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Rethinking "Nature"

Ripensare la "natura"

1. Burning Issues/Questioni aperte

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Indice

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Towards the Consistent Construction of Nature

Alexander Riegler

Introduction

When social constructivists started to make claims such as «Nature is nothing if it is not social» (Smith 1984: 30) and «nature no longer exists» (Giddens 1994: 11), many feared that they

> fail to take seriously the physical reality of nature, which demands our respect, if not for its own sake then because it will impact us materially in ways we will never be able to understand or ameliorate so long as we regard it as a mere projection of social interests (Demeritt 2002: 767).

In subsequent debates, arguments were piled up on both sides, as well as by those who wanted to establish a third reconciliatory position that takes the idea of nature as a construction seriously but «does not rob us of our ability to speak some degree of truth about nature as a consequence» (Proctor 1998: 353).

In this paper I will argue that none of the three positions (social constructivist, realist, and reconciliatory) is reconcilable with the perspective of radical constructivism. More specifically, I will call into question notions used in the arguments of these positions, in particular the notion of "nature" itself. In doing so, it should become clear that radical constructivism, even though it shares the noun with social constructivism, is inherently different from the scope and goals of the latter. That is, if radical constructivists speak about "nature as a construction" (thus prioritizing individual constructing), this does not refer to the "social construction of nature" (which amounts to thinking that nature no longer exists as separate from human society as, for example, Anthony Giddens seems to claim).

1. *The notion of nature*

Raymond Williams (1983) described the word "nature" as perhaps the most complex in the language as it can refer to one of three meanings:

Nature$_1$: the essential *quality* of entities,
Nature$_2$: the inherent *cause* for the behavior of entities, i.e., the laws of nature, or
Nature$_3$: the *realm* these entities are supposed to populate, i.e., reality (see also Demerit 2002).

Similarly, Robin Attfield (2006) argues that in most (European) languages, "nature" has three senses: (i) referring to the quality of something, (ii) being in contrast with the supernatural, (iii) being in contrast with the man-made, artificial.

I will argue that radical constructivism looks at what we consider real in an entirely different way. It entails that (1) the quality an observing cognitive subject sees in another entity is merely constructed and attributed to that entity by the subject, (2) causality, whether natural or artificial, is the description of an observer, and (3) making statements about "mind-independent nature" is mere metaphysical speculation.

Attentive readers may have noticed that I avoided saying "nature *is* constructed." This is a deliberate choice because the verb "to be" conveys the (unfortunately, often implicit and unnoticed) idea of ontological existence, i.e., that the product of the construct was material. As an epistemology, radical constructivism refrains from statements about the ontological existence of singular and all-encompassing entities (such as nature): «constructivism deals with knowing not with being» (Glasersfeld 1991). Consequently, in contrast to characterizing nature as a *noun* (placing "nature" in contrast to humans, artifacts, the supernatural, or technology, see meanings 2 and 3 above) or as an *adjective* ("nature of"), nature is best portrayed as (the process or the result of) an *activity*, that is, the cognitive subject's constructing and enacting. So what do I mean when I talk about "constructing"? Let us review the idea of constructing with regard to the three senses mentioned above, i.e., constructing (1) quality/nature of, (2) causality, and, finally, (3) nature/reality.

2. *Constructing quality (nature$_1$)*

Long before radical constructivism was introduced in Glasersfeld (1974), other authors already referred to experience out of which a cognitive subject constructs knowledge about objects. An early example is physicist Ernst Mach. Referring to Mach as a constructivist may appear curious for we would expect physicists to be the last people to embrace the idea that nature is constructed. He, however, emphasized that whatever is known in the sciences such as chemistry and physics (he was a leading expert in the last part of the 19th century) is the result of repeated experience:

> A chemist is able to recognize a chunk of sodium by merely looking at it. However, he takes for granted that he has a number of tests in mind, which would provide him with the expected result. To be certain he can apply the label "sodium" to a given sample only if he finds it as soft as wax, easy to cut, silvery on the cut surface, easily changing color, floating on water, quickly dissolving the latter, having a specific gravity of 0.972, burning with a yellow flame, etc. Thus there are a number of sensory features that appear due to certain manual, instrumental, and technical operations (some of them being rather complicated) and that constitute the notion "sodium" (Mach 1900: 417, my translation).

