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Triple-Loop Learning as Foundation for Profound Change, Individual Cultivation, and Radical Innovation

Construction Processes beyond Scientific and Rational Knowledge

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Purpose: Ernst von Glasersfeld's question concerning the relationship between scientific/rational knowledge and the domain of wisdom and how these forms of knowledge come about is the starting point. This article aims at developing an epistemological as well as methodological framework that is capable of explaining how *profound change* can be brought about in various contexts, such as in individual cultivation, in organizations, in processes of radical innovation, etc. This framework is based on the *triple-loop learning strategy* and the U-theory approach, which opens up a perspective on how the domains of scientific/rational knowledge, constructivism, and wisdom could grow together more closely. **Design/Structure:** This article develops a strategy which is referred to as "triple-loop learning," which is not only the basis for processes of profound change, but also brings about a new dimension in the field of learning and knowledge dynamics: the existential realm and the domain of wisdom. A concrete approach that puts into practice the triple-loop learning strategy is presented. The final section shows, how these concepts can be interpreted in the context of the constructivist approach and how they might offer some extensions to this paradigm. **Findings:** The process of learning and change has to be extended to a domain that concerns existential issues as well as questions of wisdom. Profound change can only happen if these domains are taken into consideration. The triple-loop learning strategy offers a model that fulfills this criterion. It is an "epistemo-existential strategy" for profound change on various levels. **Conclusions:** The (cognitive) processes and attitudes of receptivity, suspension, redirecting, openness, deep knowing, as well as "profound change/innovation from the interior" turn out to be core concepts in this process. They are compatible with constructivist concepts. Von Glasersfeld's concept of functional fitness is carried to an extreme in the suggested approach of profound change and finds an extension in the existential domain. **Key words:** Double-loop learning, individual cultivation, (radical) innovation, knowledge creation, knowledge society, personality development, presencing, profound change, triple-loop learning, U-theory, wisdom.

hints on how he sees the relationship between rational/scientific knowledge and wisdom; he summarizes this relationship in the following quotation.

"Einigen wenigen Künstler und Dichtern [...] gelingt es hier und dort, den Eindruck zu erwecken, als gäbe es keine Schnittstelle, keine Grenze zwischen dem Mystischen und dem Rationalen. Denken Sie etwa an das Lächeln der Mona Lisa oder, besser noch, an das Lächeln jener archaischen Hermes-Köpfe aus dem frühesten Griechenland. Da gibt es Momente, wo dieses Lächeln uns so bewegt, dass wir meinen, wir verstünden es. Doch sobald wir es zu fassen versuchen, um zu erklären was uns so viel zu sagen scheint und uns so sehr bewegt, sobald wir es vernunftmäßig begreifen wollen, kommt uns die Zuversicht abhanden, und wir sagen schließlich etwas verlegen, das Lächeln sei zweideutig. Doch damit vertuschen wir nur die Tatsache, dass wir keine rationale Deutung haben. Für mich ist das eine der vielen Erfahrungen, die mir belegen, dass alles Mystische eben jenseits des rationalen Begreifens oder der rationalen Schnittstellen liegt" (Glasersfeld 1996, p. 29).¹

Now, several years later, there seems to be a chance of reuniting or at least of bringing closer together these seemingly incompatible domains. Francisco Varela (e.g., Varela, Thompson & Rosch 1991; Varela 2000; Depraz, Varela & Vermersch 2003) plays one of the key roles in this process, which has been developed further by many others. In this article I want to give a short overview and develop a strategy which I refer to as "*triple-loop learning*"; it opens up a perspective on how the

I. Introduction

On one occasion when I visited Ernst von Glasersfeld at his home in Amherst, MA (it must have been around 1996) we were talking about questions concerning the limits of rational and scientific knowledge (and knowing) and its relationship to the notion of wisdom. I experienced Ernst as an honestly searching person, even in these epistemological borderline cases. He explained to me that

he understood the radical constructivist approach as a theory that tries to give an explanation of how scientific/rational knowledge is produced and spread (see also the quotation in section 4.1 of this article). Actually, we did not come to a "solution" or conclusion, but he gave me a little book with the title *Über die Grenzen des Begreifens* ["On the limits of knowing"] (Glasersfeld 1996) – to my knowledge, it has not been translated into English. In his introductory article Ernst gives some

domain of rational knowledge and wisdom/mystical could grow closer together. It is concerned with the question of *profound change* (and [radical] innovation) not only in the domain of knowledge, but also in the domain of personality or *individual cultivation*.

What are the implications of these considerations in a larger context? Looking more closely at what is at the heart of the modern knowledge society (e.g., UNESCO 2005, European Commission (2004), etc.), one can discover that the focus on knowledge and knowledge processes has an interesting implication: whereas during the first and second industrial revolution the individual more or less vanished and was “dissolved” by automation, the role of the *individual* (and in particular of *his/her knowledge* and *personality*) has become more important in a knowledge based society/economy (compare Levy 1997; Rifkin 2004, Friedman 2006, and many others). Vibrant knowledge and especially (creative) development of new knowledge or profound change are domains, which cannot be automated in most cases. Those parts of knowledge which can be automated are on the other side of the spectrum (ranging from highly dynamic and changing knowledge processes to rigid behavioral patterns or deductive paradigms) – the domain of knowledge automation (e.g., classical management and storage of explicit knowledge, classical/first generation knowledge management paradigms [e.g., Holsapple 2003], classical AI (“GOFAI”) paradigms [Boden 1990], etc.) will be of minor interest in the context of this paper (focusing rather on radical change/dynamics of knowledge), although it is clear that this kind of knowledge is a *conditio sine qua non* for every domain of survival (be it biological, cultural, social, etc.).

The return of the individual in a knowledge based society implies that we have to take a closer look at the domain of *personality*: the more the focus is on highly sophisticated knowledge, deep understanding, complex contexts, creative minds, profound change, etc., the less it is possible to simply replace the person or automate his/her particular cognitive and personal faculties.

Taking seriously the developments and goals of knowledge society has crucial implications and challenges: the more the focus is on knowledge and knowledge creation, the

more important will be the role of the individual, of his/her intellectual *as well as* personal, ethical, etc. cultivation. Ideally, this would mean a return of the value of the *person* and his/her “*individual cultivation*.” Individual cultivation concerns the formation of personality, values, habitus,² the “core,” etc. of a person (compare for instance Senge et al. 2004). In many cases these issues are closely related to the domain of *wisdom*. However, in most cases only rather simple and “low” level types of knowledge and knowledge transfer (e.g., classical (explicit/fact) knowledge (transfer), know-how, theoretical and recipe knowledge, and, in some rare cases, reflective capabilities) are offered at today’s schools, colleges, universities, and educational institutions (compare also Peschl (2003, 2006a) for a more detailed classification of knowledge types and processes). In the domain of individual cultivation the situation is even worse than in the intellectual realm.

