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## DESCRIPTION

**Constructivist Foundations (CF)** is an independent academic peer-reviewed e-journal without commercial interests. Its aim is to promote scientific foundations and applications of constructivist sciences, to weed out pseudoscientific claims and to base constructivist sciences on sound scientific foundations, which do not equal the scientific method with objectivist claims. The journal is concerned with the interdisciplinary study of all forms of constructivist sciences, especially radical constructivism, biology of cognition, cybersemiotics, enactive cognitive science, epistemic structuring of experience, non-dualism, second order cybernetics, the theory of autopoietic systems, etc.

## AIM AND SCOPE

The basic motivation behind the journal is to make peer-reviewed constructivist papers available to the academic audience free of charge. The constructive character of the journal refers to the fact that the journal publishes actual work in constructivist sciences rather than work that argues for the importance or need for constructivism. The journal is open to (provocative) new ideas that fall within the scope of constructivist approaches and encourages critical academic submissions to help sharpen the position of constructivist sciences. The common denominator of constructivist approaches can be summarized as follows.

- Constructivist approaches question the Cartesian separation between objective world and subjective experience;
- Consequently, they demand the inclusion of the observer in scientific explanations;
- Representationalism is rejected; knowledge is a system-related cognitive process rather than a mapping of an objective world onto subjective cognitive structures;
- According to constructivist approaches, it is futile to claim that knowledge approaches reality; reality is brought forth by the subject rather than passively received;
- Constructivist approaches entertain an agnostic relationship with reality, which is considered beyond our cognitive horizon; any reference to it should be refrained from;
- Therefore, the focus of research moves from the world that consists of matter to the world that consists of what matters;
- Constructivist approaches focus on self-referential and organizationally closed systems; such systems strive for control over their inputs rather than their outputs;
- With regard to scientific explanations, constructivist approaches favor a process-oriented approach rather than a substance-based perspective, e.g., living systems are defined by processes whereby they constitute and maintain their own organization;
- Constructivist approaches emphasize the "individual as personal scientist" approach; sociality is defined as accommodating within the framework of social interaction;
- Finally, constructivist approaches ask for an open and less dogmatic approach to science in order to generate the flexibility that is needed to cope with today's scientific frontier.

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## Target Article

# Who Conceives of Society?

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▶ **Problem** – How can constructivists speak of social interaction or communication with others, when, as they claim, their experiential world is their own construction? This question is frequently asked and is perfectly reasonable. The present paper is intended as an answer. ▶ **Solution** – After providing an outline of the constructivist approach to perception and the generation of recognizable objects in the experiential field, I argue that "others," too, can be explained as an individual's creation; a creation, however, that is just as constrained by the condition of viability as are the physical objects with which we furnish our world. Consequently, "society" too can be considered an individual construct rather than an ontological given. ▶ **Benefits** – The exposition may help to clarify the constructivist position with regard to social interaction and communication.
▶ **Key words** – Sociology, linguistic communication, conceptual analysis.

## 1. The creation of patterns

**1** If you examine how the notion arose that our image of the world is the representation of a reality that exists in itself and independently of any observer, you will sooner or later also come to question the relation between a thinking subject and the society to which he or she believes they belong. I can think of no better way to approach this problem than to examine how patterns arise from the perception of disconnected elements.

**2** In the first part of his contribution to the book *Das große stille Bild*, Siegfried Schmidt (1996, pp. 150–160) provides a good sketch of the radical constructivism. It forms the starting point of an essay in which he analyzes the role of pictures in the domain of advertising. Here, I take what he says about the activity of seeing as a launching pad for some reflections on the generation of mental images and the concept of society.

**3** Schmidt quotes Roland Barthes (1985): "At the sight of a photograph, Barthes says, consciousness does not necessarily embark on the nostalgic path of memory, but may choose the one of certainty. '…the essence of photography consists in confirming what it represents. Its fundamental principle is reference. This-is-how-it-was, it cannot be denied that this thing actually happened.' (p. 86). Since we have photography, 'the past is as certain as the present' (1985, p. 97)" (Schmidt 1996, p. 171, my translation from the German text).

**4** Photographs are visual experiences. In English there is the old indestructible cliché: "Seeing is believing." (*Sehen heißt glauben*). This is not limited to photographs. Any visual image will be interpreted as a representation of something that has its own existence, something that is actually *there,* regardless of whether it was generated on the basis of an actual situation or was a photographically produced picture. Even representations of flying saucers and their passengers are intended to create the impression that these things could actually be perceived and therefore "exist." And paintings of dragons, devils, and angels, too, are often intended to be taken as pictures of "real" beings.

**5** Constructivism maintains that this inference from perceptual images to things supposed to exist independently of the constructive, coordinating work of an observer is unwarranted. What a photograph refers to is not a "thing in itself" but an observer's mental re-presentation, namely the re-presentation he or she brings forth or would bring forth when perceiving the photographed situation.

**6** The problem with the relation that we call "reference" becomes particularly transparent in the case of caricatures. The kind of caricature I have in mind is a spare drawing showing a few lines, each of which seems indispensable. The drawing evokes the re-presentation of a face or a figure that we recognize at once as familiar. The remarkable feature is that the lines of the drawing do not represent at all what we would see if the person stood before us. The lines constitute a crafty simplification of the perceivable. In other words, they are a graphic embodiment, for example, traces of graphite on a sheet of paper that afford us the possibility of interpreting them as something that we have already experienced, even though we have never actually seen this simple pattern of lines.

**7** But what are these lines, in which we see the character of a person? One might say they are particles of pigment that are distinguishable from a neutral background. But the material is irrelevant. The caricature would have the same effect if the lines were white on black, thinner or thicker, or of another color. What matters is their arrangement. What caricaturists or painters of portraits produce is, from a constructivist point of view, a *potential* image of their model. Strictly speaking, they create an arrangement of visual lightness values and color shades such that the perceiver, who always involuntarily looks for possible connections between details, is led to carry out much the same scan paths that he or she would follow if facing the represented person.

**8** This may sound complicated and perhaps even incredible. I have therefore dug out two illustrations from the psychological literature that make the drawing of connections in visual perception very noticeable. In Figure 1, not much effort is required, because the possibilities of "seeing" a reasonable form are reduced to practically one.

**9** In Figure 2, most viewers will have to work harder to find something recognizable. As

**Figure 1:** "Incomplete Form"
(from: Vernon 1962, p. 63)



**Figure 2:** "Organization of Visual Sensations"
(Roland C. James' famous Dalmatian dog, from: Blakemore 1977, p. 66)

soon as it has been found, though, the effort will be forgotten and one believes one has recognized a Dalmatian that is actually part of the picture. Only a further examination reveals that the lines which yield the relevant figure are not there at all but must be supplied by the viewer.

**10** It has never ceased to amaze me that Kant (1968, S.112, §138) already had the insight that a line must be *drawn* by the perceiver before it can be seen. As the two figures show, this *drawing* must be done not only by the artist while he is creating the image; the viewer, too, has to create the image in order to perceive it, and viewers do this by moving the focus of their attention (scan path).

**11** Although we usually do not notice it, attention can move in the visual field *without* eye movement. This has been experimentally demonstrated by perception psychologists in Germany, Russia, and Canada since the 1950s.[1] Text books hardly ever mention this ability, but for the constructivist model of concept formation it is an important fact. When the focus of unbroken attention moves, it generates connections, not only on the level of sensory perception but also on the higher level of mental operations. "Higher level" is, of course, intended as a metaphor. Attention,

thinking, and reflection are usually taken to be processes in the brain, but although a network of neurons may be able to carry out hierarchically ordered operations, one should think of such a hierarchy as involving logical rather than spatial steps.

**12** This exposition may become a little clearer if you remember that what we call "association" was explained by David Hume as being based on spatial or temporal contiguity. In conscious experience it is, I believe, attention that in a field of unlimited possibilities links, i.e., associates, particulars by moving its focus uninterruptedly from one to the other. If you accept this as a working hypothesis, you may assume that such links can be generated not only in perceptual fields but also between particulars that are present and particulars that are remembered (re-presented). Consequently I see (as did Silvio Ceccato[2]) the dynamic of attention as the fundamental tool of concept formation.

**13** The attentional movement, which makes it possible to "recognize" (i.e., to construct) familiar objects in a meaningless array of black dots on a sheet of white paper, has the same function when we are not looking at a reproduced image but out of the window. There we see, for instance, a few trees, a fence behind

them, and then a road on which two brightly colored cyclists are just passing. These are all objects that we are able to compose on the basis of lightness and color values and the connections we ourselves "draw." We say, "We recognize these things," and only very rarely become aware of the fact that we could have drawn the connections differently. The praxis of experience consists largely in "seeing" the possibility of connections that correspond to familiar patterns.[3] (Figures 1 and 2 should make this very clear.)

## 2. The pragmatic concept of viability

**14** To make these claims plausible, constructivist theory must supply a model that explains how and why familiar conceptual patterns arise in the course of cognitive development. This model is simple and has been known for a long time. However, as it was always viewed from a naïve realist perspective, its constructivist implications remained hidden.

**15** Edward Thorndike (1931), for instance, said quite clearly that living organisms tend to repeat actions that are followed by "satisfying" consequences. In the practice of everyday liv-

ing, this principle has no doubt been known since the beginnings of human culture. Nomads perhaps employed it deliberately for the first time when they trained horses for riding, but mothers must have unconsciously used it long before then in their interactions with their children. Jesuits used the negative version of the principle in their schools, when they linked the undesirable actions of their pupils with consequences that were physically or psychologically unpleasant for the delinquents. But Thorndike was the first to provide the scientific formulation of the *Law of Effect*. The behaviorists adopted the principle but avoided speaking of satisfaction, which clearly involves values. They introduced the term "reinforcement" to hide them. (Though the moment you ask what makes something reinforcing, they rear their head again.)

**16** Radical constructivism accepts Thorndike's law, but has no qualms about stressing that the repetition of cognitive operations is motivated by pleasant consequences or the avoidance of unpleasant ones. On the biological level, the action patterns of living organisms are pruned by natural selection in the sense that what does not help survival may sooner or later die out. On the mental level, however, it is cognitive viability that determines selection. Viability – you might say usefulness – can be assessed only relative to goals; and goals, whatever they may be, presuppose elementary values: things, conditions, events one would like to experience or avoid. In the constructivist model these elementary values (just as consciousness and memory) are an indispensable theoretical presupposition.

**17** The drawing of connections in perception has the goal of yielding coherent patterns and, wherever possible, familiar ones. That is, patterns that prior experience has shown to be useful in the generation of meaningful action. One of the main tasks of perception is, after all, to put the perceiver into a position to decide which ways of acting seem viable. In short, perception serves to make predictions.

## 3. The population of the experiential world

**18** The infant whose visual world is beginning to develop, must slowly learn to see repeatable patterns in her visual field and to coordinate them with the sensations from

her own movement. This takes several months. As soon as it begins to function, however, the infant's repertoire of recognizable patterns rapidly grows and soon she "knows" a respectable number of items that she can grasp, lift, and move. But things also appear in her experiential world that can avoid her grasp, move by themselves, and disappear of their own accord: the cat, for example, if her tail is pulled too harshly, or the chickadee that has landed on the rail of the balcony but flies away when someone approaches. When such experiences have been gradually separated from items that falls to the floor when they are not held tightly enough, the child is in a position to create the category of self-moving things that will later be called animals.

**19** In the course of many further experiences these creatures will gradually be imbued with the capacity to see, hear, and smell and eventually also with feelings and intentions. The ascription of these properties arises because without them, the child's interactions with kittens and dogs cannot be turned into even moderately reliable schemes. Soon even this will not be enough to cope with some of the experiential items in this group that, to a much greater extent than the others, make interaction unavoidable: namely human beings. As we all remember, in many of these inescapable interactions, the schemes we developed aimed at avoiding unpleasant consequences rather than creating rewarding results. Here, again, in order to develop relatively reliable schemes, the child must impute certain capabilities to the objects of interaction. But now these ascriptions comprise not only perceptual but also cognitive capabilities, and soon these formidable "others" will be seen as intending, making plans, and being very predictable in some respects and not at all in others. Indeed, out of these frequent but nevertheless special interactions, there eventually emerges the way the developing human individual will think both of "others" and of him- or herself.

**20** This reciprocity is, I believe, precisely what Kant had in mind when he wrote:

> "It is manifest that, if one wants to imagine a thinking being, one would have to put oneself in its place and to impute one's own subject to the object one intended to consider…" (Kant 1910, p. 223, my translation)

**21** My brief account of the conceptual construction of "others" is no doubt a crude and preliminary analysis, but it at least opens a possibility of approaching the problem without the vacuous assumption of innateness that "social constructionism" entails.

**22** The Kantian notion that we impute to our conspecifics the cognitive capabilities that we become aware of in ourselves, leads to an explanation of why it means so much to us to have our experiential reality confirmed by interaction with others. The use of a scheme always involves the expectation of a more or less specific result. On the level of reflective abstraction, the expectation can be turned into a prediction. If we impute planning and foresight to others, this means that we also impute to them some of the schemes that have worked well for ourselves. Then, if a particular prediction we have made concerning an other's action or reaction turns out to be corroborated by what we perceive the other to be doing, this adds a second level of viability to the scheme we have imputed to that other, and this second level of viability helps to strengthen the experiential reality we have constructed for ourselves (cf. Glasersfeld 1985, 1986).

## 4. A perspective on communication

**23** Although it is not always explicitly acknowledged, the separation of two kinds of instrumentality, which I mentioned above, is not a new one. Since the days of Socrates, teachers have known that it is one thing to bring students to acquire certain ways of acting – be it kicking a football, performing a multiplication algorithm, or reciting verbal expressions – but quite another to engender *understanding*. The one enterprise could be called "training," the other "teaching." However, educators, who are often better at the first than at the second, tend to blur the distinction. Consequently, the methods for attaining the two goals tend to be confused. In both, communication plays a considerable part, but what is intended by "communication" is not the same.

**24** Early studies of communication developed a diagrammatic representation of the process as it appears to an outside observer. Success or failure of a communication event

was determined on the basis of the observable behaviors of a sender and a receiver. This schema was highly successful in the work of communication engineers (Cherry 1966, p. 171). It was also immediately applicable to the behaviorist approach to teaching and learning. The teacher's task, according to that view, consisted largely in providing a set of stimuli and reinforcements apt to condition the student to "emit" behavioral responses considered appropriate by the teacher. Wherever the goal is students' reliable replication of an observable behavior, this *training* works very well. And because there is no place in the behaviorist approach for what we would like to call understanding, it is not surprising that the behaviorist training rarely, if ever, produces it.

**25** The technical model of communication (Shannon 1948), however, established one feature of the process that remains important no matter from what orientation one approaches it: the physical signals that travel from one communicator to another – for instance the sounds of speech or the visual patterns of print or writing in linguistic interactions – do not actually carry or contain what we think of as *meaning*. Instead, they should be considered as instructions to select particular meanings from a list that, together with the list of agreed signals, constitutes the "code" of the particular communication system. From this it follows that if the two lists and the conventional associations that link the items in them are not available to a receiver before the linguistic interaction takes place, the signals will be meaningless for that receiver.

**26** From the constructivist point of view, this feature of communication is of particular interest because it clearly brings out the fact that language users must individually construct the meaning of words, phrases, sentences, and texts. At the age when they are acquiring language, children are not given dictionaries. Later, needless to say, the semantic construction does not always have to start from scratch. Once a certain amount of vocabulary and combinatorial rules (syntax) have been built up by trial and error in interactions with speakers of the particular language, these patterns can be used to lead a learner to form new combinations and, thus, novel conceptual compounds. But the basic elements from which an individual's concep-

tual structures are composed and the relations by means of which they are held together cannot be transferred from one language user to another, let alone from a proficient speaker to an infant. These building blocks must be abstracted from individual experience. And their interpersonal fit, which makes possible that which we call "communication," can arise only in the course of protracted interaction with others, through mutual orientation and adaptation.

**27** For the individual speaker a word often has a definite meaning long before he or she succeeds in generating an approximate understanding of what it means to other speakers. The process of accommodating and tuning the meaning of words and linguistic expressions actually continues for each of us throughout our lives. No matter how long we have spoken a language, there will still be occasions when we realize that, up to that point in time, we have been using a word in a way that now turns out to be idiosyncratic in some particular respect.

**28** Once we come to see the essential and inescapable subjectivity of linguistic meaning, we can no longer maintain the preconceived notion that words *convey* ideas or knowledge; nor can we believe that a listener who apparently understands what we say must necessarily have conceptual structures that are identical with ours. Instead, we come to realize that *understanding* is a matter of fit rather than match. Put in the simplest way, to understand what someone has said or written means no less but also no more than to have built up a conceptual structure that, in the given context, appears to be compatible with the structure the speaker had in mind. And this compatibility, as a rule, manifests itself in no other way than that the receiver says and does nothing that contravenes the speaker's expectations.

**29** Among proficient speakers of a language, the individual's conceptual idiosyncrasies rarely surface when the topics of conversation are everyday objects and events. To be considered proficient in a given language requires two things, amongst others: to have available a large enough vocabulary, and to have constructed and sufficiently accommodated and adapted the meanings associated with the words of that vocabulary so that no conceptual discrepancies become apparent in ordinary linguistic interactions. However, when

conversation turns to predominantly abstract matters, it does not usually take long before conceptual discrepancies become noticeable – even among proficient speakers. The discrepancies generate perturbations in the interactors, and at that point the difficulties become insurmountable if a participant believes that his or her meanings of the words used are true representations of objective entities in a speaker-independent world . If, instead, the participants take a constructivist view and assume from the outset that a language user's meanings cannot be anything but subjective constructs derived from the speaker's individual experiences, some accommodation and adaptation is usually possible.

## 5. How do we understand society?

**30** The ontogeny of cognition and language is, of course, more intricate than I have described here. I hope, however, to have successfully outlined the view that before we can form a concept of society, we must discern and characterize individual fellow humans as such in our experiential world.

**31** Social constructionists seem to take for granted (explicitly or tacitly) that "society," i.e., the "others" in our experiential world, is a ready-made ontological given, existing as such and independently of subjective experience. Kenneth Gergen, for example, explains the constructionist difference quite clearly:

> "For constructivists the process of world construction is psychological; it takes place "in the head." In contrast, for social constructionists what we take to be real is an outcome of social relationships." (Gergen 1999, p. 237)

**32** The others with whom the individual relates have to be there before his or her construction can begin. This is a metaphysical assumption. Though I see no need to make such an assumption, I feel that everyone is free to invent his or her own metaphysics. However, as far as a theory of knowing is concerned, I consider metaphysical assumptions vacuous as long as they do not specify a functional model of how ontology might determine the experiences from which we generate our knowledge. To say that something exists does not explain how we come to know it.

**33** Alfred Schütz, one of the deepest thinkers in modern sociology, was quite clear about the fact that the basic problem of how we come to *know* of others is an epistemological problem that would have to be investigated by psychologists (cf. Schütz 1932).

**34** Piaget's work in that area is unfortunately all but unknown in the English-speaking world. My own access to it has been very recent, through the Italian edition that the translator sent me (Piaget 1989). Let me translate a few passages that seem very appropriate to the problem I am discussing:

"What has not been acquired through experience and personal reflection can only be superficially assimilated and does not modify any way of thinking. The child acculturates itself in spite of adult authority and not because of such authority." (Piaget 1989, p. 252)

**35** In his discussion of children's socialization, Piaget uses many examples taken from a school setting. He did this, I imagine, because it is easier there to distinguish the two mechanisms he considers primary in social adaptation. One of them he sees in the imitation of certain physical actions or behaviors (which may include speech acts) owing to *coercion*; the other he specifies as the generation of mutually compatible actions and mental operations as a result of reflection and understanding which take place in the context of *cooperation*. The distinction is parallel to the one I have been making between training and teaching in the educational context. (The coercion, of course, may be subtle and diffuse, as, for example, in the case of children's acquisition of the standard number word sequence as an empty verbal routine.)

**36** Piaget applied this distinction to the process of linguistic interaction. He begins by asking how a statement uttered by one person could be agreed to by another:

"How could such a convergence be established? The two subjects necessarily have different, non-inter-changeable perceptions: they exchange ideas, that is to say, judgments concerning perceptions but never the perceptions themselves!" (Piaget 1989, p. 189).

**37** He comes to the conclusion that *meanings* are a matter of "private symbolism" and agreement cannot manifest itself except through reactions due to mutually compatible mental operations.

**38** This is obviously not the place to present Piaget's detailed model of the child's construction of linguistic meanings in the course of interaction with others. However, the passages I have quoted may suffice to show how far ahead he was in the 1940s, when he wrote these essays. He even dealt with the claim, revived today by certain social constructionists, that knowledge and language do not reside in individuals but are preformed in society:

"The preformation [of social characteristics] is, as in other contexts, nothing but a common sense illusion consolidated by the Aristotelian philosophy of potentiality and action." (Piaget 1989, p. 340)

**39** At the outset, "society" can hardly be conceived as anything more than a collective term for the handful of people we have learned to recognize in the above sense and to whom we may ascribe a number of common characteristics as well as individual differences. To these we can then add people whom we consider part of the community even though we have only seen them casually or heard or read of them. With this, we have created the notion of a community that has members we have not ourselves experienced but who we nevertheless want to set apart from the rest of the world's population. It is the lowest level of the concept of society and can be extended in various directions but never quite loses the connection to the first generalizations that were abstracted from one's own subjective experiences.

**40** I cannot claim to be well versed in sociology, but of all I have read in that field, the following passage from the work of Georg Simmel seems to me an excellent basis for sociological considerations.

"Individuals are the immediate, concrete locus of historical reality . Everything found in them, drives, interests, purposes, inclinations, psychological conditions and movements, is such that it engenders reciprocal effects among them. I see this as the contents, the material so to speak, of socialization. As such, these items with which life fills itself, the motivations that drive it, do not yet have a social character. Neither hunger nor love, neither work nor religiosity, neither technique nor the functions and results of intelligence immediately entail socialization; rather, they engender it in that they transform the iso-lated side by side of individuals to certain forms of with-one-another and for-one-another that fall under the general concept of reciprocal effects. Socialization, thus, is the pattern, realized in countless different ways, in which individuals on the basis of their sensory or ideal, momentary or lasting, conscious or unconscious interest, causally driving or teleologically drawing interests grow to form a unity within which their interests can be realized." (Simmel 1917, pp. 51–52, my translation)

**41** There are two points in the rather dense passage that I should like to stress. First, that socialization arises from elements – drive, interest, purpose, inclination – that are situated in individuals. Second, that these elements, above all the function of intelligence, are not in themselves social phenomena but serve as the basis of socialization.

**42** At this juncture I want to reiterate that radical constructivism does not purport to describe a real world but merely proposes a model of *how one could imagine knowledge to be built up*. The building up of course involves the concept of society. Just as the meanings of words have to be abstracted by each future language user from his or her own experiences and interpretation of heard or read words, so the concept of society has to be formed by each individual by means of generalization from his or her own experiences. It is irrelevant whether or not you believe that society exists in its own right, knowledge of society can be gathered only from your own experience. This goes not only for children and innocent adults, it also goes for sociologists.

**43** Simplified – and therefore seen somewhat naively – all that is written and proclaimed in scientific sociology is the sum of what an attentive observer with the help of more or less accepted methods gleans from experiences, experiments, and statistical investigations, and formulates in a way that his or her colleagues can interpret in a satisfactory fashion. Irrespective of how large the number of agreeing colleagues might be, the conceptual structure that they consider to be common property does not describe an "objective" state of affairs but a collection of individual interpretations that, in the course of discussions and mutual critique, have acquired a certain viability for all the participants.

**44** This relatively interpersonal adaptation cannot eliminate the fundamental subjectiv-

ity of concepts. Thus, for example, Luhmann writes:

> "Sociology considers itself predominantly as an empirical science and understands the notion of the "empirical" very narrowly as interpretation of a self-generated reality." (1992, p. 19, my translation)[4]

**45** It is therefore, from my point of view, misleading if social constructionists and other socially oriented constructivists speak of language or knowledge as though these items existed in a generally accessible environment, independently of the individuals that conceive of them. Such statements are incompatible with their fundamentally agnostic position with regard to ontology, which they claim to share with constructivism.

**46** As a natural scientist I may well postulate for the objects I study a stable environment and, within it, causal relations derived from my experiential world. This may yield a viable model of the respective physical domain. Physicists, astronomers, chemists, and mechanics do this with considerable success. There are, however, two reasons why it is not legitimate for social constructivists to postulate interactions between their own abstractions and other individuals who are in the society. In the first place, abstractions such as language and knowledge have to be generated by individuals on the basis of their own experience. In the second place, their interactions with these constructs are not causal but are psychological, that is to say, they are determined by individual values, goals, and feelings.

## 6. Summary

**47** I hope I have succeeded in showing that the complex concepts that play major roles in sociology can be assembled in a way that is similar to the construction of mental images. In the social context, of course, the connections among elements are not created by "drawing" lines, but rather by mental operations that lead from one abstraction to another. As I have often said, I am not concerned with describing what might "really" exist, but with designing a coherent model of knowing and showing how you, I and all other individuals might have come to have what is called knowledge. Any such model involves presuppositions. My epistemological model involves consciousness, memory, and some basic values. These presuppositions can be justified only insofar as they make a coherent theory possible. They are, therefore, not ontological foundations but part of a working hypothesis.

**48** What I have presented here is the view of an individual that no longer wants to have anything to do with the "postmodern" movement. A couple of decades ago it seemed to me an acceptable epithet for radical constructivism because it advocated breaching with the traditional notion that reason is a means of access to objective knowledge of reality. But I did not understand it as an "emancipation *from* reason" (Luhmann, quoted in Schmidt & Spieß 1995, p. 231). The model I am suggesting is, in fact, a theory of rational knowing.

### ABOUT THE AUTHOR

Ernst von Glasersfeld was born in Munich, 1917, of Austrian parents, and grew up in Northern Italy and Switzerland. Briefly studied mathematics in Zürich and Vienna and survived the 2nd World War as farmer in Ireland. Returned to Italy in 1946, worked as journalist, and collaborated until 1961 in Ceccato's Scuola Operativa Italiana (language analysis and machine translation). From 1962 director of US-sponsored research project in computational linguistics. From 1970, he taught cognitive psychology at the University of Georgia, USA. Professor Emeritus, 1987. Dr.phil.h.c., University of Klagenfurt, 1997.
(Photo: Peter Gasser-Steiner)

## Notes

This paper contains the author's translation of parts of his contribution to the Festschrift for Siegfried Schmidt in 2000, http://www.schmidt.uni-halle.de.

1. A description of these experiments is given in Glasersfeld (1995), p. 167.
2. Ceccato developed his theory of attention around 1960. A summary appeared in his introduction to volume 2 of his main work (Ceccato 1966, pp. 20–26).
3. James Mark Baldwin (1906), and Piaget following him, called this adaptation of perceptions to familiar concepts "assimilation."
4. In the same essay, however, Luhmann later writes: "Even if the self-description of society springs only from a recursive network of observations of observations and descriptions of descriptions, one might expect that eigenwerte arise in the course of these operations, that is, positions that will no longer change in further observations of observations but that will remain more or less stable" (Luhmann 1992, p. 46, my translation). I understand this as an elegant but rather loose metaphor because the recursion of operations of observation or description is not governed by fixed rules, unlike the recursion of functions that produce mathematical eigenwerte.

# Open Peer Commentaries

## How Radical Is Radical Constructivism?

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**1** In section 1, Ernst von Glasersfeld sets out to explain how familiar patterns (signs) arise in private experience – and how they are extracted or "recognized" as such. These patterns are recursive, which imposes significance (familiarity) on them, and are, in the course of time, collected into a "bulk of experience." I think a convinced constructivist can – if hesitantly – accept his rendering, even though it is one that lacks the stringency one expects from a supposedly natural scientist (§46). However, the crucial point is that this paper does not address the convinced constructivist but rather the opposite camps, and I doubt he succeeds in convincing them.

**2** We can question von Glasersfeld's radicalism early on since section 1 is devoted to the analysis of visual patterns, which is typically the endeavour of a realist, to whom it is quite natural to survey the supposed domain of "reality" by using vision. The true constructivist, on the other hand, *surveys nothing but his own experience* and in this endeavour the faculty of vision does not necessarily play a deciding role – even if today's observer-oriented sciences pay a one-sided interest in visual experience. At the level of human experience we rather expect *all types of sensation and feeling* to be on equal terms. In that view he is neither "going to the roots" nor "uncompromising," which he claims is the distinctive mark of his brand of radical constructivism (RC).

**3** The genuine constructivist is *always* subject-oriented. He is *exclusively* oriented towards his personal experience – i.e., he makes predictions, draws conclusions, produces models and knowledge etc., on the sole ground of subjective experience. On that point (§5, §17) I agree with him. However, when he refers to dedicated realist conceptions or "outside" phenomena he starts a process of confusion, to which von Glasersfeld himself later gives clear prominence (§29). Unfortunately he does not apply this to his own teaching, since this paper in this respect seems larded with ill-advised formulations.

**4** It is compulsory to avoid "outside" references in explaining your own "constructivist" lines of thought, albeit unendurably difficult. Whenever you use the word "line" (§7), a realist refers to a continuous dot pattern "out there," whereas a constructivist (hopefully) refers to a *trace* of experience, and when you use the word "thing" the realist refers to a palpable set of sensations "out there" and the constructivist once again refers to a *trace* of experience. In explaining this crucial difference we must be extraordinarily careful otherwise we simply create confusion. E.g., what happens when you start to call a *trace* of experience a "pattern" or a "picture"? To the realist each visual pattern and picture is a set of "particles of pigment," i.e., "outside" phenomena. To be honest, I am uncertain as to what von Glasersfeld is referring to when he uses confusing expressions of this kind. I am certain a realist thinks he is suggesting that there are "particles of pigments" and "spare drawings" in his mind – which sounds extraordinarily weird. The goal of the constructivist must be to *convince* the realist that each and every phenomenon arises in his personal experience and there only, which is a situation odd enough for a realist to understand. Not because he is ignorant – but because he has always been trained to think that the causes of sensation are "outside." One suggestion is to make the intent of reference exceedingly clear in the use of the "prefix" *trace*, calling "line" and its corresponding experience as the "trace of a line" or saying "thing" as opposed to the "trace of a thing" or alternatively "thin/kin/g."

**5** Von Glasersfeld also outlines the RC view on how *private* knowledge can be *constructed* from *private* experience and how this bulk of experience can be useful in *private* prediction. Also, in this task you cannot be too careful to lay stress on *privacy*, since you find here the *determining dividing line between realism and constructivism* (or rather dualism and monism.) The term "constructivism" is confusing to a realist because constructivists make it their task to *construct* knowledge (hence the name), but realists (naïve or not) have, as witnessed, also been busy constructing their knowledge for millennia. Accordingly, the process of construction is not the watershed, but rather the idea that knowledge of *different kinds* is produced – namely *subjective* respective *objective knowledge,* or better knowledge for private use versus collective use. Here we spot confusion, since on this point RC is very unclear.

**6** The apparently careless use of terms in §5 also creates confusion, since it leaves the reader uncertain as to whether he refers to "existence" as it pertains to a private or to a public domain. "Existence" in a private domain is the result of a private decision and "existence" in a public domain is a matter of consensual decision. So if we all come together and decide that "reality" exists – *it exists* – and does so simply by *convention*. This is, of course, not an example of "existence" of the classical "pre-given" kind but rather a kind that is agreed upon in social consensus. However, when discussing "existence" the constructivist must be very careful in separating apples from pears – so to speak. In §29 and §37 he claims that "meaning" is a matter of "private symbolism" – which notwithstanding also includes the "meaning of existence."

**7** Von Glasersfeld devotes section 2 to RC's idea that some patterns are *selected* as "prototypes of recognition" on the ground of their *usefulness* (viability) in prediction and not on the ground of visual resemblance or "truth-likeness" (§17). However, he fails to point out that constructivists can then successfully bracket (to borrow Husserl's term) the issue of pre-given existence. From this point on, a thinker can solve the tasks of living prediction in a single domain of experience (monism), i.e., *on the grounds of past private experience I predict what private experience there is to come.* Hence all subsequent reference to "outside" phenomena is in principle forbidden, along with any uncritical use of realism-loaded terms or formulations.

