillo, F., Rijal, D., Belqadi, L., Rana, R., Saidi, S., Ouedraogo, J., Zangre, R., Rhrib, K., Chavez, J. L., Schoen, D., Sthapit, B., De Santis, P., Fadda, C., & Hodgkin, T. (2008). A global perspective of the richness and evenness of traditional crop-variety diversity maintained by farming communities. "Proceedings of the National Academy of Sciences of the United States of America". PNAS. Published online on March 24, 2008, 10.1073/pnas. 0800607105 PNAS | April 8, 2008 | vol. 105 | no. 14 | 5326-5331. Communicated by Hans R. Herren, Millennium Institute, Arlington, VA, January 26, 2008 (received for review July 18, 2007).

Jarvie, I. C., & Pralong, S. (1999). *Popper's Open society after fifty years*. London ; New York: Routledge.

Jedicke, R., Morbidelli, A., Spahr, T., Petit, J., & Bottke, W. F. (2003). Earth and space-based NEO survey simulations: prospects for achieving the spaceguard goal. *Icarus, 161*(1), 17-33.

Jefferson, Thomas. (1776). *The Declaration of Independence.*

Kant, I. (1881). *Critique of pure reason* [Kritik der reinen Vernunft.] (F. M. Müller Trans.). London: Macmillan.

Keynes, J. M. (1936). *The general theory of employment, interest and money*. London: Macmillan and Co.

- - - . (1920). *The economic consequences of the peace.* The 2nd printing 2004th ed. New Brunswick, New Jersey: Transaction Publishers. Originally published by Harcourt, Brace, and Howe, Inc.

Kiel, L.D., & Elliott, E. W. (1996). Chaos theory in the social sciences: foundations and applications. University of Michigan Press.

Kirzner, I. M. (2006). *The Austrian Economists: Lifetime Achievement Award to Professor Israel M. Kirzner.*

Kobayashi, Y., Hammerstein, P., & Telschow, A. (2008). The neutral effective migration rate in a mainland-island context. Theoretical Population Biology, 74(1), 84-92.

Köhler, M., Moyà-Solà, S., & Wrangham, R. W. (2008). Island rules cannot be broken. Trends in Ecology & Evolution, 23(1), 6-7.

Kuang, W., & Bloxham, J. (1997). *An earth-like numerical dynamo model.*

Kuhn, T. S. (1962). *The structure of scientific revolutions*. Chicago: University of Chicago Press.

Kurlansky, M. (1997). *Cod : a biography of the fish that changed the world*. New York: Walker and Co.

Lackey, Robert T. 2004. Normative science. Fisheries. 29(7): 38-39.National Health and Environmental Effects Research Laboratory. U.S. Environmental Protection Agency. Synopsis of a talk presented at the Symposium "Science in the Public Arena: The How and Why of Scientific Decision-Making" at the Annual Meeting of the Western Division of the American Fisheries Society, Salt Lake City, Utah, February 29 - March 4, 2004.Lackey, senior fisheries biologist, is with the U.S. Environmental Protection Agency in Corvallis,Oregon. He is also professor of fisheries science and adjunct professor of political science at Oregon State University. http://oregonstate.edu/~lackeyr/Recent%20Publications.html

Larkin, M. (1990). *Our way of living : survival strategies in lobster fishing households in Prince Edward Island*. St John's: Memorial University.

Laskar, J. (1990). The chaotic motion of the solar system: A numerical estimate of the size of the chaotic zones. *Icarus, 88*(2), 266-291.

Laszlo, E., & Loye, D. (1998). *The evolutionary outrider : the impact of the human agent on evolution : essays honouring Ervin Laszlo*. Westport, Conn.: Praeger.

Laughlin, J. L. (1892). The study of political economy in the united states. *The Journal of Political Economy, 1*(1), 1-19.

Laxness, Halldór.. (1946). *Independent people : An epic* [Sjálfstætt fólk.] . New York: A. A. Knopf.

Lockhart, D., & Drakakis-Smith, D. (1991). *Environmental and economic issues in small island development*. S.L.: Commonwealth Foundation.

Lorius, C., Jouzel, J., Raynaud, D., Hansen, J. & Le Treut, H. (1990). *The ice-core record: Climate sensitivity and future greenhouse warming.*

Lowenstein, R. (2000). *When genius failed : The Rise and Fall of Long Term Capital Management* (1st ed.). New York: Random House.