2. Taking the domain of wisdom seriously: From double-loop to triple-loop learning

What do we mean by individual cultivation? What is the theoretical background of individual cultivation? More advanced forms of learning try to go beyond the classical transfer model. That is to say, the understanding of learning as a process of transferring more or less stable chunks of knowledge from one brain to another is replaced by a more dynamic perspective: learning as a continuous and active *process* of adaptation and construction in which knowledge is developed in permanent *interaction* between the cognitive system and its environment.³ Knowledge is not passively mapped into the brain, but actively constructed by perceiving, acting, and interacting with the environmental structures – there is a feedback loop between the realm of knowledge and of the environment. Hence, knowledge is a *process* which functionally fits into the environmental structures. This understanding of knowledge has its roots in constructivist concepts (e.g., Foerster 1973; Glasersfeld 1984, 1991, 1995; Maturana 1980, and many others) and in a

situated perspective of cognition (e.g., Clark 1997; Hutchins 1995). This kind of learning and knowledge acquisition is referred to as *single-loop learning* or Kolb-learning (compare also Kolb 1984; Argyris and Schön 1996; Scharmer 2000; Senge et al. 1990, 2004, Peschl 2006a, etc.).

In Peschl (2006a) several limitations of single-loop learning have been discussed. The most crucial problem has turned out to be the limitation that this strategy of learning does not allow for the construction of paradigmatically new knowledge and radical innovation (see Peschl 2006a for details). In order to overcome some of the limitations of single loop learning a second feedback loop is introduced. It puts into practice a kind of meta-learning strategy. This second feedback loop takes into consideration that any kind of knowledge is always based on assumptions, premises, or a paradigm (Kuhn 1970).

In general, knowledge always has to be seen as being embedded in and pre-structured by a particular *framework of reference*. Knowledge receives its meaning and structures from this framework of reference. Normally, this framework of reference is not explicitly present in our processes of cognition, learning, or knowledge construction. This implies that we do not have a conscious experience of these premises, assumptions, etc. on which our thinking and constructing is implicitly based. It has to be made explicit by active exploration of one’s own assumptions, premises, ideological attitudes, etc. This can be achieved by introducing a process of *reflection* and “stepping out” of one’s normal way of thinking.

Due to its implicit and relatively inaccessible character it appears as if this framework of reference is stable; due to this constancy it is a kind of “blind spot” in our thinking, perception, and understanding. Taking a closer look reveals, however, that this framework of reference is not as stable as it seems. The double-loop learning strategy takes these changes in the framework of reference into consideration by introducing a second feedback loop. This implies that a completely new dynamics becomes possible in the whole process of learning and knowledge creation: one starts to change the framework of reference. Each modification in the set of premises or in the framework of reference causes a radical change in the structure, dimensions, dynam-

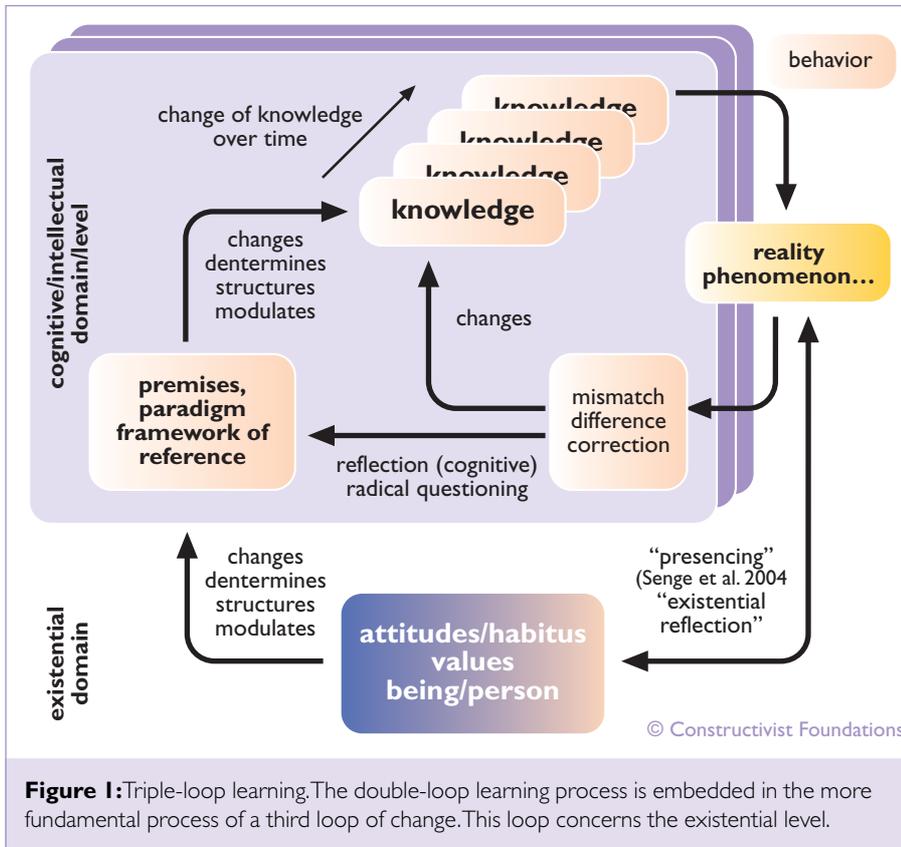


Figure 1: Triple-loop learning. The double-loop learning process is embedded in the more fundamental process of a third loop of change. This loop concerns the existential level.

ics, semantics, etc. of the resulting space of knowledge. By that process a completely new space of knowledge opens up and entirely new and different theories, knowledge, patterns of perception, interpretation patterns, etc. about reality become possible. The method being applied in this process is basically the technique of *reflection*. It is a process of *radically questioning* and consistently changing the premises and studying their implications on the body and on the dynamics of knowledge. Double-loop learning has its roots in cybernetics, learning theory, in cognitive science (e.g., Peschl 2001), and in the domain of organizational learning (e.g., Senge 1990; Argyris et al. 1996).