**8** In section 3 he successfully applies the suggested pattern-recognition methodology

to identify self-moving entities (including self-like "others") but I am unable to see how their *capacity for actions* is included in the models as developed along the lines given in sections 1 and 2. He then rightfully claims that social constructivists take the "other" for pre-given in the same vein as scientific realism takes the "things of the world" for pre-given (§21).

**9** When von Glasersfeld, in section 4, brings up human communication, we understand that the "pattern analysis" of section 1 is hopelessly partial. He has neglected not only to take into account other feeling but visual experience, but also to *extend* this "pattern" analysis to include the *action capacities* (autonomous behaviours) of the living entities named "others." In the abstract ("Benefits"), he sets out to clarify this point but fails. To construct a private model of interpersonal communication you need, in fact, to study the conceived subjective entities of your experience for a long time and under different circumstances – not only momentary patterns. Afterwards you can then explain how these conceived model entities of "others" interact by the exchange of "messages" – all of them being models residing in my bulk of private knowledge; since the Self is also a model of the same domain, it is included in these acts of communication. To my mind this provides the answer to the problem von Glasersfeld initially posed, but I am unable to extract this interpretation from his paper.

**10** The "recognition of physical semi-permanent features" in section 1 must be considered irrelevant for the analysis of *human interaction*, since in this discussion the social individual can be regarded equally well as a *pure point abstraction*, which is actually what engineers of communication tacitly do. In this way we can cultivate in isolation the *action capacities of living beings*, and this is exactly what sociology – in parallel with the systems sciences – tries to do, albeit not very successfully because we are prone to take for granted that these capacities of action are innate (or pre-given), a situation that von Glasersfeld also recognizes (§21).

**11** In section 4, in the spirit of Piaget, von Glasersfeld delivers very deep constructivist insights concerning language and communication. In §25 he digs out the essence of human communication and its inability to mediate "meaning" and its immediate consequences (§§26–28) for language acquisition in the respect it must be considered a *strictly private*[1] *endeavour* – and that language initially is not something handed over to mankind from some sort of authority (§38). Furthermore, in §§28–29, he brilliantly digs out the consequences of this *privacy of language acquisition* for all efforts of scientific communication. What is annoying is that he himself, without further precautions, *always uses a language that has long been shaped by the realist's way*[2] *of thinking*. In uncritically doing so, the discrepancies are bound to "generate perturbations" in all interactors, as he readily admits (§29) – for not to say so would cause deprecation in the realist camp. He brings to our attention §§31–33 that social constructivists take the "other" and its *action capacity* for pre-given, and in §§35–38 he usefully elucidates that both meaning and language are traditionally regarded as pre-formed in society (and thus pre-given).

**12** In §§42–43, von Glasersfeld lays stress on RC's effort to build a *model* of how knowledge of the "real world" and "society" can be extracted from strictly private experience, and in the same breath he claims that likewise all that is written in sociology is a reflection of the consensual acceptance of such models. Very well – but this goes for any epistemology, including RC. I would rather emphasise that sociology, *besides language*, has very few viable models – and that the concords of consensus are not very widely spread. The claim that steps of personal adaptation do not eliminate subjectivity (§44) appears weird since this is the very motivation for such steps. However I guess von Glasersfeld wishes to say that the *point of departure of constructivism* is strictly subjective.

**13** In §45 he attempts to deal a useful but unjustified blow to social constructivism. I think it is a good practice to avoid throwing stones at people while sitting in a glass house,

since the legitimate claim advanced in §45 goes for any science – and RC is no exception. In this paper von Glasersfeld *uses*, and has always used, a *tool of explication that has been developed under the spell of naïve human realism*, namely language, the use of which is also frequent in scientific realism. In spite of this situation it is not the characteristic of natural science to use such an ambiguous (for not say bewildering) instrument of explication. However von Glasersfeld takes, without further precautions, this realism contaminated language exactly "as it is" and in doing so he in practice takes it "for given." Thus he also commits the same "sin," and he simply saws off the branch he himself is sitting on – to the detriment of RC.

**14** So what language should von Glasersfeld use? Well – here we recognize a huge problem; but the fact that he does not entertain or alternatively fails to launch this insight is neither radical nor coherent. Sitting in the glass house of traditional language, we must at least make the effort to use it with the utmost care. The alternative is to develop better tools of explication, a communicational practice that is highly cherished within the natural sciences, and this I would really rate as radical.

**15** §46 leaves me confused since here he allows the natural scientist to (vacuously?) postulate a "stable environment," whereas he, in the same vein, forbids sociology to postulate "social interaction." Of course both camps are allowed to hypothesise whatever they like – the all-pervading problem is to *confirm the usefulness* of these hypotheses.

**16** To sum up, I think von Glasersfeld is a prominent thinker who has done a lot to give prominence to the ideas of constructivism, which he, in spite of his shortcomings, also does in this paper. But radical – no!

**Notes**

1. Even if we choose to learn a language already in use in order to become a fully fledged social individual.

2. In fact the realists' interpretation of language is unable to capture the basic ideas of constructivism.

## Operative Fictions, or: How to Talk About Society

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**1** Radical constructivism has often been criticised for its one-sided orientation towards the individual and cognition, resulting in a neglect of society and practical activities. Accordingly, von Glasersfeld's effort "to clarify the constructivist position with regard to social interaction and communication" (see "Benefit") is welcome and important.

**2** Von Glasersfeld's proposal exactly follows the line of argumentation developed in his previous publications: the others are explained as a creation of individuals, and this creation is constrained by the condition of viability or usefulness. Thus, society is considered as an individual construct. Meaning, too, is regarded as a subjective construct derived from the speaker's individual experiences and allowing for communication through mutual orientation and adaptation. All these operations are determined by individual values, goals and feelings (§§26–29).

**3** Since I agree with von Glasersfeld's proposal I will not criticise it in my commentary; instead I shall try to augment this proposal starting with an argument von Glasersfeld borrows from Georg Simmel, viz. the importance of reciprocal effect in the course of socialisation (§40). In my view, this idea can be rewritten as follows: the mechanism underlying all phenomena that we call societal is *reflexivity*. In the course of socialisation, children become able to observe their co-fellows and, via repeated experiences, collect knowledge concerning their behaviour and intentions. Making these experiences happens in processes which are all attracted by cognition (What is going on?), emotion (Is it pleasant or unpleasant?) and moral evaluation (Is it good or bad?), which mutually constitute each another. Since they learn to know that other people can do more or less the same things that they do, they turn into observed observers on the basis of the reflexivity of mutual perceiving and knowing. To label this fundamental reflexivity, which

basically allows for the stepwise advent of communicative behaviour, I have introduced the terms "expected-expectation" regarding the realm of world-knowledge, and "imputed-imputation" regarding the realm of motives and intentions. These two reflexive mechanisms enable communicative interactions between human beings on the basis of mutual referring to commonly shared and solidified knowledge. If we name this knowledge "collective" we have to keep in mind that – like all other kinds of knowledge – it is exclusively based in individuals (subject-dependent) but is not exclusively subjective, because subjects regard it/treat it as commonly shared. In other words, collective knowledge can be theoretically modelled as an *operative fiction* (for details see Schmidt 2001). It is a fiction because nobody can look into other person's head; nevertheless it works more or less reliably in communication processes. At the same time, every individual becomes capable of observing himself or herself as a specific agent different from all others. This development provides the necessary basis for the construction and maintenance of personal identity.

**4** This leads to the following interim conclusions.

- If agents cannot observe the cognitive processes of their co-fellows directly but have to rely on observable indicators of cognitive processes that must be interpreted, then both are faced with a constellation of double contingency.
- If cognition happens via self-organisation, i.e., in a strictly subject- or systems-specific way, then communication processes can only serve as offers to orient the *self-orientation* of communication partners; any direct intervention into cognitive systems is excluded.
- If cognition is subject-dependent but neither subjective nor even arbitrary, it can operate on the basis of collective knowledge, viz. knowledge that every agent expects to be shared by nearly every other agent with whom he or she communicates.

Collective knowledge comprises two interrelated dimensions, viz. the domain of encyclopaedic or world knowledge (which I call "world model"), and the domain of problem-solving devices by collective reference to this world knowledge (which I call "culture program"; for details see Schmidt 2007).

The acquisition of a native language is a dynamic, active process. Children learn how to speak and behave in a living social environment. Thus, the acquisition of linguistic competence forms an integral part of the acquisition of social competence with regard to:

- collective knowledge on the expression as well as on the content level;
- socially acceptable ranges of acting possibilities;
- effective schematisations on all levels of verbal and nonverbal behaviour;
- reliable moral orientations of all actions and communications.

**5** Children learn in social contexts how to combine semiotic material to acceptable utterances or texts. Semiotic material condenses social experiences resulting from its viable handling in previous communication processes. That is to say, the signs of a natural language (with the exception of proper names) do not refer to language independent objects or events in the environment but to social experiences in dealing with objects or events in concrete situations repeated by individuals under their specific conditions.

Based on solidified experiences collected in the course of language acquisition, the rule-oriented use of semiotic materials of any kind triggers expectable kinds of follow-up cognitive operations, viz. self-organised sense production on the occasion of the perception of texts or other media offers.

This argumentation leads to the conclusion that semiotic materiality and cognitive meaning are strictly complementary, even though they take place in different domains, viz. cognition and communication. Accordingly, the question of how cognitive autonomous systems can successfully communicate at all can be answered as follows: the reflexivity of collective knowledge, i.e., the fact that cognitive systems refer to collective knowledge (acquired through socialisation) and expect such references by their co-fellows, too, can be described as the mechanism that renders communication feasible.

**6** Communication can be modelled theoretically as a dynamic *process-system* that consists of interactive reflexive processes. This process-system is characterised by operative closure because all ongoing processes mutually refer to one another. It is coupled to its environment, since only in relation to

environments can systems be identified via distinction and vice versa. Sense production happens via self-organisation because process-systems necessarily obey their systems-specific logic.

**7** Communication can therefore be theoretically modelled as a system consisting of communication processes that refer to one another in a reflexive (self-referential) way. Communication processes can be described as the interplay between actions and sense orientations provided by operative fictions that have been created by societies and have been acquired by agents during their process of socialisation.

The production of order or sense in cognitive systems is performed on the basis of the reflexivity of communication processes schematised in discourses and so-called macro forms of communication such as literature, journalism, advertising or public relations (Schmidt & Zurstiege 2007). As already men-

tioned, discourses themselves are highly schematised on all levels. They select appropriate topics as well as acceptable contributors and contributions.

**8** Let us have a short look at four additional aspects of communication.

▪ Communication is the basis of individual as well as of social identity-management. Identity is socially attributed to agents as well as to societies in communication processes. Identity-management makes use of narrative schemata common in a society. Identity results from the interplay between self-description and other-description of what "I am" or what "we are."

▪ All communicative as well as all cognitive processes are emotionally loaded because of the interplay between body and mind. Today, a majority of biologists and psychologists are convinced that all our cognitive and communicative activities are

much more governed by our emotions than by our intellect.

▪ Communication is based upon the reflexive tacit assumption that the assertions we utter in communication processes are true. Otherwise it could not be explained why lying is so strictly banned in all societies. Lying undermines trust, i.e., the guarantee for viable communication.

▪ All our communication processes are (implicitly or explicitly) checked as to their moral acceptability. Mandatory moral principles like sincerity, reliability, credibility, etc., belong to the influential cultural operative fictions that orient all our activities since we are always keen to know whether what we do is good or evil.

Evidently these four aspects of communication refer to one another in a clearly reflexive way: to tell the truth is morally presupposed and creates a positive feeling, and both support successful identity-management, etc.

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## The Illusion of Society

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*For here we have to do with a natural and inevitable illusion.*
*Immanuel Kant (1965)*

**1** Issues such as social interaction and communication play an essential role in my recent approach to knowledge management called "Knowledge Cooperation" (Bettoni 2005), conceived as "the participative cultivation of knowledge in a voluntary, informal social group" (Bettoni, Andenmatten & Mathieu 2007, p. 2). Radical Constructivism (RC) provides a substantial support to the foundations of this approach, which aims at equilibrating intellectual and social capital. So I warmly welcome Ernst von Glasersfeld's clarification of the constructivist position in regard to "society."

**2** Von Glasersfeld mentions at the beginning the notion "that our image of the world is the representation of a reality that exists in itself and independently of any observer"

(§1). Who claims this explicitly? My experience is that when RC is presented as a solution to this problem, people (RC critics) always declare that they do not think in terms of a "representation of." It seems as if within the experiential reality of RC critics this notion (their interpretation of it) is not viable.

**3** Related to that notion, von Glasersfeld further mentions a process of "inference from perceptual images to things supposed to exist independently of the constructive, coordinating work of an observer" (§5). I can imagine that this notion could be more easily accepted by RC critics as compatible with their way of thinking. If we called this inference process "reification" we could attribute to RC critics the idea that the reification of our concepts (conceptual structures) is a process that assigns to them the characteristic of existing as things or persons (in themselves) equal for any observer and independently of observers. Maturana formulated a similar concept when he proposed the following operational explanation of "observing": "Observing or observer means an operation of putting something independent from you and looking at it as independent from you. And this is what we do. At least we in our culture do it, continuously." (Maturana 1992, p. 4).

**4** If we compare the two mentioned notions, i.e., the image of the world as "representation of" and the process of reification as "inference from" we can see a difference in "direction": in the first case one proceeds from the world to mind, in the second case from the mind to world. Empiricism and rationalism have dealt with these issues but their approach ended in dogmatism and scepticism. Why? I agree with the explanation that Kant gave:

"The cause of this is that there are fundamental rules and maxims for the employment of our reason (subjectively regarded as a faculty of human knowledge), and that these have all the appearance of being objective principles. We therefore take the subjective necessity of a connection of our concepts, which is to the advantage of the understanding, for an objective necessity in the determination of things in themselves. This is an illusion which can no more be prevented than we can prevent the sea appearing higher at the horizon than the shore, …" (Kant 1965, B 353–354).

**5** By exposing this "conceptual illusion" and explaining its mechanisms, RC can help in taking precautions against being deceived by it. From a radical constructivist perspective we can become aware of the fact that what we tacitly apply, in our culture, is primarily the sec-

ond procedure, the "inference from." A confirmation of this can be found in the structure and daily practice of human language. For example, earlier in this text I spoke about "RC critics" as if they existed as persons with the predicates that I attribute to them; my text (for reasons such as expressive economy, etc.) puts them – i.e., RC critics as I conceive them – as independent from me. And I am not the only one who does this: all of us in our culture do it – in writings and conversations – continuously, as Maturana says in his explanation of observing.

**6** What is interesting about this process of reification is that it seems to be consistent in spite of its inherent confusion. In reification, "existence" is tacitly and unconsciously attributed to concepts, although, as Kant demonstrated, existence cannot be a predicate (Kant 1965, B 620–630), i.e., the use of concepts (or "predicates") can never necessarily imply the (ontological) existence of their referents because "… the unconditioned necessity of judgments is not the same as an absolute necessity of things." (Kant 1965, B 621). The problem, according to Kant, lies in a variation of the previously mentioned illusion, which in this case is caused by the confusion of a logical with a real predicate. The confusion can be corrected by considering that "[b]eing is obviously not a real predicate; that is, it is not a concept of something which could be added to the concept of a thing." (Kant 1965, B 626).

**7** How, then, can reification seem to be a consistent procedure in spite of the mentioned confusion? The solution could be constituted by assessment operations performed on con-

ceptual structures as part of the reification process with the goal of assessing their cognitive viability. This cognitive viability (§16) is conceived as the capacity of a conceptual structure to live (grow, develop, survive as a unit) within the mind (cognitive environment, experiential world) of a subject. A concept will live (will not be substantially modified) hence "exist" in the experiential world as long as its reification leads to the result that the subject has come to expect from it (= reaching the goal). When it clashes with a constraint from the environment then it is likely to be modified by the subject. In this assessment process, what overcomes the mentioned confusion is that the unconscious evaluation of cognitive viability tacitly substitutes the impossible proof of ontological existence.

**8** On the one hand, social constructionists seem to take for granted that "society" is a ready-made ontological given that exists as such and independently of subjective experience (§31). They also claim that knowledge exists in social relationships and in a generally accessible environment (§45) and that meanings can be shared within communities. On the other hand, with regard to ontology, they claim to have an agnostic position which is compatible with RC. How can this contradiction be explained? From the perspective of reification presented above, I think that an explanation can be found by examining the process that assesses cognitive viability in social interactions. If a conceptual structure is viable in my experiential reality and if, in the course of protracted interaction with others (§26), the same concept or schema is also

found (assessed) to be viable in the experiential reality of one or more other persons (second level of viability – §22), then this concept is likely to be regarded as being shared. As a constructivist I would prefer to speak of taken-as-shared (Cobb 2000) rather than of shared meanings, shared knowledge and shared reality. Without a radical constructivist perspective, the people involved have the impression of sharing the same meaning, the same knowledge, the same portion of experiential reality. Having our experiential reality confirmed by interaction with others means so much to us (§22) that the feeling of sharing our experience as if it were a car or a house becomes very strong. This feeling gets even stronger when the social interaction happens in the form of a negotiation of meaning i.e., "a sequence of small reciprocal accommodations to establish a modicum of compatibility" (Glasersfeld 1995, p. 191). This strengthening is crucial and has the result that conceptual structures that are still viable for an individual after such a negotiation process demonstrate (or acquire) a different kind of cognitive viability that could be designated as "negotiated viability": the capacity of a conceptual structure to survive negotiations of meaning with one or more other persons. This kind of viability probably does not apply to "beauty", which in English is said to be "in the eye of the beholder" but could apply to "society" in the minds of social constructionists who, unaware of viability assessment, remain deceived by the natural and inevitable conceptual illusion that "society" is ready-made.

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## Who Conceives of the Individual?[1]

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*Far from being the being who illustrates the relation, it is the relation which illuminates the being*
Gaston Bachelard (1934, p. 158, my translation)

**1** In his article, Ernst von Glasersfeld discusses the epistemological foundations of

socio-constructivism in an original manner, starting from an apparently naïve question: "Who Conceives of Society?" This question calls for a spontaneous answer, such as "The person who conceives of society is same person who conceives of the individual." In other words: any human being. If each human is able to conceive of him or herself, that means that he or she is able to conceive of him or herself as acting, evolving, experimenting, and identifying multiple interactive relationships in the midst of multiple evolving environments. These relationships may eventually transform – and be transformed by – the human being.

**2** Von Glasersfeld puts forward a well-argued, common-sense answer to his question. He might have in mind a relevant observation of Paul Valéry (1997, p. 115): "On ne peut définir que ce que l'on sait construire mais on peut nommer quoi que ce soit" ("One can only define what one knows how to construct, but one can name anything," my translation). On the one hand, one can effectively "construct," on the ancestral plinth of some founding hypotheses carefully made explicit and generally intelligible, the paradigm presenting the epistemology of radical constructivism (RC, see, e.g., Le Moigne 2007). On the other hand, one may give the

name "socio-constructivism" to theories organizing a set of local methods that could be eventually used in the fields of sociology and education, methods that sometimes suggest some interesting insights.

**3** If this set of methods can easily be presented and legitimized as a research methodology that is also relevant in the midst of the paradigm of radical constructivist epistemology, can we consider these so-called socio-constructivist theories as a self-standing epistemology?

Jean Piaget (1967) set forth a clear distinction between *methodology* and *epistemology*, two terms which are still often used interchangeably in social organization studies. He defined "methodology" as the study of the *constitution* of knowledge, and "epistemology" as the study of the constitution of *valuable knowledge*. More precisely, epistemology asks three questions: What is knowledge? How is it generated? How is its value appraised? Hence, methodology ("How is knowledge constituted?") is just one aspect of epistemology. And the two others questions, the gnoseological one ("What is knowledge?"), and the ethical one ("How is valuable knowledge identified and appraised?"), remain the basic ones for any philosophy of science. Piaget's notion of *valuable knowledge* is wider than that of *valid knowledge*. Its meaning is not limited to validation according to the (so-called) scientific method. His definition of epistemology enriches and opens up the conception of scientific knowledge beyond the positivist or realist epistemological paradigm.

**4** So if we consider socio-constructivism as the name of a theory organizing a rather well-identified subset of methodological teaching and searching tools, we have to be explicit about the epistemological foundations that will legitimate the knowledge produced when using those tools.

If socio-constructivists consider that the social relationships perceived by any human being are fundamentally different from all the other relationships perceived by a human being, they would have to legitimate this basic ontological statement. To do so, they would have to go back to the positivist definition of sociology set by Auguste Comte (the founder of positivism), namely to view it as "social physics," seeing society as "a thing in itself" completely independent of the human-being

observers. In other words, the basic ontological assumption of positivist epistemology could be formulated as: When the observers change, the observations and the attached knowledge still remain the same.

As we may presume that this is not one of their basic epistemic hypotheses, don't socio-constructivists have to be explicit about the epistemological plinth on which they develop their specific methods, just as all researchers involved in other fields do? To do so, they can – and they very often do – explicitly base their studies on the well-founded hypotheses of RC. Von Glasersfeld's target article gives us another convincing confirmation. We may notice here that some other contemporary presentations of the "non-Cartesian epistemology" (as defined in by Bachelard 1934), such as Herbert Simon's "empirical epistemology" or Edgar Morin's "general complexity epistemology," belong to the same pragmatic-epistemic-ethic plinth. They do not need to postulate any exclusive form of "metaphysical realism" to legitimate their respective founding hypothesis.

So the various socio-constructivist and socio-constructionist theories may find on that general basis the explicit epistemological foundations they need to appraise and to legitimate the knowledge they may produce or transform: they are not competitors, but potential contributors to RC.

**5** My initial cultural and scientific training in the early 1970s, some fifteen years before I encountered the works of von Glasersfeld, include (in this order) the readings of Herbert Simon (1969), Paul Valéry (1964, 1997), Jean Piaget (1967) – which helped me to identify the civic, cultural and scientific legitimacy of the "constructivist epistemologies" – Gaston Bachelard (1934), Edgar Morin (1973), Gregory Bateson (1972) and Heinz von Foerster (1982). Only in 1988 did I first encounter the work of von Glasersfeld, namely the French translations of Glasersfeld (1984). My intention here is to briefly propose some complementary insights, supporting the arguments of von Glasersfeld, who focuses on three main components of RC: the "creation of patterns" processes (§§1–13), the pragmatic concept of "viability" (§§14–17), and the concept of "social interaction and communication" (§§18–45).

**6** The concept of "pattern," and the examination of the process of cognitive develop-

ment of those sufficiently stable patterns, gives us an understandable recognition of those relationships through which we perceive the experience of "the living/smelling/moving/thinking" subject (Valéry 1973). In the context of active relationships stemming from his affective and cognitive experiences, the subject does not perceive the need to process separately his relational experiences with an entity called "society." He perceives, on the contrary, the interlacing character of the various types of patterns that he recognizes, usually trying to distinguish them without separating them. To do so, he associates a stable attribute to some of them, i.e., a name.

We may here point to the work of Herbert Simon and his colleagues on the formation and the interpretation of patterns studied in observations of good chess players. Those studies show the teleological character of the dynamic of attention in the formation of patterns: each one appears in terms of strategic potential associated with an initially favored field of exploratory action.

These inquiries allow us to stress the importance of a physiological constraint known by all human beings: the limitations of their cognitive and communicational capabilities. These limitations are unfortunately subsumed under the label "bounded rationality." However, the constraint does not concern the concept of rationality (such a concept has no physiological limits); it concerns the condition of its exercise, that is to say, the cognitive potential that can be practically implemented in a given context.

This constraint appears rather stimulating: it is an incentive for the subject to attempt to display the multiple resources of his "ingenium."[2] Along the same lines, Simon often emphasizes the importance of the work of the epistemologist Norwood Russell Hanson (1958), in highlighting the role of pattern formation and interpretation in human cognitive activities, such as knowledge production, transformation or assimilation.

**7** The discussion of the concept of viability, willingly used by von Glasersfeld to give an account of the stabilization of "patterns," can be extended to highlight some other facets of this complex and rich concept (§§16–17). He must express at the same time the pragmatic ("usefulness"), teleological ("goals") and rational ("coherent") components of the formation, and the interpretation of the patterns

through which any experience becomes intelligible for the subject

One difficulty of the concept of viability lies in the ambiguity of the related word "coherent": it always connotes an implicit reference to the Aristotelian principle of non-contradiction (usually extended to the semantic contradiction, although Aristotle restricted it to the syntactic negation). Each time we apply this principle and show that a statement is not "coherent," we are tempted to contest the reliability and viability of the corresponding behavioral scheme. Morin has often stressed the virtue of the "dialogic principle" in taking into account, rationally, the conjunction of complementarity and antagonism in most human behavior. "The method of conducting" human "reason in human affairs" (Simon 1983) only requires that the exercising of human reason is not restricted to the unique use of perfect syllogism, that is, formal (mono) logic.

It is more important to improve the intelligibility of a statement than the elegance of formalism. Valéry, in his rich discussion *Sur l'Eureka* of Edgar Poe, shows the relevance of the concept of "consistency" argued by Poe:

"Pour atteindre ce qu'il appelle la vérité, Poe invoque ce qu'il appelle la Consistance (Consistency). Il n'est pas très aisé de donner une définition nette de cette consistance … Dans le système de Poe, la consistance est à la fois le moyen de la découverte et la découverte elle-même. C'est là un admirable dessein; exemple et mise en œuvre de la réciprocité d'appropriation"[3] (Valéry 1957a, p. 857).

**8** One of the benefits of the discussion of the socio-constructivist methodology proposed here by von Glasersfeld is to invite us to revisit the fascinating complexity of the concept of "society." His reference to sections in the work of Georg Simmel, characterized in an intelligible and generally accepted manner, seems particularly welcome (§40). The definition of Simmel (1908), according to which society exists whenever several individuals are in reciprocal relationship, suggests to us a reading of "society" that is more phenomenological than ontological (§46). The question is always for the individual to self-represent his or her experience of reciprocal actions – or interactions – in which he or she is involved.

Putting this concept of interaction in the center of the systemic modeling process,

Morin has solidly reconstructed the general paradigm of "organization" (or as he often spells it, "organizaction") to take into account the infinite variety of the "order and disorder interactions" through which are weaved all our human knowledge, whatever categories of experience such knowledge describes. The general paradigm of organization, which Morin readily calls the "paradigm of general complexity"[4], is transdisciplinary and cannot be reduced to a specific discipline, be it sociology or psycho-sociology. That is to say, the paradigm is easily fitted to the modeling and interpretation of all forms of interactions and, particularly, of social relationships and social phenomena. Understanding society as an "eco-auto-organizing system", Morin (1984) offers, to those sociologists that are aware of the epistemological legitimization of their studies, a frame of reference that has "nothing to do with the 'postmodern movement'" (§48).

**9** We may agree today that we have to live in a world of incertitude. We may want to live in a more intelligible world. We have no reason to consider that we shall definitely scientifically "explain" the universe, human society on our small planet, or even ourselves. The famous claim of the poet Arthur Rimbaud, "Je est un autre" ("I is another"), is still ringing in each human being, mysterious and, nevertheless, so plausible.

To know oneself, to understand oneself, is not, for each of us, perceived as an act different from the act of knowing the other. The other may be "I," or my neighbor, or any animate or inanimate phenomena with which I perceive myself interacting. And I want to try to understand this perception in order to consciously and teleologically elaborate "my next step." It is in those terms that I understand the question that concludes von Glasersfeld's discussion.

**10** We now have to go back to the ancestral question of human understanding, the question which fascinated Leonardo da Vinci, committing himself – as Valéry (1948, p. 228) commented in his reading of the 1938 publication of the *Notebooks* of Leonardo da Vinci – "dans une fureur sacrée de faire pour comprendre et de comprendre pour faire qui passe toute philosophie" ("to a sacred passion of making in order to understand and of understanding in order to make, which is above any philosophy"), or Vico (1993) reminding us:

"Hinc ingenium homini ad sciendum seu faciendum datum" ("Ingenium has been given to humans in order to understand, that is to say, to make"). We may recognize with Blaise Pascal (1963, cote 200-347 – H.3), that if "notre dignité consiste en la pensée, …travailler à bien penser devient le principe de la morale" ("all our dignity consists in thinking, … the principle of morality will be that of working towards thinking well", my translation). We may assume the irreducible complexity of the ethic of understanding (Morin 2004, pp.121ff.). The pages devoted by Edgar Morin to the intertwining of the ethic of understanding the complexity of any human being, "homo sapiens/demens," and of the ethic of understanding the contexts in which human beings are acting may now become our viaticum for the next steps of the adventure of humanity, which according to Vico is, *its own self work*.

**Notes**

1. This title was elaborated during a conversation with Marie Larochelle, when we were considering the unusual title used by von Glasersfeld to present his discussion of the question: "How can constructivists speak of social interaction or communication with others, when, as they claim, their experiential world is their own construction?"

2. I propose to keep here the Latin word *ingenium* used by Giambattista Vico in order to define "the strange faculty of human mind, which is to join."

3. "To reach what he calls the truth, Poe calls upon 'consistency.' It is not very easy to give a clear definition of this consistency … In Poe's system, consistency is both the process of discovery and its result. We see here an admirable design; an example and an implementation of the reciprocity of appropriation" (my translation).

4. The general paradigm of organization was first presented in Morin (1977, 1980), to emphasize the basic congruence of the concepts of organization, information, communication and computation. A brief presentation in English can be found in Morin (2007).

5. I would like to thank Marie José Avenier for her fruitful discussions of this commentary and Alexander Riegler for his very helpful assistance in the final editing.

## Skeptical Mathematics?

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**1** Ernst von Glasersfeld seems to say to social constructivists, "You attribute reality to society, but your society is just another construct, all you know is just the bits of light and shadow and color that your visual system provides to you." Now, "society" is just a big word for "other people." I can give to this text of von Glasersfeld's either a short answer or a long one.

**2** Here's the short answer. Von Glasersfeld is skeptical about whether I exist, but he is sure that he is skeptical about that. Moreover, he is sure that I should be skeptical about whether *he* exists, and that I ought to be quite sure about *that*.

**3** If that is too quick and easy, then here is a longer answer.

The problem for philosophy of mathematics is mathematical certainty. Everybody seems to be quite sure that, for example, the sum of the squares on the sides of a Euclidean right triangle equals the square on the side of the hypotenuse. But our ordinary everyday knowledge and our empirical scientific knowledge all seems to involve at least some slight tiny modicum of dubitability. How can we be so absolutely sure of mathematical truth? Formalists say, "These so-called math truths are just empty symbolism." Platonists say, "They are perceptions of transcendental eternal inhuman realities." Some, like me, say, "They are about concepts, which are socially held and historical. Therefore, questions about the nature of mathematical truth come down to questions about human thinking, at the social level, and have to be studied as empirical problems about thought and culture and even about the brain itself."

**4** Now, it would be presumptuous of me to put words into the mouth of von Glasersfeld, so instead of imagining what he might say, let me reason as a hypothetical "social constructivist" philosopher of mathematics who is actually convinced by the radical constructivism (really, Humean skepticism) of von Glasersfeld.

**5** "Aha! I have been trying to ground the reality of the Euclidean triangle in the reality of the text book, the classroom, and the consensus of the mathematical world. But now I see! I have no right to assume there *is* a mathematical world, or even a classroom, or even a text book. I only know these lights and darks and colors, that I hypothetically imagine may perhaps come from some conjectured reality that I myself have *constructed* into a text or a classroom or whatever! Instead of explaining the nature of mathematical knowledge, I now understand that mathematical knowledge itself is merely another construct! This may be of little or no use to me as a teacher, a student, or a researcher. But it will certainly be of great help if I am ready to give up any interest in teaching, studying, or researching."