Lenton, T.M., Held, H., Kriegler', E., Hall, J. W., Lucht, W., Rahmstorf, S., & Schellnhuber, H.J. Tipping elements in the Earth's climate system. Published online February 7, 2008, 10.1073/pnas.0705414105. Edited by William C. Clark, Harvard University, Cambridge, MA, and approved November 21, 2007 (received for review June 8, 2007). PNAS | February 12, 2008 | vol. 105 | no. 6 | 1786-1793

Lewellen, T. C. (1995). *Dependency and development : an introduction to the Third World*. Westport, Conn.: Bergin & Garvey.

Leggett, M. (2006). An indicative costed plan for the mitigation of global risks. *Futures, 38*(7), 778-809.

Llewelyn-Davies, Weeks, et. al. (1970) *Mustique development plan*.

Lloyd, William Forster. (1833). Two lectures on the checks to population, delivered before the University of Oxford, in Michaelmas Term 1832. Republished as W. F. Lloyd on the Checks to Population. *Population and Development Review*, Vol. 6, No. 3, Sep., 1980, pp. 473-496.

Lovelock, J., & Whitfield, M. (1982). *Life span of the biosphere.*

Ludwig, D., Hilborn, R., & Walters, C. (1993). Uncertainty, Resource Exploitation, and Conservation: Lessons from History. *Ecological Applications, 3*(4), 548-549. Also: *Science* 260(2):17, April 2, 1993

MacArthur, R. H., & Wilson, E. O. (1967). *The theory of island biogeography*. Princeton, N.J.: Princeton University Press.

Mackay, C. (1841). *Extraordinary popular delusions and the madness of crowds.* 1967 edition: *Extraordinary popular delusions and the madness of crowds with facsim. title pages and reproductions of original illus. from the editions of 1841 and 1852*. Wells, N.J.: Fraser Publ. Co.

Marrow, P., Johnstone, R., & Hurst, L. (1996). Riding the evolutionary streetcar: where population genetics and game theory meet. *Trends in Ecology & Evolution, 11*(11), 445-446.

Maxwell, J. C. (1873). Nature 7, March 27, 1873, p. 400: Review of Thomson's & Taite's *Elements of natural Philosophy.*

Malhotra, R. (1994). Nonlinear resonances in the solar system. *Physica D: Nonlinear Phenomena, 77*(1-3), 289-304.

Mankiw. (2002) *Principles of Macroeconomics.*

Marrow, P., Johnstone, R., & Hurst, L. (1996). Riding the evolutionary streetcar: where population genetics and game theory meet. *Trends in Ecology & Evolution, 11*(11), 445-446.

Marshall, A. (1890). *Principles of economics* (Second ed., 1891). London and New York: Macmillan and Co.

Mauer, S. B., & Tucker, A. W. (1983). An Interview with Albert W. Tucker. The Two-Year College Mathematics Journal, 14(3), 210-224. Retrieved from http://www.jstor.org.rlproxy.upei.ca/stable/3027090

May, R. M., & McLean, A. R. (2007). *Theoretical ecology : principles and applications*. Oxford ; New York: Oxford University Press.

Maynard Smith, J. (1982). *Evolution and the theory of games.* New York: Cambridge University Press.

- - - . (1975). *The theory of evolution* (3rd ed.). Harmondsworth ; Baltimore etc.: Penguin.

- - - . (1994). Must reliable signals always be costly? Animal Behaviour, 47(5), 1115-1120.

- - - . (1971). What use is sex? Journal of Theoretical Biology, 30(2), 319-335.

- - - . (1974). The theory of games and the evolution of animal conflicts. Journal of Theoretical Biology, 47(1), 209-221.

- - - . (1982). Do animals convey information about their intentions? Journal of Theoretical Biology, 97(1), 1-5.

- - - . (1988). Can a mixed strategy be stable in a finite population? Journal of Theoretical Biology, 130(2), 247-251.

- - - ., & Price, G. (1973). The logic of animal conflict. *Nature 246:* 15 - 18.

- - - . (1976). A short-term advantage for sex and recombination through sib-competition. Journal of Theoretical Biology, 63(2), 245-258.