In other words, the "nature of sodium" cannot be characterized independently of the mind of the chemist whose education and repeated dealing with the substance made him acquainted with its nature.

Mach's claims were corroborated by the work of Ernst von Glasersfeld, who, basing it on Jean Piaget's work, described in greater detail the cognitive processes by which entities are constructed based on the «regularities which we are able to impose on the flux of experience.» Any cognitive subject «must segment its experience, compare chunks, and institute lasting individual identities» (Glasersfeld 2000). Glasersfeld (1982) suggested that the construction process takes place in four steps (see also Riegler 2011):

1. The construction of sensorimotor entities: Based on repeated experiences, the cognitive subject constructs schemata, which consist of the sensory context C in which an experience took place, the action A the subject carried out, and the observed new sensory context E. The latter characterizes the expectations of the subject, i.e., forming a production rule $C \,\&\, A \rightarrow E$. The construction of such schemata already takes place in the earliest days of childhood when the infant repeats an action A (say, banging the head) in context C (being under a table) over and over again just to ensure E (sensation of pain) will reliably follow. The

subject retains those schemata that prevail, even in the face of perturbations. Later on, retained contexts are externalized as objects (in the example: the "existence" of the object "table").
2. The construction of multi-modal entities: By including sensory material from various modalities, perceptual compounds become multi-modal and the externalized objects "more real" as their existence is corroborated in various dimensions. For example, the infant's tactile sensation is confirmation of her visual sensation (see Foerster 1984).
3. The construction of abstract entities: At the next level, schemata can be used in the construction of further, nested schemata making the cognitive subject capable of reflective abstraction. This allows the abstraction from purely sensorimotor schemata. Also, schemata can be reused in different and integrative contexts, such as the concept of "nature."
4. The construction of social entities: The final, social level of reality construction is reached as soon as the subject constructs herself as an experiencer among others. The social level greatly adds to the ways of validating schemata as the subject finds herself in agreement and disagreement with others.

However, the more recent constructions on the level of social agreement/disagreement cannot eradicate much older constructions the cognitive subject made in an early stage. This explains the differences in the concepts people have about "wilderness," i.e., «nature in its fullest […] free of human imprint» (Proctor 1998). A city dweller who has not experienced wilderness first-hand romanticizes it, while a person from the countryside may have constructed entirely different conceptions about it. Thus, under the assumption that nature is constructed, this construction is the product of the cognitive efforts of the individual rather than of society.

3. *Constructing causality and laws of nature (nature$_2$)*

In general understanding, the laws of nature describe the behavior of entities «by reasons of their immanent causality alone» (Hepburn 2006: 517). This is the idea of a mind-independent "*machina mundi*" that governs the behavior of entities in the world. For Aristotle, behavior rested on four different causes, which could not be mathematically described, in particular because in antiquity changes such as acceleration could not be formalized. However, with the increasing sophistication of mathematical tools, in particular infinitesimal calculus, natural phenomena became

accountable for in purely mechanistic deterministic ways ("*natura non facit saltus*"). Nature, in other words, became the synonym of the scientific endeavor: «"Nature" means that which is open to scientific method» (Sheldon 1945: 263, as quoted in Keil 2008).

In particular, one of the original causes, *causa finalis*, expressing the goal or purpose being served by an event, has been replaced by the formal notion of "negative feedback" (Rosenblueth, Wiener, and Bigelow 1943), which abolished the idea of teleology, i.e., that in analogy to the purposeful behavior of living being, all of nature *inherently* tends toward definite ends. By formalizing teleology, the distinction between living being and non-living objects was revoked for the benefit of a realist worldview that centers on a mind-independent nature in which the behavior of entities is causally interlinked.

David Hume, however, rejected the idea of causal necessity between observed events (i.e., between two elements in the experiential flux), irrespective of how often they have been observed to occur together. The doubt about the ontological nature of causality was picked up by early Ludwig Wittgenstein, whose «Superstition is the belief in the causal nexus» (Wittgenstein 1922: 5.1361) expresses his claim that only in the realm of logic is there necessity and «outside logic everything is accidental» (ibid: 6.3). Hume referred to psychological certainty, Wittgenstein to "compulsion" whenever the (chronological) order of experiential elements in the memory of the cognitive subject provides the incentive to establish a causal relationship among them: $event_1$ causes $event_2$, etc. That is, causality emerges if the observational pattern is an invariant pattern of time. However, as pointed out by Olaf Diettrich (2001), this condition is not sufficient. He argued that we need a time metric defined by a mental metric-generator which allows us to distinguish between shorter and longer intervals of time:

> If our time metric generator were of the kind that it would be accelerated after a flash of light and retarded after an acoustic event, we might well come to the conclusion that thunder is the cause of lightning rather than the other way around (Diettrich 2001: 304).