## Put Another Way…

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**Preamble**

**1** As Ernst von Glasersfeld has reminded us many times in many publications and presentations, what is written here "…does not purport to describe a real world, but merely proposes a model of *how one could imagine knowledge to be built up*" (§42, *emphasis* in the original). To bring up the point that what is written by a radical constructivist, such as von Glasersfeld, myself or others, is not an assertion of truth runs the risk that George Lakoff suggests in the title of his book *Don't think of an elephant* (Lakoff 2004). To read the sentence is to do the very thing one is invited not to do. But, it seems, for realists, indeed anyone subjected to a life experience growing up in a realist society, one can hardly help associating what someone has written with attributions of truth on the part of the author. Since such associations are incessantly, but subtly and implicitly, cultivated in the minds of all in cultures such as the one we live in, the only way to become independent of such reflexive associations is to wrestle with them explicitly.

**2** What follows is offered as an alternative explanation of the nature and status of the concept of society. This alternative is entirely compatible with radical constructivism as described elsewhere by von Glasersfeld (1995, 1999) and some others. This is not a claim of the truth-value of this alternative interpretation, but instead is no more and no less than a claim that there is an alternative explanation that fits and is useful. It is not even a claim of primacy or superiority in some comparative sense. It is merely the claim that this alternative explanation of the nature and status of the concept of society exists, is viable, and is compatible with radical constructivism: a radical constructivist's explanation of "society."

**The nature of knowledge of society**

**3** My claim is that, at a certain level, asking "Where do our notions of society 'come from'?", "Where do our notions of love 'come from'?" and "Where do our notions of force 'come from'?" are all equivalent questions, in particular with regard to von Glasersfeld's claim to offer a theory of rational knowing (§46). In answering such questions, we encounter the nature and status of "society," "love," and "force." My claim is that the nature and status of these three, as things we think about, are essentially the same.

**4** Science is one field that attempts to practice the construction of rational knowledge. In his book on concepts at the foundations of physics, Max Jammer (1957, p. 2) provides an intelligible account of what he calls the "objectives" of science: "its two major assignments are the description of certain phenomena in the world of experience and the establishment of general principles for their prediction and what might be called their 'explanation.'"

**5** In this description Jammer seems to be saying that one can explain science as carrying out its program using two types of knowledge: experiential and explanatory. Scientists are trying to formulate rational, naturalistic explanations for specified sets of experiences, which meet certain conditions. This depiction in terms of experiential and explanatory knowledge is entirely compatible with radical constructivism as von Glasersfeld describes it, e.g., in Glasersfeld (1995, 1999).

**6** This enterprise is really not so unique to science. Human beings strive to formulate rational explanations for experience in many intellectual fields and in everyday experience. (This is not to claim construction of rational explanation is the whole of human cognition, but just that it is one of the activities we distinguish in what we call human cognition.) Differences may lay in qualifications placed on the set of experiences or the quality and rigor of the explanation, but the underlying enterprise is the same.

Jammer goes on to describe the "apparatus" used in science to carry out its "assignments."

"For the efficient achievement of these two objectives science employs a conceptual apparatus, that is, a system of concepts and theories that represent or symbolize the data of sense experience, as pressures, colors, tones, odors, and their possible interrelations. This conceptual apparatus consists of two parts: (1) a system of concepts, definitions, axioms, and theorems, forming a hypothetico-deductive system, as exemplified in mathematics by Euclidean geometry; (2) a set of relations linking certain concepts of the hypothetico-deductive system with certain data of sensory experience" (Jammer 1957, p. 2).

**7** What does Jammer's explanation of the nature of science have to do with our questions about society, love and force? I shall begin by asking, "How do we identify when two people are in love?" When pressed, most people answer with something like: "You can tell by the way the two act." In other words, we draw the conclusion that love is present based on observable behavior. Do we see love or do we see the observable behavior? Where does the love come in? Love is our explanation for the observed behavior. The observable behavior is experiential knowledge. Love is the explanation that subsumes this observable behavior. In this sense can we see love? Not really. Love is a concept in explanatory knowledge and as such is "the free creation of the human mind." (Einstein & Infeld 1938) As explanation, love is present in the human mind, not out there in the external world.

**8** The same applies to "force." Do we measure force? Not really. We quantify effects that we explain are due to force. Using strain gauges, we quantify the change in electrical properties of objects that deform. We explain that the deformation is due to force. We use the measured change in the electrical property of a strain gauge and our explanatory knowledge to compute the magnitude and direction of a force. Both the measured change in electrical property and our explanatory system for force are necessary for the computation. In other settings, we measure the motion of an object. We explain that the motion of objects has a certain relationship to force. With this explanation we can use the measured motion of an object to compute the magnitude and direction of a force. We do not measure or observe force itself. We compute the magnitude and direction of force from specified experiences based on our hypothetico-deductive explanatory system involving the concept, force, and links to the specified experiences.

**9** In this sense both love and force have the same nature and status. They are both concepts in explanatory knowledge. Each is used to explain a specified set of experiential knowledge. We select specific elements of experiential knowledge to link, in ways of our own choosing, with aspects of the explanation for these experiences. We cannot see or measure love or force because they exist *only* in our minds as explanations for things we *can* see or measure.

**10** As concepts, which exist only in our minds, that we use to explain to ourselves elements of our experience and to make predictions, love and force do not exist physically to be transmitted from one person to another. Hence, as a consequence, in the radical constructivist explanation, each of us can only construct our *own* concepts of love and force that we modify or refine in order to reach a better fit to the experiences they are intended to explain.

**11** So, how about society? Is it experiential knowledge or is it explanatory knowledge? Society is the explanation of a specific body of experience parsed from the manifold of experiences we have and believe others have. In the case of society, one inescapable aspect of the fit we strive to achieve is a kind of agreement with others with regard to the explanation. As von Glasersfeld put it:

"Put in the simplest way, to understand what someone has said or written means no less, but also no more, than to have built up a conceptual structure that, in the given context, appears to be compatible with the structure the speaker had in mind. And this compatibility, as a rule, manifests itself in no other way than that the receiver says and does nothing that contravenes the speaker's expectations" (§28).

**12** Society, as an explanation, is constructed by each of us in coordination with those others we distinguish out of the manifold of our experiences. By this radical constructivist line of reasoning, employing a distinction between experiential and explanatory knowledge inspired by Jammer, the concept, society, has the same status, nature and origins as the concepts, love and force. The concept, society, exists in minds and nowhere else.

**13** Is it possible to give a different explanation: one such as that of the social constructivists? Certainly. Can productive use be made of such an explanation? Certainly. But, from a radical constructivist's point of view, a position in which society is taken as a given, mind-independent reality that can be known to an individual, is both not necessary and potentially misleading. Not necessary, as demonstrated in von Glasersfeld's target article and the present commentary. Potentially misleading in that it omits any attention to the origins and genesis of explanatory knowledge of society. A radical constructivist would hold that even more productive use might be made of an explanation of society consistent with radical constructivism.

**14** For the radical constructivist, two more questions arise. If an element of a mind-independent reality can be known, in this case society, how does coming to know it happen and why only society? In the case of the former question, we have not seen a successful, convincing response to the challenge that the Skeptics issued millennia ago.

**15** The second question has little meaning if the first has not been answered. But, suspending that problem, if society is not an explanation constructed by individuals in concert with others, but exists as a mind-independent reality and can be known to people as such, then why not everything else? If everything else can be known as such, then why use the label "constructivist" if construction is not necessary to know the world, either one part or all of it?

## "Mathematical" Schemes as Instruments of Interaction

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**1** Elsewhere, Ernst von Glasersfeld draws from Piaget's (1954) studies of the child's construction of reality as a corroborating indication of the viability of his attentional model as an explanation of children's construction of permanent object concepts. In his current paper, von Glasersfeld introduces the possibility of extending the use of his attentional model in explaining children's construction of others and social interaction. Von Glasersfeld's hypothesis is that his attentional model can be used in explaining how children construct a category of self-moving things (animals) and others not unlike themselves. In this construction, "In order to develop relatively reliable schemes, the child must impute certain capabilities to the objects of interaction. But now these ascriptions comprise not only perceptual but also cognitive capabilities, and these others will be seen as intending, making plans, and being very predictable in some respects and not at all in others" (§19).

**2** Von Glasersfeld's hypothesis that children impute cognitive capabilities to those with whom they are in interaction opens up a crucial line of research in the mathematics education of children regarding how children use their "mathematical" schemes[1] as instruments of interaction with their peers and with their teachers. One of the main problems that plague studies of children's mathematical interaction is that researchers who are primarily interested in social processes seldom provide accounts of the schemes of action and operation that the interacting children use and how the children use them as they interact with each other and with their teachers concerning mathematical situations. As a consequence, there is no account provided of the meanings that individual children construct in what an observer construes as mathematical interaction, nor is there an account given of individual children's mathematical learning either during or across interactive episodes. My goal in this commentary is to say enough to suggest that the meanings children impute to the language and actions of other children are based on their current conceptual schemes and that, if the schemes are at different levels of the constructive process, it is no easy feat for children to use their schemes in interactive mathematical communication.

### Establishing meaning in interaction

**3** Von Glasersfeld, citing Shannon, reminds us that, "the sounds of speech or the visual patterns of print or writing in linguistic interactions – do not actually carry or contain what we think of as *meaning*. Instead, they should be considered as instructions to select particular meanings from a list that, together with the list of agreed signals, constitutes the "code" of the particular communication system" (§25). Mathematical interaction, of course, is often not just linguistic interaction, since it might include children's interaction with items such as geometrical sketches, computer icons, or modified forms of the abacus. Regardless of what items (the observer's items) or what sensory channels are involved in an interaction, according to von Glasersfeld (§26), the individual must construct the meaning of what is sensed. The construction of meaning involves cognitive assimilation, which Piaget (1964, p. 18) regarded as, "the integration of any sort of reality[2] into a structure." I interpret "structure" in the citation from Piaget in terms of the schemes that children use in mathematical interaction and the *meaning* of what is sensed as those aspects of the schemes that are within the awareness of the assimilating child.

**4** In studies of children's mathematical interaction, it is essential to remember that the meanings children might attribute to the items they establish are inferences of the observer. In my experience of analyzing children's mathematical schemes, although there was often good reason to infer that they were aware of the *results* of operating, it seemed as if the operations that I inferred the children used were outside of the grasp of their consciousness. I have always found that occasioning the metamorphoses that make such awareness possible in children is difficult. But when such monumental events of learning do occur, children open new mathematical frontiers and they find that what was previously difficult is now easy. But I am not only concerned with attempting to help children become aware of their operations. In fact, my primary concern lies in researchers becoming aware of the operations that *they* use to construct children's mathematical schemes and how children use those schemes in interaction.

### Operations and interaction

**5** Elements of the researcher's explanatory models of children's mathematical schemes serve as analytical constructs when accounting for meanings that children establish in mathematical interaction. As an illustration, consider two 5th grade children, Jason and Laura, engaging in interaction using a computer tool called TIMA: Sticks[3] (Steffe 2003). At the start of the school year, I inferred that Jason had constructed what I call recursive partitioning operations,[4] whereas Laura seemed to have not yet constructed them. In Figure 1, Laura had partitioned a stick into four parts, pulled out one part, partitioned that part into four parts, colored three of them, and pulled out the three colored parts while playing in TIMA: Sticks.[5] When asked what fractional part the three parts was of the original stick, Laura guessed "three-tenths." After resting his chin on his hand and thinking, Jason answered, "three-sixteenths." In explanation, he pointed to the three parts and said, "See, if we would have had it in that, four, four, four, and four – sixteen. But you colored three, so it is three-sixteenth!" It was Jason's goal to find what fractional part of the 4-part stick the 3-part stick comprised, and to do so he introduced partitioning each part of the 4-part stick into four parts. That is, he engaged in recursive partitioning. Laura, on the other hand, did not engage in recursive partitioning.

**6** The qualitative difference in the operations of the two children can be, in part, understood by inferring the unit structure that Jason established prior to his explanation. There is good reason to infer that he then established sixteen as a composite unit containing four other composite units, each of which contained four units. That is, I infer that he established a unit of units of units as a result of recursive partitioning. There was nothing in Laura's guess of "three tenths" that I could use to infer her operations, so I looked

to another task where the children were asked to partition a stick into 12 parts using Parts, but they were not to dial Parts to 12 to infer Laura's partitioning operations. Laura dialed Parts to 11, pulled out one part, and joined it to the end of the stick, establishing a 12-part stick. Jason, on the other hand, drew a new stick and insightfully partitioned that stick into three parts and then each part into four parts using recursive partitioning operations, which corroborates how he operated in the above task.

**7** I infer that Laura used her number concept, eleven, as a partitioning template. My inference is that Laura produced two levels of units – a unit that contained the 12-part stick and the units that constituted the 12 parts. She used the operations that produce a unit of units in partitioning, but not the operations that produce three levels of units. Again, there was no indication that she could engage in recursive partitioning, which involves using the operations that produce three levels of units.

**8** Laura did offer the explanation that Jason had "three pieces and added four in each thing." In the explanation, she *reenacted* Jason's operations by coordinating partitioning the stick into three parts and then each part into four parts. I call the operations she used to reenact Jason's operations "units-coordinating operations." I infer that she was definitely aware of a *sequence* of three units, each containing four parts in her visual field, and that this awareness constituted her meaning of the results of Jason's actions. On the other hand, I infer that Jason anticipated partitioning the stick into 12 parts prior to action and that he was aware of an image of three levels of units, however amorphous or minimal the image might have been. I make the same kind of inference about Laura in the case of two levels of units, but not three levels of units. In the latter case, she could only operate on material in her visual field. But in that case, there was the issue of whether she could only produce a sequence of composite units or whether she could take the sequence as a unit.

**9** The difference in the partitioning operations of the two children had major consequences in their subsequent mathematical interactions. For example, the teacher/researcher explored interactions concerning commensurate fractions[6] following the children's attempts to partition a stick into twelve



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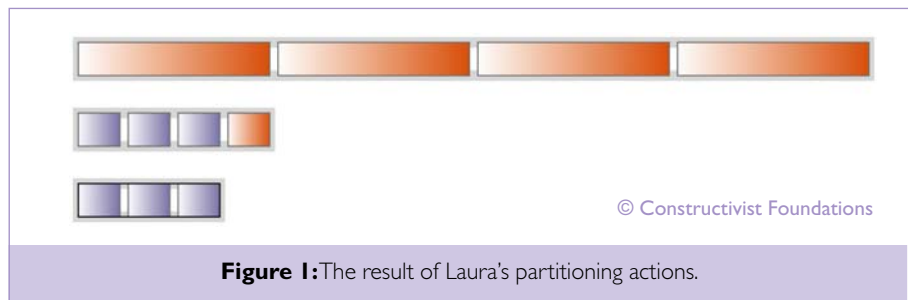
**Figure 1:** The result of Laura's partitioning actions.

parts without dialing Parts to "12" (Steffe 2003). During the exploration, Laura made a 15-part stick by first partitioning a stick into three parts then each part into five parts using her units-coordinating operations.[7] The teacher/researcher then pulled three parts out of the 15-part stick and Laura said that the 3-part stick was three-fifteenths of the 15-part stick. So, the teacher/researcher decided to tell the children that the 3-part stick was also one-fifth of the 15-part stick to find out if the children could provide an explanation. Laura said that she did not agree that it could be one-fifth. Jason, however, explained that it took five of the 3-part sticks to make the 15-part stick. In explanation, he pulled a 3-part stick out of the 15-part stick, made copies of it, and aligned five of them directly beneath the 15-part stick. Laura then said, "I get it!" Her saying that she got it, however, did not indicate that she had established the operations that produce commensurate fractions. The reason is that immediately after saying, "I get it," she looked disconcerted when she measured another 3-part stick and "1/5" appeared in a number box. She could not explain why "1/5" appeared and, for her, the situation was unrelated to the immediately prior situation. So, her saying "I get it" indicated that she established the relation using the units she established in her visual field and as soon as the perceptual situation was not available to her, the relation was also unavailable. The relation was ephemeral and occurred only in the immediate here-and-now.

**10** Laura had yet to construct the operations that produce three levels of units in the absence of perceptual material. As a consequence, the two children could not communicate *about commensurate fractions* if that means, as Maturana & Varela (1980) suggested, that one organism can affect the

behavior of another organism by orienting the behavior of the other organism to some part of its domain of interactions *comparable* to those of the orienting organism. "This can take place only if the domains of interactions of the two organisms are widely coincident" (Maturana & Varela 1980, pp. 27–28). Jason's language and actions did orient Laura to interact with the results of his actions, but I do not consider that these interactions between the two children constituted communication in the sense that Maturana & Varela explained[8]. The contribution of non-communicative interactions to the construction and/or modification of mathematical schemes is but one among the most critical problems in the line of research in mathematics education that is opened up by von Glasersfeld's hypothesis that addresses the individual in mathematical interaction.

**Notes**

1. I use quotation marks to indicate that the schemes to which I refer are abstracted from observations of children's interactions that I judge as mathematical. In the remainder of the text, I drop the quotation marks for convenience of reading.

2. I interpret "any sort of reality" as the observer's reality.

3. TIMA is an acronym for Tools for Interactive Mathematical Activity.

4. Partitioning operations are recursive if a child can partition a given partition in service of a non-partitioning goal.

5. In TIMA: Sticks, a child can draw a stick, partition the stick into as many parts as desired up to 99 by selecting a computer action PARTS, dialing a counter to any number through 99, and then clicking on the stick using the mouse. Using PULL-OUT, the child can then click on one or

more of the parts produced and pull them out of the stick while leaving the stick intact. The child can also fill any part with any one of 12 colors.

6. I use "commensurate" to indicate a relation between, say, one-third and five-fifteenths that children produce by partitioning a segment into three parts, partitioning each of the three parts into five parts, pulling one of the three partitioned parts out from the three original parts, and establishing it as one-third as well as five-fifteenths. When children can operate similarly in the absence of perceptual material, I refer to the relation using "equal fractions."

7. When it was Laura's goal to make a partition of a partition, she could do so using her units-coordinating operations. But that does not constitute recursive partitioning.

8. When the children each constructed two levels of units, they did engage in interactive mathematical communication.

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## "Things That Go Bump in the Night"

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**1** Here I underline two features of radical constructivism (RC) that render it more difficult to "cross-over" into the "social." Firstly, the fact that we, as observers, do not have any privileged access to "*external objective reality,*" and secondly, that we do not have any privileged access to what we call our "*internal subjective reality*" either.

**2** My comments focus on §4 and those following it, which deal with the "Seeing is believing" cliché. My concern is to elaborate the RC position that we cannot have a privileged access to external reality. Apart from the case of "vision," I have noted a temptation for writers to attribute a special privilege to the sense of touch, as if it gives us "direct access to reality." I then go on to apply this analysis to the assumption that we have a privileged access to our *own* inner experiences. My aim is to clarify that for both "external reality" and for "internal reality" we remain without any privileged access.

**3** In §4 Ernst von Glasersfeld outlines the RC position regarding the fact that "vision" has no direct access to objective reality (as is implied in the common phrase "Seeing is believing"). There is sometimes a tendency to quietly privilege "touch" with having a direct access to reality because, while most people can recognise that their "eyesight" may play tricks on them from time to time, it seems that when we "bump into objects" in our environment there can be no mistake about it – and

that therefore we have been in "direct contact with reality," and "know" that we have hit up against a "constraint" or an "obstacle," which tells us that our current pathway is not viable. (It is not entirely coincidental that realists choose exactly this area to demonstrate the "silliness" of idealists who are asked to deny that they feel pain when they walk into a glass door!)

**4** However, we cannot *know* that we have "bumped into some object" or "constraint" just from the "bumping." We cannot *know* that it *is* a barrier or "impediment." It is not the "world" that tells me (via the bumped-into object) that there is a constraint that I have not succeeded in circumnavigating. It is always necessary for one to construct a picture of the world out of the sense signals which arrive together in one's experiencing. It is "I" who must construct my experience as that of "encountering a constraint." That is, I construe my experience of the situation as having felt a limit to the operational usefulness of my understanding.

**5** The impression that the sense of touch gives us a privileged access to objective reality is an illusion: from the RC point of view all of the senses have the same epistemological status as the sense of vision – i.e., none of them can give us a privileged access to reality. Maturana's point that at the moment of experiencing an event we cannot tell an "illusion" from a "perception" (Maturana 1988) applies to all of our senses – not just to "tricks of the eye." We may experience not only hallucinations of "seeing," but also of hearing, smelling, tasting and touching.

**6** The phrase used by Ernst von Glasersfeld in §4, "Seeing is believing," can be equally used for the other senses thus: "Hearing is believing," "Smelling is believing," "Touching is believing," "Tasting is believing." In effect, the problems presented in psychotherapy can

be read as the inversion of the "Seeing is believing" phrase, which illustrates in part why people get into difficulty in their lives and why often they find it so arduous to solve their problems. In psychotherapy, therefore, we frequently see phenomena arising from the inverse conviction to that of the realist ("I'll believe it when I see it") position. In contrast to this view we have many problems presented in psychotherapy that are well represented by the phrase "*I'll see it when I believe it*" ("Believing is seeing") as also with the other senses, such as "*I'll hear it when I believe it*" ("Believing is hearing") etc. One of the crucial tasks of the therapist is to understand what the person is *able to listen to* and *hear*.

**7** While it is clear that the RC position says that we cannot have any privileged access to outer objective reality, it is less clear – but I would claim it is nonetheless the case – that neither can we have any privileged access to what we regard as our own *inner reality* – our interior world of experiencing.

**8** Allowing that the five senses do not give us a privileged access to the outer world, it also needs to be said that neither do they give us a privileged access to any *inner world* of experiencing that the senses generate in our body.

**9** The fact that it is *our* own body that manifests "our experience" (that which cannot be "shared with" or "compared with" that of others) does not mean that we ourselves have a privileged access to "*our own experience.*" As Maturana repeats, we live in two different and non-collapsible domains – the domain of experience and the domain of explanations (Maturana 1990). The domain of experience is not translatable or reducible to that of explanations (knowing). There is always a gap between the two domains. This places us as a "knowing observer" across from, and apart from, not only external reality but also from our own ongoing flux of inner experiencing.

We still have to *construe* what that experiencing could *mean* to us. In doing this we are positioned in the same relation to our inner experience as we are to the outside world – that is, it remains a "black box" in the domain of experiencing, and we must try to "grasp it" from the domain of explanations.

**10** Charles Sanders Peirce, with whose pragmaticism[1] von Glasersfeld's model has a lot in common, in discussing how we live in our two worlds of "inner" and "outer" realities notes that:

> "…we call the world of fancy the internal world, the world of fact the external world. In this latter we are masters, each of us, of his own voluntary muscles, and of nothing more. But man is sly, and contrives to make this little more than he needs. Beyond that, he defends himself from the angles of hard fact by clothing himself with a garment of contentment and of habituation. Were it not for this garment, he would every now and then find his internal world rudely disturbed and his fiats set at naught by brutal inroads of ideas from without. I call such forcible modification of our ways of thinking the influence of the world of fact or *experience*. But he patches up his garment by guessing what those inroads are likely to be and carefully excluding from his internal world every idea which is likely to be so disturbed. Instead of waiting for experience to come at untoward times, he provokes it when it can do no harm and changes the government of his internal world accordingly" (Peirce 1955, pp. 87–88).

**11** In this quote we find many of the issues with which a radical constructivist therapist is faced regarding how people try to balance themselves between, on the one hand, the avoidance of repeated invalidations and, on the other hand, the accumulating effects of the non-viability of their knowing systems. In therapy we often find problems that people are unable to change because they are living their explanations as a form of "*self-fulfilling prophecy*," or as a form of "*self-defeating prophecy*." They ignore or do not learn from experiencing continual invalidation of their outlook. They do not "learn from experience" as Peirce points out above.

**Touching problems**

**12** There are many examples of clinical problems that raise important questions about having "privileged access" to our own inner experiences. At the root of many disturbing clinical presentations lie confused epistemological assumptions about "bodyhood" and "experiencing."

**13** The bodily sense of "touch" can be subject to a range of unusual psychophysiological experiences, ranging from dilemmas in the area of transsexualism and sex-reassignment, to the well-known phenomena of the amputee who "feels" his limb to still be present (phantom limb), and to the less well-known phenomena where a person feels that his actual limb is not "his own" but is entirely "other" to his bodyhood - and engages in a medico-legal struggle to have the offending limb amputated. In recent years new medico-legal issues have been raised when there were cases of able-bodied persons who had succeeded in having perfectly healthy limbs amputated.

**14** In these cases we have persons from our modern post-human culture of self-modification (through reconstructive and cosmetic surgical procedures) who are requesting to change their body according to highly idiosyncratic personal criteria. The demand for the surgical reconstruction of the body follows the personal "cognitive" reconstruction of their bodily experiences. The problem with this request is that it can be described alternately as the wilful disablement of perfectly healthy, functioning limbs.

**15** So whether surgical self-modification is construed as "enhancing appearance" or as "self-mutilation" ("maiming") is another of those bioethical conundrums that usually have to be solved by some legal pronouncement or decree that simultaneously delimits the patients' autonomy and freedom of choice and also specifies the legal powers and autonomy of the medical profession regarding the management of such phenomena. The necessity of taking this legal pathway usually signals the loss of some long-standing cultural distinction regarding our human identity, values or ethics.

**16** This type of case is therefore extremely interesting for the RC model precisely because it involves "society," "social values" and "social constraints." It is particularly interesting because of the need to make radical reconstructions of individuals' rights to exercise idiosyncratic construals. Resolving these cultural constructions means renegotiating many fixed socio-cultural assumptions and beliefs about the human body and its integrity.

**17** All of these clinical examples are opportunities for the radical constructivist therapist to engage with the dilemma of the "social," of the larger system processes (culture, ethos, morality) that contextualise the experiencing bodyhood of each individual. These dilemmas of therapy illustrate the need to build an adequate RC model for the development of what Maturana calls "consensuality" (Maturana 1988).

**18** I believe that many problems and confusions are generated out of the common but erroneous assumption that we *do* have a privileged access to our own *inner world* of experiencing that our senses generate in our bodyhood. It becomes crucially important in each clinical case to distinguish between, on the one hand, "distortions of bodily experiencing" and, on the other hand, "cognitive distortions" in the domain of explanations.

**Note**

1. Peirce called his original version of "pragmatism" by the term "pragmaticism" to distinguish and distance his model from that of William James and others who he felt had not understood his approach.

## The Missing Links of Radical Constructivism

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**1** In my view, Ernst von Glasersfeld presents radical constructivism[1] for social scientists in a coherent package, starting with pattern formation in the visual field and extending it to sociological constructs such as others, communication, groups, or society. The archenemy in von Glasersfeld's case runs, as always, under the flag of naïve realism, but the overall design for radical constructivism von Glasersfeld style establishes no recognizable links to the empirical research in the social sciences. A sociologist may be a naïve realist or she may be a radical constructivist, but he and she will operate in an identical fashion when exploring their social universes around them. Whether society is an "ontological given" or a "construct" or whether a theory of societal differentiation is true, corroborated or viable is situated far away from the principles of designing questionnaires, of conducting interviews in empirical social research, of interpreting survey data sets or of developing factor analyses and regression models.[2] As long as social scientists operate with the available set of methods and research designs, they remain unrestricted and unguided by radical constructivism, as characterized by von Glasersfeld. Only when social scientists turn to epistemological issues or when the status of sociological concepts such as community or society is at stake, does the dialogue between radical constructivism and other epistemologies or theories of knowledge set in. Outside this narrow realm of epistemological problems, radical constructivism remains silent.

**2** In my commentary I will make the point that radical constructivism von Glasersfeld style unnecessarily plays only a passive or an inactive role. Quite obviously, I want to demonstrate that there is life for radical constructivism outside its seemingly irrelevant function in empirical social research and that it is possible to develop radical constructivism in designs with tangible consequences and effects for the cognitive routines in the social sciences. In short, it is conceivable, despite "Who Conceives of Society?", that radical constructivism matters.

### Trivial and non-trivial relations between radical constructivism and empirical research

**3** Initially I would like to introduce a distinction between two types of radical constructivism for the social worlds,[3] which can be presented by the dichotomy of trivial versus non-trivial designs, as depicted in Fig. 1.

**4** In its trivial form, radical constructivism plays the role of a background epistemology that does not alter or affect the well-established routines and operations of social science and the day to day activities of social science research. In its trivial design, radical constructivism in the social arena does not matter. Non-trivial designs of radical constructivism, however, also lead to different groups of practices and routines altogether and change the shapes of research designs and the sequence of normal research operations mildly or even wildly. Likewise, radical con-

structivism, due to advances in the social sciences, is destined for adaptation and accommodation as well.
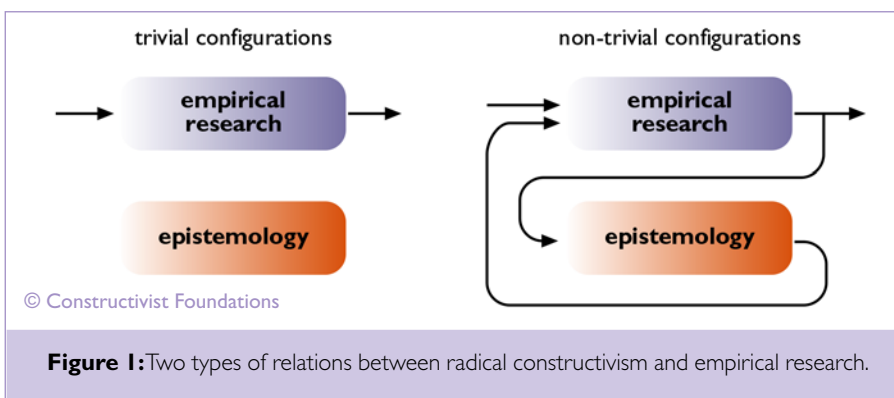
### Non-trivial configurations of radical constructivism: weak and strong ties

**5** Following a well-known distinction in social network theory, weak or strong social ties have been defined in terms of the "amount of time, the emotional intensity, the intimacy … and the reciprocal services" (Granovetter 1973, p. 1361). Similarly, in cognitive networks, ties between empirical methods and research designs[4] on the one hand and a theory of knowledge or an epistemology on the other hand can be introduced with reference to the amount of testing special elements of the theory of knowledge, the closeness of characteristic features or the mutual long-term effects.[5] Strong ties assume that building blocks from a theory of knowledge can be transformed into research and test designs, weak ties exhibit mainly similarity relations between the operational research repertoire and an underlying theory of knowledge and no ties are reserved for the case of no discernible or tangible relations between a theory of knowledge and empirical research methods, designs and practices.

**6** The remarks so far, as well as from now on, do not contain a criticism of Ernst von Glasersfeld's target article. Rather, the overall intention is that radical constructivism, aside from offering an interesting normative theory of knowledge, can and should be extended and advanced along two major forms, namely along weak ties and strong ties to empirical research in the social sciences and beyond.

**7** The strong forms assume strong ties between a set of theoretical elements of radical constructivism as an empirical theory of cognition and new methods or research designs that are able to influence the viability status of these theoretical components in a positive or a negative manner. It goes without saying that the strong paths of non-trivial designs are, like the Popperean truth, "hard to come by." Currently, it is difficult to specify strong ties between radical constructivism and the social sciences, the cognitive sciences or evolutionary biology.

**8** In its weak forms, basic building blocks of radical constructivism lead to a set of essential features that, for any empirically-oriented scientific discipline, are necessary and



trivial configurations          non-trivial configurations

empirical research

epistemology

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**Figure 1:** Two types of relations between radical constructivism and empirical research.

sufficient for limiting current research routines (negative heuristic), for specifying a group of admissible procedures (positive heuristic), for breaking new paths for research designs (innovative heuristic) and for self-adaptation and self-accommodation by radical constructivism itself, depending on the cognitive evolution of specific empirical research areas.