- - - . (1977). Parental investment: A prospective analysis. Animal Behaviour, 25(Part 1), 1-9.

- - - . (1978). In defence of models. Animal Behaviour, 26(Part 2), 632-633.

- - - . (1980). Models of the evolution of altruism. Theoretical Population Biology, 18(2), 151-159.

- - - . (1987). On the equality of origin and fixation times in genetics. Journal of Theoretical Biology, 128(2), 247-252.

- - - ., & Hofbauer, J. (1987). The "battle of the sexes": A genetic model with limit cycle behavior. Theoretical Population Biology, 32(1), 1-14.

- - - ., & Parker, G. A. (1976). The logic of asymmetric contests. Animal Behaviour, 24(1), 159-175.

- - - ., & Harper, D. G. C. (1995). Animal Signals: Models and Terminology. Journal of Theoretical Biology, 177(3), 305-311.

Mayr, E. (1991). *One long argument : Charles Darwin and the genesis of modern evolutionary thought*. Cambridge, Mass.: Harvard University Press.

- - - . (1988). *Toward a new philosophy of biology : observations of an evolutionist*. Cambridge, Mass.: Belknap Press of Harvard University Press.

- - - . (1976). *Evolution and the diversity of life*. Cambridge, Mass.: Belknap Press.

- - - . (1963). *Animal species and evolution*. Cambridge: Belknap Press of Harvard University Press.

- - - ., & Provine, W. (1980). *The Evolutionary synthesis : perspectives on the unification of biology*. Cambridge, Mass.: Harvard University Press.

McNamara, J., Binmore, K., & Houston, A. (2006). Cooperation should not be assumed. *Trends in Ecology & Evolution, 21*(9), 476-478.

Mearsheimer, J., J. (2006a). "China's Unpeaceful Rise," *Current History*, Vol. 105, No. 690 (April 2006), pp. 160-162.

- - - . (2006b). "Conversations in international relations - interview with john j. mearsheimer" (Part II)," *International Relations*, Vol. 20, No. 2, pp. 231-243.

- - - . (2006c). "Conversations in international relations - interview with john j. mearsheimer (Part I)," *International Relations*, Vol. 20, No. 1, pp. 105-124.

- - - . (2001). *The tragedy of great power politics*. New York, NY: Norton. First published as a Norton paperback in 2003, 6th printing.

- - - ., & Walt, S. (2007). The israel lobby and u.s. foreign policy. New York: Farrar, Straus and Giroux.

Menger, C. (1883). *Problems of economics and sociology (untersuchungen über die methode der socialwissenschaften und der politischen oekonomie insbesondere)*. 1963 edition. Urbana: University of Illinois Press.

- - - ., & Hayek, F. A. (1871). *Principles of economics* [Grundsatze der Volkswirthschaftslehre] (J. Dingwall, B. F. Hoselitz Trans.). (1976th ed.). Introduction by F.A. von Hayek. New York: Ludwig von Mises Institute.

Milinski, M., Sommerfeld, R.D., Krambeck, H., Reed, F.A., & Marotzke, J. (2008).The collective-risk social dilemma and the prevention of simulated dangerous climate change.Edited by Robert May, Oxford University, Oxford, United Kingdom, and approved December 18, 2007 (received for review October 8, 2007). PSAS – February 19th, 2008 – vol. 105 – No. 7 – 2291-2294.

Monbiot, G. (2008). *Bring on the apocolypse*. Toronto: Anchor Books.

Morgenthau, H., & Thompson, K. (1985). *Politics among nations.* 6th edition. New York: McGraw-Hill.

Myerson, R. (2007). FUNDAMENTAL THEORY OF INSTITIONS: A LECTURE IN HONOR OF LEO HURWICZ.

- - - . (1991). *Game theory : analysis of conflict*. Cambridge, Mass.: Harvard University Press.

- - - . (1984). Two-Person Bargaining Problems with Incomplete Information. Econometrica, 52(2), 461-487. Retrieved from http://www.jstor.org.rlproxy.upei.ca/stable/1911499

Nagarajan, P. (2006a). Collapse of easter island: lessons for sustainability of small islands.

- - - . (2006b). The Near Collapse of Nauru: harbingers unsustainability of small islands without a shift in development paradigms. Paper presented at the Islands of the World IX Conference, Kahului, Maui, July 31-August 2, 2006.