2.1 Triple-loop learning

Double-loop learning is focused mainly on the intellectual and cognitive domain and its dynamics. However, if one is interested in profound change a *new level*, implying a new dynamics, has to be introduced; profound change does not only happen in the cognitive domains, but touches a more fundamental

level – an *existential* level that includes the person and his/her attitudes, values, habitus, etc. Whereas it is possible to “play games” on the cognitive/intellectual level (in the sense of trying out or simulating intellectual positions without being touched existentially by them), one can experience that there exists a level, where “intellectual games” are not possible any more. We are then confronted with a level going beyond the domain of cognitive or intellectual questions touching the self in the very center.

Similarly to the case of double-loop learning, we discover that the whole intellectual framework, the whole domain of knowledge and representation, our sets of premises, assumptions, etc. are *embedded* in a more fundamental domain (see Figure 1): the domain which could be described as “the self” – that is, the level where I am myself in an *existential* sense. Of course, this domain is a construction as well, but the degrees of freedom for the processes of construction are rather limited. Furthermore, as one can experience every day, a lot more effort is nec-

essary to make changes in this domain than to change one’s intellectual, philosophical, political, etc. position. Philosophically, one can refer to this domain as the “person.” It goes beyond the level of personal skills, competencies, personality, etc. because it transcends the domain of personality traits, behavioral and cognitive patterns, solely quantifiable data, etc. It touches the person on his/her fundamental level of being and, in many cases, concerns the domain of *wisdom* – in most cases it is rather difficult to talk about it in classical scientific terms. As will be shown in the sections to come and as has been discussed excessively by classical philosophy (starting from the Greeks), the notion of wisdom goes far beyond the cognitive and classical knowledge domain – one of its main characteristics is that it is concerned with existential questions which are closely related to the domain of the self. Wisdom goes beyond what Polanyi (1966) and the more recent discussions in the field of knowledge management (e.g., Krogh et al. 2000; Nonaka et al. 1995, 2003, and many others) refer to as *tacit knowledge*. The introduction of this existential domain implies a third loop in our model of learning processes: *triple-loop learning*.

2.2 Learning as change on various levels: An overview

Hence, the goal of learning processes on that level is *profound change*. What does that mean and how can it be realized? While classical learning strategies focus on changes in the domain of knowledge and the intellect, the triple-loop approach also includes changes on the existential level and in the domain of the “will/heart”.⁴ Looking more closely various levels of “intensity” of change, the following can be identified (compare also Scharmer 2000 or Senge et al. 2004):

i. Reacting and downloading. The simplest way of responding to change either arising in the internal or external environment or that is the result of the cognitive system’s own activities (e.g., if one is confronted with or has caused a problem, change, task, or challenge) is to simply react. In other words, already existing and well established behavioral, perceptual, or cognitive patterns are applied to solve the problem or the learning/adaptation task. This is the most convenient and most economical

way of reacting to change, because it only requires downloading of already prefabricated solutions, knowledge, etc. The price of this simple response is quite high: (i) the reactions are highly rigid and (ii) the resulting solutions or changes do not go very deep and in most cases do not even scratch the underlying issues of the problem. It has to be clear, however, that all these processes are always embedded in a feedback loop (see Figure 1) in which the border between externally triggered changes and produced changes is blurred. As an implication, it becomes evident that this mode of learning offers – from a constructivist and cybernetic perspective – only very limited possibilities (other than cycling through already predetermined, rather rigid, and well established action-reaction feedback-loops).

ii. Redesign and adaptation. Alternatively, it is possible to not only apply already existing patterns, but to use these patterns as a blueprint that is adapted slightly to the current situation. From a cognitive perspective this is a highly efficient learning strategy, because it is not as rigid as level (i) learning processes, but it can be done with minimal cognitive effort: namely, to make use of already existing patterns, change them slightly (e.g., changing values of variables) and apply them to the new situation, task, etc. From the field of cognitive (neuro-)science these processes are well understood – these are the classical learning and adaptation processes well known from the domains of connectionism or computational neuroscience (Bechtel et al. 2002; Hebb 1949; Peschl 2001; Rumelhart et al. 1986, and many others). From this perspective it becomes clear that these processes are mathematically equivalent with processes of *optimization*, i.e., we search for an optimum in an already pre-structured space (of solutions). What we do in single-loop learning is structurally equivalent with these level-(ii) processes of redesigning and adaptation. Taking a constructivist and second-order cybernetic perspective seriously forces us to go one step further because these processes of adaptation and redesign are always embedded in a feedback loop where the results of the (cognitive/knowledge) adaptations have a direct influence on the environmental dynamics, triggering changes in the cognitive system's experiences. Hence, a new cognitive

dynamics is triggered which forces us to go one step further.

iii. Reframing. In most cases downloading, adaptation, and optimization (i.e., level-(i) and level-(ii) learning/change processes) are sufficient for mastering everyday problems and challenges. In a way these solutions are not very interesting from the perspective of radical change, because they do not bring forth fundamentally new knowledge, insights, or understanding. As has been discussed in the context of double-loop learning, fundamental cognitive change is always connected with reflection and stepping out of the – more or less consciously – chosen framework of reference: i.e., going beyond the boundaries of the pre-structured space of knowledge and “reframing” it in the sense of constructing and establishing new dimensions and new semantic categories. This process concerns the level of mental models, premises, and assumptions and their change. Here, the notion of the *observer* and his/her relationship to the observed systems comes into play; reframing is about taking the observer's position seriously (e.g., Maturana 1991; Glasersfeld 1995) in the sense that one reflectively steps out of his/her own experiences and tries to look at the situation as a whole in a reflective act (e.g., Glasersfeld 1989). “On the level of reflective abstraction, however, operative schemes are instrumental in helping organisms achieve a coherent conceptual network that reflects the paths of acting as well as thinking which, at the organisms' present point of experience, have turned out to be viable.” (e.g., Glasersfeld 1989). Going one step further, this process of reflection leads to the construction of alternative conceptual frameworks enabling the reframing of already well established cognitive structures.

iv. Profound existential change and “presencing”. On a more fundamental level, change goes beyond reframing and no longer concerns only intellectual or cognitive matters. On that level, questions of *finality, purpose, heart, will*, etc. come to the fore. As has been shown above, that is the domain of the triple-loop learning strategy. “Why do change initiatives based on culture and learning sometimes also fail? One explanation is that the rhetoric of change was in disconnection to

what really matters most [...] Thus a fifth approach to coping with change is to focus on deep intention, purpose, and will. Now the responses of [previous] levels [...] become part of an even more subtle set of contextual variables, which are referred to as purpose, (shared) vision, or common will.” (Scharmer 2000, p. 9) In this mode, change is not solely based on cognitive reflection any more, but more importantly on *existential reflection* and learning. In a way, the goal is to bring the existential level, the person, his/her will, his/her acting, as well as his/her cognitive domain into a status of inner unity. What might sound esoteric is in fact a very old theme and philosophical issue going back at least to Aristotle's (1985) *Nicomachian Ethics* and to most Western and Eastern philosophical and religious traditions. Very often these questions concern the domain of *wisdom*. Due to its existential character Scharmer (2000) and Senge et al. (2004) refer to this mode of change/learning as “*presencing*.”