**9** As already pointed out, von Glasersfeld's "Who Conceives of Society?" reserves too modest a role for radical constructivism. In my judgment, the availability or the lack of ties that are at least weak will become crucial for the viability and the sustainability of radical constructivism in the years and decades ahead.[6]

**Notes**

1. It must be noted that there are subtle differences between *radical constructivism* Ernst von Glasersfeld style, *second-order*

*cybernetics* as developed by Heinz von Foerster (see, for example, Müller & Müller 2007, Müller 2007a, or Müller 2007b) or *conversation theory* as propagated by Gordon Pask. Thus, von Glasersfeld represents one of the current variants of radical constructivism.

2. It goes without saying that the argument is not dependent on quantitative methods and research designs. It applies with equal force to qualitative methods or qualitative research designs as well. On qualitative methods and designs, see, for example, Cresswell (2007).

3. It must be noted that von Glasersfeld makes a sharp distinction between "social constructionism" and radical constructivism in social domains.

4. Methods can be conceived as components of research designs so that each research design is composed of at least one particular method. For available handbooks of

methods see, for example, Bortz & Döring (2002).

5. In social network theory, ties are assumed to be strong, weak or absent where absent ties are reserved either to "nodding" relationships or to the complete absence of any contacts (Granovetter 1973, p. 1361). In cognitive networks, the absence of ties is used for a relationship where an underlying epistemology provides no restrictions or rules for empirical research.

6. In a follow-up article nder the title '*Methodologizing' Radical Constructivism*, a series of articles and books on constructivist foundations which started with von Foerster and Müller (2003), Müller & Müller (2007), Glanville & Müller (2007), Müller (2007a) & Müller (2007b) will be continued with a focus on the construction of a genuine research methodology for radical constructivism with weak ties and strong ties.

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## Why Private Meanings Are Incoherent

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**Introduction: The view from within**

**1** The epistemology of radical constructivism is based on and tied up with a certain choice of perspective. The central question of how knowledge is "built up" (§42) is addressed strictly from the point of view of a single individual: an observer's internal system processes raw sensory data by "drawing" connections (§13) according to "patterns" or "schemes" that evolve and are selected according to internal criteria of cognitive viability, i.e., according to whether they have proven to regularly produce actions that are "meaningful" according to internal "basic values" of the individual (§§15–17). Conceiving of other individuals and of society is, then, to be understood along precisely the same lines (§§18 and following). Henceforth, the strictly internal "conceptual schemes" and

"conceptual structures" that radical constructivism takes as its starting point will be called *private*, just to have a convenient term (cf. §37).

**2** Obviously, radical constructivism does not content itself with the desire merely to *describe* cognitive processes from a certain individualist stance. One of its most important claims, or so it seems, is that this stance is the *only* one appropriate to epistemology, everything else being unwarranted metaphysical (§32) or ontological (§31) commitments. As for typical sociological notions such as "(linguistic) meanings" or "society," von Glasersfeld urges that they are abstractions that are to be *generated* by each individual anew (§46); it is only "mutual orientation and adaptation" (§26) that makes conceptual structures of different interacting individuals somehow "compatible" (§28). The radical constructivist stance is even assumed to be a superior attitude for participants in controversial conversations (§29).

**How can "private" conceptual schemes be "compatible"?**

**3** In what follows, I will focus on one crucial step in von Glasersfeld's argumentation, viz.

his view that every individual constructs his own *private* meanings (understood as conceptual structures or elements thereof) for linguistic expressions, so that linguistic interaction and even *communication* in general is based on a notion of *compatibility* between different speakers' private conceptual schemes. The central question here is: "Just what does it mean that different private conceptual schemes (private meanings) are compatible, or what constitutes a viable *criterion* to this end?" As von Glasersfeld himself stresses twice (§28, §37), the criteria to be looked for can only be "public," residing in properties of verbal and non-verbal *actions* of the interacting individuals, properties that can be sensed and processed by the participating system.

**4** Obviously, private conceptual schemes of different individuals cannot be compared directly in any way. For one thing, I have no access to my conspecifics' internal cognitive machinery; all I have is my perception of the actions (more precisely, of the bodily movements and noises) that are the result of this machinery's inner working. What is perhaps more important, I do not even have access to my own conceptual schemes: I cannot say why

I am sure that this apple is red; I somehow simply know it.

**5** So all I can do to check that my conspecifics' private meanings are "compatible" with mine is to look at the circumstances of actual, publicly observable use of the words we use. But again, this is not as trivial as it may sound. As von Glasersfeld puts it in (§28), "this compatibility, as a rule, manifests itself in no other way than that the receiver says and does nothing that contravenes the speaker's expectations." Of course, this criterion cannot be taken literally: in a thought experiment, even someone whose cognitive schemes are identical to mine in any conceivable respect will at times surprise me, e.g., by unveiling some unknown plans or intentions of his or acting in a way I could not possibly foresee due to lack of some vital piece of information. As a consequence, the radical constructivist faces the burden of proof that there is a non-circular way of determining whether some action is unexpected because of discrepancies between the private meaning schemes of individuals or because of "something else" (e.g., disparities in knowledge of the world).

**6** All we can say for sure is that we observe (or "conceptualize") more or less stable recurrent interactional patterns around us that gradually change through time, that can, in a certain sense, be extended to include new individuals (e.g., infants), and that differ from what is found in other interactional groups. However, stable interactional patterns also evolve between a man and his dog. What sort of criterion could possibly tell us in the latter case whether the patterns observed are "due to mutually compatible mental operations" (§37)?

**7** One possible escape hatch could consist in pointing out that we might be able to *impute* private meanings to our conspecifics in just the same way that we are able to impute to them those general cognitive capabilities "that we become aware of in ourselves" (§22). There are many philosophical pitfalls here, however – it is not at all clear how such an imputation is possible at all. It was David Hume who, in his *Treatise*, pointed out that all that the subject is "aware of" in perceiving or feeling is the perception or feeling itself; by no means do humans sense a "self" that "has" this perception or feeling. But, from the internal point of view, it is only on the model of such a "self" or "mind" that "has" the percep-

tion that we can attribute feelings etc. to other "minds"; first-person ascriptions presuppose third-person ascriptions, not vice versa. See the postscript on the problem of "other minds" in Kripke (1982) for an accessible introduction to these issues.

**8** Moreover, there are no clear-cut *behavioral* criteria for what it means to impute intentions or feelings to others. Dennett (1996) gives ample empirical evidence for animals behaving *as if* they are able to adopt the "intentional stance" towards other beings, ascribing intentions and propositional attitudes to them, although all available evidence points to the conclusion that these animals do not possess anything like a conceptual (re)presentation of others' minds, acting only on innate behavioral patterns instead.

## An alternative view
## on interactional patterns

**9** The upshot of the preceding discussion is that we are left with a notion of more or less stable and recurrent interactional patterns, a notion that suggests an inverted way of looking at things: when we *ascribe* "compatible" cognitive or conceptual abilities to our conspecifics, we do it *because* we have established recurrent patterns with them. In other words, the patterns are not the causal *consequence* of private schemes having become compatible through some process of adaptation – they *justify* our ascriptions, i.e., they give "meaning" to them, only *after* they have come into existence. Moreover, our ascription acts themselves are simply a *part* of these patterns. The following sections will expand on this view.

**10** The genesis of complex interactional patterns involving several individuals can be modeled within a generalized theory of evolution, for a lucid presentation of which see Schurz (2001). Although the vast internal complexity of the individual systems involved has a *causal* bearing on the development of such patterns, the *outcome* of the development has, on a conceptual level of description, a certain *independence* of the private cognitive properties to be found "within" those individuals, because the "geometry" and dynamics of the individuals' "phase spaces" can be vastly different from the geometry and dynamics of the "combined" phase space resulting from their persistent interactions. In particular, the behavior and "attractors" of the combined

phase space may, to a surprising degree, be *insensitive* to details of the inner processes of the interacting individuals. I avail myself of some mathematical notions that are used in a more or less metaphorical, illustrative fashion here, borrowing heavily from Cohen & Stewart (1994), where the ideas briefly alluded to here are expounded at great length.

**11** The patterns that emerge through the interaction of sufficiently complex individuals will be only partially "perceivable" by those individuals themselves. Metaphorically, high-dimensional recurrent patterns of state changes (e.g., "attractors") of the combined phase space are "visible" in the "private" phase spaces of the individuals only as lower dimensional "projections." Different individuals' phase spaces may yield very different projections of one and the same pattern. (A good intuitive illustration of how much is lost by projecting an object onto a subspace of lower dimensionality can be gained, e.g., from looking at different two-dimensional images of one and the same four-dimensional hypercube).

**12** As such, all this does not pose a threat to radical constructivism: one could simply insist on looking only at the private, internal aspects of such interactional patterns, no matter what additional and "high-dimensional" properties, inaccessible to the individuals involved in them, they might have. The possibility of discussing such additional properties would still be available, if only as some sort of (theoretical) construct.

**13** It is precisely linguistic communication that shows why epistemology cannot choose to settle for the view from within. I shall take it for granted that any sound epistemological position must be, at least in principle, linguistically *communicable* to others; language and communication, however, are good examples for interactional patterns of the kind envisaged above. In using language, we simply *rely* on these patterns; we "live in them," much the same way as we live in and live by other artifacts that have been created by man. Whatever privately goes on inside us when we happen to be "in" such a pattern is irrelevant, both in the sense that private inner states are not accessible to others and, more importantly, in the insensitivity sense discussed above.

**14** Again, the radical constructivist might be inclined to confine himself to looking at what goes on inside the individual while it is "in"

such a pattern. We shall now discuss the phenomenon of *linguistic reference* to see why this will not do the trick. Referring to an "object," "idea" or "state of affairs" by means of language is possible only inasmuch as the "entity" referred to is involved in an interactional pattern that is, in turn, intertwined with or part of the pattern network surrounding the use of the linguistic expression in question. What is important here is the fact that we have to look at the patterns *as a whole*, not only its "private," individual aspects, to see what the reference amounts to. A simple illustration of this would be what Putnam (1975) has called the "linguistic division of labor": everybody in a certain group might be considered a competent user of the word "gold," although only a few experts are able to determine with certainty whether a given piece of metal is indeed gold. To give a more mundane example, different people can talk about a certain person even though they have widely differing, and in part possibly false, beliefs about that person. Language here serves as an external device that "transcends" the "private" specifics and idiosyncrasies of the individuals using it.

**15** It follows with conceptual necessity that one does *not* refer to some private, inaccessible phenomenon when talking about someone's feelings, intentions or ways of meaning and understanding. In ascribing "intentions," "values" or "feelings" to a person, each of us, including radical constructivists, inevitably reinstantiates a complex social pattern that, although not causally independent of the internal states of that person, cannot somehow magically be directly "about" private aspects of the person.

**16** If this argumentation is correct, then it follows that there simply is no such thing as a "private meaning"; the very *word* "meaning" cannot but refer to something that is entangled in and even *produced* by a whole network of evolving interactional patterns that might have totally different repercussions "inside" different individuals that participate in that network. But if there are no private meanings, then the question of how to check for their interpersonal compatibility simply does not arise. This does not imply that misunderstandings are *a priori* impossible: we constantly face unexpected reactions, children must "acquire" the meanings of words, etc. But the question of what counts as "unexpected," and why, in which respect, and with what consequences this is so, and the question of under what circumstances someone can be said to have "mastered" the meaning of a word are all settled only *within* a communicational system. They cannot be answered "in advance" from a purely individualist stance.

Inasmuch as *society* is the totality of interactional patterns (in the sense discussed above), this means that a valid notion of society, indeed our being part of it, is *presupposed* in our analyses of communication – not the other way round. In a way, the way human society has evolved is responsible for the most intricate aspects of human cognition – as many others have argued before – without thereby presupposing in any way that society is "a ready-made ontological given" (§31; see Tomasello 1999 for a recent compelling exposition.)

**17** As a final point, it should be emphasized that the line of argumentation briefly sketched here does not hinge on any specific ontological assumptions, although the language used to present it, almost inevitably and similarly to many passages in von Glasersfeld's article, is imbued with the kind of "common sense ontology" that is typical of ordinary language. In particular, even when one takes one's conspecifics and their actions strictly to be one's own conceptualizations, it is, I think, quite possible to argue that the referential function of the words we use to ascribe cognitive states or linguistic meanings to another person is, at best, very indirectly connected to whatever private internal processes we assume to be at work "inside" him.

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## Is Ontology Necessary?

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**1** Let me begin by stating that I am very much in sympathy with the arguments and conclusions presented by Ernst von Glasersfeld in this article. Indeed it expresses, in a succinct and powerful manner, what to me is the basis of radical constructivism (RC): Any individual knower can acquire her knowledge only by *constructing* it, in a process that takes place in her own mind – a subjective act of processing and interconnecting her own personal experiences and mental abstractions. This holds when the constructed knowledge deals with inanimate objects, and also when it refers to other persons – whether as individuals, or grouped together in some notion of a "society." Thus, there is no conception in RC of establishing knowledge that is *objectively true*, in the sense of describing correctly some aspect of an ontological reality that exists independently of the subjective experience of knowers.

**2** And yet, when reading the article, I am left with a slightly uncomfortable feeling that there is something missing here – an unspoken issue that is not adequately addressed. The issue is ontological; it may be expressed, somewhat simplistically, in the form of a question: "What is it (i.e., the knowledge that is constructed) knowledge *of* …?"

**3** RC maintains – as has been repeatedly pointed out by von Glasersfeld and others – that the only "source material" that is available to an individual knower, and from which she can construct knowledge, is her own *experiential world*: i.e., the total sum of all her experiences (which, it is important to note, will include both sensual perceptions and mental reflections). In other words, there is no way that she can get to peek behind this "filtering screen" of her own experience and observe the world as it "really is," i.e., some kind of "reality" that exists independently of herself and of other learners. In particular, it is not possible to separate perception from reflection in the construction of knowledge: to "observe" an object independently of our mental processing of the sensual stimuli that we associate with this object (§5). Thus, RC features a sharp distinction between *epistemology* and *ontology*, and indeed tends to focus on the former: the origin, scope and limits of the knowledge that is being constructed. In fact, expositions of RC will often reject considerations of ontology as being irrelevant to the construction of knowledge: for instance, von Glasersfeld states (§47) that

his goal is to establish a coherent model of knowing, without any superfluous ontological presuppositions.

**4** And this is of course quite all right, as far as it goes: the epistemological *theory of knowing* offered by RC is indeed able to stand on its own, with no need for any ontological underpinning. My concern, however, is with the individual *knower*. I submit that she will need (and, indeed, will invariably have) some kind of *ontological basis* for whatever knowledge she constructs. Let me expand on this.

**5** We all have a conception, in our minds, of a fundamental division that obtains between what might be called our *internal* and *external* experiential world. To the first belong such items as: our thoughts, emotions, volitions, beliefs, preferences etc. All these are experienced as being, in some sense, situated "inside us." The second is populated by more or less tangible items that we conceive of as being located "outside us": inanimate objects, animals and plants, and other people. And it is important to remark here that I am not talking about the *knowledge* that we can gain about such external items – this has to be constructed by the individual knower, as stated above. Rather, I am arguing that we all "feel" – i.e., experience, in a somewhat vague manner – the perception that these external items *are available out there*, for us to experience. And note that this feeling is *precognitive*: it comes into play before, and provides a base for, any cognitive knowledge construction that the individual knower will engage in. This activity of construction is then, of course, envisaged in RC as a process of continually adapting and modifying mental images, as pointed out in von Glasersfeld's article. But I am suggesting that such a process of construction will necessarily rest on this precognitive ontological notion of an "external experiential world."

**6** This touches on the issue of *solipsism* – a vice that RC is often charged with promoting. In the present context, it can be described as the proposition that *there is no external world*: all the external objects that we think we are experiencing are in fact nothing but figments of our imagination, i.e., hallucinations situated in our own mind. Of course, such a posi-

tion will be universally rejected. But note that this rejection is not based on epistemological arguments: from a logical point of view one simply cannot exclude the possibility that one is in fact hallucinating all one's experiences. On the contrary, we repudiate the idea of solipsism on ontological grounds: it simply does not accord with the way we choose to live our lives. (This issue is discussed in more detail in Quale 2007b.) In other words, we adopt as an *ontological presupposition* the viewpoint that our external experiential world is actually there for us to experience.

**7** It seems to me that von Glasersfeld is in effect doing precisely that in his discussion of *interactions* between human beings (§15, and particularly §19). In common parlance, the notion of interaction presupposes at least two agents that can interact – i.e., act on, and react back on – each other. (Clearly, this notion becomes meaningless in a solipsist perspective, where there is nothing outside oneself to act on.) The article describes (§19) the child's interactions with items in her external world (including human beings), as being necessary for her construction of reliable knowledge about these items. Surely this must imply the ontological assumption that this external world, and the items in it, are available for us to interact with?

**8** A note on terminology: I am deliberately avoiding the use of the term "exist." This is because the notion of "existence" is often associated with specific realist conceptions of an "objectively existing reality," of which we are able to obtain cognitive knowledge. (For a more detailed discussion of this issue, see Quale 2007a.) Instead, I am adopting an alternative terminology, where the external world is described as "being there," and "being available for us." This is intended to evoke the imagery of an external experiential world on a precognitive level, as noted above; and this conception of an external world can then provide, for the knower, the necessary ontological basis for her construction of knowledge, in the way that is defined in RC.

**9** To sum up: I maintain that RC, considered as an epistemological model of knowing, should not turn its back on ontology. Rather, I am proposing an extension of this

theory to also take account of non-cognitive knowing. In particular, I am suggesting that it is fully compatible with – and, indeed, that it should explicitly accept – the following ontological premise:

- The external experiential world is available for us, as a *shared resource*. This means that individual knowers are able to act on it, and interact with each other in it; in this way they can reach an agreement that they are experiencing the same world. In that sense, it (i.e., the external experiential world) may be legitimately regarded as the source of our sensual perceptions, and radical constructivists may thus confidently repudiate the charge of solipsism.

- However (and this is crucial), it is not possible for an individual knower to obtain *objective knowledge* of the items that populate this external world. All knowledge must be constructed by a knower, through a processing of mental abstractions as described in von Glasersfeld's article; it is not possible for the knower to isolate the external item from the framework of these abstractions.

**10** Expressed in Kantian terms: We cannot observe "the thing in itself" independently of our own faculties of perception and reflection; nevertheless, we are allowed to assume that "the thing is there" for us to observe. I submit that this viewpoint may go some way towards alleviating the unease that many critics of RC have expressed, regarding this theory's alleged "denial of reality" and implications of solipsism.

**11** Let me emphasise again that the present commentary is not intended as a criticism of the arguments presented by von Glasersfeld in the article; as already noted, I am in substantial agreement with these arguments. It is, of course, perfectly legitimate to concentrate on the epistemological aspects of knowledge building and in this context declare oneself to be unconcerned with ontological issues. However, I am suggesting that such issues may be of concern in other connections – and indeed that a discussion of them may supplement, and yield some valuable contributions to, the theory of RC.

# The Personal and Social as Mutually Specifying

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**1** In his engaging and thoughtful article, "Who Conceives of Society," von Glasersfeld argues for a pragmatic conception of truth. Some accounts are preferable to others because they work better. That is, they are more viable. Of course, viability is always defined in relationship to what one is trying to accomplish. Von Glasersfeld expresses this by noting that the cognitive viability of an account "can be assessed only relative to goals" (§16) and that every account is built upon presuppositions, or postulated premises. Presuppositions cannot be verified, but are justifiable if they prove helpful. In von Glasersfeld's words, they are "not ontological foundations but part of a working hypothesis" (§47).

**2** Von Glasersfeld also argues for an isolated individualism. Consistent with his radical constructivism (Glasersfeld 1984, 1995), he maintains that organisms are closed systems that are only in touch with their own processes. Therefore, what people know is always indirect, personal, and a product of their structure. Von Glasersfeld's pragmatism fits well with his radical constructivism because the latter precludes people from ever knowing the world as it is. People know their constructions of the world, not the world itself. Outside events may trigger "perturbations" within the individual's system, but do not instruct the system how to respond. Therefore, when people believe they are empirically mapping the outside world, what they are really doing is responding to their own internal processes (Efran & Fauber 1995; Glasersfeld 1984, 1995; Maturana & Varela 1992). Organisms remain cognitively isolated to the extent that all they ever know is their individual constructions. This makes evaluating the accuracy of constructions not only impossible, but also nonsensical. It is the viability of constructions that matters; how well they work in the course of daily living is the only coherent means for evaluating them.

**3** Coherence is of particular concern to von Glasersfeld. To him, pragmatic presuppositions "can be justified only insofar as they make a coherent theory possible" (§47). When von Glasersfeld states in no uncertain terms that he "no longer wants to have anything to do with the 'postmodern' movement" (§48), his implicit rationale is that postmodernism – with its repudiation of reason – has become incoherent. Unlike postmodernists, von Glasersfeld does not desire emancipation from reason. To the contrary, his radical constructivism represents "a theory of rational knowing" (§48), albeit one that does not see rationality as yielding objective knowledge of reality.

**4** Whereas von Glasersfeld condemns postmodernists for rejecting reason, he criticizes social constructionists on very different grounds, namely for reifying objective reality. He says that it is "misleading if social constructionists and other socially oriented constructivists speak of language or knowledge as though these items existed in a generally accessible environment, independently of the individuals that conceive of them" (§45). From within a radical constructivist perspective, von Glasersfeld's argument against social constructionism is perfectly viable and internally coherent. If people can only be in touch with their interior processes, then to speak of shared social constructions existing independently of people is highly problematic. Further, to suggest that social constructions are communally accessible implies that they can be accurately perceived - an incoherent position to a radical constructivist.

**5** But social constructionism only remains incoherent if one stays committed to radical constructivist presuppositions. George Kelly, in his personal constructivism, argued for *constructive alternativism*: the view that there is always another way to construe things (Kelly 1991, 1969). The alternatives are infinite. All one needs to do is entertain different assumptions. Social constructionists do just that, offering an account of human knowledge construction based on different presuppositions than those made by their radical constructivist brethren. Their account competes with the radical constructivist account. It does not presume an isolated knower. Instead, it posits that "meaning" is something people "do together" in the ways they talk and interact with one another (Burr 1995; Gergen 1985, 1991, 1994, 1999; Shotter 1993). Relationships become the central means by which constructions are generated. Through relationships, people fashion shared ideas about the world in which they dwell – including ideas about personhood. These ideas, referred to as social constructions, take on a life of their own to the extent that they are passed on and evolve from generation to generation. For example, social constructions of "masculinity" and "femininity" go back quite some time in human history, yet current humans cannot help but construe themselves and others using current incarnations of these terms. Though a full articulation of social constructionism is beyond the current scope, the point is that social constructionism is coherent if one accepts its presuppositions, even though these presuppositions diverge from radical constructivism's assumption of the isolated subject.

**6** Von Glasersfeld believes that one of the ways social constructionists are incoherent is in reifying language and knowledge as independent entities that can be objectively known. Yet I suspect that many social constructionists would challenge this interpretation of their perspective. Social constructionists tend to see social constructions as shared but disputable accounts, not objectively knowable entities. This is why different groups (ranging from two people in a relationship to entire societies) often advance different truth claims; the social constructions each group has produced vary. Social constructions may take on an independent existence to the extent that – once invented – they are often applied well beyond the lifetimes of those who originated them. However, they are not "things" to be found in the world, which is precisely why they are not objectively accessible in the way von Glasersfeld says social constructionists claim they are.

**7** Of course, the "bottom up" perspective of radical constructivism and the "top down" orientation of social constructionism need not be postulated as contradictory. They can potentially inform one another. Many socially oriented constructivists (and perhaps even a few social constructionists) are likely to find von Glasersfeld's explanation of the social interesting and reasonable:

"Irrespective of how large the number of agreeing colleagues might be, the concep-

tual structure that they consider to be common property does not describe an 'objective' state of affairs but a collection of individual interpretations that, in the course of discussion and critique, have acquired a certain viability for all the participants" (§43).

**8** Von Glasersfeld's "bottom up" account may complement the social constructionists' "top down" view. In other words, perhaps it is fruitful to postulate that the personal and the social mutually influence and shape one another. In such a conception, one might uphold von Glasersfeld's notion that people are isolated knowers only in touch with their own processes. However, in coordinating their actions with one another in the course of group living, people exist as parts of social unities that generate "shared" meanings, or social constructions. These social constructions need not be seen as objective and independent entities. Rather, they can easily be

seen as "a collection of individual interpretations that, in the course of discussion and critique, have acquired a certain viability for all the participants" (§43). Yet the process of discussion and critique that spawns this "collection of individual interpretations" is nothing if not a means for further perturbing, or triggering, the internal processes of individuals. Thus, how people socially coordinate their individual interpretations with one another influences the next round of perturbations they generate. Importantly, the perturbations created do not dictate an individual's response because that response is always a product of the person's structure. Nevertheless, different perturbations arise in different contexts and individual development is both a product of the kinds of perturbations an organism encounters and the ways it reorganizes itself in reaction to them. This occurs in good measure because a substantial part of each context is shaped by the ongoing discus-

sion and critique of those dwelling within it, however cognitively isolated they may be. It is therefore reasonable (rational, even?) to suggest that the "social" informs the "personal" as much as the "personal" informs the "social." What one does impacts one's surrounding medium, even if individuals never can directly access this medium. This, in turn, perturbs and changes the medium in a manner that inevitably impacts its next series of perturbation-inducing events. Von Glasersfeld's presupposition that all organisms are isolated subjective knowers can thus remain viable within a framework that sees the personal and social as mutually informing. Implying that isolated knowers coordinate the ways in which they "bump" into one another – and that this coordination impacts the kinds of perturbations that arise within them – constitutes a perfectly rational variation on von Glasersfeld's theory of rational knowing.

## On the Viability of Being a "Self-Orienting Subject"

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### The non-analytic potential of a cybernetic perspective

**1** In the opening passage of his paper, Ernst von Glasersfeld zooms in on a *subject*, grasping the world as *reality*, determined by *society*, while reflecting him- or herself as a part of this society. In the advanced sense of being a conceptual essay it aims to understand how "patterns arise from the perception of… elements" (§1).

**2** This analytical assertion involves several assumptions that are implied in the use of conventional notions such as "thinking subject," "patterns," "disconnected elements" and even "perception" or "society." It also touches on discourse terms such as "observer-independent reality."

**3** Despite their conceptual connotations, these terms do not, however, fit into the essen-

tially non-analytic approach to constructivist thinking. According to mathematician Luitzen E. J. Brouwer (1975) and in the sense of philosopher Immanuel Kant, I assume that the validity of analytical notions does not depend on any reference to ontological consistency. The non-analytic potential of the constructivist approach (which is also cybernetic) bears on the synthetic experience of an observing subject who does not rely on trivializing the experiential world into a set of separations when modeling and simulating conceptual foresights.

**4** Consequently, the risk of misunderstanding arises within the analytically bonded notions of the language used, which simplify the prospective complexity of a given discourse. Like the assumption that seems to conceptualize "reality" mainly as a product of internal visualization ("mental images"), the figures used are perfectly suited for illustration. The same metaphors can be, at the very least, misleading for sufficient appreciation of the conceptual potential of von Glasersfeld's vision.

**5** In the light of the almost brilliant equilibrium of the author, who manages to compose a resourceful explanation, switching between the notional conditionality and the expected contextual understanding, I intend to focus on

the interdisciplinary potential of some suggestions that offer new perspectives on conceiving society, which are driven by a non-analytical and holistic vision.

### The fateful ambivalence of autonomous orientation

**6** In order to avoid a misconception, I would remind readers of the belief that I share with the author (§42) that the only reasonable and possible kind of knowledge (not only of society) is individual and is initially of a non-analytic nature. Since a thinking subject differentiates the world, he or she has to comply with any external drive. In my own categories, evoking a holistic view of epistemic determinism, *there are no verities or certainties beyond the individual orientation.* Being originally free of any separation (or objectification), everything should be conceived initially as an attitude from one's own integrity.

**7** The concept of *autonomous orientation* (Tsvasman 2006) explains the driving attitude of a subject defined as "thinking" to separate things into the form of "notions." A self-orienting subject does not define him- or herself as a separate – and therefore as a *thinking, communicating* or even *analyzing* – subject until involved with other subjects in *inter-subjective* handling. At this point, another consequence

of the above-mentioned simplification (of the discourse through the use of language-validated terms) occurs. The term "notion", for example, ignores any history of a determination that could clarify the epistemic inconsistency of any analytic contextualization of the conceptual meanings. As set out in the following passage, an intersubjective perspective is the consequence of the semantic re-contextualization of the approach (towards its non-analytic potential) drafted in von Glasersfeld's article.

**8** Von Glasersfeld explains *viability* in terms of goals of individual perception. Summing up (§17), he explains the natural drive of individual orientation as "to put the perceiver into a position to decide which ways of acting seem viable. In short, perception serves to make predictions." At this point the author's concept seems to ignore the natural "fate" of individual orientation to be substituted for initial socialization (which emerges from inter-subjective activity). He attempts to deal with this problem in the next chapter, dedicated to "communication," which is assumed to arise "in the course of protracted interaction with others, through mutual orientation and adaptation" (§26). However, this explanation still overlooks the essential point that "mutual orientation and adaptation" is socially determined.

**9** Conceiving the world outside as an order of entitative subjects or objects, a thinking subject distinguishes "things" according to a certain interface-criterion that confines the trivialized visuality as a product of initial socialization (towards a certain balance of attention and memory; §§4–16). The pure cognitive-psychological explanation above undervalues the intent of socialization, which is to restrict the autonomous orientation of the subjects involved. With those intentions, inter-subjectivity is enabled to concentrate its efforts against those energies that cannot be conceived and absorbed on an individual level. Confined for being "destructive" or termed as "enemies," the inter-subjectively absorbed hindrances quasi *ad negativum* define the sets of "viable patterns" as inter-subjective *validities* (realized as inter-subjectively stable objects, communicated as notions, etc.).

**10** As might be expected by von Glasersfeld, from the visionary constructivist outline that gives an alternative to sociology (§§41–45), I intend to "merely propose a model of how one

could imagine" that emergence which we perceive as society "to be built up." In the specifically constructivist view, sociology appears to be a set of instruments used for individual interpretation (by a selected circle of experts) or – in my terms – a technology of valid knowledge rather than an empirical science. Here I use the term "technology" in the meaning of "know-how for trivializing, objectifying or re-producing meanings." In this case I have to claim a consistent cybernetic understanding of those relations between *autonomous orientation* and *inter-subjectivity* that I assume to be the subject of what I call "social cybernetics."

**11** Commending *radical* constructivism as an approach that aspires to a kind of thinking-consequence, I will try to interweave this commentary with my initial draft, thought-out in response to the views indicated in §§30–46.

**The drive of "combining efforts"**

**12** To consider the basic assumptions, the only reasonable purpose of inter-action seems to be to *combine efforts* (cumulating its drive inside the inter-subjectively objectified meanings in the form of "value" or "power"). So the only motivation for social action on the part of the *autonomously orienting subject* is the viability of combining efforts. The initial socialization includes, therefore, something like an "expectation of devotion," which is not challenged later on, becoming a stable part of the so-called psychic or mental *awareness* of the initially-socialized subject. This psychological perspective of understanding social action also seems to fit von Glasersfeld's understanding, indicated in §§31–33. By the term *inter-subjectivity*, I mean more than a purely communicative act, because it also implies the intentionality of intra-subjective operations, which is the subject of what we call "consciousness." By analogy, *intra-subjectivity* should be used instead of "psychic or mental structure."

**13** The mainly self-evident possibility of *combined efforts*, without running the risk of provoking a subject to reassess his or her social *awareness*, is to objectify its necessity as an external order of things (*externalization*), which is then a "ready-made ontological given, existing as such and independently of subjective experience" (§31). If we accept this concept, our *world of living* appears to be a medium of inter-subjectivity, and the "built-in" belief in reality is a medium of socializa-

tion. The significant aspect is, furthermore, a kind of ban on autonomous orientation, which is immanent in social action.