Nash, J. (1953). *Two-person cooperative games*. Econometrica, *21*(1), 128-140.

- - - . (1951). *Non-ooperative games.* The Annals of Mathematics, *54*(2), 286-295.

- - - . (1950). *Non-cooperative games.* An online archive of a facsimile of a typewritten Ph.D. thesis submitted to the Mathematics Department, Princeton University.

- - -. (1950b). *Equilibrium points in n-person games.* Proceedings National Academy of Sciences 36: 48 - 49.

- - -. (1950c). *The bargaining problem.* Econometrica 18: 155 - 162.

Neumann, J. & Morgenstern, O. (1944). *Theory of games and economic behaviour. (*60th anniversary ed., 2004), Princeton, N.J. ; Woodstock: Princeton University Press. Introduction by Harold W. Kuhn. Afterword by Ariel Rubinstein.

Nietzsche, F. (1882). *The Gay Science.*

Nordvarg, L., & Håkanson, L. (2002). Predicting the environmental response of fish farming in coastal areas of the Åland archipelago (Baltic Sea) using management models for coastal water planning. Aquaculture, 206(3-4), 217-243.

North, D. C. (2007). *Corporate Leadership in an Uncertain World.*

- - - . (no date). *Economics and Cognitive Science*. Unpublished working paper.

Nunn, Patrick D. (2004). 'Through a Mist in the Ocean: Human Understanding of Island Environments', Tijdschrift voor Economische en Sociale Geografie, Vol. 95, No. 3, pp. 311-325. [Whole Special Issue of TESG available in hard copy from the Circulation Desk only]

Okwi, P.O., Ndeng'e, G., Kristjanson, P., Arunga, M., Notenbaert, A., Omolo, A., Henninger, N., Benson, T., Kariuki, P., & Owuor, J. (2007). Spatial determinants of poverty in rural Kenya. Published online on October 17, 2007. Edited by Partha Sarathi Dasgupta, University of Cambridge, Cambridge, United Kingdom, and accepted August 6, 2007 (received for review February 6, 2007).

PNAS | October 23, 2007 | vol. 104 | no. 43 | 16769-16774.

Oppenheimer, R. J. (1955). The open mind. First printing of 1st ed. (hardback with dust jacket). New York: Simon & Schuster.

Parenteau, B. (2004). A 'Very Determined Opposition to the Law': Conservation, Angling Leases, and Social Conflict in the Canadian Atlantic Salmon Fishery, 1867-1914. Environmental History, 9(3), 436-463. Retrieved from http://www.jstor.org.rlproxy.upei.ca/stable/3985768

Parker, G. A. (1974). Assessment strategy and the evolution of fighting behaviour. Journal of Theoretical Biology, 47(1), 223-243.

- - - . (1983). Arms races in evolution—An ESS to the opponent-independent costs game. Journal of Theoretical Biology, 101(4), 619-648.

Parker, G. A. (1985). Models of parent-offspring conflict. V. Effects of the behaviour of the two parents. Animal Behaviour, 33(2), 519-533.

Parker, G. A., & Knowlton, N. (1980). The evolution of territory size—some ESS models. Journal of Theoretical Biology, 84(3), 445-476.

Parker, G. A., & Macnair, M. R. (1978). Models of parent-offspring conflict. I. Monogamy. Animal Behaviour, 26(Part 1), 97-110.

Parker, G. A., & Macnair, M. R. (1979). Models of parent-offspring conflict. IV. Suppression: Evolutionary retaliation by the parent. Animal Behaviour, 27(Part 4), 1210-1235.

Parker, G. A., & Rubenstein, D. I. (1981). Role assessment, reserve strategy, and acquisition of information in asymmetric animal conflicts. Animal Behaviour, 29(1), 221-240.

PARKER, P. G., WAITE, T. A., & DECKER, M. D. (1995). Kinship and association in communally roosting black vultures. Animal Behaviour, 49(2), 395-401.

Pearse, P. H. (1988). Property Rights and the Development of Natural Resource Policies in Canada. Canadian Public Policy / Analyse De Politiques, 14(3), 307-320.

Popper, K. R. (1999). *All life is problem solving* [Alles Leben ist Problemlösen.] . London ; New York: Routledge.