As can be seen in Figure 1 these modes of change/learning cannot be seen as being separated from each other. It is only in the mode of analysis that these domains have to be distinguished. In the mode of action these domains and loops are closely intertwined and depend on each other. I want to refer to this perspective of learning which takes into account all the above levels of change (and especially the existential level) as “*individual cultivation*.”

3. Individual cultivation, presencing and U-theory

3.1 An epistemo-existential strategy for profound change

How can that profound existential change or learning process be realized? What steps are necessary to implement this process of individual cultivation that is suggested by the triple-loop learning strategy? There are many ways of supporting this process of individual cultivation, ranging from classical upbringing in families and (not only school and university) education to the very old classical concept of the relationship between a master and his/her student(s) (e.g., in the ancient

Greek philosophical schools, in Western and Eastern religious traditions of monasteries, etc.). However, taking a closer look at most modern educational institutions reveals that they are not capable of offering such an educational setting any more.

On a more general level, a relatively new (and at the same time very classical) theoretical framework capturing this process of individual cultivation and profound change has been developed by C.O.Scharmer (2000, 2001, forthcoming) and Senge et al. (2004); it is referred to as “U-Theory” or “presencing.” In the following section I am going to present a condensed overview of a further development and adaptation of this approach in order to get an idea of which processes are necessary for profound learning and change in a constructivist context.

One can describe that process as a U-shaped curve that is realized in a series of states: the left branch going down the “U” focuses on issues of *observation*, perception, *sensing*, discovery of patterns of thought and cognition, and on how to leave these patterns behind oneself in order to be cognitively and emotionally “prepared” for profound change. At the bottom one finds him-/herself in the state of presencing; it can be characterized as a condition of high receptivity and openness and as a state where radically new knowledge/change can emerge. The upward branch deals with issues concerning the *realization*, prototyping, and embodying these changes in the (external or internal) environment.

3.2 Sensing and seeing radically different: From downloading to letting go and presencing

Suspending. A *conditio sine qua non* for any form of profound change, learning, or innovation is an attitude of suspension: in order to achieve the goal of profound change, it is necessary to detach and free oneself from well-established patterns of perception and thought. That means that – in the first place – it is necessary to suspend one’s instant recipes, judgments, solutions, etc. Being confronted with a new situation or a complex problem we are always tempted to simply download already well-proven and well-established solutions (compare the downloading process of the level-(i) form of change). From an epistemological perspective this means that we

are projecting our knowledge, judgments, patterns, and mental models onto the world. Both from our experience and from cognitive neuroscientific as well as constructivist-epistemological considerations it is evident that we will never reach the ideal of “pure receptiveness”; the goal of suspension is not to claim that this is possible, but to put more emphasis on this cognitive activity of being receptive – understood as an “epistemological attitude or virtue” that can be trained. It turns out to be extremely helpful for most processes that strive for profound change and deep learning. Apart from constructivist claims that learning primarily consists in eliminating perturbations induced by interaction through a process of accommodation (in the sense of Piaget 1992, cf. Glaserfeld 1989⁵), the phase of suspending aims at being receptive and open to what happens in the world and at trying to lower the level of construction and projection activities. This seems to be a contradiction but, as will be shown in sections 4.2ff, both aspects are necessary for triggering profound change.

Shifting the focus from projecting to receptiveness does not imply that our cognitive/knowledge structures will become “images” of our environment in a naïve realist sense; rather it is a necessary condition for opening up the view for new perspectives and for new perceptual and cognitive categories (compare also Varela, Thompson & Rosch 1991; Varela 2000; Depraz, Varela, and Vermersch 2003). As will be shown below, the goal of the activity of suspending as well as of letting go and presencing is to establish a space that enables a process of organic co-construction of profound change based on deep understanding. In a social/collective context this process of suspending is a precondition for a successful process of dialogue (cf. Bohm 1996; Isaacs 1999; Schein 1993), which is one methodological means of how this process can be realized.

Redirecting. In this step one redirects his/her attention towards the interior: “[...] you change the *direction* of attention, which tunes out the spectacle of the world, so you can return to the interior world. In other words, you substitute an *apperceptive* act for perception.” (Depraz, Varela, and Vermersch 2003, p. 31) Metaphorically speaking, one turns his/her gaze back towards the source of this

perceptual act and tries to look at and consciously through his/her perceptual patterns. “It is the idea that normally the habitual thing is that one should redirect attention outward. Redirect it to what is emerging as an object, as a content, which has its own intentionality. The point about redirection is that you reverse that. You keep it within, but toward the source, toward the source of the mental process rather than the object” (Varela 2000, p. 6). “Suspension will lead to very early emerging events, contents, patterns, gestures, whatever. Then you can actually redirect your attention to them. That’s where the new is. So the suspension creates a space, the new comes up, and then you can redirect. Redirection is a specific gesture” (Varela 2000, p. 5). This process of redirecting goes beyond reflection; it aims not only at uncovering and questioning premises and cognitive patterns, but at exploring the source of these patterns and, by that, opening up a new space, a space that enables the emergence of new constructions, new profound insights, fundamental change, etc. Here again, the notion of the observer plays a crucial role, because the person who is going through that cognitive process of redirecting has to explicitly and consciously acknowledge his/her role as an observer who is capable of both being inside and “outside” the system and of constructing a new perspective or of exploring his/her own experiences of observation.

Letting go. In order to reach this state of emergence it is – at first – necessary to *let go* what one has discovered in this process of redirection and exploration of one’s own premises, assumptions, etc. “[...] you have to change from voluntarily turning your attention from the exterior to the interior, to simply accepting and listening. In other words, [...] you go from “looking for something” to “letting something come to you,” to “letting something be revealed.” What is difficult here is that you have to get through an *empty time*, a time of silence, and not grab onto whatever data is immediately available, for that’s already been rendered conscious, and what you’re after is what is still unconscious at the start.” (Depraz, Varela, and Vermersch 2003, p. 31) Of course, this process can cause existential fear in some cases, because one loses the (epistemological) ground on which one is standing and which normally provides a

rather stable cognitive framework. This is a well-known state in the constructivist framework (if it is adopted in a reflected manner). Being in a state of receptivity always means being in a relatively passive role which brings about a higher chance of being (epistemologically and existentially) hurt. However, surrendering into this rather receptive and open state does not imply that one is completely passive; rather, the contrary is the case: in a way one finds oneself in an active state of extremely high attention towards what is coming up without trying to project one's own expectations, plans, knowledge, etc. It is a slightly paradoxical situation: on the one hand one is waiting seemingly passively for what is going to happen and on the other hand this is a highly active state concerning one's attention and receptiveness. These processes of trying to get empty and at the same time to be attentive towards what is going on "out there" are well known from art and religious traditions as well as from Husserl's phenomenological approach (e.g., the concept of *epoche*).