**"Actualization" as social technology?**

**14** To be socialized one must first devote one's potential as a subject of autonomous orientation to what we call "society," which is supposed to be a self-evident emergence of cumulating efforts. In the second step one must prepare oneself (through education) for acting as a *person* who is able to operate in accordance with a certain set of validities (as certain values or powers that are cumulated in the appropriate objectified notions) in order to re-produce their authority. This activity displaces the original drive towards autonomous orientation by using the energy destined for self-orienting (at the pre-social or biological level I would call "the level of embodiment"). As a person, one must act according to the rules that constitute the *technology* (in the above-mentioned meaning) of *actualization*. The origin of what we call "psychic" is therefore an experience of being dependant, in awareness of one's potential as an autonomously orienting subject, but alienated by the initial socialization (for the purpose of actualization).

**15** A hypothetical not-socialized subject will orient him- or herself autonomously for the biological purposes of self-maintenance and reproduction (I suggest calling these *embodiment*). A socialized subject will act, by contrast, in accordance with its society's set of rules. The meta-subjective purpose of social acting is what I call *actualization* ("Verwirklichung"), which is therefore a certain mode of constructing reality, based on the objectification of the specific validities. (By this position, I anticipate the possibility of alternative modes of constructing reality that would be still reason-legitimized but not necessarily *technological* – i.e trivializing, objectifying, re-producing and therefore analytical.)

**16** Those "actualizations" (as the absolute purpose of *combined efforts*) seem to fit with the initial *interest* of a self-orienting subject – as a living organism or an acting individual – in a stable *world of living* which filters the not-absorbable and, inasmuch, destructive energies (substantiated as hindrances). This initial *interest* explains the credit (the already mentioned devotion) that a self-orienting subject gives to that regulation which is required for socialization.

## Conceiving the inter-subjective "validities"

**17** Expecting a specific system of inter-subjectively validated "patterns" (applied here in the meaning implied in Simmel 1917), socialization suggests a set of rules for orientation for the involved subjects to be used as a kind of orientation-know-how. The latter fits that know-how of "trivialization" (in the meaning near to von Foerster 1998) that sustains the self-devotion of autonomous orientation.

**18** My proposal is therefore to use the term "validity" when language-related (inter-subjectively trivialized and thus socially dominated) separations are meant. Alienated from its usage in logic or statistics, this term denotes - besides the *technological* significance of the sociolinguistic perspective - both the economic aspect of "value" as well as the imperative aspect of "power." Subsequently the term "validity" means any consensually stable inter-subjective separations that link autonomous orientation for the needs of society. In this context "sociality" stands for a certain consensus of inter-subjectivity aimed at concentrating energies that have been diverted from individual orientation in order to construct a relatively stable *world of living* by creating, maintaining and managing "validities" inside a non-trivial "reality of ontological determinants." The term "validities" connotes, therefore, the determination mechanisms that are intrinsic in socialization. This implies the offer of autonomous orientation

for the non-subjective needs of an inter-subjective construction of *validities*. (In this context the term also implies a strong aspect of attentiveness that is important for conceiving of the mechanisms of mediality).

**19** A different perspective exposes the problem that can be observed if socially maintained *validities* emerge as autopoietic systems with their own interest in autonomy. In this case, any legitimization of validity becomes system-rational (reasonable in the terms of the systemic integrity), while no longer tied to individual orientation. The use of these validities to assemble reality is not obligatory for the subjects involved, hence I tend to define the "thinking subject" in general in the terms of his or her autonomy of orientation.

**20** This non-analytic commentary gives a good example of the interdisciplinary potential of "conceiving society." It also is a basis for possibility of a consequent constructivist alternative to any system-centered, validity-rational or even subject-hostile socialization concepts.

## The dictate of emerging "constancies"

**21** The outlined view reveals dimensions hidden under the ingenious simplicity of von Glasersfeld's solution, summarized in the abstract to "Who conceives of society?" According to his vision, both "recognizable objects in the experiential field" and "others" appear as *validities*, confined by their *constancy*. The

only difference between *subject* and *object constancies* seem to be linked to their potentiality as *orientation-driven* (subjects) and *cumulation-driven* (objects). Subjectivity (of living humans), motivated by embodiment, is therefore dominated by the actualization of validities motivated by power. The subjects of social acting perceive each other to be "objective" because of constancy, strained by the validity-driven *medialization* (in the meaning of Tsvasman 2006) as "identities."

**22** A self-orienting subject has no intrinsic motivation to be *constant* and therefore "objective," "real" or even "actual," until involved in a certain inter-subjective action. The only essential attitude of a self-orienting subject is *potentiality.* Even when socialized as "individuality" (or medialized as "identity"), the thinking subject remains no more than driven by autonomous orientation. The emergence of the *orientation-driven* validity-system (so-called "consciousness") is structurally equivalent to the emergence of the *cumulation-driven* validity-system (which is "reality"). Both appear to be products of socialization, a *power-driven* emergence of inter-subjective validization. The intrinsic goal of socialization is therefore reality-construction, which maintains the experiential world, populated by *persons* who sustain validities according to the rules of communicative handling. Being a certain mode of inter-subjectivity, the latter transforms the biological drive of *embodiment* into the power of *actualization.*

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## Does Brain Science Render Constructivism Superfluous?

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**1** Ernst von Glasersfeld draws an admirable picture of the constructivist viewpoint. The subjective world, including our interaction with the social world (including society) is not grounded in an objective-physical world but a psychological construction loosely or not at all correlated with the "objective" world. He describes the building blocks of the

inner construction of our view of society on a psychological level. I argue that present brain science arrived at a fairly precise knowledge base of the brain's constructive mechanisms - even of the social world. Social cognitive neuroscience has accumulated, in many ingenious experiments, knowledge of the brain processes behind the most elementary social behaviors such as empathy, imitation, attitudes, prejudices, and social emotions. Neither the basic neuroscience results nor social neuroscience is compatible with radical constructivism, which is a return to radical subjectivism. What do we gain from the notion that society is an individual's creation? Brain science has taught us over the last 100 years how this creation is built in our brain during evolution and development. We have learned

to ground psychological concepts in physiological constructs amenable to experimental verification and replication. Certainly, Donald Hebb's *The organization of behavior: A neuropsychological theory* (1949), constituted the end-point of introspective psychology and constructivism by translating the psychology of perception and learning into neural nets and cell assemblies. The years after 1949 up to today brought us an endless stream of discoveries in the neurosciences confirming Hebb's formulations.

**2** Perception and motor responses consist of associative networks in the brain that are build according to Hebbian cell-assemblies construction principles. What else can the brain do except connect repetitively synchronous active cells (in philosophical language: associ-

ations)? The brain is an associative store dependent upon spatial or/and temporal contiguity. Von Glasersfeld traces the concept back to Hume and to experimental psychology: Thorndike added emotional meaning through reward and punishment to the concept of association without questioning the fundamental role of classical conditioning (Pavlov) and associationism (Aristotle). So far, so good. There is general consensus among scientists that, the neural mechanisms behind constructivism, namely the formation of Hebbian cell assemblies is well researched and described in thousands of neurophysiological papers. There is also consensus that cell assembly formation needs the real physical world to construct upon: in the real world spatial and temporal contiguities arise and shape ("construct") the associative nets during the first years of our life. The remaining time of our short lives builds ornaments around these basic building blocks.

**3** What's the problem; why call it "constructivism" at all? What kind of "ism" is this, describing the banal reality of brain function in higher mammals? Extending the facts of cell assembly-construction to society does not pose an intellectual or logical problem: it is the associative brain that perceives, shapes ("constructs") and responds to social stimuli and cultural context. What is notable about this? What else should the brain do except associate social stimuli with simultaneously present and rewarding/punishing stimuli? That's what Hebb predicted and his theory culminated in the "molecular alphabet of learning" (Nobel prize 2000 to Eric Kandel). You may call these neurobiological phenomena subjectivity or radical constructivism, but it is nothing other than cell assembly formation, a well-known and safe haven for neuroscience, explored, among others, by Wolf Singer (Singer, Tretter & Cynader 1975), and describing the neural mechanisms behind associative binding: i.e., binding through oscillations allows a neurophysiological explanation of "meaning" and "significance" ("*Bedeutung*"). The "constructivist" view adds nothing and explains nothing, it rewords Hebbian (1949) theory, particularly when it comes to view society as each individual's construction. With or without a constructivist or behaviorist view society remains with the problems it always had: justice and injustice, economic "egalite" versus the present "liberalism" (the richer the better) - they all demand the same remedies whether these societal structures are physically "real" or "constructed." A constructivist revolution fought with weapons will result in the same dead and wounded, the same grief and pain, the same blood and sorrow as the marxistically motivated or mathematically predicted revolution.

**4** In the face of modern neuroscience we should give up on constructivism, even more so on radical constructivism, and stick to the physical and psychological reality given in science and daily life, even if it is the brain's illusion from associative networks. The illusion of constructivism may hurt!

**5** The critical arguments do not exclude philosophical and epistemological discourse from scientific progress (or regress). Philosophical dialog with the neurosciences is more important than ever. Neuroscientists tend to use their personal folk psychology to embrace naiveties such as rejecting the philosophical concept of "free will" from neuroscientific experimentation such as the studies of Benjamin Libet (1985). Libet used the subjective verbal report of his subjects as an indicator of the transfer from the unconscious to the conscious will. Because the brain signal, the slow cortical potential, preceded the verbal response of the subjects, he concluded that all conscious decisions are already unconsciously made beforehand by the brain, and reasoned that therefore there is no "free will." Brain scientists naive in human experimentation, such as Wolf Singer (2004) and Gerhard Roth (2007), were persuaded by that poor reasoning and accepted its logic. However, the occurrence of the brain signal before the verbal response may reflect many different processes such as slow response speed, placebo-expectancy effects, a slow physiological time constant of the slow cortical potential and many other possible confounds. So the same Singer who brilliantly confirmed Hebb's cell-assembly theory on a cellular level makes the categorical mistake of transferring a philosophical argument into a neural reality by declaring free will an illusion. These and other overgeneralizations of the neurosciences need to be restrained by educated philosophical interaction. Constructivism, however, with its emphasis on individual creation of the world on a subjective level is not a creative enough alternative to the neuroscientists' folk psychology, which argues out of the guts of subjective experience.

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## Intentions and Mirror Neurons: From the Individual to Overall Social Reality

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### Introduction

**1** Cognitive psychology, neurobiology, and cognitive systems research provide diverse clues as to how we are able to incrementally construct representations of the perceived environment and how we consequently understand other individuals and society. The construction of an individual's reality starts with the capability to control one's own body and to be able to predict the usual sensory effects caused by body movements. To be able to infer the potential intentions of others, mirror neurons project one's own behavioral codes onto perceived patterns that are caused by others. Equipped with representations of many other individuals, personal social realities are constructed. In this commentary, I focus on these points for the construction of social reality and the consequent existence of society as a whole.

### Perception and action

**2** Perception and motor control are multi-layered processes in which bottom-up sensory-based inputs are compared with and filtered by top-down anticipations (Herbort, Butz & Hoffmann 2005; Poggio & Bizzi 2004). Attention plays an important role in focusing the top-down mechanisms on certain aspects of the perceptions, probing the sensory inputs, so to say, based on internally generated representational hypotheses. However, besides the actual scan path taken to recognize an object or a particular individual in an image (§7), it is the verification of a certain hypothesized internal object representation and the elimination of alternative hypotheses

that establishes recognition. Similarly, incomplete forms are seen as a whole because the most likely hypothesis corroborates enough information (1) to generate the whole internally and (2) to project that whole onto the perceived patterned structure – leading to the perception of lines without the actual lines being present. Various insights in psychology and neuroscience support this view of perception, suggesting that perception is an active process in which top-down anticipations are merged with bottom-up sensory information (Butz, Sigaud, Pezzulo & Baldassarre 2007; Poggio & Bizzi 2004; Rao & Ballard 1999).

**3** However, these interactive processes are not limited to purely visual processing but also extend to the optimization of behavioral control (Poggio & Bizzi 2004). Schwartz, Moran & Reina (2004) have shown that premotor and motor cortical areas interact in the representation of arm location and in the control of movement direction. With respect to eye saccades, it has been confirmed that the consequences of a saccade are predicted and stabilized by reafference copies stemming from the superior colliculus (Sommer & Wurtz 2006; Vaziri, Diedrichsen, & Shadmehr 2006). Behaviorally, it has been shown that forward models are inevitable in accomplishing adaptive and stabilizing arm movements (Desmurget & Grafton 2000; Mehta & Schaal 2002). Thus, interactive top-down, bottom-up anticipatory processes are involved in perceptual processes, action control, and interactions between the two.

### Mirror neurons

**4** Based on such interactive encodings, effects of motor activity can be attributed to individual bodily constraints – filtering sensory effects caused by motor actions. However, changes in sensory stimulation may not only be caused by our own movements but also by other environmental factors, such as movements of other objects or living beings. The comparison between the anticipated next sensory stimulation and the actual incoming information yields clues about the surrounding environment. The brain can use the resulting difference information to generate hypotheses of what is currently out there in the world.

**5** The information may suffice for learning distinctions between bodily self-induced perceptions and other things in the world. It may

also suffice to distinguish between inanimate objects and actual other living creatures, since the latter will move in non-regular patterns and thus cause irregular (or complex regular) perceptual changes in the observer (§18). However, in order to also deduce the intentions of perceived others in the environment, another capability appears necessary.

**6** The detection of *mirror neurons* suggests that the brain manages to deduce the intentions of others from mirroring its own behavioral dynamics onto the observed dynamics produced by other individuals, commonly representing behavioral patterns of itself and others (Rizzolatti et al. 1996). Mirror neurons in monkeys are active only when the purpose of an observed behavior can directly be inferred. For example, it has been shown that mirror neurons are active when a monkey sees somebody grasping an object even when the object is not visible (but the monkey knows that the object is present). However, they are inactive when the monkey sees the same action without the object being present (Umiltà et al. 2001). This property suggests a strong role of mirror neurons in action understanding rather than action representation.

**7** In humans, such mirror capabilities appear much more advanced, enabling, for example, learning by imitation (cf. Rizzolatti & Craighero 2004, for a review). Various recent publications suggest that mirror neurons may set the stage for language development (in several additional evolutionary and cultural developmental stages, cf. Arbib 2002; Rizzolatti & Arbib 1998) as well as for the development of empathy and social cognition in general (Gallese 2001; Gallese 2003). These observations support Kant's early hypothesis that we put ourselves in the place of others (§20), specified also in the more recent *simulation theory* of understanding other individuals (Gallese & Goldman 1998). However, they corroborate this hypothesis with neural evidence and give the further hint that our understanding of others and, ultimately, social reality is not only based on the mere simulation of observed behaviors but also on the *anticipation of the intentions, motivations, and emotions* of others.

### Social reality

**8** With the capability to deduce the *intentions* of other individuals, effective interactions with the perceived social reality become

possible. In the growing child, social reality can be constructed starting from a very small set of known people and the representation of their minds, thoughts, and behaviors. However, the mirror system suggests that this initial representation of a community (§39) is not based on a simple set of individuals, but rather on a set of intentional beings, who can be trusted, loved, or hated, depending on the supposed intentions that we attribute to each of them. Thus, a community of trusted individuals will form and distinguish itself from the set of other, strange individuals to whom we have trouble attributing intentions (because they are so different from ourselves) or to whom we attribute bad intentions. Thus, as von Glasersfeld states in §41, drives, interests, purposes, and inclinations serve as the basis of socialization but they are embedded into our own behavioral intentional control system. The constructed social reality thus depends on our own capability of attributing these intentional elements to other individuals in society.

**9** Consequently, society as a whole must emerge out of these basic principles. Knowledge and also language are inevitably embedded in individually constructed social realities (§45). Von Glasersfeld, however, draws the conclusion that "it is not legitimate for social constructivists to postulate interactions between their own abstractions and other individuals who are in the society" (§46) and that it is "misleading if social constructionists and other socially oriented constructivists speak of language or knowledge as though these items existed in a generally accessible environment" (§45). Although individual biases in social studies often do occur, it should be further emphasized that language and knowledge in society exist due to a common set of shared symbolic items and cultural norms in a group of people, for which this set of symbols (that is, particularly, language and other symbolic norms) has a generally – albeit individually slightly differing – commonly accepted meaning. Society is *alive* itself and teaches its children how these symbols are generally understood – but each child re-interprets these symbols anew, leading to the continuous evolution of society and culture as a whole (somewhat in accordance with §42). Hand-in-hand with individual social realities, consequently, society and culture continuously evolve, re-fining, re-defining,

and re-interpreting language and knowledge as a whole – implicitly realized in the overall social community. Due to this social commonality, however, it seems to me that surveys and social studies can very well assess overall knowledge states or language perceptions and thus also have the right to speak of language or knowledge in terms of an overall (averaged) state of society.

**Summary**

[10] While top-down bottom-up interactive processes in perception, motor control, and interactions of the two can set the stage for successful interactions with the environment as well as for the detection of other objects and individuals in this environment – very much in accordance with the constructivist approach put forward by von Glasersfeld – *mirror neurons* set the stage to understand the intentions behind the observed behavior of other individuals. The development of each individual's social reality is mediated by these representational constraints and capabilities – understanding others, knowledge, language, and society based on the self-developed intentional system. Besides the individual constructivist perspective, though, society as a whole may be viewed as a self-developing reality that exists in its own right, albeit clearly never without a sufficient set of individuals that continuously causes the further evolution of that society. Due to this overall commonality, social survey-based studies may very well yield a glimpse of the overall state of society without scientists necessarily forcing their own opinions onto the results of their studies.

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## A Mind of Many

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[1] In his own words, von Glasersfeld can think of "no better way" to approach the question of how we form our knowledge of society than to "examine how patterns arise from the perception of disconnected elements" (§1). Accordingly, he briefly examines the active elements in visual perception (in particular perception of images). This move plays the role of a first step in a story of individual construction of knowledge of what would seem to be increasingly complex entities, namely, objects, animals, humans, social agents, social institutions, communities, etc., each constructed out of fully constituted but "not yet properly connected" simpler elements. The result is an individualist, locked-in, notion of society, both in the sense that social entities are understood (constructed) by individual minds first and foremost and in the sense that they are composed of ready made atomic elements (intentional agents already constructed as self-sufficient by an individual mind).

[2] What this view denies (without argument or evidence) is any intervention of "higher order" elements (e.g., social norms and institutions, language, etc) in the very processes that are involved in their construction as knowable entities by individuals. We should note that this is not the same as denying any involvement of social categories in the formation of an individual's knowledge of them (that would be non-sensical), but it does mean that this intervention is inherently external to individual construction and consequently society only plays the role of a constraining factor that must be satisfied by a process of constitution that is the sole responsibility of an isolated mind. While von Glasersfeld's "epistemological model involves consciousness, memory, and some basic values" (§47), our argument from an enactive perspective is that these axiomatic elements are not atomic and already imply the participation of those social processes they intend to ground and that this fundamental intervention happens before these processes are constituted as knowable by the individual mind they shape.

[3] While sharing many elements with radical constructivism, e.g., the role of viability constraints and the logic of fitting vs. matching, the enactive approach to cognition (Thompson 2007; Varela, Thompson & Rosch 1991) would see this account of sociality as very one-sided and hence likely to miss a proper understanding of crucial social phenomena.

[4] Our objection begins with von Glasersfeld's initial step (and could be repeated in a similar vein in the remaining moves). How is it warranted that the activity by which an individual constructs the perception of a visual image is totally devoid of social influence? Do we really learn to *see* images on our own as isolated individuals? Like von Glasersfeld, let us consider static images. Studies on the origins of image making have shown that our capability for perceiving images as such is nothing if not a rather late and culturally laden achievement of the evolution of the human mind. Our ancestors only started making images (and understanding them as such) around 30,000 years ago in the spiritual paintings of cave art. Our culture is so saturated with images that the problem of how they first became capable of making and understanding them strikes us as a non-problem: we simply do it and it seems apparent that this would be a natural capability of our minds. However, when we consider that no activity of image-making (or of perception of human-made images) pre-existed the first image ever made, we start to wonder how this understanding could have developed in a world devoid of such images.

[5] There are interesting theories of how this may have happened (e.g., Lewis-Williams 2002), but I want to draw attention to certain facts that are discovered along the way to answering this mystery. It turns out that the perception of images is a socially mediated activity. For instance, in studying the Abelam people in New Guinea, Forge found that adults could simply not "see" anything when shown photographs of themselves and others if they were not head-on shots. Only with some training would young children begin to develop an ability to comprehend the convention of photographical representation. He concluded that their vision had been socialized in a way that makes photographs especially hard to see (Forge 1970; see also Segall, Campbell & Herskovits 1966). Similarly, stories abound in the history of art of "culture clashes" in how images are intended to be understood. Henri Breuil (Spivey 2006) tells of a 19th century Turkish man who, on being shown a "realistic" painting of a horse, said that he could see no resemblance between the pattern on the canvas and a horse. "A horse has a backside, you can walk around it; that thing on the wall does not even begin to resemble a horse."

**6** We may assume here as uncontroversial that the socialization that leads to human-made image perception is unlikely to leave the processes of general visual perception unaffected. We can then see that even for activities that would seem to come naturally to an individual and isolated mind, the processes of development that lead to the capacity for performing these activities are already socially-mediated. (Isn't this also the case in apparently "natural" and "universal" skills such as bipedal walking? Are not the accounts of feral children raised in the absence of human intervention who walk on four legs the ultimate proof of social mediation at the most fundamental levels of individual activity?)

**7** An even stronger case could be made for the perception of animality and the perception of other persons. Von Glasersfeld suggests that, as we develop, we keep on adding categories such as intentions, plans and the notion of the other and of communities, to individually constructed perceptions in what he sees as a natural scale of complexity. However, evidence shows that the hierarchy on this scale is very questionable. Infants already respond to others as others (Trevarthen 1979) and they are able to engage in interactions a few hours after being born (Meltzoff & Borton 1979). They become sophisticated social beings much earlier than we can safely say that they develop the concept of an object or an image (Stern 2002). These apparently higher-level social elements are already present before constructive abilities that would seem to require no sociality – moreover, a good body of evidence suggest that those abilities actually rely on the appropriate development of such close social skills (Trevarthen & Hubley 1978). If we construe knowledge as an embodied and situated coping, an infant's knowledge about sociality comes too early to fit von Glasersfeld's story.

**8** An enactive approach to cognition (Di Paolo, Rohde & De Jaegher 2008; Thompson 2007; Varela, Thompson & Rosch 1991) recognises the constructive activity of the individual mind. It has a specific name for it: *sense-making*. This activity is what defines a cognitive agent as such. Its constructive aspects have been argued for extensively in ways that strongly overlap with von Glasersfeld's radical constructivism (Varela, Thompson & Rosch 1991). In addition, the logic of sense-making has recently been formally

grounded on the processes of self-constitution of living beings (Di Paolo 2005; Jonas 1966; Thompson 2007; Weber & Varela 2001). However, unlike radical constructivism, the enactive approach places the notions of autonomy and emergence on an equal footing to those of experience and sense-making. Under the resulting, more dialectical view, it becomes evident that the level of the individual is not the only autonomous level upon which a cognitive entity might emerge. Social interactions as dynamical processes – let alone social institutions – may themselves acquire an autonomy beyond that of the individuals that participate in them, and steer themselves in a direction that may not be that of the individual intentions that participate in them (as anyone stuck in trying to get past an oncoming person along a narrow corridor, or anyone participating in a sour argument that every person involved in is desperately trying to avoid, may have experienced). A detailed exposition of how enactivism can be extended to social interactions and the resulting tensions between different kinds of autonomy can be found in De Jaegher & Di Paolo (2007).

**9** In this view, individuals are as much constituted by social processes as they constitute them. A good set of definitional properties that make me an individual are provided by the social processes through which I develop as such, including my knowledge of myself, my world and my community (this is not about separating this developmental engagement into cultural and biological elements – this would miss the point that humans are precisely those beings that culturally steer their biology in body, action and experience in order to become a project unto themselves, beings concerned with their own being). And, in a mutually constraining and constituting loop, social institutions and interactions cannot completely erase individual autonomy if they are to remain viable themselves (though this does not rule out the possibility of widespread oppression).

**10** Individual minds come to know about society by the combination of their own individual activity (whose origins are socially mediated) and their direct *participation* in social interaction, not just its observation. There is no better evidence for this than the phenomenology of intersubjectivity, in particular as spelled out by Sartre, Merleau-Ponty, Gurwitsch and Schütz, who von Gla-

sersfeld himself cites. The experience of the alterity of the other, of her alternations between being for me a fully understandable entity I can interact with and a totally opaque centre of subjectivity that pushes me around with intentions that I find mystifying, is the clearest evidence of the direct participation of social processes in individual sense-making. In examining Husserl's later accounts of transcendental intersubjectivity, which already concede the primordiality of intersubjectivity over the constitution of objects, Schütz still finds it problematic and inaccurate as an account of how others are experienced in their whole otherness and also as subjects that constitute ourselves with their actions, their gaze, and ultimately through social norms (Schütz 1966). Schütz finds even the later Husserl still too individualistic.

**11** It would be simply impossible to provide a clean and productive passage between the sciences of life and cognition to the sciences of sociality if we could not acknowledge the complexity and mutual influence among the different entities we encounter along this spectrum (from genes, to organs, to bodies, to animal selves, personal selves, socio-linguistic selves, interactions, communities and institutions, etc.). There is no simple linear progression that tells the full story. If there was, the result would be the kind of universal, reductive social science that von Glasersfeld seems to prefer, one that is itself devoid of social influences, one that is based on "more or less accepted methods" that the attentive observer gleans from experiences, experiments and statistics (§43). Such a cocktail may make perfect sense for a contemporary Western scientist, but it may be a poor recipe for understanding and successfully negotiating the complexities of other cultures. Ironically, this difficulty is an implication of radical constructivism itself – one that von Glasersfeld does not draw – and this is so precisely because *the relations between individuals and societies follow the law of fit rather than match*: different societies and their individuals drift to different satisfying conditions of viability. It makes little sense as a general rule to employ the methods that work for knowledge generation in one society indiscriminately to achieve the understanding of another.

**12** It should be clear that, though critical of a *Rear Window* approach to the social, the enactive approach shares a lot with radical

constructivism: its logic of fit, the eschewing of useless conversations about "reality", and the commitment to pragmatic and scientific approaches to knowledge. Von Glasersfeld ends his essay by signalling his distancing from post-modernism. While I agree with this discomfort, I think von Glasersfeld essentially reverts to a modernist view. Enactivism should perhaps be seen as an attempt to overcome and transcend postmodernism without ignoring its lessons. This would mean a return to reason for sure, but a reason that is embodied and socially situated, aware of its limitations and with no claims to universality.

## Towards a Radically Social Constructivism

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**1** The first 22 paragraphs of Ernst von Glasersfeld's paper constitute the clearest introduction to *radical constructivism* I have read. It is eminently readable and I would recommend it to anyone who has the slightest uncertainty about this version of constructivism. It does not cover new ground, but being clearly written is a virtue and Ernst is its unquestioned authority.

**2** I have some minor comments on his section 4, on communication. Here, Ernst draws a valuable distinction between *training* and *teaching*. Educators have the choice between training someone to perform - whether to excel in a sport, perform a calculation, or become literate - and what Ernst calls "engendering understanding," facilitating the creation of meaning for what is said. Criteria for achieving the former are set by the educator. Criteria for achieving the latter come from the learner's experiences and interests, considered subjective by some. Both processes being instrumental, their conceptions are embedded in an asymmetrical teacher-student relationship. Both also coincide with the communication-theoretical distinction between senders and receivers, for which Ernst cites Shannon (1948) as an example. There are other notions of communication. But before I introduce one of them in my §13, let me take a look at his §25.

**3** In §25, Ernst describes Shannon's technical model of communication. It involves physical signals – sounds, images, and electronic impulses – traveling from one communicator to another. The physical signals chosen by the sender, he suggests, "should be considered as instructions to select particular meanings from a list that, together with the list of agreed signals, constitute the 'code.'" The communication theorist's presumption is that communication requires both to use a common code. When tying the same physical signals to the same experiences, communicators will be able to understand each other.

**4** I fully accept the radical constructivist premise of *cognitive autonomy*, asserting that our nervous system does not have direct access to what exists outside of it and can only construct the world one comes to know in terms of its own processes. For humans to practice their living, their constructed world must persist in the presence of perturbations from an environment, or in Ernst's terms, it must "fit" that environment. Thus, conceptual structures cannot be regarded as representing something principally inaccessible. Accepting this premise entails that we have no direct access to the cognition of others either. What is meaningful to me may mean something quite different to someone else and that difference does not matter unless it interferes with my own world.

**5** What then are the physical signals of Shannon-like communication theorists? Are they not the meanings that physicists (as detached observers) attribute to what they are trained to perceive and measure? If one takes physical signals not as external events but as having the meanings that observing physicists ascribe to them, then the code that the communication theorist seeks to discover cannot relate meanings to signals and back to meanings, as the theory demands, but must relate accounts of a sender's experience to accounts of the communication theorist's experiences and to accounts of the receiver's experiences. But how can an observer do that?

**6** I concur with Ernst's answer that it can't be done. Each receiver of communications selects meanings of what was said in relation to his or her past experiences. Ernst explains that "to understand what someone has said or written means no less but also no more than to have built up a conceptual structure that, in the given context, appears to be compatible with the structure the speaker has in mind. And this compatibility, as a rule, manifests itself in no other way than that the receiver says and does nothing that contravenes the speaker's expectations" (§28). Unable to know when one's conceptual structure is compatible with another, Ernst settles on the implication of presuming this inability: no evidence to the contrary.

**7** A communication theorist of the Shannon variety who accepts my qualifications §§4–6 may well assume experiences and meanings to be involved on both sides of a communication channel, but without direct access to them, that theorist cannot possibly construct a code – except by projecting his or her own experiences on senders and receivers. This cognitive ability is what Ernst characterizes with Kant as "imput(ing) to our conspecifics the cognitive abilities that we become aware of in ourselves" (§22). Since this confines us to our own cognition, how would someone else's understanding be manifest? Here my answer deviates from Ernst's conception of meaning as that which speakers construct and associate with words, phrases, and larger units of speech or writing before generating "an approximate understanding of what it (they) mean(s) to other speakers" (§27). Short of the absence of "occasions when we realize that, up to that point in time, we have been using a word in a way that now turns out to be idiosyncratic in some particular respect" (§27), when do we know understanding has been accomplished? What is the meaning of "understanding"?

**8** First of all, "*understanding*" is a word used widely, not just by communication theorists. It is uttered by someone in the presence of others, whether in response to something said or written (actually, also concerning a practice). It does not occur in anyone's mind. Asserting "*I understand*" implies little, if anything, about whether two conceptual structures match (as in the idea of understanding as cognitive sharing), are compatible (as in the idea of under-

standing as two conceptual structures fitting like a hand in a glove), or I have generated "an approximate understanding of what (a word) means to other speakers" (§27). To state a relationship between two conceptual structures one must know both, even if we made them up. But we operate only our own. To me, "*I understand*" signals nothing other than my sense of closure and my willingness to go on talking about something else. Saying "*I understand*" amounts to a conversational move. It suggests a particular turn. It is an act that I perform in language expecting a response.

**9** Acts do something, whether performed in or without speech. Words or linguistic utterances do not merely invoke experiences, as Ernst suggests, they can change the course of one's actions, permit one to go on. Any speech act, performed by a speaker, may be accepted by its addressee or interrogated. Saying "*I understand*" is (implicitly) accepted when the conversation continues to another issue. It is interrogated when I am requested to give reasons for saying so, which in turn may be accepted or may result in further interrogations.

**10** Likewise, its negation, "*I don't understand,*" serves as my request for elaborations on what was said, and it may be repeated until understanding is confirmed. Between asserting a lack of understanding and claiming its restoration, speakers juggle to coordinate their understanding to what they see or hear, knowing only whether they feel justified in saying "I understand," and at best hypothesizing whether others would say this as well. "I (don't) understand" has dialogical meaning.