- - - . (1944). The Poverty of Historicism, I. *Economica, 11*(42), 86-103.

- - - . (1944b). The Poverty of Historicism, II. A Criticism of Historicist Methods. *Economica, 11*(43), 119-137.

- - - . (1945). The Poverty of Historicism, III. *Economica, 12*(46), 69-89.

- - - . (1945). The Poverty of Historicism. 2002 ed. Florence, KY, USA: Routledge.

- - - . (1945). *The open society and its enemies*. Vols. I & II, London: G. Routledge & Sons, Ltd.

- - - . (1956). ON THE NON-EXISTENCE OF SCIENTIFIC METHOD. (preface from 1956 edition, Vol. I of the Postscript to 1983 edition of The Logic of Scientific Discovery edited by W. W. Bartley III ed.,). London: Routledge.

- - - . (1962). *Conjectures and refutations : The growth of scientific knowledge* (First Edition Preface from the 1963 Routledge edition ed.).

- - - . (1963). *Conjectures and refutations : The growth of scientific knowledge* (Originally published: 5th ed., rev. London ; New York : 2002. ed.). London ; New York: Routledge Classics.

- - - . (1992). *In search of a better world* [Auf der Suche nach einer besseren Welt.] (Laura J. Bennett, with additional material by Melitta Mew Trans.). London ; New York: Routledge.

- - - - . (1956). *Realism and the aim of science* (1983, including Popper's introduction from the 1982 edition and Popper's preface from 1956 edition ed.). London: Routledge.

- - - . (1959). *The Logic of Scientific Discovery* [Logik der Forschung, 1935, Vienna, Austria] . London ; New York:

Routledge.

- - - . (1974). Unended Quest. 2002. ed. London: Routledge Classics.

Popper, K. R., & Bartley, W. W. (1956). *Realism and the aim of science* (1983, including Popper's introduction from the 1982 edition and Popper's preface from 1956 edition ed.). London: Routledge.

Ramaekers, S. (2006). No Harm Done: The implications for educational research of the rejection of truth. *Journal of Philosophy of Education, 40*(2), 241-257.

Rampino, M. R. (2002). Supereruptions as a threat to civilizations on earth-like planets. *Icarus, 156*(2), 562-569.

Reddingius, J. (1972). Gambling for existence. A discussion of some theoretical problems in animal population ecology. Leiden: Brill.

Schuyler, G. W., & Veltmeyer, H. (1987). Rethinking Caribbean development. Halifax, N. S.: International Education Centre, St. Mary's University.

Seager, H. R. (1893). Economics at Berlin and Vienna. The Journal of Political Economy, 1(2), 236-262. Retrieved from http://www.jstor.org.rlproxy.upei.ca/stable/1817770

Seamon, D., & Zajonc, A. (1998). Goethe's way of science : a phenomenology of nature. Albany: State University of New York Press.

Reichenbach, H. (1966a). *Experience and prediction ; an analysis of the foundations and the structure of knowledge*. Chicago: University of Chicago Press.

- - - . (1966b). Erkenntnis 1, 1930.

- - - . (1965). *The theory of relativity and a priori knowledge*. Berkeley: University of California Press.

Reichenbach, H., Hutten, E. H., & Reichenbach, M. (1971). *The theory of probability : an inquiry into the logical and mathematical foundations of the calculus of probability* (2nd ed.). Berkeley, CA: University of California Press.

Rowbottom, D. P., & Aiston, S. J. (2006). The Myth of 'Scientific Method' in Contemporary Educational Research. *Journal of Philosophy of Education, 40*(2), 137-156.

Robinson, J. (1962). *What are the rules of the game?* Chapter in *Economic philosophy* (1983 ed.). Singapore: Penguin Books.

Russell, B., (1903). *Foundations of logic*. (1994 Edition, with Urquhart, A., & Lewis, A.C.). London ; New York: Routledge.

- - - . (1913). *Theory of knowledge*. (1984 Edition:*Theory of knowledge : the 1913 manuscript*. London ; Boston: G. Allen & Unwin.

- - - . (1915). *Our knowledge of the external world as a field for scientific method in philosophy*. Chicago: Open Court.

- - - . (1919). *Introduction to mathematical philosophy* (1950 ed.). London: G. Allen and Unwin.

