The Two Epistemologies of Ernst von Glasersfeld

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> Purpose • The article pursues three aims. First, it intends to differentiate between two different approaches for knowledge studies, namely an empirical and a normative mode. In a second move, two different epistemologies in the work of Ernst von Glasersfeld will be introduced under the labels of "Epistemology I" and "Epistemology II." Epistemology I relates to empirical research, Epistemology II is normative in nature. Third, the article makes the point that while Ernst von Glasersfeld's Epistemology II has already been presented in a finite and mature form, his empirical analysis of cognitive processes still provides a rich pool of tools and designs that should be further developed and advanced in the years and decades ahead. **> Method** • The article is analytical in nature, identifying the different building blocks and relational networks of von Glasersfeld's two epistemologies. By this, the article intends to contribute to a further advancement of von Glasersfeld's Epistemology I. **> Results** • The main finding lies in recognizing the radical and innovative elements of von Glasersfeld's Epistemology I and on the still-challenging research designs of Epistemology I.
> Key words • Epistemology, theory of knowledge, history of philosophy, philosophy of science, radical constructivism, self-referentiality, viability.

Throughout the years I have been fascinated with Ernst von Glasersfeld as a highly imaginative empirical investigator of issues such as knowledge acquisition, learning, primate languages, or languages in general. At the same time, I viewed his philosophical contributions on topics such as knowledge, reality or viability as rather interesting but as not particularly radical. In this short article I would like to propose a distinction between two different epistemologies in von Glasersfeld's work. His first epistemology is basically an empirical research program on knowledge acquisition for humans and primates alike in the domains of words and numbers, his second epistemology is a normative framework on relations between knowledge statements and reality or for criteria of knowledge adequacy. In essence, both epistemologies use the same terminology and both epistemologies co-exist side by side in von Glasersfeld's articles and books. Thus, I hope that this split into two epistemologies in von Glasersfeld's work turns out to be useful for others as well and helps us to recognize the importance of his empirical research program in the wide field of studies on knowledge acquisition.

The basic differences between empirical and normative epistemologies

Before turning to the two epistemologies in von Glasersfeld's oeuvre I would like to discuss the basic differences between two basic approaches or ways to operate with knowledge issues that have become particularly clear after the emergence of the cognitive sciences and philosophy of science as distinct disciplines. The first road is empirically oriented and follows the relevant rules for empirical research. Along the first road one finds empirical research programs or larger research traditions with a common focus on knowledge-issues. Here one sees a broad stream of empirical hypotheses, theories, and models for knowledge research and one is confronted with a large number of experiments and tests for evaluating the empirical adequacy or viability of these hypotheses, theories or models. Turning to research areas and to scientific disciplines more specifically, theories of learning and the broadening fields of the neuro-cognitive sciences, including domains such as cognitive psychology, cognitive anthropology, and the like, operate along the first road.

The second road is mainly concerned with the issue of separating knowledge proper from pseudo-knowledge or mere speculation. The second road operates strictly independently from empirical research and places heavy emphasis on the definition of concepts and on: the elaboration of criteria for knowledge elements such as explanations, theories, and models; the manifold relations between explanations, theories and models; or the criteria for theory and model confirmation.[1] Additional domains within the second road cover issues such as the relations between knowledge proper, speculative knowledge, and reality. Moreover, the second road has a long-standing history of philosophical inquiry that goes back to the awakening of the Greek mind after 600 B.C. and to earlier philosophical traditions outside the Western mind.

For the subsequent explorations another distinction is to be introduced that differentiates between the main areas of research. Area I can be viewed as the arena of empirical research and observation and measurement-based synthetic investigations whereas Area II can be seen as the domain

1| As a relevant selection from the normative road to knowledge inquiries, see, for example, Balzer, Moulines & Sneed (1987), Curd & Cover (1998), Bunge (1998, 2002, 2003), and Salmon (1998).

of rules, principles or guidelines and, thus, of normative inquiries.