**11** In these terms, educators may talk, trusting their intuition of being understood, until someone interrupts the flow. For those whom Ernst calls *teachers* – aiming at understanding – an interruption consists of hearing an utterance like "*I don't understand.*" Devoted teachers take their time to repair the interruption, until they hear their students saying something to the effect of "*now I understand.*" By contrast, and I am not sure if Ernst would go so far, when educators watch for something that disconfirms or contravenes their own expectations, then they become *trainers*. Trainers apply their own criteria to what they observe to determine whether the students' performance is acceptable: giving the correct or a reasonable answer to a test question, adequately building on what was said, or writing

without violating grammatical rules. As Ernst stated in other publications (Glasersfeld 1984, 1991, 1995), none of this says anything about how the student actually conceptualizes a task and I therefore wonder why we are so concerned about conceptions, fitting or not.

**12** Note that in Ernst's examples, communication between educators and students is asymmetrical. Influence and information is assumed to flow one-way, and both parties must accept their inequality for teaching or training to succeed. As Gregory Bateson (1972) taught us, human communication can be symmetrical or asymmetrical. I do not think Ernst would disagree. However, to come to grips with social phenomena – as in Ernst's question "Who conceives society" in section 5 of his paper – one needs to explore a more general paradigm of communication in order to discuss social constructions that are more specific than "society." Otherwise, one may get lost in abstractions.

**13** To me, the most basic and far-reaching experience-based paradigm of communication takes off from the concept of *con-sensual co-ordination*. Maturana and Varela (1992) coined this phrase without developing it fully. In the organization theory literature it is called "co-orientation." Inserting a dash into "co-ordination" suggests cooperation rather than what managers do for their subordinates and inserting a dash into "con-sensual" suggests something like "jointly sensed or perceived" as opposed to "reaching consensus," such as during a meeting. Accordingly, I take consensual coordination to be (1) the experience of *participating* in a situation in which (2) participants observe *each other*, i.e., perceive others and presume to be perceived by them as well, and (3) coordinate their actions in the presence of something *seen as jointly attended to*. The latter may be the context of that coordination, goods exchanged for services, a topic under discussion, or a technology used jointly. Examples of consensual coordination include birds flying in formation, the accident-free flow of dense traffic on a highway, people talking about the same TV show, and a family conversing at a dinner table. In case of the latter, each family member has a concept of belonging to the family, not necessarily shared. They see each other sitting at the table, observe what everyone is eating, hear what everyone is saying, and can conceptualize how the dinner conversation unfolds. Note that the definition

of consensual coordination does not rely on whether it is symmetrical or asymmetrical.

**14** I am suggesting that conversation, such as at a dinner table, is paradigmatic of all social formations. It is jointly managed by its participants and entirely self-organizing. It proceeds consensually from topic to topic, punctuated by speech acts and conversational turns without repeating itself, and it evolves in front of everyone's eyes and ears. Participants feel free to articulate their experiences as long as they believe that they are of interest to other participants. Their cognitive autonomy (including their bodily integrity) is respected by acknowledging and braiding their individual contributions into a consensually available thread. Understanding becomes coordinated around this thread. It is no longer an individual's conception, but the consensual part of the conversational coordination. While a conversation may accomplish something in passing, e.g., eating dinner or learning something that brings about other kinds of coordinations elsewhere, convergence is not a requirement. By (my) definition, all conversations preserve the possibility of their continuation at another time or place and with the same or different participants. In other words, when people with the right kind of conversational experiences meet in the right kind of contexts, conversation may be reconstituted and continue.

**15** In claiming that conversation is paradigmatic of all social formations, I am suggesting that other forms can be explained by recognizing constraints on the ideal conversation. For example, in interview situations, dialogical equality is suspended, one asks questions and the other agrees to answer them. In negotiations of a business deal or labor dispute, there is the desire to converge to a resolution and no desire to continue indefinitely. In the exertion of power over subordinates, accountability is unevenly distributed, communicators are not dialogically equal. In the conduct of science, scientists agree to speak and write in terms of a discipline-specific vocabulary, a formal discourse.

**16** I agree with Ernst's criticism of social constructionists' (written with "on," e.g., Gergen, 1994) taking interpersonal relations as ontological givens and developing concepts of cognition as derived from them (§31). But I would not want constructivism (written with a "v") to be limited to the study of individual

cognition. Unlike Ernst, to me, "society," besides being too abstract to experience as such, is *not* merely "a collective term for the handful of people we have learned to recognize … and to whom we may describe a number of common characteristics as well as individual differences (plus) people whom we consider part of the community even though we have only seen them casually or heard or read of them" (§39). Social formations cannot be reduced to collective terms as for "furniture," "water," or "group," here of a group of people with mutually fitting individual cognitions. From the perspective of a detached observer, a society may well be conceived as a collectivity, but it can be experienced only by *active participation*. And because participation in society entails taking part in shaping it, the social forms within which society manifests itself should be conceived of as *social constructions in progress*.

**17** For example, while it is likely that migratory birds tacitly know their annual route, it is unlikely that geese, for example, have a fixed idea of the formation in which they are flying. Their formation is the result of consensual coordination among a few immediate neighbors. We may observe one goose in front of a formation but this does not mean it is the designated leader of the flock. Geese take turns in that position much like we take turns in conversations. Studies suggest that the formations that emerge during the flight of geese reflect the makeup of their visual apparatus, consensorily invoked during flight – much as we take turns in conversations because it is physiologically difficult for us to speak to others and listen to them at the same time.

**18** On the other hand, consider the other extreme, well short of society: working for a large social organization. Being on the faculty of the University of Pennsylvania, I have learned what to say and how to respond to colleagues, students and administrators in my physical, academic, and functional proximity. I have an abstract idea of the university's organizational hierarchy and a concept of its mission. I can read applicable rules of conduct representing the history of how the university resolved past problems. I continuously renegotiate my identity within limits acceptable to others. I make commitments and keep them, and I employ speech acts to rearrange my environment in order to succeed in what I want to do. Should I violate

written rules, I am sure to get a response from pertinent office holders, without knowing who that will be since individuals change their roles more often than the definition of their offices. I am reading their response in terms of the rules that make it possible for me to be faculty member, which tend to exceed the lifespan of most university employees. True, a social organization can work only when sufficient numbers and kinds of qualified individuals are willing to work under the umbrella of a conceptual whole; it is the network of communication, written or spoken, that links my participation to what the other participants enable me to do.

**19** I am suggesting that all social organizations are realized (made real) in networks of conversations, develop their own histories, and are facilitated and constrained by infrastructure – ranging from buildings to house these conversations to technologies adopted to coordinate various organizational efforts – that distributes resources obtained from their environment among members. All social organizations also develop a culture, institutionalize their rules and practices, and keep records that enable its current members to read the organization's past and consensually coordinate their future conduct.

**20** Individual members of a social organization may shift participation from one conversation to another but become privy to only a few. Individual experiences of the whole are limited to particular vocabularies, utterances, and narratives that enter and become part of the conversations in which they participate. It is in the use of such language that the institutionalized rules and practices of their organization are invoked, shaped, and reinterpreted. Participants in conversations employ speech acts to create joint accomplishments (consensual coordinations) and hold each other accountable for their respective contributions. What happens outside of conversations reveals itself either by drawing outsiders' voices, vocabularies, narratives, and writing into one's conversation or by making parts of one conversation available to other conversations.

**21** Clearly, cognition cannot be observed. It needs to be inferred. Conceptual structures are abstracted from behaviors, especially from linguistic accounts generated when languaging with others. Such abstractions may be obtained from interviewing subjects, observ-

ing behaviors assumed to involve thought processes, or content-analyzing texts found circulating within a social formation. Even non-verbal experiments, often conducted by radical constructivists, are wrapped in language: subjects are instructed what to do; observations are recorded, described and analyzed in categories derived from literature; and findings are discussed among colleagues and published. Assertions about conceptual structures not only rely on language, they also concern the use of language by others. Languaging, spoken and listened to, written and read, is individually experienced but consensually created, inherently interpersonal, essentially social, and participatory in the sense that listeners and readers codetermine what makes sense for speakers to say or writers to write, even dancers to express. If this is so, I question the benefits of ignoring the social nature of the linguistic data by isolating what could be explained psychologically and by abstracting conceptual structures from such data. Cognitive explanations of social realities limit our ability to cope with that world to descriptions of its parts at the expense of the larger picture that we construct and consult in everyday life. Shouldn't we abandon the individualism inherited from psychology and instead study how we communicate with each other, actively participate in phenomena of joint interest, and experience the social realities that we are always in the process of co-constructing – consensually?

**22** To learn how we socially construct our realities, I suggest we start by exploring: (1) the constitutive role of *individual participation* in conversations; (2) the *interactive (dialogical) use of language* - speech acts, language games, and conversations that are born in and alter their users' consensual coordination and perception; (3) the role of *vocabularies and narratives* that constrain these conversations in the name of the social formations of which these conversations are a part; (4) the *texts* that (social organizations or networks of) conversations consensually generate, record or pass on to other conversations from which they *come back to their source, rearticulated or responded to,* affecting the generation of future texts; (4) exploring ways to *weave the conversations in which we participate into networks of conversations*, into social systems that appear entirely virtual, but manifest themselves in the constraints adopted in and/or

imposed on our conversations; and finally (5) developing *methods for analyzing consensually available linguistic data*, narratives, and speech acts, such that their results can affect ongoing conversations, improving them or challenging unbearable constraints that make participation unproductive and joyless. Succeeding in the latter would demonstrate one's competence as a participant in a social forma-

tion (viability), which is a criterion stronger than passive conceptualization.

**23** The foregoing is intended to claim a place for a *radically social constructivism* that does not rely on the metaphysical assumption of ontological givens, avoids on cognitivist abstractions (or reductions) from the communication processes in which we realize ourselves as human beings, but on the embodied

and largely linguistic practices of conversing with one another. Languaging is an intrinsically social phenomenon and so are all explanations that are grounded in language. As Ludwig Wittgenstein (1953) said about language, everything worth talking about is there, nothing is hidden; there is no private language; to which I would add that the cognition we talk of is not private either.

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## Society, Social Construction, and the Sociological Imagination

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**1** The issues raised by Ernst von Glasersfeld's paper, "Who Conceives of Society?", reflect long standing debates about the status of the social sciences among the scientific disciplines. There is still, indeed, an ongoing debate in the social sciences on whether there exists an entity that we could call society (cf. Mayhew 1968). Is the very idea of "society" rooted in the ideology of a particular class structure? Is "society" at the outset, as von Glasersfeld contends, the "handful of people we have learned to recognize" and then "extended" (§39)? His approach in general is rooted in cognitive, psychological, individualistic thinking. This is so alien to how sociologists think that it is hard to find the right standpoint from which to comment on von Glasersfeld's paper. The atomistic individual that von Glasersfeld grounds his views on is, from the sociological perspective, an ontological fabrication. One could imagine stepping back from both my sociology and von Glasersfeld's philosophy to argue that both the "individual" and "society" are ideological constructs and not natural kinds. The argument that societies and individuals are too mutable to be natural kinds can be countered in at least two ways: one is to adopt the Aristotelian notion of a second nature; the second is to view society, culture, and humans as part of nature. Von Glasersfeld claims that socialization arises from drives, interests, purposes, and inclinations (§41). These are all functions

of intelligence, and none of these is a social phenomenon. The concept of society, he claims, "has to be formed by each individual by means of generalization from his or her own experiences" (§42). This sort of methodological individualism views the individual as a natural kind and society as an artificial construction. In the wake of the new sociology of science, which has demonstrated the dangers of trying to distinguish immutable facts from our descriptions of the world, methodological individualism is doubly problematic. It violates the fundamental perspective that drives sociology, and it ignores the empirical results of the new sociology of science.

**2** Nonetheless, von Glasersfeld's effort seems like a reasonable undertaking because the realm of the social is widely assumed to be transparent to any undisciplined gaze. In fact, it is no more transparent to the non-sociologist than is the realm of quantum reality to the non-physicist. I have no competence as a physicist simply because I can "see," "feel," "taste," "smell," or "hear" features of the physical world that are the starting point for training, education and research in physics. So even before the substantive problems addressed in von Glasersfeld's paper come into focus, we are faced with the problem of what to make of remarks that begin by eliminating the very credibility of the sociological perspective. Unlike von Glasersfeld, I do not believe that "everyone is free to invent his or her own metaphysics" (§32). What is one to make of his assertion that he is "…not well versed in sociology, but…" (§40)? This "but" is an invitation to an implausible suspension of disbelief. Would such a "but" not sanction a social scientist to follow up the assertion, "I cannot claim to be well versed in physics, but…" with ungrounded, untutored, and incredible remarks on everything from geometrodynamics to tensors and from black

body radiation to string theory? And even then we must note that for sociologists, intellectual styles and metaphysics are properties of social networks, social institutions and cultures, and not of individuals.

**3** I am at a great disadvantage here since every effort I make to correct von Glasersfeld's conception of how sociologists understand society and social construction plays directly into his critique. Von Glasersfeld says X, Restivo says Y, but Y can only reiterate what von Glasersfeld objects to. Given this impasse, is there any way in which this paper contributes to or reflects almost two hundred years of systematic and cumulative sociological theory and research? This is hardly possible given that von Glasersfeld has restricted his sociological grounding to two classical thinkers, Simmel and Schütz, who, for all of their brilliance, have long been incorporated or surpassed, and from our own period, to Niklas Luhmann. Luhmann, one of the most advanced theorists in modern sociology, is hardly the place to go for help if you are not well versed in sociology.

**4** All of von Glasersfeld's claims are grounded in the sociologically untenable view of the "individual" as a real identifiable entity, something that is independent of society and manifests "subjectivity." By contrast, I view "society" as an adaptive strategy and a discoverable unit of scientific analysis that emerged on the evolutionary landscape long before humans did. That is, social organization is a mechanism for survival and adaptation, a mechanism already visible in cellular cooperation and grouping behavior in pre-mammalian evolution. When humans "arrived", they arrived already social, not as a collection of atomistic individuals. Every time von Glasersfeld uses the term "individual" or "subjective experience", he takes for granted what must be interrogated and what has in fact

been made problematic by sociologists (not to mention philosophers such as Nietzsche and Wittgenstein). Sociologists simply do not describe the way we come to conceive "society" in individualistic terms. Karl Marx offers one of the first and most concise statements of the sociological view of self, mind, and consciousness:

> "Even when I carry out scientific work, etc., an activity which I can seldom conduct in direct association with other men – I perform a social, because human, act. It is not only the material of my activity – like the language itself which the thinker uses – which is given to me as a social product. My own existence is a social activity" (Marx 1958, p. 104).

**5** This insight has been theoretically refined and empirically substantiated in the works of such sociological thinkers as George Herbert Mead (1967), Erving Goffman (1967), Mary Douglas (1986), C. Wright Mills (1959), Randall Collins (1998, 2005), Dorothy Smith (1999), and, in the sociology of mathematics in particular, Restivo (1992), David Bloor, (1976) and Donald MacKenzie (1981). This is the tip of an iceberg of research and literature that should be consulted and digested before one can credibly claim to say anything about what "society" and "social construction" are that does justice to the discipline of sociology. This illustrates the danger of imposing a "freely chosen" metaphysics onto the sociological landscape. If von Glasersfeld wishes to offer a philosophical critique of sociological ideas, he should be obliged first to capture those ideas in the native's own terms. Sociologists do not arrive at "society" by way of individuals but rather by way of social units of analysis such as play, games, rituals, structures, and networks. Consciousness itself appears as a function of networks of social relationships already in classical social theorists from Nietzsche and Marx to Mead.

**6** Consciousness itself appears as a function of networks of social relationships already in the works of the more insightful classical theorists, notably Nietzsche, Durkheim, Marx, and Mead.

**7** Von Glasersfeld treats "social constructionism" as one of several possible philosophical background theories in sociology. My own view, supported by many but certainly not all sociologists (and herein may lie a rationale for offering a more congenial assessment of von Glasersfeld's paper than I can offer), is that social constructionism is the fundamental theorem of scientific sociology. If one adheres to the lessons of the Durkheimian and Meadian traditions that run through the contributions of modern sociologists and anthropologists such as Mary Douglas, C. Wright Mills, and Randall Collins, then the view I offer here will be at one with at least this tradition. My view can and should be seen, then, as representing one tradition within sociology, but one with an extremely powerful pedigree and with substantial empirical support. Even before addressing this position, von Glasersfeld might have clarified the distinctions in the relevant literatures that separate various uses of "constructionism," "constructivism," "social constructionism," and "social constructivism." The significant distinction here is between "constructivism" and "social constructionism" according to Barbara Herrnstein Smith (2005, pp. 4–5). Smith views "social constructionism" as a critically and politically engaged set of views on knowledge and science. "Constructivism" is a broader set of views on the nature of knowledge and cognition. This conception of social constructionism plays into the philosopher's notion that social constructionism is a philosophical concept. "Constructivism", as Smith understands it, would clearly make an appropriate foil for a philosopher. The distinction between constructionism and constructivism is more arbitrary. In the science studies and cultural studies literature, these terms are used interchangeably. I prefer "constructionism" because it stresses "making" or "manufacturing", the "doing" feature of social life (Restivo & Croissant 2008). Von Glasersfeld seems to think it is necessary to start this construction process at a psychological level; but it is precisely this level of analysis that has been eliminated by the emergence of sociology. Sociology has demonstrated that the psychologist's "individual" is in fact a social structure, a set of social relationships.

**8** What, then, does it mean to say something is socially constructed? It does not mean that something – for example, an idea, a concept, a theorem, a law of nature, or an object like the moon – is an arbitrary creation of human beings driven by certain religious, economic, political, ideological, or other similar interests or imperatives. It does mean that there is one and only one way that humans can come

to be, to know things, and to build cultures, and that is through our interactions with others in our earthly contexts. This is the great discovery of the nineteenth century social theorists. Durkheim (1995: see especially his remarks on logic on pp. 433ff.) plays a crucial role in crystallizing this discovery and applying it to clarifying the nature of religion and logic as social constructions. It is at this crucial juncture that sociology begins to separate itself from philosophy. It is in the realization of Durkheim's agenda in the application of sociological reasoning to scientific knowledge and in his rejection of transcendental and imminent reasoning that we locate the origins of the contemporary sociology of science and mathematics.

**9** Let me bring my commentary to a close by returning to von Glasersfeld's formulation of his problem: "How can constructivists speak of social interaction or communication with others, when, as they claim, their experiential world is their own construction? This question is frequently asked and is perfectly reasonable. The present paper is intended as an answer." (§1). This is the classical philosophical way of logically undermining the very idea of the sociology of knowledge; the claim is that the sociology of knowledge is self-refuting. The problem is a red herring and only makes sense if one assumes that because something is socially constructed, it is not "real." Is the sociology of knowledge as much a social construction as the knowledge systems it analyzes as social constructions? Of course: we have no other way to do things, feel things, or think things than by way of our social interactions in their social and material contexts. For an elegant examination and refutation of the error at the root of the self-refutation argument see Bloor (1991, pp. 17–18).

**10** Everything I have written so far is moot, given the most fundamental assumption underlying Glaserfeld's paper. That is that philosophers stand on a "higher ground" from which they claim jurisdiction over the critical analysis and evaluation of the presuppositions, theories, and methods of all the other disciplines. This once widely-accepted conception of the philosopher's role has become, at the very least, problematic and in my view must be rejected. Untutored social scientists claiming a philosophical or metaphysical "high ground" would find it impossible to publish a treatise on, for example,

Bell's theorem in any reputable scientific journal. It is clear from this paper that the struggle Durkheim carried out to establish sociology on a scientific footing against prevailing psychological and individualistic assumptions continues to require due vigilance and action. **11** Is it possible to imagine a resolution of the differences that separate Restivo and von Glasersfeld? Can this be done in a debate, in a series of conjectures and refutations, by refining the logics of our positions, or in some other rational manner? I do not think that any resolution is possible in these terms. The reason is, and here I follow the paradigm for comparing philosophical systems proposed by Clifford Hooker (1975), that our positions hide entire world views; it is those world views that must be compared, contrasted and criticized – element by element – not sociology and philosophy, and not one metaphysics versus another. And if it is indeed worldviews that are at stake here, we may be early witnesses to the demise of one or both of these two disciplines.

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## Obey Society, and Note Your Resistance

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**1** Who conceives of society? As far as I can see, Ernst von Glasersfeld does not really answer this question, yet he points to the importance of being explicit about both the notion of society and an awareness of who entertains this notion. For him, society seems to count among the many patterns that individuals produce and use to construct their reality. Yet in looking at society as one of these products of individuals constructing their reality, there are at least two possibilities that account for it. Von Glasersfeld claims that constructivism is able to inquire into the question of "how patterns arise from the perception of disconnected elements" (§1).

**2** For the concept of society, as for other concepts and percepts (Deleuze 1995), this means that it may play its role either on the side of a pattern that arises or on the side of the perception of disconnected elements or, indeed, on both sides of the distinction. We know that for individuals to be able to construct their reality, the ability to connect things and events is as all-important as the ability to disconnect them. And we know that their inclination to connect and to disconnect changes, depending on the availability of media of distribution such as language, writing, print, television, and the computer (let alone media of communication such as money, power, love, truth, and belief; McLuhan 1964; McLuhan & Fiore 2001; Parsons 1977; Luhmann 1997).

**3** Who conceives of society? Von Glasersfeld seems to say that it is we who do this: "before we can form a concept of society, we must discern and characterize fellow humans as such in our experiential world" (§30). Thus, we are lead to ask who do we mean by "we"? Von Glasersfeld looks at "individual fellow humans," among whom he seems to count himself as well. That again points to a media point of view since it seems to be counting – counting himself and counting others (McLuhan 1964, chap. 11) – which comes first and well before any more substantial notion of who the others actually are develops. That counting is made responsible for any concept of society, which then tells us that there are fellow humans we are personally acquainted with and more fellow humans we do not know but who nevertheless count among our community (§39), an extension we only became acquainted with, as it is, when having to live in cities (Weber 1986; Baecker 2004).

**4** The question I am most interested in is the question raised by von Glasersfeld as to whether Luhmann's talk of "eigen-values" (as, for instance, in Luhmann 1998) of society actually is, or is not, just a loose metaphor as von Glasersfeld maintains by emphasizing that in the society of human beings "the recursion of operations of observation or description is not governed by fixed rules, unlike the recursion of functions that produce mathematical eigenwerte" (§44, Fn. 4). Indeed, how are we to conceive of the possible eigen-values of society? And who are we to possibly be able to conceive of possible eigen-values?

**5** Eigen-values appear when certain recursive functions are again and again applied to themselves. What recursive functions might be able to account for society? And by what rules might they be governed?

**6** There is indeed one, any only one, fixed rule that, according to both Heinz von Foerster and Niklas Luhmann, may be able to account for a society emerging that presents us with both the perception of disconnected elements and the patterns arising from the perception of disconnected elements (Foerster 2003; Luhmann 1997; Baecker 2007). That is the rule of double closure, which claims that for any ending there must be a beginning as well. Both ending and beginning apply to just one type of operation, which again for von Foerster and Luhmann is the same, namely communication. Communication means that with all events that present individual fellow humans with some perception of society there is the rule that these events lead to further events of the same type. Note that the rule of double closure applies here to those events that do not just somehow and naturally follow each other but that also refer to each other and gain their range of exchange and order from that reference to each other (Günther 1976; Baecker 2005).

**7** Thus, we may able to say that it is indeed communication that conceives of society. Of course, this only leads to the next question, which is, "Who conceives of communication?" Communication is that peculiar notion that claims that relations emerge and are somehow unreliably reliable among human and other beings that relate to each other without having to do so (Ruesch & Bateson 1987). It is a notion at odds with causality, claiming both possibility and liberty to be essential ingredients of what it refers to. It is a notion that claims self-constraint as the only constraint one has to deal with (Elster 2000).

**8** Thus, when Luhmann says that it is only society that is able to conceive of society (Luhmann 1997), he may well be using a Spinozist conception of some god-like entity (Qvortrup 2008), yet he is also saying that only communication and society are able to present us with both the perception of disconnected elements and the patterns arising from it. As soon as we perceive individual fellow humans and begin to count ourselves

among them, we look at both disconnection and connection. All eigen-values emerging with society recursively reproducing itself must follow the fixed rule of accounting for the possibility of both disconnection and connection. This applies to all kinds of society: early ones and developed ones. And it applies to all phenomena within society, be it the family that raises us, love that seduces us, power we ask for to restrict the range of our fellow humans, money we use to both disrupt and combine in more improbable ways, or sciences that we entertain to never be sure of the knowledge we would like to be sure of. But the rule of having to be able to account for both the possibility of disconnection and connection may well be the only fixed rule we

have to obey and rely on when dealing with society.

**9** There are two ideas in von Glasersfeld's paper that we are thus able to emphasize rather than oppose. The first is that not only education but any kind of human practice that relies on communication (and there is no human practice that does not rely on communication) is indeed a matter of understanding and fit rather than of repetition and training (§23). Understanding and fit mean that at any instant one must be able to count the other as different than himself ("understanding") and that to count himself means not to stop counting thereafter but to go on counting the others as well ("fit"). And the second one is the unusual but deeply sociological idea of

counting individuals as units that do not find themselves completely within the realm of the social but embody, so to speak, non-social features as well, among which are their bodies, their minds, their fears, and their desires (§41). Indeed, this is Georg Simmel (1950) at his very best: society is only possible by providing individuals with places that are empty, awaiting their determination by both the individuals and their fellow humans, other beings, and their interaction. And society is only possible by offering individual human beings ways to socialize, which are determined by paying respect to their never being completely socialized. This may even help in counting them, since counting needs both distinction and relation.

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## Sociology, Dynamic Critical Realism, and Radical Constructivism

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**1** Ernst von Glasersfeld criticizes social constructivists for their assumption that reality is an outcome of social relationships. It would be a "metaphysical assumption" to assume that the "others with whom the individual relates have to be there before his or her construction can begin" (§32). Society, for von Glasersfeld, is a relative concept, a term for all the people an individual has learned to recognize and of whom one has heard or read of.

**2** As a consequence, this means that there are as many societies as there are individuals and that society is a subjective construction . In sociology, the notion of society has been used not for small-scale social systems, but for large social systems, systems of social systems, social supersystems covering many actors, their interactions, and the social structures that their interactions involve. The problem with von Glasersfeld's notion of society is that it includes only those whom one knows and whom one has heard about, it would include "the handful of people we have learned to recognize" and those "we have only seen (…) casually or heard or read of" (§38), it does not

include people whom one does not know and has not heard about. As the number of people whom one knows and can meet and about whom one can hear personal stories is limited, von Glasersfeld's concept is ultimately limited to small social systems, or to systems that include personal acquaintances and prominent people featured by the media. But to term such systems "societies" contradicts the common usage of the term in sociology. For Anthony Giddens, probably the most prominent contemporary sociologist, society is constituted by the "intersection of multiple social systems" (Giddens 1984, p. 164) that involves a "clustering of institutions across time and space" (ibid). Other features of a society for Giddens are locales and territory, normative elements that involve laying claim to the legitimate occupation of the locale, and the prevalence of a sort of common identity that need not be considered as right and proper, but is constituted through common practices. Based on von Glasersfeld's notion of society, concepts such as "global society", "European society", or "French society" do not make sense because they always cover individuals whom one or others have not met or heard of. Von Glasersfeld's notion of society then is not really a notion of society, but more of small-scale personal social systems. Radical constructivism, as a consequence, does not seem to be useful for sociology and social theory: its radical individualism is a form of reductionism that reduces society to those whom one knows and one has heard about.

**3** For sociology to work, it needs to assume that there are many other people existent who exist and with whom one can interact. The assumption that there are people who are members of a society, even though one has not heard about their personal existence and identity, is justified because our everyday communication and experiences and those of others whom we know tell us that every day we meet and see and interact with, on the one hand, people that we have already known for some time and, on the other hand, with individuals that we have not known before. That there are large-scale social systems that we term "society" that are existent outside of our minds, but not independent of us, is a necessary assumption for sociology. Hence sociology does not work on a basis of radical constructivism, or to put it another way: radical constructivism does not matter for sociology. Our everyday experiences tell us that we can be confident that others exist and are potential partners in communication in an overall shared space that is termed "society" and that is created by many individuals together. Hence it is not independent of these individuals and cannot be reduced to their cognition as they require others with whom to mutually create that space. This space is objective in the sense that it is co-created by humans who, in their social relationships, create supra-individual regularized patterns of interaction that they can rely on in everyday life and that make social activity work, and in the sense that action is oriented and produces social results
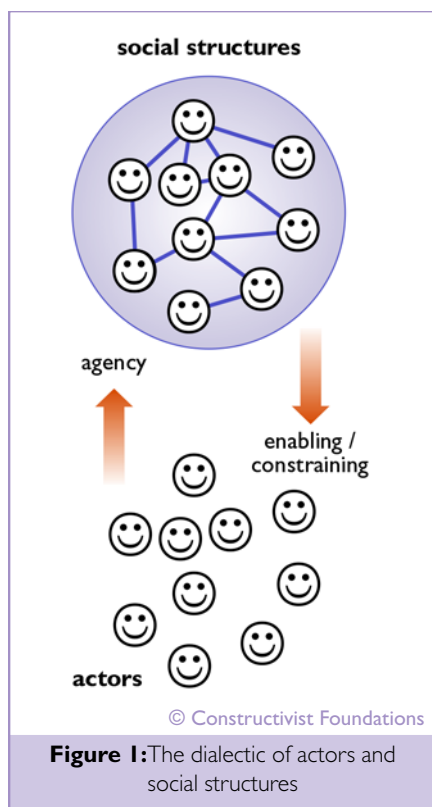
**Figure 1:** The dialectic of actors and social structures

and actions of others. Society is not independent of individuals, but also not, as von Glasersfeld seems to claim, only subjectively cognitively constructed (§1, §42). It is a system that is co-created by many individuals who partly know each other and partly do not know each other. So, for example, the results of elections are binding for a society and are co-created by all those who voted, even though no voter knows all the other voters or has heard of the names, personal identities, etc. of most of them. That such collective phenomena as elections, in which the actors do not encounter each other personally, obviously bring about results, gives us confidence in assuming that society exists objectively as a reality that is larger than all the subjective realities and that is an outcome of the totality of the interactions of many human subjects. This social reality is co-created by many individuals, and parts of it are relevant for each individual's thinking and interactions: they enable and constrain the individual's actions that together with other actions again produce social reality, which conditions further individual actions that again bring about social reality, etc.

**4** What troubles me most about radical constructivism is that it frequently claims that there is no objectivity and no truth, or that we do not know if this is the case, but at the same time it dogmatically defends the truth that there is no objectivity and no truth (cf. §§42, 43, 45). For me, this sometimes conveys the impression of radical constructivism as a closed sect that defends its dogmas. Such a defence of dogmas can also be found in the target article, which reminds social constructionists such as Kenneth Gergen that they are not constructivists if they assume the existence of a social reality and not just of individual realities (§§31, 32, 45). Personally, I never considered radical constructivism as suitable for sociology and my view is that social constructivistic social theories are more realist than constructivist in character and that all sociological approaches are non-constructivistic and realistic. Hence, I can only welcome von Glasersfeld's decision to see many social constructivists as not constructivists. By doing so, he categorically and by definition decimates the number of constructivists.

**5** Radical Constructivism stresses that knowledge is a construction and invention and not a mapping and discovery (cf. §42). The constructor would be the human individual. Social constructivist approaches argue that reality is constructed in social relationships. What I value about some social constructivist approaches such as, e.g., those of Klaus Krippendorff (2006), Peter Berger and Thomas Luckmann (1966) or Kenneth Gergen (1999), is that they stress the importance of human actors in society and its social relationships. This helps strengthen positions that are directed against functionalistic social theories that exclude human actors from social systems or see them as completely determined by social structures. So, for example, Berger and Luckmann (1966) stress that in society there is a dialectic of human and social reality that is constituted in processes of externalization, objectification, and internalization. Such accounts are much more objective and intersubjective than radical constructivism's reductionist focus on individuals, hence I consider them as realistic accounts of society, not as constructivist ones. Von Glasersfeld's target article seems to make the same assessment, but from a radical constructivist position that is critical of social constructivist approaches.