Presencing. In this state one enters into an "intimate epistemological dance" with reality. In other words, due to the high level of receptiveness and attention it is possible to "catch the wave" of the environmental dynamics and "surf" it in a process of smooth and intimate interaction between the cognitive and environmental dynamics. This is E.v.Glaserfeld's (1984, 1991, 1995) functional fitness in its perfect realization; or Maturana's (1970, 1980) concept of (structural) coupling in its most sophisticated form. Epistemologically, this leads to a process of what Rosch (1999) and others refer to as "deep or primary knowing." In that moment, constructivist and (weak) realist attitudes come very close and almost collapse. In this context, a close relationship and connection between constructivism and weak realism becomes evident. What is important in our context of the question of profound change and learning are the following points:

- This is a way of constructing highly sophisticated and profound knowledge about an environmental aspect with a minimum influence of projection. By that it is possible to achieve a profound understanding of the phenomenon under investigation. This understanding goes beyond

a purely cognitive and intellectual penetration; it also includes the existential dimension in the sense that the person is related to the phenomenon under investigation.

- This is a prerequisite for enabling profound change or learning. Having a deep understanding about a phenomenon implies that one also knows or "sees" its potential(-ity); i.e., one comes to see what could or what wants to emerge out of the interaction between one's cognitive activities and the environmental dynamics.
- One does not only enter into a "contemplative" dance of understanding with reality, but also into an organic process of co-construction, co-formation, co-design, co-influencing, co-changing. Thus the potentials/-ities of both the cognitive system and the environment/phenomenon it is interacting with begin to organically connect into a joint dynamic in which radically new structures, processes, dynamics, knowledge can start to emerge.
- For these processes to happen, both systems and their close interaction are necessary; both systems which are involved are mutually respected in and respecting their dynamics, possibilities, determinations, and limitations. The goal is not to project one's own prefabricated knowledge and mental models on the phenomenon and try to change it according to these ideas. Rather, the goal is to organically co-evolve and co-develop a dynamic which brings both partners into a state where it is possible to enter into a process of mutual blossoming and realizing more of one's finalities.
- Metaphorically speaking, one can compare this process to the interaction between a good artist and the material she/he is working with: both unfold and blossom in the process of this interaction by respecting as well as cultivating the potentials/-ities of the other. In a way, the stone already has the form of the statue (in potentia) in itself and the artist brings forth this form by both being inspired by that stone and by his own cognitive activities, mental models, plans, talents, etc.
- If one took this approach seriously, this would have an enormous impact on our understanding, and foremost on our way of doing science. Bortoft (1996) gives an

example of what such science could look like.

What is happening in this downward branch of the U-theory can be summarized as follows: "Thus what we're talking about here is reversing two of your usual thought processes, the first of which is the condition of the second: (i) You have to re-direct your attention from the exterior to the interior. (ii) You have to change the quality of your attention, moving from an active search to an accepting letting-arrive. This means that while the first reversal actively moves between the dueling poles of the exterior and the interior, the second reversal moves from activity to a passive and receptive waiting, thereby doing away with any duality remaining from the first reversal." (Depraz, Varela, and Vermersch 2003, p. 31) It is important to note that these processes are not only intellectually challenging, but also have a deep impact on the domain of intent/finality, and on the emotional and existential level, because they touch the innermost domains of the person (or organization) who/which is going through this process. From what has been said above it is clear that these processes and their results are highly fragile and it is very difficult to make them explicit in natural language. However, they are a *conditio sine qua non* that profound change in the sense of triple-loop learning can happen. It is only this kind of change that makes a real difference (compared to classical adaptive or optimization approaches) and may bring about radically new knowledge, radical innovation, completely new social, political, or organizational structures, etc.

3.3 Acting profoundly differently: from presencing to embodying and institutionalizing

Letting-come and crystallizing. As a consequence of this state of presencing it is possible that profoundly new interaction patterns, knowledge, perspectives, etc. can emerge. This is not only a form of radical innovation, but a kind of *emergent innovation*. It does not so much arise from an external source which projects his/her ideas on the phenomenon; rather, it has its source both inside the cognitive system and in the object/phenomenon to be changed (and in their interaction). In a way this new structure *crystallizes* in an

emergent process of letting-come. Of course, it is not the result of just passively sitting there and waiting (see above), but it has something to do with an attitude of being patient, receptive and epistemologically humble: i.e., to wait with a high level of attention, intellectual accuracy, and to get into a very close and almost intimate relationship with the phenomenon that one wants to study and/or change. This process of letting-come is the other side of the process of letting-go. In other words, one shifts the focus from surrendering to looking at what wants to emerge and what is new. This is an epistemologically fragile process in which new ideas and changes emerge and converge (“crystallize”) towards a specific vision, concept, idea, etc.

Enacting and prototyping. At some point it is necessary that what has emerged in this process of presencing and crystallizing starts to manifest in some kind of external form – be it in material form, or in a concrete plan, in a concrete action, etc. Of course, this very first externalization can only be a kind of *prototype* which gets “tested” in the environment. The goal of that state is, however, that what has emerged in the interior gets externalized so that it can be verified, seen by the others, discussed by the others, slightly adapted, etc.

Embodying and institutionalizing. The final step consists in implementing the adapted prototype in the daily routines, in established practices, in everyday action, in the repertoire of reaction patterns, etc.

These steps do not have to be seen as recipe which can be blindly executed to end up with fundamental change. Rather, it is a framework helping us to orient ourselves in this rather complex domain. These steps do not have to be executed in the above order – rather, it is necessary to introduce loops and jumps in this order. The instruments used in order to implement this framework will differ according to the specific domain in which it is applied.

Finally, it has to be mentioned that this way of looking at profound change processes can not only be applied on an individual level (“individual cultivation”), but also in the *collective* domain of organizations, social systems, etc.