Prior to the fragmentation of science into different disciplinary fields in the second half of the 19th century, both ways of knowledge and world-making were well integrated within single approaches or broader philosophical traditions such as idealism or empiricism. After the split into academic disciplines such as psychology, and especially with the emergence of the cognitive sciences in the second half of the 20th century, the two roads became clearly separated from one another. However, mixtures of empirical and normative theories of knowledge still prevailed in the latter half of the 20th century, too.

Within the German-speaking context an interesting example can be found under the label of an evolutionary epistemology that was formulated in a dual way, namely as a natural history of knowledge acquisition and as a class of epistemological principles as well. In 1973, Konrad Lorenz proposed an evolutionary epistemology under the title *Behind the Mirror* with the ambiguous subtitle *A Search for a Natural History of Human Knowledge*. In 1975, Gerhard Vollmer published the book *Evolutionary Epistemology* and in the year 1976 Rupert Riedl followed with the publication of the book *Strategy of Genesis*. During these formative years, Karl R. Popper used more and more evolutionary theorizing to justify his falsificationist program. The Altenberg Circle, which convened in the home of Konrad Lorenz near Vienna, became a rather powerful intellectual movement during the 1970s and 1980s, but was met with strong criticism, especially from academic philosophers. Headed especially by Wolfgang Stegmüller (1984, 1985) one could see a clear line of counter-arguments that emphasized the split between an evolutionary theory of learning and knowledge acquisition across different species, including the human one, and a normative epistemology on the criteria of confirmed, corroborated, tested or justified knowledge. Natural histories of knowledge acquisition from bacteria to humans constitute an important part of evolutionary biology, but, so the argument goes, remain mostly irrelevant for contemporary normative epistemological discussions. Moreover, any attempt to transfer principles or guidelines from the empirical contexts of evolutionary biology to the normative arena would fall victim to a naturalist fallacy on the one hand and, on the other hand, would produce normative solutions that clearly fall behind the current state of the art in normative epistemology.

More recently, Siegfried J. Schmidt (2003, 2010) proposed a neo-idealist variant of a normative epistemology as a sustainable or viable post-constructivist successor to radical constructivism. Remarkably, Schmidt uses the argument of a naturalistic fallacy and turns it against the possibility of radical constructivism as an empirical research program. Instead, Schmidt introduces a complex network of conceptual relations that would, however, be difficult to transform into empirical research.

The distinction between the two epistemologies so far can be summarized by Table 1, which separates various contributions by radical constructivism (RC) along the two main roads of knowledge investigations, namely along the empirical and the normative road. Von Glasersfeld's work has been split into two different epistemologies, namely into Epistemology I and Epistemology II. The work of the core group of radical constructivists has been placed in the first road of knowledge studies whereas more recent variants have come under the normative branch.

As a next step, the two different epistemologies of von Glasersfeld will be described in greater detail.

Domains	Empirical Research	Normative Inquiry
Knowledge	Von Glasersfeld's theory of knowledge acquisition (Epistemology I) Research program by von Foerster on cognition (second-order cybernetics) Research programs by Maturana and Varela on autopoietic systems Research program by Gordon Pask on machine-learning, etc.	Von Glasersfeld's theory of knowledge (Epistemology II) Schmidt's neo-idealist program, etc.
World (Environment)	Aside from the RC research tradition, embedded cognition as a current variant	Postmodernism RC style Parts of von Glasersfeld's Epistemology II Mitterer's non-dualism, etc.

Table 1: The two epistemologies of von Glasersfeld and their wider radical constructivist context.