**6** There is a particular stress on the dialectic of structures and human actions in contemporary sociology. Such accounts are realistic in the sense that they assume that there is a social reality that is co-constructed by human beings. But they are not naively realistic, they do not assume that this reality is passively given to humans, but that it is shaped, produced, and differentiated by humans in social relations as well as conditioning human activities. These are dynamic, dialectical forms of realism. They differ from von Glasersfeld's radical constructivist notion of society in that they do not consider society, as von Glasersfeld does, as a subjective construction of an agglomeration of individuals (§39), but that the individuals are only a foundation from which an irreducible social reality emerges that is permanently re-constituted and differentiated.

**7** My own theoretical account of society (Fuchs 2003a, 2003b, 2008) is such a form of dialectical realism. It is based on the problem of finding solutions to the traditional gap between actor theories and structural theories in sociology. This gap can be overcome by dynamic, dialectical social theories. It starts from the human-centred argument that human beings, as such, are creative social beings that co-create social reality together with others. Society is conceived as a large-scale system of networked social systems that is based on the dialectic of social structures and human actors. Society reproduces man as a social being and man produces society by socially coordinating human actions. By social interaction, new qualities and structures can emerge that cannot be reduced to the individual level. This is a process of bottom-up emergence that is called agency. Emergence in this context means the appearance of at least one new systemic quality that cannot be reduced to the elements of the system. So this quality is irreducible. Social structures also influence individual actions and thinking. They constrain and enable actions. Society, through such processes of permanent conditioning and agency, again and again creates its own unity and maintains itself (cf. Fig. 1). Social structures enable and constrain social actions as well as individuality and are a result of social actions (which are a correlation of mutual individuality that results in sociality). The crucial point that distinguishes such an approach from the one by von Glasersfeld is that social

reality is more than the sum of individual realities that are viable, has irreducible qualities, and changes dynamically.

**8** The notion of the dialectic of structures and actors can be found in some contemporary dialectical social theories. So, e.g., Anthony Giddens (1984, p. 2) argues that "in and through their activities agents reproduce the conditions that make these activities possible." Pierre Bourdieu (1977, p. 83) speaks of a "dialectical relationship between the objective structures and the cognitive and motivating structures that they produce and that tend to reproduce them", Margaret Archer (2002, p. 18) of a "dialectical relationship between personal and social identities" and Roy Bhaskar (1993, p. 153) of "dialectics of struc-

ture and agency." One aspect that these approaches have in common is that they consider themselves as dynamic critical realist theories that are not naive but dynamic, and they acknowledge the importance of active humans and their social relations in society. The arguments of some social constructivist approaches such as that of Berger and Luckmann come very close to these theoretical approaches. They assume and argue for the existence of an objective social reality that is not passive, static, and determining, but actively co-created and dynamically transformed by humans in social relationships.

**9** Radical constructivism generally argues that it cannot make any statements about the existence of realities beyond individual cogni-

tion. But arguing that one simply cannot decide or does not deal with supra-individual realities such as the social means taking a solipsistic approach, although radical constructivism frequently denies being solipsistic. Von Glasersfeld, in my opinion, reduces society to cognition and the individual; his account is what Anthony Giddens, in characterizing methodological individualism, calls "an imperialism of the subject" (Giddens 1984, p. 2). Von Glasersfeld's paper, in my opinion, shows the incompatibility of radical constructivism and sociology. Sociology is an inherently realistic science that cannot be built upon von Glasersfeld's claim, in the abstract of the target article, that society "can be considered an individual construct."

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## Who Conceives of Mind? Von Glasersfeld's Turn to Society

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**1** I have long admired Ernst von Glasersfeld's attempt to render rationally viable a radical constructivist epistemology. And, I have long wished to see him turn his attention more fully to issues of social interchange. The present offering moves cogently in this direction, and this is all to the good. However, immersed in the dialogues on social construction as I am, the offering also poses an array of particular problems, both intellectual and practical. I offer the following in the service of pressing forward the dialogues on knowledge, self and the social world.

**2** In my view, von Glasersfeld's work can be seen as a contemporary extension of rationalist philosophy – drawing sustenance from both Descartes and Kant, among others – in positing a mind/world dualism in which preeminent significance is accorded to the mind. One of the most significant features of this tradition is that the existence of mind is transparently clear, while the nature of world remains obscure (e.g., "how can we generate a picture of the whole from a pattern of dots?"). Thus, the scholar is forever struggling with

problems such as how we can know what is actually "out there," and how the "out there" enters the "in here" in such a way that we can be effective actors. And, to solve such thorny problems, the rationalist scholar almost inevitably begins to expand the ontology of mind, positing various features, mechanisms, or capacities. Thus, in the present offering, we find that the mental world obeys the law of effect, draws inferences, and possesses goals, elementary values, imagination, memory, conceptual structures, and more. In effect, to solve even the most basic problems of knowledge, we find it necessary to populate the mind with a substantial cast of characters.

**3** It is at this point that constructionists such as myself become quite curious. How is it, we ask, that scholars such as von Glasersfeld came to know about these various mental events? On what grounds can he claim that people's minds are populated in this manner? Is it simply self-evident? Did he somehow look inward and see these events swimming about in his sensorium? The questions are obviously hortatory. The presumed existence of these various events or activities is all the more curious as we take into account variations in the conception of the person found in both history and culture. The idea that individuals are governed by reason, for example, did not come into fashion until the 17th century, and this fashion is quintessentially Western. And why, we might ask, do we not find Western rationalists positing atman, liget, amae and other non-Western ways of concep-

tualizing the mind as essential to solving the problem of knowledge? It is this sensitivity to history and culture, combined with the inability of philosophers to solve the epistemological riddle, that lead Richard Rorty (1979) to conclude that the problem of epistemology, as posed by dualists, is essentially a byproduct of language use. That is, if we did not in the West presume a mind/world dichotomy – with knowledge viewed as in some way a mirror of nature – the problem would not exist.

**4** It is at this point that I draw attention to a point of agreement between von Glasersfeld and myself. As he points out, "I am not concerned with describing what might 'really' exist." As a constructionist I am also aware that my very standpoint is a construction, and thus there are no words that will "get it right" about the ultimate nature of what exists. However, von Glasersfeld's next move is problematic for me. As he says, he is thus attempting to generate a rationally coherent model of knowing. Drawing from Ludwig Wittgenstein (1953), whose work is central to the constructionist endeavor, this is saying that he is trying to play the Western game of language (bound by its rules) in such a way that he can solve the long-standing epistemological riddle. But if we ourselves have invented the riddle, then we must ask ourselves what hangs on the attempt at a solution? What is there beyond the personal satisfaction of completing what is akin to a very sophisticated (and linguistically insoluble) crossword puzzle? There may be

good answers to this question, and I am open to further dialogue on this matter. In the meantime, however, my central concerns are more pragmatic. Most social constructionists take the view that meaning is generated not within minds but within relationships. Again, following Wittgenstein, the meaning of a word is derived from its use in social action. Thus, the very concept of mind is a byproduct from this more essential process of human coordination. And, while there are no claims to the "truth" of this position, the pragmatic consequences are enormous.

**5** First, there are the ideological repercussions. Radical constructivist epistemology is essentially a supporting rationale for self-contained individualism. We are invited to see ourselves, on this account, as fundamentally estranged from each other, unsure of each other's meanings or motives. In a Hobbesian sense, we entertain a world of all against all. For the constructionist, by contrast, we are invited to understand ourselves as inherently inter-twined. We are drawn into valuing human relationship, for it is within relationship that values are engendered. For the constructionist, then, reforming social practices takes on a new and important role: entire movements in therapy have been inspired by viewing therapy as a site of co-constructing new futures; educators shift their class-room practices from monologue to dialogue; social science researchers abandon research that objectifies their subjects and seek means of collaborating with their subjects in their inquiry; organizational specialists abandon the traditional conception of individual leadership and search for means of establishing distributed leadership practices; and those who seek means of crossing barriers of human antagonism develop new forms of dialogic interchange. I am satisfied, for the present, to view these as contributions to a more viable global future. But I remain open to the next word.

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## Author's Response

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**1** Let me begin by saying Thank You to the commentators. Especially to the sociologists among them. They have shown an enormous amount of patience and good will in the face of a text that was not only irritating but also largely absurd from their perspective.

**2** At an international conference in Atlanta in the late 1990s my work was discussed, and I suggested two points that required further efforts on the part of radical constructivists: the development of a language less prone to misinterpretation and a detailed study of "social interaction" (cf. Steffe & Thompson 2000). Regarding the first point, **Kjellman**'s commentary clearly shows that I have not made sufficient advances. With obvious gusto he puts his finger on a weakness in my article and it does not console me that that others did not remark on it. But **Kjellman** does admit that there is "a huge problem" (§14).

**3** We talk, write, and to a large extent think in languages that have been shaped by naïve realism. We look out the window and say, "there is a bird." It would be unusual to say, "I see a bird," yet this is all we could vouch for. The verb "to be" confers objective existence whether we like it or not. I have struggled with this problem through the years, but without much success.

**4** I should have initiated my §4 by saying: "What we interpret as photographs are visual experiences." And I should have gone on, "This is not limited to what we interpret as photographs. Anything we interpret as a visual image will be interpreted as …" and so on. I decided to use the illustrations from experimental psychology because they are the surest means I know to make readers aware of their own constructive activity. Maybe I should have mentioned that sheets of paper and bits of pigment are also their construction on a prior level. I apparently trusted them to see for themselves, as they read on, that it was they who had to segment and categorize the raw material of a visual image just as they had to draw lines to generate patterns.

**5** I do not, however, agree with the criticism in his §15. The "stable environment" that a natural scientist postulates for the objects of his or her study is stabilized by causal relations derived from his or her world. Sociologists, in contrast, seem to me very vague as to *how* the social interactions they keep referring to generate an observer-independent society.

**6** On the second point I made at the conference in Atlanta, there have been considerable advances and several of the commentaries provide evidence of this. The exposition presented in **Schmidt**'s §3 is an important amplification of RC. I welcome his introduction of the notion of "operative fiction," which, I believe, parallels the notion of "heuristic fiction" that I adopted from Kant and Vaihinger to deal with scientific theory building. **Schmidt**'s "interim conclusions" (§4) are fully compatible with RC, and what he expounds in the remainder of his commentary goes a long way towards developing a constructivist approach to the problems of social interaction. He ends with the comment that "to tell the truth is morally presupposed and creates a positive feeling, …" (§8) which, given what is going on just now in the United States, may be a trifle optimistic.

**7** **Bettoni** has for many years carried forward the careful interpretation of Kant's writings, a work that was initiated by Hans Vaihinger, who documented Kant's constructivist leanings in the appendix to his *Philosophie des Als Ob* (1913). The quotations **Bettoni** presents in §4 and §5 provide encouragement for RC, and may do something to further the dialogue between the various factions of constructivism.

**8** I am grateful for **Le Moigne**'s extension of the constructivist horizon. His observation (§3) that assumptions posited as theoretical presuppositions in the development of a research methodology are often mistaken for ontological assertions is most appropriate in view of several of the present commentaries. I also applaud his admonition that, given the agreement of social and radical constructivists concerning the basic epistemological question of reality, they should act as collaborators rather than competitors (§4).

**9** That a well-known mathematician formulates a "short answer" to my article is greatly encouraging and I am delighted with **Hersh**'s formulation (§3). I am confident that he would agree if I said that to be "sure," in this

context, means to be sure enough of something to act upon it.

**10** The notion of heuristic fiction also surfaces in **Dykstra**'s commentary, and his exposition of Jammer's approach to the business of science (§6) brings out a parallel to Bateson's notion of "explanatory terms" (Bateson 1972). Both **Schmidt** and **Dykstra** provide firm support for the contention that the concept of society is such a fiction and should therefore not be seen as existing in itself.

**11** To me, too, mathematics is about concepts and mental operations. But, unlike **Hersh**'s statement in his last sentence (§5), I believe that this view *is* helpful in teaching – especially when one comes to calculus. A case in point is **Steffe**'s successful application in mathematics education of patterns of thought that are central to RC. This may be the most powerful argument for that model, which was developed on a purely theoretical basis. The arithmetical efforts of school children are surely among the first deliberate incursions into the domain of abstract thought in the course of intellectual development. The fact that the constructivist approach helps to illuminate that development is a demonstration of its viability.

**12** Paul Valéry wrote that once something was published, it was like an implement that anyone could use the way he or she wanted (Valéry 1957b). This is perfectly in tune with RC. And RC does not claim to be the only possible way of thinking. It's anyone's right to modify it. From a theoretical constructivist point of view, the distinction of an "inner" and an "outer" reality (**Kenny**, §18) is no less the experiencing subject's construct than anything else. The psychotherapist's task, however, is to provide the client with an acceptable interpretation of his or her experiences, and he can hardly risk suggesting that these experiences are not "real." **Kenny**'s commentary is yet another confirmation that developing the constructivist way of thinking was not a futile undertaking.

**13** **Müller** makes the point that RC is irrelevant for the research that social scientists do, because their methods and research designs are independent of epistemological considerations. As I have frequently said, this also goes for engineers, mechanics, architects, and gardeners; but it does not go for psychologists and philosophers because their job

involves investigations of knowledge. Links between RC and research in other disciplines could certainly be established, but it is not *my* business to make attempts in that direction. **Müller**'s evaluation of the situation may be a little pessimistic. RC has had considerable influence on research and methods in science and mathematics education and one of its main tenets played a significant role in the development of modern physics some time before the term "constructivism" was used in epistemology. The realization that science may organize and systematize our experiential world but cannot describe an ontic reality has been stated explicitly by all the leading physicists of the last century. One of Schrödinger's formulations may serve as example:

> "As our mental eye penetrates into smaller and smaller distances and shorter and shorter times, we find nature behaving so entirely differently from what we observe in the visible and palpable bodies of our surroundings that *no* model shaped after our large-scale experiences can ever be 'true.' A completely satisfactory model *of this type* is not only practically inaccessible, but is not even thinkable." (Schrödinger 1952, pp. 25–26)

**14** Among the ideas **Meyer** attributes to me is that RC is the *only* appropriate epistemology (§2). My frequent reference (§§8, 26, 45) to "my point of view" hardly supports that attribution and my §42 explicitly contradicts it. In §3, **Meyer** asserts that I stress "public" criteria in the context of understanding, whereas in my §37 I explicitly agree with Piaget who held the opposite. Hume (1742), whom **Meyer** draws on in §7, introduced the notion of reflection at the beginning of Section II of his *Enquiry,* reflection in the form of recollection and anticipation. With this he created, as did Locke and Berkeley, the actively reflecting subject that is aware of its perceptions; and it is this subject that we can, as Kant suggested, impute to the experiential items we call "others." Concerning **Meyer**'s discussion of "meaning" (§16), anyone who has spent time with children at the age of language acquisition, will be able to confirm that they indeed have "private meanings," because the way they use words quite often does not conform to the way adults use them.

**15** In response to **Quale**'s proposal to "take account of non-cognitive knowing" (§9), I

can only say, "Yes, by all means, but non-cognitive insights should not be confounded with results of rational thinking." An "external world" is not denied by RC, but a discussion of its character and contents is the domain of mysticism of one sort or another. As for it's "being there" or "available for us" (§8) we can only say that some of our actions fail, but we cannot tell whether the failure is due to a flaw in our program of action or to an ontic obstacle, which, in any case, could not be described except negatively by the actions or operations that failed. Because of these constraints, children's construction of their house and its furniture is not free, and neither is their construction of others, for they, too, have their way of not fulfilling some expectations.

**16** I fully agree with George Kelly's view of *constructive alternativism* (**Raskin** §5), but not with the claim that it is "Through relationships, people fashion shared ideas about the world in which they dwell – including ideas about personhood" as though relationships were *given.* Relationships are to me like lines in a visual image, they have to be "drawn" by an agent; they do not exist as such.

**17** As I have said elsewhere in this response, social constructionism and RC need not compete with one another (**Raskin** §§7–8); provided they both stick to the basic axiom that one cannot know an ontic reality, they should collaborate, for there is much in the area of social interaction that RC has not touched upon.

**18** As **Tsvasman** mentions Kant in the first section of his commentary, I presume that he would define "analytic" as pertaining to *a priori* concepts. If this is so, he is right in saying that the RC perspective is non-analytic, because one point on which it disagrees with Kant is that it holds that *all* concepts are abstractions from experience.

**19** I am afraid I am an alien to **Tsvasman**'s language and have difficulties in interpreting much of what he writes. Thus I do not know, for instance, how to unravel the statement: "The term 'notion,' for example, ignores any history of a determination that could clarify the epistemic inconsistency of any analytic contextualization of the conceptual meanings" (§7). Similarly, I am baffled by the assertion that my expression "mutual orientation and adaptation" is "socially determined" (§8). From my point of view, this would put the cart before the horse, because

I see the construction of such mutuality as the origin of all that can be called social.

**20** **Tsvasman**'s view of the social is obviously far more sophisticated than my approach of conceptual semantics and I leave its evaluation to others.

**21** The neurosciences are presented by **Birbaumer** as a monolithic structure that has grown harmoniously for a hundred years and in the face of which we should "stick to the physical and psychological reality given in science and daily life, even if it is the brain's illusion from associative networks. The illusion of constructivism may hurt." (§4)

**22** I may not adequately grasp his meaning, but to me it seems like sticking one's head in the sand. He extols Donald Hebb, who has always been a hero of mine, as the founding father of the neurobiological success story. It was Hebb who wrote: "At a certain level of physiological analysis there is no reality but the firing of single neurons" (Hebb 1958, p. 461) and "What science deals with is an *imagined* world […] a construct, and some of the peculiarities of scientific thought become more intelligible when this fact is recognized" (Hebb 1975, pp. 4 and 9). Cell assemblies and all their further linkages and organization are, according to the neurobiologist's model, installed by the brain's own functioning. In another neuroscientific expert's words, "The only patterns that are integrated into the activities of the brain areas to which the sensory cortices transmit their outputs are those patterns they have constructed within themselves. … This is the neurobiological basis for the solipsistic isolation that separates the qualia of each person from the experiences of everyone else …" (Freeman 2000, p.90). Why should constructivism be abandoned as a dangerous illusion, when some neuroscientists are working with an analogous model? And what, if **Birbaumer** favors that model, is "the physical and psychological reality given in science and daily life"?

**23** My very scanty account of visual perception in my §§6–7 is greatly extended by what **Butz** explains in his §2: "…it is the verification of a certain hypothetical internal object representation and the elimination of alternative hypotheses that establishes recognition." This is a perfect fit with what, following Piaget, I have always called "assimilation." Mirror neurons could, I am sure, explain what I used as an example in a 1991 paper:

recognizing by this kind of integrative assimilation a Volkswagen beetle when you only see its hind quarters up to the rear wheel.

**24** **Butz**'s §§3–7 seem to indicate a remarkable parallel of results from neurophysiological studies and from the research on children's conceptual development by cognitive psychologists such as Piaget and his followers. What **Butz** suggests in §§9–10, sounds like a most interesting fleshing out of the very spare skeleton of conceptualization that I was able to provide.

**25** **Di Paolo** (§2) quotes my statement (§47) that "my epistemological model involves consciousness, memory, and some basic values" and says that "these axiomatic elements are not atomic and already imply the participation of those social processes they intend to ground and that this fundamental intervention happens before processes are constituted as knowable by the individual mind they shape."

**26** How does a sociologist arrive at this conviction? Accepting **Di Paolo**'s analysis for a moment, I would say that even if these three capacities of mine were engendered by social processes of which I was not aware, these consciousness, memory, and basic values are now mine and cannot provide me with anything but subjective constructions.

**27** **Di Paolo** (§8) cites work in child development by Trevarthen and others that created a stir in the 1970s. Steffe and I, who were investigating children's concept of number at that time (cf. Steffe et al. 1983), followed it closely, admired its methodological sophistication, but concluded that none of the observed behavioral responses of infants demonstrated the acquisition of *concepts*. Newborn pigs, too, interact with mother and litter mates in quite specific ways, but we would not want to say that they had a concept of the other.

**28** I want to thank **Krippendorff** for his precise and enriching elaboration of my views on communication. As we are concerned with a very detailed analysis, let me add my bit to the discussion of "I understand" (**Krippendorff**'s §8). I, too, see it is a form of closure, indicating that one has succeeded in fitting one's interpretation of what the other said into a coherent network of ideas which *may* also fit what the other had in mind. It does not, however, guarantee that one has captured what the other intended to say.

**29** **Krippendorff**'s scenario of the family at dinner (§14) is a charming idealization. I quite agree with the description – except for the fact that there may also be participants who "feel free to articulate their experiences" even if they are of no interest whatsoever to others.

**30** I like what **Krippendorff** says about organizations being realized in "networks of conversations" (§19). This seems to me somewhat similar to the way the concept of "space" can be constituted by a network of physical movements. But, again, in my view this does not eliminate a fundamental subjective relativity. I see conversation as Gordon Pask used to describe it, as an activity involving at least four: myself and the person my partner thinks I am, and my partner and the person I think he or she is. I have never denied that there may be a world beyond the domain of cognition, but I have focused on "cognitive explanations" (**Krippendorff**'s §21) because I was working on a rational theory of knowing. My conclusion, unlike **Krippendorff**'s final remark (§23) is that cognition, in spite of adaptation to the perturbations created by others, is a private affair.

**31** My approach, **Restivo** says, "is rooted in cognitive, psychological, individualistic thinking. This is so alien to how sociologists think that it is hard to find the right standpoint from which to comment on von Glasersfeld's paper. The atomistic individual that von Glasersfeld grounds his views on is, from the sociological perspective, an ontological fabrication." (§1)

**32** As I have tried to make clear in my text and explicitly stated in §42, "… radical constructivism does not purport to describe a real world but merely proposes a model of *how one could imagine knowledge to be built up*." That is why I say "It is irrelevant whether or not you believe that society exists in its own right, knowledge of society can be gathered only from your own experience" (ibid.). At the end of his commentary (§10), **Restivo** refers to "the struggle Durkheim carried out to establish sociology on a scientific footing against prevailing psychological and individualistic assumptions continues to require due vigilance and action." As this struggle does not seem to have ended with a decisive victory, it will have to be continued – and it will not be settled by simply claiming that society impinges upon individuals. It would require a

detailed analysis showing that there is an impingement apart from that of "others" whom the individual has constructed in the basis of his or her experience.

**33** When **Restivo** explains in his §4 that he "view(s) 'society' as an adaptive strategy and as a discoverable unit of scientific analysis that emerged on the evolutionary landscape long before humans did," he clearly is not talking about a current concept but about a sociologist's hypothetical assumption. And sociologists, he states, "do not describe the way we come to conceive 'society' in individualistic terms" (ibid.). At the end of (§7) he claims that the "construction process at a psychological level … has been eliminated by the emergence of sociology. Sociology has demonstrated that the psychologist's "individual" is in fact a social structure, a set of relationships. This seems to me a lapidary, rather apodictic statement. Does it not beg the question of how notions of "relationships" and "structures" arise? Does it not require some agent who relates specific items by means of specific relational concepts and then ties the established links, again by specific relational concepts, to form larger complexes?

**34** **Restivo** (§2) picks up my assertion that I am not well versed in sociology. Touché. I should have left it out, because there is no doubt quite enough in my text to show my ignorance of that discipline. I do not, however, agree that lack of sociological training should incapacitate one from discussing, as my title suggested, the *concept* of society. This concept was current long before the birth of sociology and is habitually used by people who have never been enlightened by sociologists. It pervades our everyday thinking, much like the concept of time, for which, without being a physicist, I have been able to work out a quite viable conceptual analysis.

**35** **Baecker** (§6) suggests that Heinz von Foerster, Niklas Luhmann, and he himself account for the arising of society as an eigenvalue by "the rule of double closure, which claims that for any ending there must be a beginning as well. Both ending and beginning apply to just one type of operation, which again for von Foerster and Luhmann is the same, namely communication." I don't know how Luhmann and Baecker understood von Foerster's notion of double closure, but I have a passage in which von Foerster (Foerster & Müller 2003, p. 43) explains how he intended it:

"Ontologically, eigenvalues and objects, and likewise, ontogenetically, stable behaviour and the manifestation of a subject's 'grasp' of an object cannot be distinguished. In both cases 'objects' appear to reside exclusively in the subject's own experience of his sensorimotor coordinations, that is 'objects' appear to be exclusively subjective. Under which condition, then, do objects assume 'objectivity'? Apparently, only when an actor or subject $S_1$ stipulates the existence of an actor or a subject $S_2$, not unlike himself, who, in turn, stipulates the existence of still another subject, not unlike himself, who may well be $S_1$."

**36** This does not, I think, support the notion of an independently existing society. As in the case of patterns, where I insist that elements must be constructed before patterns can be formed, I claim that an individual has to be conceived before the notion of society can arise.

**37** I also cannot agree with **Baecker**'s assertion in (§6), that "Both ending and beginning apply to just one type of operation, which again for von Foerster and Luhmann is the same, namely communication." Working with Silvio Ceccato in the 1950s, we came to the conclusion that "end" designated the mental operating when attention is focused for more than one moment on a specific sensory signal and is then, for at least one moment, unfocused; and "beginning" designates the opposite sequence of attentional moments. I do not see what this could have to do with communication.

**38** **Fuchs** (§5) cites Berger & Luckmann: "in society there is a dialectics of human and social reality that is constituted in processes of externalization, objectification, and internalization." If "dialectics" is intended to mean more than some form of interaction, I am at a loss as to what it might be. All I can say is that no matter how you slice it, externalization, objectification, and internalization are process that have to be carried out by an individual. In his §9, **Fuchs** asserts that "arguing that one simply cannot decide or does not deal with supra-individual realities such as the social means taking a solipsistic approach, although radical constructivism frequently denies being solipsistic." This again disregards the fact that RC is a theory of knowing, i.e., of concepts and conceptual relations, and can therefore be called

"solipsistic" only if one discards the original *ontological* meaning of the term.

**39** About the concepts of individual and society, **Restivo** writes (§1): "that both the "individual" and "society" are ideological constructs and not natural kinds." I would say "conceptual" rather than "ideological." But then he states that my "sort of methodological individualism views the individual as a natural kind and society as an artificial construction." To say of any item that it is a "natural kind," is saying that it exists in an ontic domain independent of our experience. This would be a metaphysical assumption, which radical constructivism avoids making - in the case of "individual" no less than in any other.

**40** There seems to be no agreement among sociologists as to which came first, society or individuals. **Baecker** (§9) ends his commentary by saying: "And society is only possible by offering individual human beings ways to socialize, which are determined by paying respect to their never being completely socialized." This clearly entails that an individual has to be there before it can be socialized and **Baecker** seems to agree with my quote from Simmel, in whose view socialization was the result of activities that, in themselves, are not social.

**41** As **Gergen** says, he and I are immersed in different dialogues. For a long time we have sporadically picked at each other in a rather futile way. I welcome his commentary because it generously opens a friendly way to discuss our differences.

**42** I am, indeed, as he says (§2), a dualist; but my dualism is, I believe, not the traditional one. My dichotomy is not that of a mind and a structured reality to be known, but rather of an actor's activity and his or her awareness of the activity's results. I certainly do not view knowledge "as in some way a mirror of nature" (§3) but I do assume consciousness as the capacity to review experience and to reflect upon it.

**43** Wittgenstein was the first philosopher I read and I, too, consider him with awe. As *I* read him, however, he never ceased to hope that knowledge could become a mirror of nature. This seems clear in the last entries in *On Certainty*, where he speaks of errors and evidence (Wittgenstein 1969, pp. 89–90)

**44** **Gergen**, like me, is not concerned with what might "really exist" (§4). So what's our riddle? I would suggest that we are driven by

the desire to see some order in our experiential world, to find a pattern that makes it seem coherent.

**45** What I am unable to share is Gergen's assumption that the self is "inherently intertwined" with others and that it arises in social relationships (§5). As a theoretical presupposition this seems contradictory to me. Relations cannot be there "in themselves," they require an agent to "see" them.

**46** I repeat: I try to think of RC as *one* model and therefore in no way preclude "the next word."

**Summary**

**47** In his concluding paragraph (§11), Restivo writes that he sees no possibility of resolving the differences that separate his view from mine. "The reason is, … that our positions hide entire world views; it is those world views that must be compared, contrasted and criticized – element by element – not sociology and philosophy, and not one metaphysics versus another." I agree. Our decisions about what is trustworthy knowledge and what is rational are derived from the way we have come to organize the world of our experience. This organization was driven and shaped by the failures we encountered, when physical actions or mental operations did not yield the results we expected. If we reflect upon and try to draw conclusions from what we think we have done, we may call them our world view. If we look closely, we will see that the world view we have reached contains some presuppositions – assumptions that have proved useful in the course of organizing experience. Some will see these presuppositions as metaphysical intuitions; I prefer to consider them working hypotheses.

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# The Biological Foundations of Virtual Realities and Their Implications for Human Existence

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▶ **Purpose** – Purpose: To consider the implications of the operation of the nervous system – and of the constitution of cultures as closed networks of languaging and emotioning – for how we understand and generate so-called "virtual realities." ▶ **Findings** – The nervous system operates as a detector of configurations of relations of activities within itself and thus cannot represent anything external to it. The distinction between virtual and non-virtual realities does not apply to the operation of the nervous system; rather it pertains to the operation of the observer as a languaging being. Our human existence has changed as virtual realities have become non-virtual through their systemic cultural inclusion in the realization of our biological human manner of living. ▶ **Implications** – Virtual realities are never trivial, because we always become transformed as we live them according to the emotioning of the psychic space that they bring about in our living, and this is so regardless of whether we like it or not. ▶ **Key words** – Behavior, dreaming, evolution, neural network, robots, self, reality, virtual reality, conversation, culture.

## Introduction

One of the central features of our operation as living systems is that we cannot distinguish in our experience between what we call, in daily life, "perception" and "illusion." This is so because we, as living systems, are structure-determined systems, and all that happens in us or with us is determined in our structure and in our structural dynamics. Indeed, it is precisely because of this that virtual realities are possible. In the first part, I discuss the biological aspects of virtual realities; in the second, I discuss the implications for human existence.

## Part I: Virtual realities and the nervous system

Here I wish to discuss what the experiential indistinguishability between what, in daily life, we call "perception" and "illusion" entails in relation to the nervous system, in relation to our existence as languaging beings, and in relation to virtual realities. This I shall do in a series of self-contained statements.

### Sensors and effectors

The nervous system is, both anatomically and physiologically, a closed network of interacting neuronal elements. As such, the nervous system operates as a closed network of changing relations of activities between the neuronal elements that compose it, in the sense that any change of relations of activity in it leads to further changes in relations of activity in it. Sensors and effectors have a dual character since they operate as neuronal elements and participate in the composition of the nervous system through their structural intersection with some nerve cells. As sensors and effectors they are part of the organism and constitute the surface of encounter between the organism and the medium. So, the organism interacts with the medium through its sensors and effectors, not through the nervous system. What happens is that in their structural intersection with neuronal elements, sensors and effectors operate as components of the nervous system and participate as such in its closed dynamics of changing relations of activities. The nervous system, therefore, does not encounter the medium, and as it operates as a closed network of

changing relations of activity between its neuronal components, it does not have input or output relations with the medium in its operation.

### Neuronal dynamics

The structure of the nervous system is not fixed. It varies continuously in a network of intercrossing cyclic changes that take place in the structural dynamics of its components through many different cyclic processes with different time constants that result in different kinds of changes: changes in the regulation of the dendritic and axonal branching of the neuronal elements, in the metabolic dynamics, in the ionic channels, in the density of receptors – which in turn result in changes in the effectiveness of the synaptic relations – as well as many other changes of a cyclic nature. As a result of these structural changes, the operation of the nervous system as a closed network of changing relations of activities between its neuronal components is also in continuous cyclic change of long (sometimes permanent) and short time constants. In these circumstances, the course followed by the flow of changing relations of activities in the operation of the nervous system as a closed network arises moment by moment, determined by its structure at each moment in the flow of its continuous change.