- - - . (1928). *Sceptical essays*. London: G. Allen & Unwin.

- - - . (1931). *Why i am not a christian*. London: Watts & Co.

- - - . (1932). *Education and the modern world*. New York: W. W. Norton & Company, Inc.

- - - . (1940). *An inquiry into meaning and truth*. London: Allen and Unwin.

- - - . (1945). *A history of western philosophy, and its connection with political and social circumstances from the earliest times to the present day*. New York: Simon and Schuster.

- - - . (1953). *The impact of science on society*. New York: Simon and Schuster.

- - - . (1948). *Human knowledge, its scope and limits*. New York: Simon and Schuster.

- - - . (1949). *Authority and the individual*. New York: Simon and Schuster.

- - - . (1956). *Logic and knowledge : essays, 1901-1950*. New York: Macmillan.

- - - . (1962). *Has man a future?*. New York: Simon and Schuster.

- - - . (2001). *The scientific outlook*. London ; New York: Routledge.

Schabas, M. (2005). *The natural origins of economics*. 2007th paperback ed. Chicago: University of Chicago Press.

- - - . (1990). *A world ruled by number : william stanley jevons and the rise of mathematical economics*. Princeton, N.J.: Princeton University Press.

Schelling, T. C. (2005). Sveriges Riksbank Prize Lecture in the memory of Alfred Nobel: *An astonishing sixty years: the legacy of hiroshima*. 8 December 2005.

- - - . (1960). *The strategy of conflict*. Cambridge: Harvard University Press.

Schuyler, G. W., & Veltmeyer, H. (1987). *Rethinking caribbean development*. Halifax, N. S.: International Education Centre, St. Mary's University.

Seager, H. R. (1893). Economics at Berlin and Vienna. *The Journal of Political Economy, 1*(2), 236-262.

Seneca. (*c.* 60 A.D.). *On the shortness of life*. C. D. N. Costa Trans. 2005th ed. Penguin Books.

Shiller, R. J. (2000). *Irrational exuberance* (2nd, 2005 ed.). Princeton, N.J.: Princeton University Press.

Slocum, J. (1900). *Sailing alone around the world.* Adlard Coles Ltd, (1948 edition). Printed by Fletcher & Sons, Norwich, Great Britain. Introduction by Arthur Ransome July 1947.

Smith, A. (1776). *An inquiry into the nature and cuases of the wealth of nations* (2000 ed.). Modern Library Paperbacks.

Smith, V. L. (2002). *Constructivist and Ecological Rationality in Economics.*

Smith, W. P. (2005). Evolutionary diversity and ecology of endemic small mammals of southeastern Alaska with implications for land management planning. Landscape and Urban Planning, 72(1-3), 135-155.

Sokal, A. D. (2008). Beyond the hoax: science, philosophy, and culture. New York: Oxford University Press.

- - - . (1996a). *A physicist experiments with cultural studies.*

- - - . (1996b). *A plea for reason, evidence and logic.*

- - - . (1996c). *Transgressing the boundaries: An afterword.*

- - - . (1996d). Transgressing the boundaries: Toward a transformative hermeneutics of quantum gravity. *Social Text,* (46/47, Science Wars), 217-252.

Somit, A., & Peterson, S. A. (1992). The Dynamics of evolution : the punctuated equilibrium debate in the natural and social sciences. Ithaca: Cornell University Press.

Soros, G. (2006). Europe as a prototype for a global open society.

Stewart, G. (1925). A Land Policy for the Public Domain. Economic Geography, 1(1), 89-106.

Szathmáry, E., & Smith, J. M. (1993). The Evolution of Chromosomes II. Molecular Mechanisms. Journal of Theoretical Biology, 164(4), 447-454.

Stigler, G. J. (1982a). Sveriges Riksbank Prize Banquet Speech.

- - - . (1982b). Sveriges Riksbank Prize lecture: *The process and progress of economics.*

Stiglitz, J. E. (2001a). Sveriges Riksbank Prize autobiography.