The mix between the two epistemologies in von Glasersfeld's work

It is intriguing to see that von Glasersfeld uses his two epistemologies side by side and mixes and recombines them constantly and persistently. Moreover, one can show that von Glasersfeld operates in the two different locations of Area I and Area II simultaneously even within a single article. His "Introduction to Radical Constructivism", for example, starts in Area II and introduces radical constructivism as a counter-program to and as a radical departure from common sense assumptions about knowledge and reality. Radical constructivism is characterized as a genuinely new alternative that stresses the importance of being responsible and the constructive nature of our experience. In the first section of the article von Glasersfeld still relates mostly to Area II and introduces a fundamental dichotomy between metaphysical realism as a philosophical tradition of *très longue durée* on the one hand and radical constructivism on the other hand. Metaphysical realism is associated with catchwords such as objective reality, and (iconic) correspondence between objective reality and knowledge or truth, and with operations such as discovering or detecting, whereas radical constructivism is linked with actively constructed subjective realities, with viable knowledge structures, and with operations such as inventing or

Module	Main Characteristics
Conceptual Analysis	Operational analysis of concepts Comparative operational analysis across different languages
First-Order Models	Models of the observer (scientist)
Second-Order Models	Models for the behaviour of observed groups
Piaget-Theory (Static)	Equilibration of schemes
Piaget-Theory (Dynamic)	Assimilation and accommodation of schemes

Table 2: The main building blocks for von Glasersfeld's Epistemology I.

producing.[2] Von Glasersfeld then turns to another niche in Area II and discusses the differences between a viable knowledge organization and its close relationships with evolutionary thinking. In evolutionary theory, too, one cannot establish degrees of correspondence between the fitness of organisms and the structure of the environment, but only a negative relation between species or mutations and their irreproducibility or non-viability. The second section of the article operates in Area II as well and turns to the history of philosophy, stressing the importance of a small counter-movement, with Giambattista Vico as one of its core-representatives, against the dominant realist epistemology. In the third section of his article von Glasersfeld turns to Area I and offers a few glimpses of his Epistemology I as an empirical research program. Introducing the work of Jean Piaget, von Glasersfeld provides a sketch of the theoretical core of Epistemology I. Towards the end of the article von Glasersfeld returns to Area II and characterizes, once again, radical constructivism as a radically new world view that is in the process of overcoming and replacing metaphysical realism, which has dominated the philosophical theater for millennia.

Generally speaking, von Glasersfeld's Epistemology II is usually at issue whenever he discusses the design and the content of radical constructivism in general. Especially in his widely recognized papers on the nature or the structure of radical constructivism, von Glasersfeld operates predominantly in Area II whereas in his articles on words and numbers he works mainly within Area I.

Ernst von Glasersfeld's Epistemology I as a research program on knowledge acquisition

Turning to Area I more specifically, von Glasersfeld's Epistemology I is organized as an empirical research program with all the necessary ingredients of research programs as they have been laid out in the introductory section.

As for the theoretical core, the main building blocks are adapted mostly from Jean Piaget. Basically, Epistemology I uses Piaget's action scheme approach with assimilation and accommodation as the two main dynamic operations. The class of relevant methods, models, and mechanisms of Epistemology I reflects this theoretical core and comprises a series of Piaget-models for the cognitive formations of fundamental concepts such as time, objects, identity or moral judgements. Moreover, the class of compliant models, mechanisms, and methods contains instruments for conceptual analyses that have been developed by von Glasersfeld in his cooperation with Silvio Ceccato. Turning to the application side one can find, most probably, three paradigmatic examples of von Glasersfeld's Epistemology I, namely chimpanzee communication and the construction of Yerkish language, the formation of numerical concepts in children, and, finally, concept formation in education in physics.[3] Epistemology I took place mostly between the 1960s and the 1980s, after von Glasersfeld entered the United States, although his earlier work with Silvio Ceccato served as an essential preparatory or latent phase for Epistemology I as a research program. Table 2 lists several important building blocks for the theoretical core as well as for available models and methods.

One of the most interesting elements of the Epistemology I program lay in the specification of research designs that contained models of the first-order as well as models of the second-order. Leslie Steffe, a close friend and collaborator of von Glasersfeld within the IRON project on number formation, draws the following distinction between first- and second-order models.