The course followed by the structural changes of the neuronal elements that compose the nervous system is modulated in several ways:

1. through their own internal structural dynamics;
2. through structural changes triggered in them as a result of their interactions with other neuronal elements;
3. through structural changes that arise in them as a result of their structural intersec-

tion with other cells such as the internal and external sensory elements of the organism; and

4. through structural changes triggered in them by substances secreted by other cells of the same nervous system, cells of the rest of the organism, or substances that come from the medium in which the organism exists as it operates as a totality.

A basic consequence of this structural dynamics is that the structure of the nervous system as a closed network of interacting neuronal elements changes continuously through structural changes that arise in its components as a result: (1) of their own operation; (2) of the operation of the physiological dynamics of the organism; and (3) of the interactions of the organism in its domain of existence.

**Not dreaming**
The nervous system intersects structurally with the organism at different locations that are its internal and external sensory and effector surfaces, and does so through some neuronal elements that are components of both the nervous system and the organism. The cellular elements that in this intersection operate as sensors and effectors as components of the sensory and effector surfaces of the organism are elements of interactions of the organism, not of the nervous system. At the same time, those same elements, as they operate as neuronal elements, are components of the nervous system and not of the sensory and effector surfaces of the organism. As a closed neuronal network, the nervous system only operates by generating internal changing relations of activities between its components and does not interact with the medium. As such the nervous system does not operate with representations of the medium or of what happens to the organism in its interactions in the medium. One cannot even say that the closed operation of the nervous system is like dreaming, because dreaming pertains to the manner of being of the organism as a totality. It is the observer who sees the inside and the outside of the organism and who makes the distinction "dreaming," not the operation of the nervous system. The ner-

vous system exists in its operation in its closed dynamics without any reference to what an observer may see as external to it.

**Structural interaction**
Due to the structural intersection of the neuronal elements of the nervous system with the sensory and effector elements of the organisms, the sensors and effectors participate in the structural dynamics of both the organism and the nervous system while the nervous system and the organism stay operationally independent. As a result, two things happen. One is that the structural changes that the sensors and effectors of the organism undergo in their encounters with the medium result in structural changes in the neuronal elements with which they intersect. The other is that the structurally changed neuronal elements that intersect with the sensory and effector elements of the organism change their manner of participation in the changing relations of activities of the neuronal network that they integrate. This is valid both for the external and the internal sensory and effector surfaces of the organism.

The general results are also twofold.

(1) The structure of the nervous system changes in a manner contingent to the structural changes triggered in the sensory surfaces of the organism during the flow of its interaction in the medium. The basic result of this is that the dynamics of the nervous system as a closed neuronal network, and the sensory effector correlations that it generates through its intersection with the sensory and effector surfaces of the organism, change in a manner contingent to the flow of the interactions of the organism.

(2) The nervous system as a closed neuronal network continues generating an internal dynamics that gives origin to internal and external sensory and effector correlations in the organism that are proper to its manner of living its life, or the organism dies. So, although the operational domains in which the organism and the nervous system exist do

not intersect, and remain independent as such, each modulates what happens in the other through the structural changes to which it gives rise. Finally, this occurs under circumstances in which the sensory and effector surfaces of the organism are operational and not necessarily anatomical in the classic sense.

While the nervous system operates in a flow of structural changes in its dynamic architecture, *sensory and effector surfaces* are notions that the observer introduces in order to refer to aspects of a systemic operation as components of a larger dynamic architecture. Thus, for example, in a pressure cooker, the cap that regulates the exit of water vapor can be said to operate both as a sensor and as an effector for the regulation of the temperature of the water in the pot, even though it is only an element of the dynamic architecture of the pot. Sensors and effectors are descriptive artifices to facilitate description and understanding of the dynamic architecture. While these artifices facilitate understanding, they also obscure the systemic operation of the architecture.

**Behavior**
In the structural intersection of the nervous system with the internal and external sensory and effector surfaces of the organism, the changes of activity in the neuronal elements trigger structural changes in the effector and sensory elements of the organism. As a result, the manner of incidence of the organism in its internal and external medium changes too. Nevertheless, the nervous system does not make the organism act on the medium; its activity only triggers structural changes in the sensory and effector surfaces of the organism, giving rise to the sensory effector correlations through the encounters of the latter with the medium. Those structural changes bring about change in the manner of incidence of the organism on the medium (internal and external) in a manner determined by the structure of the nervous system at every moment. However, as a result of such change, the manner of encountering the medium of the organism changes according to the structural changes that its nervous system undergoes along its internal and external relational living.

> It is the observer who sees the inside and the outside of the organism and who makes the distinction "dreaming", not the operation of the nervous system

> The nervous system does not make the organism act on the medium

The nervous system does not operate with representations of the medium, nor does it operate with symbols of the features of the medium, and it does not use in its operation dimensions proper to the description of the medium by the observer. The nervous system operates only as a closed network of changing relations of activities between its component neuronal elements in a continuous flow of changing relations of activity between them. It follows from all this that when the observer sees an organism performing a particular behavior as a dynamic interaction with the medium, the nervous system is only performing a dynamic correlation between the sensory and the effector surfaces of the organism according to its structure at that moment and is not generating any behavior. The behavior that the observer sees as he or she beholds the organism as a totality in a medium arises in the encounter of the organism with the medium in a manner in which both the organism and the medium participate. So behavior is not something that the organism does, but something that arises in the organism/medium encounter. This is why I said above that one cannot even say that the closed operation of the nervous system is like dreaming, since the notion of dreaming requires the distinction of inside and outside.

**The working of neurons**
Neurons operate as detectors of configurations of activities on their afferent surfaces. This is so because the nerve impulse begins at the origin of the axon (axon hillock) of any neuronal element as a result of a local composition of all the afferent activity from other neuronal elements impinging upon the collector surface of the neuronal element. As a result, not only single neuronal elements, but groups of neuronal elements and groups of groups of neuronal elements also operate as detectors of configurations of activity in the afferent activity impinging upon them. Indeed, the nervous system as a closed network of changing relations of activities between its component neuronal elements only operates as a detector of changing relations of activities in itself. As a consequence, as the activity of the nervous system gives rise to internal and external sensory effector correlations in the organism, it does so according to a closed internal dynamics of operational distinctions of recursive changing configurations of relations of activities in itself.

**The evolution of the nervous system**
The structure of the nervous system changes, through the various processes indicated above, following a course contingent to the course of the internal and external interactions of the organism that it integrates. Moreover, the structure with which any organism begins its individual life history is one that has been established along an evolutionary history in which the organisms of any given lineage and the medium in which they are realized have changed together congruently. As a result of this evolutionary history, the initial structure of the nervous system at the beginning of life of any organism with a nervous system, is one that gives rise in the organism to the external and internal sensory effector correlations adequate for the realization of the manner of living that defines the lineage.

What makes a nervous system a nervous system is not the kind of elements that compose it, but rather – both in its manner of operation as a closed network of changing relations of activity between interacting plastic elements, and in its existence as a system in structural intersection with the sensory and effector surfaces of a larger system that operates as a totality in a relational space – that those very same sensory and effector surfaces contribute to define it. Thus, a protozoan such as a paramecium, for example, has a molecular nervous system in the form of a closed network of changing molecular relations in operational intersection with the closed autopoietic molecular system that the paramecium is as a living system, The operational intersection occurs at the sensory and effector surfaces that arise in the organism as it operates as a totality. Similarly, a mouse has a nervous system composed as a closed network of changing relations of cellular activities in operational intersection at the sensory and effector surfaces that the mouse has in the domain in which it operates as an organism. Indeed, it is because of the manner of the operational constitution of a nervous system that it is possible to design an artificial system that will, indeed, operate as a robot with a nervous system.

> Behavior is not something that the organism does, but something that arises in the organism/medium encounter

The nervous system operates as a closed network of changing relations of activities in intersection with the sensory and effector surfaces of an organism. Therefore, all that the nervous system does in relation to the organism as this operates as a totality in the medium, is to give rise to sensory effector correlations in the organism. These correlations constitute its behavior as the organism operates as a totality in dynamic structural coherences with the medium in which it exists in recursive interactions. Therefore, it is because of its manner of operation as a closed network of changing relations of activities in intersection with the organism, and because of its condition of being a structure-determined system, that the nervous system does not and cannot operate in a way that distinguishes the features of the medium as if these were independent entities. No doubt it appears to do so to an observer who sees it generating adequate behavior in its domain of existence. But organisms operate in a way that generates adequate behavior in their domain of living as they are alive as the result of the evolutionary and ontogenic history of structural coupling in the medium to which they belong.

**Robots**
In these circumstances, the difference between a robot and a living system resides in the different manner of origin of their operational and structural congruence with the medium in which they exist. Thus, the operational and structural congruence between a robot and the medium in which it exists is the result of an operation of design in which both the robot and the medium in which it operates have been made to fit dynamically with each other. So a robot and the medium in which it will operate arise as congruent through a human act of design. Contrary to this, the operational and structural congruence between a living system and the medium in which it operates, as I have already mentioned on several occasions, is the result of an evolutionary and an ontogenic history in which both the living systems and the medium have changed together congruently in structural coupling.

**Implications for the distinction of virtual/non virtual**

The main consequence of the manner of operation of the nervous system, according to what I have said, is that as it does not operate with representations of entities that would exist as an external reality. As it operates as a closed network of changing relations of activities, it only generates sensory effector correlations in the organism that it integrates without acting by itself on an external world. It follows from this that the distinctions between inside and outside and between virtual and non-virtual realities that an observer may make do not apply to the operation of the nervous system. The distinctions between perception and illusion, or between virtual and non-virtual realities, pertain to the operation of the observer as a languaging being capable of operating in the distinction of the inside and outside of an organism as he or she beholds it as a totality in interactions in a medium.

# Part II: Virtual realities and human existence

The main difficulty that arises for us as observers with the aim of understanding the operation of the nervous system as a closed network of changing relations of activities between its component neuronal elements, has to do with understanding three experiential features of our humanness, namely:

1. the experience of the self;
2. the experience of the other as an independent being; and
3. the experience and understanding of what psychologists and philosophers call inter-subjectivity.

**Being in language**

If we attend to what we do, and to what happens with us, when we engage in languaging, we see that we live together in a flow of coordinations of coordinations of doings or behaviors. Further, if we attend to what we do and to what happens with us when we participate in a conversation, we see that we live

(dance) together in a flow of recursive coordinations of languaging and emotioning. Languaging is not a domain of abstractions or symbolizations, rather languaging occurs as a domain of concrete doings, whether these are things we do with our hands, or things we do in our thinking. Languaging takes place in the various domains of our doings in the continuous realization of all our doings. So, we human beings exist in the flow of our living in conversations, that is, in a flow of languaging and emotioning. Whatever we say happens to us that does not appear in the flow of our languaging or our conversations, does not happen to us as human beings. When one says, "I do not have words for what I see or feel," one is saying "I am living something that does not yet pertain to the recursive domain of coordinations of doings and emotionings in which I exist as a human being. I cannot say that what I feel is something that is some thing." We do not use language and conversations; rather, anything we distinguish, including ourselves (as when we say "we"), occurs as a flow of conversations in a relational domain with others like ourselves.

It is not that language is the home of the Dasein, as Heidegger says: our being as human beings occurs in languaging in the flow of our being in conversations. A human being is a dynamic manner of being in language, not a body, not an entity that has an existence that can be imagined independent of language and that can then use language as an instrument for communication.

The *self* is a manner of explaining the experience of operating as a local relational identity as a human being that distinguishes (touches, senses) his or her operation as a body. Existence in language is required for the experience of the self to happen. Similarly, *subjectivity* is not an interior living, it is a manner of connoting how we are or feel in the distinction of the distinction of self as if this were an entity. Thus, subjectivity exists as a manner of living in the conversation that distinguishes the self.

> It is possible to design an artificial system that will, indeed. operate as a robot with a nervous system

> The distinctions between perception and illusion, or between virtual and non-virtual realities, pertain to the operation of the observer

At the same time, once we distinguish ourselves in languaging, we appear as languaging entities in the domain of distinctions in which we arise as selves. Henceforth we can speak as if we had an existence independent from the operation of distinction that brought us forth, and as if we could use language as an external instrument that is independent of our doings. So we find ourselves operating in unaware self-processes when we ask about ourselves, arise into "thingness" and become selves as discrete entities that obscure our being processes. This account, of course, does not replace the experience of self, nor does it intend to do so; it only describes what happens so that we have the experience we talk about as we talk of the self.

All that we do as human beings is possible precisely because the nervous system operates as a closed network of changing relations of activities between the elements that compose it, and because the elements that compose it have plastic structures. What happens is that the different circumstances of interactions of the organism in the medium give rise in its nervous system to two different kinds of interrelated processes, namely:

1. Different changes of relations of activity between the neuronal elements that compose it, and through the internal changes of configurations of relations of activity thus generated to different flows of sensory effector correlations in the organism; and

2. Structural changes in the neuronal components triggered through the changes of activity of the neuronal network in the contingencies of the interactions of the organism.

As a result of these two processes, the structure of the nervous system changes in a manner that continues to generate sensory effector correlations in the organism that are coherent with its manner of interacting in the medium in which it exists. In the case of organisms such as human beings who live in language, the main consequence is that the structural changes of the nervous system are such that they continue to give rise to sensory effector correlations proper to the operation of an organism that exists in language.

### Experience of the other

We human beings live the experience of distinguishing other human beings. As we attempt to explain such experience, we ascribe a self to each of them in the same terms that we claim for ourselves – that is, as an entity. As we do this, subjectivity arises as the experience in which we distinguish the difference between distinguishing oneself and distinguishing an other self.

In order to account for the harmonization of the coexistence of two or more individual selves, the notion of inter-subjectivity is proposed in psychological and philosophical reflections as an explanatory notion that suggests the possibility that otherwise independent selves may be able to interconnect in ways that transcend their boundaries. In our culture we describe the experience of harmony with others as an expression of some sort of interconnectedness, and we live it as such. However, as we are structure-determined systems, this cannot occur. What happens is that all experiences have the character of something lived that we can talk about only as they arise as distinctions in a conversation, either with oneself or with another. That is, an experience appears in our living only as we distinguish what happens to us or in us, and the experience appears to us with an evocation of what we distinguish in the culture to which we belong.

Since experiences are distinctions that we make of what happens in us or to us as languaging beings, and since all that we live has recursive consequences in our living, nothing that we distinguish as happening to us, be this the experience of self or the experience of inter-subjectivity, is trivial for our living as languaging beings. Furthermore, and since a culture is a closed network of conversations, we necessarily live the consequences of these experiences in our living according to the culture in which we live them, which is where they are features of the world that we live. Thus, for example, sorcery is effective in a culture that accepts sorcery as a feature of its living, and it is lived in the form proper to that culture.

### Intersubjectivity

In these circumstances, since (a) the notion of reality is an explanatory notion (b) the notion of structural determinism is an abstraction from the coherences of our experience, and

(c) we explain experience rather than an objective independent reality by using the coherences of our experiences to explain our experiences, the other arises as an experience to be explained in terms of the conditions that give rise to him or her in the distinction of an observer. Accordingly, the other is to be explained as an experience of the observer, and not as if the other existed independently of being distinguished by the observer. In these circumstances, the notions of *inter-subjectivity* and *self* become explanatory notions for manners of living that arise as we live the experience of interacting with other human beings in conversations that deal with the ease or difficulty with which we coordinate our behaviors with each other. Difficulties arise, though, when we do not fully see that the effectiveness of our coordinations of behavior is the simple result of our operation in reciprocal structural coupling, and we insist on accepting the presence of the other as an independent entity as a primary condition – this is what we cannot do, due to our condition as structure-determined systems.

### Virtual realities as domains of coexistence

From all that I have said above, it is apparent that for the operation of the nervous system as a closed neuronal network, all that happens in or with it are phenomena (processes) of the same kind – namely, changes of relations of activities in its neuronal components. And this is so for all cases, even when, to the observer, the organism appears to be realizing different behaviors. This means that waking, mating, eating, breathing, emotioning, reflecting, thinking, or talking are different phenomena only in the relational domain in which the organism operates as a historical whole, and not in the operation of the actual nervous system as a closed neuronal network. No doubt the different relational circumstances that an animal lives involve different neuronal dynamics in the operation of its nervous system. However, what gives them their different characters is what happens in the relation between the organism and the medium, and not what happens in the nervous system itself. The normal manner of operating of living systems as systems that do not distinguish in the experience between perception and illusion is what makes possible what are now called "virtual realities."

## ABOUT THE AUTHOR
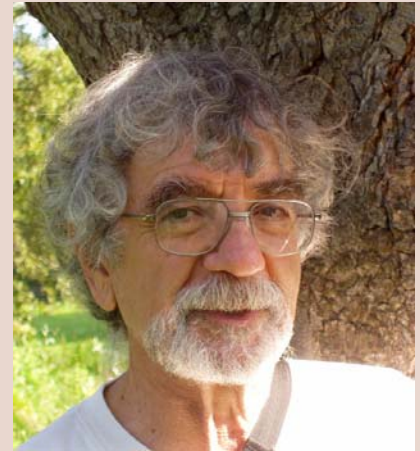
Humberto Maturana was born in Santiago Chile in 1928. Starting with biological research on perception, he has developed the Biology of Cognition and the Biology of Love. Several threads are intertwined through the development of his body of work. For one, he notes that in any relation where something, including an explanation, is offered it is the person who accepts who determines the truth, value, or adequacy of the offering. Maturana retains an awareness throughout his work that it is the observer who determines the validity of what he or she accepts as valid. In his works he shows that we do not know, and constitutively cannot ever know, if what we live as valid at any instant is something that we shall later treat as a mistake, as an illusion or as a perception. In noting that we live our lives trusting the repetitiveness of the manner in which things appear to operate, he developed the notion of structural determinism. As we too are structure determined systems so that external agents do not specify what happens in us, then nothing external can tell us anything about itself. Thus instead of asking how things are, he began following a path of asking for the processes that gave rise to them, and for the criteria used to accept the answers he considered valid. Thus in all his writings one may find the proposition of generative mechanism that give rise to the phenomena he explains, along with the criteria he uses to claim that something is as he says it is. (Photo: Pille Punnell)

Virtual realities are illusions – that is, experiences that we call "virtual" in relation to some other experiences that we call "real." According to all that I have said about scientific explanations, the nervous system, and structural determinism, the only experiences that can possibly be called *real* as a reference that permits us to call all others *virtual*, are those that we live in the realization of our biological living in structural coupling with the medium in which we exist.

As humanness arose with language, humanness arose in a historical path open to the possibility of endless generation of virtual realities through the open-ended possibility of recursion in the consensual coordinations of consensual coordinations of behavior of languaging. Moreover, as actual living in language expanded, the possibility of recursions in the inner dynamics of the nervous system expanded too, and with that came the possibility for the recursive generation of more domains of virtual realities. Indeed, virtual realities in the domain of conversations have been with us from the very beginning of our human existence. Our human existence has changed as virtual realities have become non-virtual through their systemic cultural inclusion in the realization of our biological human manner of living.

**Conclusion:**
**Virtual realities are never trivial**

Yet virtual realities, as we have distinguished them in our technological culture, should not by themselves be a source of serious concern. What should call us to reflect, though, if we do

have ethical concerns, is what happens to our psychic existence as we manipulate the domains of virtual realities to which we expose one another. No matter whether we are aware or not of what kind of reality we live at any instant, all the realities that we live affect us in the same way in the emotional dimensions of our psychic existence, because there is no virtual emotional life. Indeed, it is precisely because of this that all that we live in our psychic existence is non-virtual. Indeed, it is the absence of any "virtual" psychic existence that allows virtual realities to become, first, cultural manners of being and, eventually, features of our non-virtual living in the realization of our biological living.

Let me expand on this idea. Our nervous system is continuously changing along the flow of our living, and it does so in a manner that is moment by moment contingent on the course of our living, both in our conscious and unconscious, external and internal, relational psychic space. As a result, all that we live, regardless of what kind of living we live, arises in us modulated by the history of our psychic existence regardless of whether this takes place through our living in what an observer might call a *virtual* or a *non-virtual* reality. In these circumstances, and since our structure and the structure of the medium that we bring about systemically in our living change together congruently as we live, our living becomes dependent on the virtual realities that we live as they become systemic factors in the cultural realization of our living. In other words, as we live them repeatedly, realities that were initially virtual progressively

stop being virtual. As features of our culture, they become part of our biological manner of living and, hence, of the non-virtual reality that we live.

The problem with virtual realities, then, if there is any, is not how they occur, or if they occur at all, but whether we do or do not like the psychic manners of existence and the cultural transformations that we generate through them. Virtual realities are never trivial, because we always become transformed as we live them according to the emotioning of the psychic space that they bring about in our living, and this is so regardless of whether we like it or not. If we care about what happens to us and to other human beings through what we do through virtual realities, then it is our responsibility to act accordingly.

## Note

# Sowing Seeds: Heinz von Foerster's Second Order Cybernetics and Complexity

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To those wondering how much Heinz von Foerster has inspired French thinkers, the table of contents of this book speaks for itself: Henri Atlan, Mauro Ceruti, Jean-Pierre Dupuy, Jacques Miermont, Edgar Morin and Robert Vallée bear witness to how deeply meeting von Forster has marked their work and their lives.

Von Foerster never wanted his thought to be subsumed under a label, and therefore never personally wrote a philosophical monograph. This book is a collection of tributes originally given in October 2004 in Paris. The AE-MCX (www.mcxapc.org) and AFSCET (www.afscet.asso.fr) learned societies called for contributions to plant von Foerster's ideas in France. The text, written in French, brings to light von Foerster's commitment not only to science, but also to humanity and citizenship, giving his words contemporary relevance and making them challenging.

The contribution by *Edgar Morin* should be highlighted. Not only is he an influential scientist and philosopher in France and other Latin countries, but also a man who has deeply understood and applied von Foerster's conceptions. He covers von Foester's epistemology in five points.

1. Firstly, his fundamental problematics ("*problématique*") about knowledge. For von Foerster, there is *order from order* – order that comes from the laws of nature; and *order from disorder* – statistical order that we can establish, but from a population of events that seem undetermined. With the example of the magnetised cubes, he illustrates the order – generated by the magnetising – and the disorder – generated by shaking the box containing the cubes – that will result in an apparently ordered structure, an organisation. The paradox is that it is an organisation that arises, and not that much order. By reminding us of the

example of the cubes, Morin aims to make clear the fundamental idea that in our physical, biological and human universe, concepts of order, disorder and organisation cannot be dissociated.

2. Auto-organisation is a keystone for many developments in life and human sciences: von Foerster has shown the path to conceiving of the "autonomy in the dependence" and therefore to overcoming the barriers to knowledge arising in determinism. By introducing retroaction and recursivity, he has finally brought notions of complex causality to us, overcoming unsatisfactory linear causality.

3. "Detrivialisation" of knowledge has to go with "detrivialisation" of living, or we will never understand the diversity of our world.

4. The knowledge of knowledge, a second-order term, typically Foersterian, is offered as an alternative to "epistemology." By emphasizing the recursive nature of knowledge and truth, they are no longer frozen and in the possession of a minority, but forever include part of their translation and reconstruction by their carriers. This opens onto a lecture on what consciousness is and on the reason why circularity between a subject and an object cannot be broken.

5. The last point, but not the least, is about the implication of these ideas in our actions: the development of freedom. Von Foerster's epistemology opens onto ethics: the necessity to think at the second degree favours possibilities of freedom, for us and for those with whom we live.

*Henri Atlan* brings a contribution from what has become of some of von Foerster's pioneering work on auto-organisation. The two men shared a great interest in defining and understanding auto-organisation. As a result of their interactions, it's now well known as a phenomenon that can be inter-

preted as an increase in redundancy and as an increase in variety at the same time. Atlan has extended the exploration of this concept through the usage of numeric simulation (networks of computer neurons), which he demonstrates in his speech. He presents his experiments in simulating structural auto-organisation and also functional auto-organisation, the latter giving access to an understanding of the emergence of functions: his simulator behaves as if it "recognises" forms or patterns of inputs. The next step is to build "intentional" machines, machines for which finality is an emerging property. For this, we would, at first, have to consider an extra device that could memorise final states and the steps to achieve them. And after revisiting the concepts of teleology and rational action to clean mechanical causality out from them, Atlan gives another condition: the existence of a second network, a "perceptron," able to learn association of final States and Causes and in which the most frequent learning will progressively emerge as desired goals. This line of thought finally extends to specifying the concepts of action and intention, as the reader will discover.

The contribution of *Mauro Ceruti* is a philosophical perspective on two of von Foerster's leading thoughts: the "cognitive blind spot" and constructivist ethics. The first one is related to the question of "knowing that one does not know." From individual representations to major scientific theories, the construction of knowledge appears to be the complex conjunction of many processes that seem opposed: confirming former cognitions or finding exceptions, variations in the quantity or in the quality of considered events, finding continuity and breaks, etc. Ceruti goes through history and points out the misleading effects of denying knowledge dualities. Next, with a wealth of examples, he argues for the necessity of constructivist ethics: not knowing what we do not know, we should be careful not to claim absolute rules but rather feel responsible, as individuals, for keeping choices open,

increasing consciousness, building serenity and learning to make decisions with others.

The reader will also appreciate how *Jean-Pierre Dupuy*, taking four moments from von Foerster's life, makes him/her feel how deeply Foester's thoughts are based on experience. *Jacques Miermont* gives a broad view of major inputs from von Foerster to psychology and psychiatry, from theory to clinical applications. *Robert Vallée* shares his work on the "eigen-values" that made him close to von Foerster.

The editors of the book, Evelyne Andreewsky and Robert Delorme, have catered for the reader unfamiliar with von Foerster by reproducing, in a second part of the book, a French translation of two of his major communications.

In *Responsibilities of Competence,* von Foerster (1972) presents cybernetics as a bridge by which "hard science" disciplines can contribute to the scientific treatment of the hard problems that "soft sciences" deal with. He sets the core of cybernetics around the interlaced conceptual network of regulation, entropy retardation, and computation that he then applies himself to defining. Von Foerster's claim is that understanding cybernetics along with these concepts would give appropriate methods for solving hard problems, namely those of neurosciences, education, society and humanity. Finally, the scientist, made competent by cybernetics, has a duty to act towards a better world.
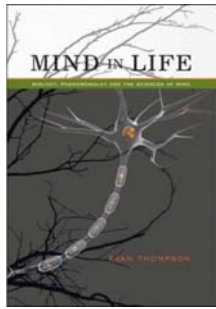
*Ethics and Second Order Cybernetics* (1990) was originally given at a major conference on family therapy in Paris. It connects the reader to a field that greatly expresses and develops von Foerster's constructivist approach: psychology. Leaning on circularity and the inclusion of the observer in the observation, von Foerster makes the audience feel how radical and even frightening the epistemological change can be that is suggested by cybernetics. In fact, he goes far beyond this, first pointing to the opening it makes in human sciences and then going on to show a way for the

expression of ethics. As spoken language makes ethics easily turn into morality, von Foerster calls on Metaphysics (the field of undecidable questions) to remind us of our individual responsibilities and on Dialogics to set word-free inter-action as an alternative communication channel. In von Foerster's words, Ethics can free itself of being explicit thanks to its sisters, Metaphysics and Dialogics. He finishes with a proposal for defining humanity, which fully justifies recommending the reading or re-reading of this text.

Because this book has something of the storytelling of cheerful meetings, von Foerster is made more accessible to the novice; however, it does not lose any of its intellectual sharpness. Henri Atlan and Edgar Morin, in particular, greatly influenced by von Foerster and quite famous in French-speaking countries, give a helping hand to those who wish to explore their work further from the perspective of von Foerster's vision and thoughts. And Atlan and Morin take also the credit for the fact that von Foerster has become better known in the French-speaking community. Let us a hope the book will contribute to the further spread of von Foerster's ideas.

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# Disclosing Autopoeitic Subjectivity: Tracing a Path from Life to Consciousness

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**T**wenty years ago, philosopher Evan Thompson and biologist Francisco Varela began a project to explore the possibility of a circulation between the sciences of mind (cognitive science) and ways of studying, understanding, and transforming human lived experience. This resulted in *The Embodied Mind* (1991), a book they wrote with cognitive scientist Eleanor Rosch, that:

■ examined and critiqued three broad strands of work in cognitive science (cognitivist, emergence, and enactive);

■ provided a brief introduction to Buddhist approaches to mind (as a case-study of one tradition that has developed methods and insights into lived, first-person experience); and

■ sketched some initial ideas about how each could inform the other.

Thompson's latest book, *Mind in Life*, continues and expands upon *The Embodied Mind*. As with the earlier book, Thompson's aim is to "bring the experimental sciences of life and mind into a closer and more harmonious relationship with phenomenological investigations of experience and subjectivity." He wants to "make headway on one of the outstanding philosophical and scientific problems of our time – the so-called explanatory gap between consciousness and nature. Exactly how are consciousness and subjective experience related to the brain and body?" But he is also careful to calibrate reader expectations. His goal, he writes, is not so much to *close* the explanatory gap as to "enlarge and enrich the philosophical and scientific resources we have for addressing the gap." (all quotes from the Preface).

As such, the book is in many ways a more detailed and current version of the same "enriching" perspective that was proposed in *The Embodied Mind*. Thompson provides more detailed treatment of relevant insights from phenomenology, theoretical biology (autopoiesis), and the "embodied dynamicist" approach to psychology and neuroscience. He also updates the earlier book in many ways, providing detailed information about the current status of many methods and strands of research that were touched upon in the earlier book.

There are also some obvious differences between *The Embodied Mind* and *Mind in Life*. For example, rather than continuing the exploration of Buddhism as a method for studying first-person experience, Thompson argues for the importance and relevance of Husserlian phenomenology; indeed, compared with the interpretation of Husserl expressed in *The Embodied Mind* this constitutes a major re-appraisal. (Thompson now believes that their earlier interpretation of Husserl was mistaken.)

Another difference is that there is a detailed treatment of autopoiesis (curiously, *The Embodied Mind* contained virtually nothing on this topic). Indeed, Thompson extends autopoiesis – which argues for the equivalence of "life" and "cognition" – to propose a model of "sensorimotor subjectivity." This, he argues, is a fruitful way to reconceptualize and overcome the some of the difficulties posed by the classic Cartesian mind-body dichotomy to the study and understanding of first-person experience. This proposal may be the book's major contribution.

In conclusion, this is a rich, complex, and valuable book in the constructivist tradition of philosophy and science – and a book deserving of extended review and discussion. Nonetheless, at the end of reading it, one does feel as if "something is missing." Perhaps it has to do with a somewhat ineffable difference between *The Embodied Mind* and *Mind in Life*, a difference that seems somehow related to the fact that Thompson is the sole

author of *Mind in Life*. The book originated as a collaboration with Varela that was cut short by Varela's untimely death; as a result, although Thompson acknowledges the strong influence of Varela, ultimately the book is more (solely) his own. This may not make a difference to readers unfamiliar with their earlier work together, but for many it may be difficult to read the book and not wonder "what could have been." Taking a less historical perspective, "what is missing" is perhaps the degree to which the book is *explanatory*. Thompson himself sets the challenge when he writes, "It is one thing to be able to establish correlations between consciousness and brain activity; it is another things to have an account that *explains* exactly how certain biological processes generate and realize consciousness and subjectivity" (emphasis added). Thompson notes that we are currently struggling to conceive even of the form that such explanations could take, and he might well agree that his own book only makes moderate progress towards that goal. However, the good news is that there are people like Thompson who continue to engage in the effort – and to produce books such as *Mind in Life*.

## Reference

Varela, F. J., Thompson, E. & Rosch, E. (1991) The embodied mind: Cognitive science and human experience. MIT Press: Cambridge, MA.