4. Implications for constructivism? Learning from the triple-loop learning strategy and U-Theory

4.1 Going beyond scientific and rational knowledge?

The radical constructivist theory has chosen as one of its main goals the development of a model of how rational knowledge is produced.

“Will man nun die Unterscheidung zwischen dem wissenschaftlichen Wissen und der Weisheit [...] fester untermauern, so muss man eine Antwort auf die Frage finden, wie wir zu diesem brauchbaren rationalen Wissen kommen [...] Wir brauchen also ein allgemeines theoretisches Modell, das die Produktion des rationalen Wissens einigermaßen plausibel macht [...] Das ist die eigentliche Aufgabe der konstruktivistischen Theorie” (Glaserfeld 1996, p. 21).⁶

From the discussion above, it follows that this goal leads to an unnecessary narrowing of the scope of the (radical) constructivist theory. In fact, constructivism is one of the leading epistemologies in the fields of psychotherapy, coaching, personality development, organizational science, etc. Although these fields are very often concerned with topics going far beyond the domain of rational knowledge, in most cases the constructivist approach covers – according to its own rules – mostly the epistemological, rational, methodological aspects and/or meta-aspects, e.g., by using the epistemological/methodological authority of constructivism to explain that we “only” give validity to most of our fears, perception, etc. of reality by constructing them.

The approach presented in the sections above goes one step further and extends the notion of knowledge by introducing what has been referred to as the “existential domain.” As has been mentioned in the introductory quotation by Glaserfeld this knowledge is very difficult to grasp and to make explicit (it even goes beyond the domain of tacit knowledge, e.g., Polanyi 1966). However, this does *not* imply that it is worthless or that it is not

necessary to consider. On the contrary, as has become evident in the triple-loop learning strategy (cf. 2.1) this domain is rather the foundation on which all the other epistemological processes are embedded.

Hence, the notion of construction is not limited to rational knowledge, but also includes these existential issues. Of course, they are always reflected in the “rational” domain, but they concern a domain which can be referred to as the sphere of *wisdom* covering not only questions of (rational) knowledge, but also of the *existential* dimension of the person(-ality). This implies that it is necessary not only to extend the notion of knowledge, but also of learning. From that perspective, learning is not only about knowledge transfer, knowledge construction, knowledge processes, reflection, etc., but also includes the development and change at the more profound level of the person(-ality). How this can be realized has been shown by the processes involved in the U-theory/presencing.

4.2 Searching for a new balance between cognitive activities of construction and projection on the one hand and receptivity and openness on the other hand

Generally speaking, the approach of U-theory offers an “epistemo-existential framework” of how the strategy of triple-loop learning can be realized. From a constructivist perspective it “plays with fire”: it walks on the borderline between (weak) realism and constructivism.

Turning this seeming disadvantage from an epistemological problem into a challenge, one can start to understand that this approach of presencing is a *chance* that could bring these (seeming opposite) positions closer together. Of course, it is clear that penetrating into reality “as it is” remains impossible; however, this approach offers a suggestion which not only takes the problem of primacy of projection (which is a “slight” epistemological tendency of constructivism) into account but also tries to actively lower the influence and predominance of constructive and cognitive activities. In other words, it gives back some “epistemological rights” to the world in the sense of respecting its “active” role in the process of knowledge generation. The goal is *not* to resurrect realism, but to *find and establish a new balance* between the two poles of cognitive activity and projection on the one hand

and the influence of the dynamics and structure of the environment (on the constructive activities) on the other hand – or, even better, to develop an *attitude* which implies that there is an epistemologically vital need for a permanent struggle and to seek to achieve this balance between projection and receptivity/openness. As is suggested by the presencing approach, it is necessary to cultivate a high degree of epistemological attention and an attitude of radical suspension, redirecting, reflection, letting-go, and openness in order to overcome these obstacles of projection.

4.3 Carrying the concept of functional fitness and viability to its extremes

From a constructivist perspective this focus on receptivity implies that the concept of *functional fitness/viability* (Glaserfeld 1984, 1991, 1995, 2000) is carried to its extremes in this approach: as has been stated above, almost a kind of “epistemological fusion” between reality and knowledge/cognition seems to take place in this process of presencing. This is not some “esoteric” state, but concerns a philosophically and intellectually challenging process: namely, the intellectual effort to profoundly understand (some aspect of) the environment. From the constructivist perspective, the interesting point is, however, that one does this with the full awareness that one is the author of this process (constructing) understanding, but nevertheless tries to decrease this influence as much as possible. The result is a knowledge process that is receptive to and “honestly” respects the dynamics and limits of reality, and at the same time fully enacts the cognitive activities of construction. In other words, both the cognitive system and the environmental structures are fully and actively involved in this process and enter into a dynamic of mutual triggering, co-construction, co-creation, respecting, and mutually bringing each other into a state of unfolding and blossoming.

In a sense, the epistemological process of mutually getting closer carries Glaserfeld’s concepts of functional fitness and viability to an extreme: in this dance-like cooperation the two parties (i.e., the cognitive system and its knowledge dynamics on the one hand and the environmental dynamics on the other hand) arrive at a state of profound understanding. It can be characterized as an *epistemologically*

intimate fit, like a key and a lock. The interesting point in the context of the U-theory concerns the fact that it does not suffice to remain solely in the domain of knowledge, but that it is necessary to “step down” in the *existential* domain in order to end up in such an intimate relationship with the environment. That is the point where the epistemological and ontological seem to collapse and where the domain of *wisdom* is touched – in a way the most concrete and the most abstract are joined in that moment/domain. It is on the border between the rational/scientific knowledge and wisdom (cf. Glaserfeld 1996, p. 21).

4.4 “Unlocking” both the environment and the cognitive system: Extending the concept of viability by the aspect of profound change

As has been shown above, one implication of this intimate epistemological relationship is the possibility of entering into a process of profound change – both in the cognitive system and/or in the environment. This opens up the aspect of co-construction in the constructivist perspective in a more fundamental sense: co-construction is no longer limited to cognitive or physical structures, such as the interaction between one or more cognitive systems and (symbolic) artifacts. The concept is extended in the sense that out of that intimate coupling between cognitive (as well as existential) and environmental dynamics (i.e., “deep knowing”), *profound change* on an existential level may emerge. Both the environmental and the cognitive dynamics may mutually “unlock” each other’s potentials. The change does not have its cause from some external source or influence, but from inside the participating systems and their potentials coupling into a joint system. Thus, going through this process of presencing enables a “profound change *from the interior*” as an emergent process rather than having some external instance projecting or attributing his/her own ideas and plans on the entity which is in this process of change.