> "Von Glasersfeld produced his model of units and number by using mental operations to analyze his own conceptions of units and number. So, I refer to his analysis as a first-order analysis. The goal of a first-order analysis concerns specifying the mental operations that produce particular conceptions of the analyst … When the goal is to explore operations by means of which human beings construct mathematics … we construct second-order models which are models an observer constructs of the observed persons' knowledge in order to explain their observations." (Steffe 2007: 46)

Steffe continues that the interplay between first-order and second-order models lies at the heart of Epistemology I as a research program and, following Steffe, can be considered as a central component of a radical constructivist research program.

> "The reciprocal relationship between first- and second-order analyses is basic in radical constructivist research programs because it illustrates that researchers and their ways and means of operating and observing constitute the research programs." (Steffe 2007: 46)

At this point it must be sufficient to conclude that von Glasersfeld operated on the basis of a well-defined empirical research program whenever he worked on special issues in the domains of numbers and words and on the ways and modes humans or primates use them. Moreover, von Glasersfeld used self-participatory and self-reflexive research designs that can be considered as non-standard and as rare exceptions, even in the current research environments.

2| Some of the features in this dichotomy are also captured in Popper's (1975) distinction of "searchlight" and "bucket" theories of knowledge.

3| These three paradigmatic examples have been extracted from Glasersfeld (1995), which presents a short autobiographical sketch.

Epistemology II as a normative theory of knowledge

For von Glasersfeld, Epistemology II consists of two large topics or segments, one being the history of philosophy, and the other being contemporary philosophy, composed of areas such as epistemology, ontology, philosophy of science, logic, ethics, and the like[4]. With respect to the history of philosophy, von Glasersfeld associates radical constructivism as a research tradition with a small philosophical side-stream that includes various forms of scepticism due to its negation of an "objective reality" or "objective knowledge". Among forerunners of radical constructivism one finds variants of idealism (Berkeley, Kant) because of the active involvement of the human mind or singular thinkers such as David Hume, who is highly esteemed due to his radical empiricism and, one should add, to his constructivist philosophy of mind[5]. For von Glasersfeld, the Neapolitan Giambattista Vico became of particular relevance and is applauded for his acknowledgement of the active role of the human mind in structuring experiences.

Proceeding to another field in Area II, von Glasersfeld's Epistemology II can be characterized as a negative ontology and as another variant of a normative evolutionary epistemology. More specifically, von Glasersfeld's normative theory of knowledge[6] rests on two theoretical assumptions:

> "knowledge is not passively received but built up by the cognizing subject; the function of cognition is adaptive and serves the organization of the experiential world, not the discovery of ontological reality." (Glasersfeld 1995: 18)

Module	Main Characteristics
Theory of Knowledge	Against "objective reality" and correspondence; for an active, though largely unconscious world-making of subjects
Validation	Viability as core element (instrumentalism, pragmatism and evolutionary epistemology as neighbors of Epistemology II) Fitness and coherence
History of Philosophy	Pre-Socratics, Vico, Berkeley, Kant et al. as Forerunners of Epistemology II

Table 3: Principal components for von Glasersfeld's Epistemology II.

Table 3 lists some of the important building blocks of von Glasersfeld's Epistemology II as a philosophical approach in Area II.

For Epistemology II, another domain in Area II has become increasingly important over the last two decades. Here, von Glasersfeld's Epistemology II sees itself as an intellectual avant-garde that tries to accomplish what David Hume provoked in Immanuel Kant, namely an awakening from dogmatic slumber or, more specifically, from realist daydreams. Table 4 assembles a small number of constructs that are commonly associated with Epistemology II within contemporary postmodernist discussions.[7]