- - - . (2001b). Sveriges Riksbank Prize lecture: *Information and the change in the paradigm in economics.*

Story, J. (1840). A familiar exposition of the constitution of the united states. By Joseph Story, Justice of the U.S. Supreme Court 1811-1845. Foreword by Edwin Meese III. Harper: New York. Entered, according to Act of Congress, in the year 1840, by MARSH, CAPEN, LYON, AND WEBB, In the Clerk's Office of the District Court of Massachusets: TO THE PEOPLE OF THE COMMONWEALTH OF MASSACHUSETTS, THIS WORK, DESIGNED TO AID THE CAUSE OF EDUCATTION, AND TO PROMOTE AND ENCOURAGE

THE STUDY OF THE CONSTITUTION OF THE UNITED STATES, BY HER INGENUOUS YOUTH, IS RESPECTFULLY DEDICATED, BY ONE WHO GRATEFULLY ACKNOWLEDGES, THAT HER TERRITORY IS THE LAND OF HIS BIRH, AND THE HOME OF HIS CHOICE, THE AUTHOR, *Cambridge, January 1840*. (1997 Conservative Book Club edition, © 1986 Regnery Gateway: Lake Bluff, IL, U.S.A.). From the personal library of M. W. Funk, hardback and just jacket in good condition.

Tarski, A. (1941). *Introduction to logic and to the methodology of deductive sciences* (3rd revis ed., 1965). New York: Oxford University Press.

Tate, J. (2000). Avoiding collisions: the Spaceguard Foundation. Space Policy, 16(4), 261-265.

Thomas-Hope, E. M., & Goodbody, I. (2002). Natural resource management for sustainable development in the Caribbean. Kingston, Jamaica: Canoe Press.

Towns, D. R., Daugherty, C. H., Drake, D. R., & Mulder, C. P. H. (2002). *Insular biotas* (Special issue ed.)

Travelers' Checks: Hotels closing on Hawaii's Molokai. Retrieved 4/14/2008, 2008, from http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2008/03/30/TRNRUM4U1.DTL&type=printable

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Tucker, A. W. (1983). The Mathematics of Tucker: A Sampler. The Two-Year College Mathematics Journal, 14(3), 228-232. Retrieved from http://www.jstor.org.rlproxy.upei.ca/stable/3027092

Tucker, A.W.. (1950). A two*person dilemma. Unpublished notes, Stanford University, May 1950.

UN. (1984). *Planning for sustainable development : guidelines for island developing countries* (2nd , rev ed.). New York: United Nations.

Vitousek, P. M., Loope, L. L., & Adsersen, H. (1995). *Islands : biological diversity and ecosystem function*. New York: Springer-Verlag.

Waismann, F., Menger, K., & Benac, T. J. (1959). Introduction to mathematical thinking : the formation of concepts in modern mathematics. New York: Harper.

Wakano, J. Y. (2007). Evolution of cooperation in spatial public goods games with common resource dynamics. Journal of Theoretical Biology, 247(4), 616-622.

Wallace, A. R. (1880). *Island life* (1892nd ed.). London: Macmillan and Co.

Weibull, J. (2002). *What have we learned from evolutionary game theory so far?* Stockholm, Sweden: Institute for International Economic Studies. This issay is composed of notes for an invited talk held 30 August 1997 at the Econoetric Society European Meeting in Toulouse.

- - - . (1998). Evolution, rationality and equilibrium in games. *European Economic Review, 42*(3-5), 641-649.

- - - . (1994). *Evolutionary Game Theory*. Cambridge: The MIT Press.

Wexler, Y., & Rokhlenko, O. (2007). Prisoner's dilemma posed by fitness-associated recombination strategies. *Journal of Theoretical Biology, 247*(1), 1-10.

Wieser, F. (1893). *Natural value* [Natürliche Werth.]. London: Macmillan & Co. Reprinted 1989 by Augustus M. Kelley, Fairfiled, N.J. Reprints of Economic Classics. Edited with a preface and analysis by Willaim Smart, Glasgow, 1893. Author's preface, Prag, September 1888. 243 pages.

Winkler, R. (2006). Now or never: environmental protection under hyperbolic discounting. CER-ETH, Center of Economic Research at ETH Zurich. Working Paper 06/60, October 2006.

Wisdom, J. (1987). Chaotic behaviour in the solar system. *Nuclear Physics B - Proceedings Supplements, 2*, 391-414.

- - - . (1985). *Meteorites may follow a chaotic route to Earth.* Retrieved 11/12/2007.