In that context the concept of viability is extended beyond the epistemological point of functional fitness (e.g., successful predictions). It also means bringing oneself (and probably the other system[s] involved) into a state of finality in the following sense: due to the profound understanding of the systems involved, which has been gained in the down-

ward U-process, it is possible to realize their deepest potentials. From an outside perspective that process is interpreted as profound change of the system(s) involved. That is what the triple-loop learning strategy is about.

4.5 Instead of a conclusion:

Open questions and new perspectives

Interestingly, the classical distinction between know-how and know-what (see also Glaserfeld 2000) is called into question in this approach. Of course, the aspect of change always has a focus on the know-how (“*facere*”); however, due to the existential dimension the applied know-how cannot be seen as being completely uncoupled from the “what” question and, even more importantly, from the question of finality.

Closely related to this question are the issues concerning a purely instrumentalist and/or functionalist understanding of knowledge. From what has been presented above, the question of the role of “contemplative knowledge” (in the sense of knowledge that is not primarily effective) arises. More generally, it seems that profound change needs a kind of space of “*gratuité*” (e.g., Peschl 2006b): an “*enabling space*” which is – in a first step – free of function, purposes, goals, etc. The approach of the U-theory provides one way that such a space could emerge. Although there seems to be high compatibility with the constructivist approach, it is unclear what the role of this “non-instrumental knowledge” could be in that paradigm.

Finding a good balance between receptivity and openness on the one hand and construction and projection on the other is a question almost as old as epistemology. Both the constructivist approach and the concepts presented in this paper are in the middle of this struggle for the “right balance.” While the constructivist has a slight tendency towards the active role of cognition (i.e., primacy of projection) the U-theory approach follows the more “weak realist” tendency of being as receptive, unbiased, and open as possible.

Looking at the question of how profound change or the radical new can emerge in a constructivist framework one has to admit that they are more “accidents” in this epistemological context – “accidents” because the tendency of constructivism to project already existing (interpretation) cognitive patterns and to apply successful and well-proven

(behavioral) strategies has failed and one is forced to go for alternative strategies of knowledge construction. The approach developed in this paper seems to be such an alternative, which respects both the justified epistemological constraints of constructivism and the necessity for openness and receptivity to the new and unexpected. Both poles are *conditiones quae non* for profound change. Both approaches have their pros and cons and it remains an open question as to how to find a good equilibrium and where that equilibrium is located. It seems that this is an ongoing struggle and epistemological effort, which is an opportunity rather than a disadvantage, because we are forced to keep the level of alertness and reflection on this question high. It is a kind of “epistemological thorn in the flesh” which will not lead to a uniting of constructivist and (weak) realist positions, but to a thoughtful and reflected way of handling this non-trivial problem of being aware of one’s own construction and projection activ-

ities and at the same time offering the environmental dynamics a high level of possibilities for perturbation.

The triple-loop learning strategy as well as the presencing approach provides a framework in which these processes of profound change can emerge. A lot of work has to be done to implement these concepts and develop concrete methods for various contexts, however. These contexts comprise both the individual (e.g., individual cultivation, vision, etc.) and the collective domain (e.g., organizational change, radical innovation, etc.). The constructivist approach does not only offer a sound epistemological framework, but also a rich repertoire of methods and approaches from a wide field of disciplines (e.g., therapeutic domain, organizational learning, etc.) that have their roots in the constructivist tradition. If these methods were combined with approaches from other fields (such as phenomenology), a highly sophisticated and powerful paradigm for rad-

ical/profound change could emerge. This paradigm would not only have a deep impact on the process of how profound change can be brought about, but could also trigger a new understanding of science that is compatible with the constructivist approach and that has a broader perspective on knowledge, its dynamics, and its permanent renewal and innovation.

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Notes

1. A rough translation for this quotation: “Some artists manage to give the impression that there is no clear border between the mystical and the rational [...] Think, for instance, of the smile of Mona Lisa or of the smile of the archaic Hermes-statues in ancient Greece. There exist moments in which we are so moved by this smile that we think that we could understand it. However, as soon as we try to explain or rationally understand it we lose confidence and finally state, in a rather embarrassed way, that it is “ambiguous.” By that we try to cover the fact that we do not have a rational interpretation. For me, that is one of many experiences which prove that the mystical is beyond the border of the rational.”
2. The term “habitus” has its roots in Latin (*habere* – to have) and is a philosophical terminus technicus (e.g., Aristotle 1985, ethics, etc.) referring to a very well established (learned/internalized) behavioral pattern (in most cases used in an ethical context or in the context of virtues, personality, etc.).
3. The term environment covers a wide field ranging from people to things and even to the “internal environment.” It is both given and the result of a (cognitive) process of co-construction.
4. Classical philosophy shows that there is a close relationship between the “heart” and the will. Both are concerned with the orientation, the finality, etc. of the human person.
5. “The learning theory that emerges from Piaget’s work can be summarized by saying that cognitive change and learning take place when a scheme, instead of producing the expected result, leads to perturbation, and perturbation, in turn, leads to accommodation that establishes a new equilibrium” (Glaserfeld 1989, p. 128).
6. A rough translation: “If one wants to support the distinction between scientific knowledge and wisdom with more profound arguments, one has to find an answer for the question of how to produce usable rational knowledge [...] We need a general theoretical model that makes the production of rational knowledge plausible [...] That is the original and genuine task of constructivist theory.”

References

- Argyris, C. & Schön, D. A. (1996) *Organizational learning II. Theory, method, and practice*. Addison-Wesley: Redwood City CA.
- Aristoteles (1985) *Nikomachische Ethik*. Felix Meiner Verlag: Hamburg.
- Bechtel, W. & Abrahamsen, A. (2002) *Connectionism and the mind. Parallel processing, dynamics, and evolution in networks*. Blackwell Publishers: Malden MA.
- Boden, M. A. (ed.) (1990) *The philosophy of artificial intelligence*. Oxford University Press: New York.
- Bohm, D. (1996) *On dialogue*. Routledge: London.
- Bortoft, H. (1996) *The wholeness of nature. Goethe’s way of science*. Floris Books: Edinburgh.
- Clark, A. (1997) *Being there. Putting brain, body, and world together again*. MIT Press: Cambridge MA.
- Depraz, N., Varela, F. J. & Vermersch, P. (2003) *On becoming aware. A pragmatics of experiencing*. John Benjamins: Amsterdam, Philadelphia.
- European Commission (2004) *Innovation*