Additional characterizations of the two epistemologies of Ernst von Glasersfeld

The two epistemologies of von Glasersfeld in Area I and Area II can be described more specifically with the help of additional dimensions. For Area I, two dimensions can be selected, namely a vertical one for micro- or macro-levels and a horizontal one for degrees of formalization. Micro-levels operate in the domain of single neurons or neural assemblies whereas the macro-level is used for single actors or groups of actors of both the human or primate variety. Within this two-dimensional array, Epistemology I can be characterized as an empirical research program at the intersection of macro-levels and with a mild degree of formalization. In this way, Epistemology I differs significantly from, for example, the research on cognition carried out in Heinz von Foerster's Biological Computer Laboratory, which can be considered as highly-formalized and situated mostly at the micro level of neural organization. (See, for example, Müller & Müller 2007)

Epistemology II in Area II could be described with the help of several additional dimensions as well. Using a horizontal dimension of low to high degrees of specificity and a vertical dimension of low to high degrees of normative formalization, von Glasersfeld's Epistemology II should be located at the low left-hand corner at the intersection of low degrees of specificity and low degrees of normative formalization. Epistemology II in Area II could be characterized additionally with the help of a horizontal political left/right dimension and a vertical low/high theoreticity dimension. In this case, Epistemology II can be placed in the segment with a medium degree of theoreticity and with a politically centrist position far away from either explicit left-wing or right-wing orientations.

Finally, a short remark must be added that the two arenas for the two epistemologies need not be strongly inter-linked. In other words, no band of necessity, despite the high similarity in the concepts, combines Epistemology I and Epistemology II. For example, Epistemology I can be used as an empirical research program in Area I and combined with a more sophisticated realist epistemology far away from iconicity and a passive de-picturing of a singular objective reality. Furthermore, it is questionable at best to see radical forms of

4| As a summary of the components of Epistemology II, see Glasersfeld (2005).

5| For a recent summary of Hume's theory of mind, see Kreimendahl (2011) or Roth (2011).

6| An interesting selection of articles on Ernst von Glasersfeld's theory of knowledge can be found in Glasersfeld (2007: 91–169). Most of these articles belong to Epistemology II, although examples and segments of Epistemology I are constantly present.

7| As typical authors on the postmodern condition, one can name Zygmunt Bauman (2000), Judith Butler (2003, 2005) or Jean-Francois Lyotard (1984).

Worldview	Themes
Individual	Radically new role model as world-constructor, Iconoclastic attitude towards common sense realism and common sense-theory of knowledge
Ethics	Responsibility, autonomy, etc.
Culture	Pluralism, tolerance, etc.
Society	Self-organization

Table 4: Core building blocks for von Glasersfeld's Epistemology II within the postmodernist context.

scepticism only directed against off-springs of metaphysical realism. Rather, radical scepticism could be turned powerfully against Epistemology II as well. Additionally, Epistemology II as a postmodernist *Weltanschauung* and postmodern *Lebensgefühl* can be maintained in the complete absence of Epistemology I. In fact, the popularity of von Glasersfeld's Epistemology II among management consultants, coaches, and therapists of various persuasions lies mainly in the reception and acceptance of Epistemology II as a viable post-modern view on communication, understanding, autonomy, individual responsibility or self-organization, irrespective of the structure and organization of Epistemology I as an empirical research program.

After discussing the two epistemologies in von Glasersfeld's oeuvre, I would like to conclude by highlighting the strengths and opportunities of Epistemology I. Epistemology II has been well advanced by Ernst von Glasersfeld himself and, at least in my view, cannot be improved or extended further.

The strengths and opportunities of von Glasersfeld's Epistemology I

Ernst von Glasersfeld's Epistemology I remains remarkably strong and can offer, as one of its most important opportunities, radically new designs in conducting research in the cognitive sciences or in the social sciences. Focusing, thus, on von Glasersfeld's Epistemology I as a still powerful and vibrant new symphony, research within the framework of Epistemology I can be organized as a trans-disciplinary and self-reflexive group effort that is applicable across the entire spectrum of the study of living cognitive systems. Epistemology I as an empirical research program still differs widely from conventional scientific practices, methods, and approaches. In this section some of these profound and radical changes through appropriate Epistemology I-designs will be outlined, which can be applied to the entire spectrum of relevant cognitive science disciplines.

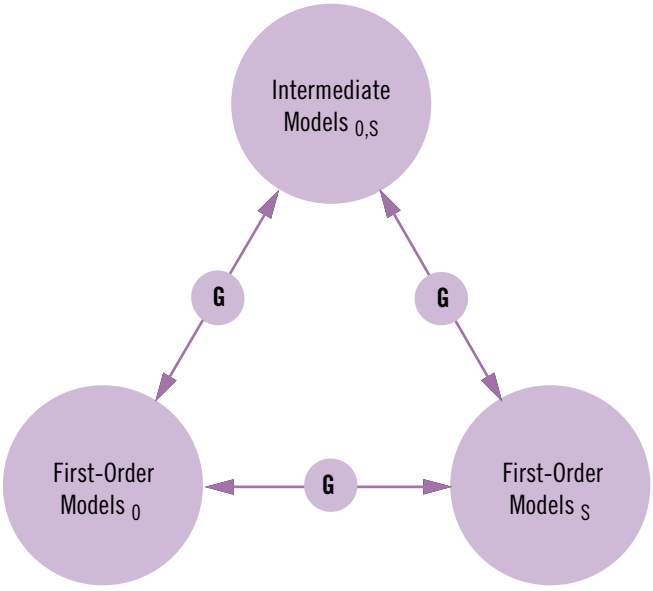


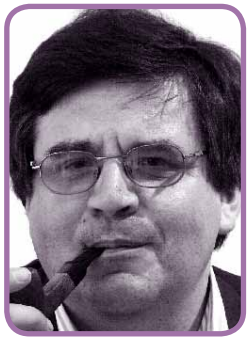
Figure 1: Research designs for Epistemology I.

As a starting point, Epistemology I-designs are characterized, as can be seen from Figure 1, by including researchers in an explicit way. Given the overall structure and organization of Epistemology I, a theory of the brain, laws of evolutionary forms, and patterns of cognition or regularities in organizations or societies, past and present, have to be generated in a triadic configuration where observing scientists are but one node of a triadic generative network.

The radical difference that makes the characteristic difference between Epistemology I-designs and traditional social science approaches can be seen in Figure 1, too. Here, one finds a triadic configuration with generative relations (G) between an observing scientist S, observing observers O and an intermediary unit linking S and O. It must be noted that Steffe's distinction between first- and second-order models fits well for Figure 1 as well. The first-order models within the Epistemology I framework are the first-order models$_O$ in Figure 1, the second-order models for von Glasersfeld become the first-order models$_S$, and a Piaget model of learning is present as an intermediary ensemble as well.

Thus, the research process within Epistemology I designs has been and should be organized in a generative and closed way so that it can drift towards its stable *Eigenforms*. It is through these triadic recursive interactions *in vivo* that the laws or patterns of knowledge acquisition and brain research emerge.

Towards the end of this section, a few looks ahead and hints will be given showing that operating with Epistemology I designs



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is head of WISDOM, Austria's infra-structural centre for the social sciences and president of the Heinz von Foerster Society. His main research interests range from issues in complex modeling within the social sciences and from interdisciplinary analyses of innovation processes in science, technology and the economy to the history and the current potential of inter- and transdisciplinary research, to the frontiers of second order cybernetics and radical constructivism or to the newly emerging risk-potentials for contemporary societies in general. His recent publications include *An Unfinished Revolution? Von Foerster and the Biological Computer Laboratory 1958–1976* (2007, together with A. Müller), *Gordon Pask: Philosopher Mechanic* (2007, together with R. Glanville), *The New Science of Cybernetics. Towards the Evolution of Living Research Designs, vol. I: Methodology* (2009) and *Modern RISC-Sociteies. Towards a New Paradigm of Societal Evolution* (together with L. Kajfež-Bogataj, I. Svetlik, N. Toš).

is not a sentimental or nostalgic affair, but still urgently needed and required. After all, the cognitive status of Epistemology I remains one of an unfinished revolution of an unfinished revolution (For more details see Müller 2007).