- management and the knowledge-driven economy. European Commission, Directorate-general for Enterprise: Brussels.
- Foerster, H. von (1973) On constructing a reality. In: Preiser, W. F. E. (ed.) *Environmental design research*. Hutchinson & Ross: Stroudsburg PA.
- Friedman, T. L. (2006) *The world is flat. A brief history of the twenty-first century*, Ferrar. Straus and Giroux: New York.
- Glaserfeld, E. von (1984) An introduction to radical constructivism. In: Watzlawick, P. (ed.) *The invented reality*. Norton: New York, pp. 17–40.
- Glaserfeld, E. von (1989) Cognition, construction of knowledge, and teaching. *Synthese* 80: 121–141.
- Glaserfeld, E. von (1991) Knowing without metaphysics. Aspects of the radical constructivist position. In: Steier, F. (ed.) *Research and reflexivity*. SAGE Publishers: London, Newbury Park CA, pp. 12–29.
- Glaserfeld, E. von (1995) *Radical constructivism: A way of knowing and learning*. Falmer Press: London.
- Glaserfeld, E. von (1996) *Radikaler Konstruktivismus. Ideen, Ergebnisse, Probleme*. Suhrkamp: Frankfurt/M.
- Glaserfeld, E. von (2000) *Konstruktion der Wirklichkeit und des Begriffes der Objektivität*. In: Foerster, H. von, Glaserfeld, E. von, Hejl, P. M., Schmidt, S. J. et al. (eds.) *Einführung in den Konstruktivismus*. 5th ed. Piper: Munich, pp. 9–39.
- Hebb, D. O. (1949) *The organization of behavior; a neuropsychological theory*. Wiley: New York.
- Holsapple, C. W. (ed.) (2003) *Handbook of knowledge management 1: Knowledge matters*. Springer: Berlin, New York.
- Hutchins, E. (1995) *Cognition in the wild*. MIT Press: Cambridge MA.
- Isaacs, W. (1999) *Dialogue and the art of thinking together: A pioneering approach to communicating in business and life*. Doubleday Currency: New York.
- Kolb, D. A. (1984) *Experiential learning: Experience as the source of learning and development*. Prentice Hall: Englewood Cliffs NJ.
- Krogh, G. von, Ichijo, K. & Nonaka, I. (2000) *Enabling knowledge creation. How to unlock the mystery of tacit knowledge and release the power of innovation*. Oxford University Press: New York.
- Levi, P. (1997) *Collective intelligence: Mankind's emerging world in cyberspace*. Perseus Books: Cambridge MA.
- Maturana, H. R. (1970) *Biology of cognition*. In: Maturana, H. R. & Varela, F. J. (eds.) *Autopoiesis and cognition: The realization of the living*. Reidel: Dordrecht, Boston, pp. 2–60.
- Maturana, H. R. & Varela, F. J. (eds.) (1980) *Autopoiesis and cognition: The realization of the living*. Reidel: Dordrecht, Boston.
- Nonaka, I. & Takeuchi, H. (1995) *The knowledge creating company. How Japanese companies manage the dynamics of innovation*. Oxford University Press: Oxford.
- Nonaka, I. & Toyama, R. (2003) *The knowledge-creating theory revisited: Knowledge creation as a synthesizing process*. Knowledge Management Research and Practice 1: 2–10.
- Peschl, M. F. (2001) *Constructivism, cognition, and science. An investigation of its links and possible shortcomings*. Foundations of Science 6: 125–161.
- Peschl, M. F. (2003) *Structures and diversity in everyday knowledge. From reality to cognition and back*. In: Gadner, J., Buber, R. & Richards, L. (eds.) *Organising knowledge. Methods and case studies*. Palgrave Macmillan: Hampshire, pp. 3–27.
- Peschl, M. F. (2005) *Acquiring basic cognitive and intellectual skills for informatics. Facilitating understanding and abstraction in a virtual cooperative learning environment*. In: Micheuz, P., Antonitsch, P. & Mittermeir, R. (eds.) *Innovative concepts for teaching informatics*. Ueberreuter: Vienna, pp. 86–101.
- Peschl, M. F. (2006a) *Modes of knowing and modes of coming to know. Knowledge creation and knowledge co-construction as socio-epistemological engineering in educational processes*. *Constructivist Foundations* 1: 111–123.
- Peschl, M. F. (2006b) *Raum für Innovation und Knowledge Creation*. *Lernende Organisation* 29: 56–64.
- Piaget, J. (1992) *Biologie und Erkenntnis. Über die Beziehung zwischen organischen Regulationen und kognitiven Prozessen*. Fischer: Frankfurt/M.
- Polanyi, M. (1966) *The tacit dimension*. Doubleday: New York.
- Rifkin, J. (2004) *The end of work*. Putnam: New York.
- Rosch, E. (1999) *Primary knowing: When perception happens from the whole field*. Retrieved from <http://www.dialogonleadership.org/Rosch-1999.pdf> on 6 May 2005.
- Rumelhart, D. E., Hinton, G. E. & Williams, R. J. (1986) *Learning internal representations by error propagation*. In: Rumelhart, D. E. & McClelland, J. L. (eds.) *Parallel Distributed Processing: Explorations in the microstructure of cognition*. Foundations. MIT Press: Cambridge MA, pp. 318–361.
- Scharmer, C. O. (2000) *Presencing: Learning from the future as it emerges. On the tacit dimension of leading revolutionary change*. Retrieved from <http://www.dialogonleadership.org/Presencing-TOC.html> on 2 February 2005.
- Scharmer, C. O. (2001) *Self-transcending knowledge. Sensing and organizing around emerging opportunities*. *Journal of Knowledge Management* 5: 137–150.
- Scharmer, C. O. (forthcoming) *Theory U: A social technology for leading profound change*.
- Schein, E. H. (1993) *On dialogue, culture and organizational learning*. *Organization Dynamics* 22: 44–51.
- Senge, P. M. (1990) *The fifth discipline. The art and practice of the learning organization*. Doubleday: New York.
- Senge, P., Scharmer, C. O., Jaworski, J. & Flowers, B. S. (2004) *Presence. Human purpose and the field of the future*. Society for Organizational Learning: Cambridge MA.
- UNESCO (2005) *Towards knowledge societies*. Paris, United Nations Educational, Scientific and Cultural Organization (UNESCO World Report).
- Varela, F. J., Thompson, E. & Rosch, E. (1991) *The embodied mind: cognitive science and human experience*. MIT Press: Cambridge MA.
- Varela, F. (2000) *Three gestures of becoming aware*. Retrieved from <http://www.dialogonleadership.org/Varela-2000.pdf> on 27 April 2005.

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