More concretely, the applicability of Epistemology I-designs for two broad areas, namely the cognitive sciences and, finally, the social sciences will be discussed briefly.

The wide applicability of Epistemology I

With respect to the cognitive sciences, Epistemology I can still act as a catalyst and as a radically new perspective, especially within the contemporary cognitive science landscapes. By and large, Jean Piaget's accommodation and adaptation framework ceased to be explored significantly further after Piaget's death in 1980.[8] Even today's models of embedded cognition, as they have been advanced over recent years, would need to cross a large cognitive distance in order to proceed in a fashion that is compliant with Epistemology I, namely in a triadic as well as a generative configuration that includes the observing scientist as an integral element within an operationally closed configuration.

Epistemology-I-designs continue to remain a necessary and persistent critic to current developments in Artificial Intelligence or linguistics. The appropriate Epistemology I-research designs for semantic computing or for living and learning observer–machine interactions constitute viable, albeit radically different research trajectories, compared to the normal practices in linguistics or in Artificial Intelligence.[9]

Turning, finally, to the field of organization studies in particular and to the social sciences in general, one can specify two features that would be necessarily present in Epistemology I-designs and that are typically absent in today's normal social science investigations.

- On the one hand, in Epistemology I-designs the observing social scientist becomes an integral part of a triadic research process where processes under observation are analyzed in a closed and generative configuration. For example, learning models of observers *qua* social researchers have to play a significant role in the research of learning models. Normally, learning models are always seen as the learning models of others and the learning models of social scientists are not considered as part of an interactive research design. In the context of Epistemology I-designs, the main emphasis does not lie on the fact that specific learning models of researchers could have an adverse or negative effect on the interpretation of observations, but the point to be made is far more profound and of a more general nature. Any learning model, for example, cannot be considered as complete as long as the learning model of observing systems, studying learning models, is not part of the investigation. This incompleteness simply means that it cannot be decided whether the learning models of researchers are commensurate with the learning model theory in construction.
- On the other hand, the Epistemology I-designs are organized recursively, drifting towards robust patterns of learning patterns, functions of cognitive functions, models of anthropological models, etc. This implies that the Epistemology I-designs must operate with a much richer first-order empirical basis because they have to assemble a variety of studies of first-order processes that are to be solved recursively within a second-order mode.

Thus, the trans-disciplinary unity of observing living systems, so strongly advocated within von Glasersfeld's Epistemology I, but also within von Foerster's second-order cybernetics (e.g., Müller 2007, 2008), has to wait until either we advance these two frameworks significantly further or the traditional sciences of living cognitive systems by living cognitive systems have implemented the drastic and necessary changes suggested by von Glasersfeld or von Foerster as early pioneers.

8| For a contemporary summary, see Müller, Carpendale & Smith (2009)

9| For a more recent version sufficiently close to the former BCL perspectives in the field of semantic computing, see Krieg (2005).

Conclusion

In this article a distinction between two epistemologies in Ernst von Glasersfeld's work has been made. While Epistemology II has been presented in a mature form by Ernst von Glaserfeld already, and can hardly be improved further, Ernst von Glasersfeld's Epistemology I forms a comprehensive research program with a still fruitful theoretical core and with radically different sets of heuristic rules and research designs. This focusing on Epistemology I as a largely unfinished trans-disciplinary agenda for empirical research on knowledge-based processes possesses an enormous but currently completely under-utilized potential and remains of high relevance for today's research in the cognitive sciences, medical research or the social sciences, broadly conceived. A few promising hot spots in the Epistemology I-designs have been provided where von Glasersfeld's Epistemology I could act as a powerful feature detector, as a radical problem deflator, and, above all, as a distinctly new way of organizing research with and of cognitive systems. In all these matters we still can learn tremendously from Ernst von Glasersfeld, now and in the future.

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