It is due to the mental time-metric-generator that causal order between experiential elements can be established such that the subject can form anticipations and make predictions. And since the mental metric-generator is mind-dependent, the causality is necessarily mind-dependent as well, and so are the laws of nature.

In his paper on *The Nature of the Laws of Nature*, Humberto Maturana arrives at a similar conclusion:

> Nature and the laws of nature are notions concerned with the explanation of experience, not with the explanation of reality as a domain of independent entities (Maturana 2000: 467).

For him, "experience" is that which a cognitive subject distinguishes as happening to her, with her or in her, as the subject attends or reflects upon what she does (cf. Step 3 in reality construction). The laws of nature are, then, «abstractions of the regularities (coherences) of our operation as living systems that we distinguish as we explain our experiences with the coherences of our experiences» (ibid: 468). Or as Ronald Hepburn expressed it: «Our knowledge of nature's powers and laws is itself derived from our experience» (Hepburn 2006: 518).

4. *Constructing reality (nature$_3$)*

Radical constructivism certainly does not stop short at the "deconstructivist attitude," which refutes particular beliefs that have become taken for granted in the mainstream realist worldview while leaving the "whole picture" untouched. For reasons detailed below, it is simply inconsistent to claim that concepts such as "table" are the result of constructions while, for example, "nature," "others," and "society" are not because they are considered absolute in terms of reality conceived as mind-independent. However, the epistemological trivial position of those who accept the idea of knowledge construction *only* as long as it serves the goal of gradually approaching mind-independent reality, is unattainable for two reasons.

Logically, as pointed out by von Glasersfeld, we cannot verify whether or not such gradual progression takes place since all the means at the subject's disposal to verify her knowledge are the very senses through which she gathered the sensory experience for this knowledge in the first place. In the sense of Putnam's «God's eye view» (Putnam 1981), the subject would need to stand outside and transcend herself to compare her current knowledge with the state of reality. There is no (logical) necessity to assume, though, that because as cognitive subjects we cannot access that reality it does not exist. (For how radical constructivists deal with the, at first glance, unsettling idea that we should forgo the idea of being able to relate to a firm, objective reality see the next chapter). For the radical construc-

tivist, ontology and metaphysics coincide as both become (in the sense of Occam's razor) superfluous components in any explanation.

Empirically, the position is unattainable due to the undifferentiated signal encoding in the nervous system of a cognitive subject (Foerster 1984). That is, nervous signals only encode the degree of their excitement but they do not reveal what caused a sensory signal nor how big the stimulus was that caused the signal. Maturana pointed out that in living beings and other structure-determined systems, it is the structure of the system that determines the degree to which it can be perturbed by some event external to it and not the event itself, which, therefore, may also go completely unnoticed for the system. How does this square with the impression that we recognize external entities? If the identity of these entities is not directly revealed by our sensory experience, it can only be inferred from the cognitive construction processes as described above.

In the light of the logical and empirical objections to the idea that eventually our constructions will hit rock bottom and reveal the truth of the mind-independent reality, any constructivist perspective must necessarily be thorough, or "radical" as von Glasersfeld put it. That is, the process of constructing must be assumed to cover all aspects of cognition without ever being able to verify them against reality. This implies that that which we refer to as the totality of entities, i.e., nature_3, must be considered a construction.

The requirement of being consistently constructivist on all levels makes any aspiration to establish the third "reconciliatory position" between realism and constructivism (as suggested by Proctor) impossible because ultimately such a position conflates with the realists' position.

5. *Inaccessible nature?*

In the spirit of Robin Collingwood, our arguments so far have led to the conclusion that the mind-independent nature about which we cannot say anything with certainty may or may not exist because:

> Objects to which no predicate other than existence is ascribed, are unknown since we cannot say anything about them other than that they are (D'Oro and Connelly 2010).

From the many reactions the radical constructivist position provoked it becomes clear that, psychologically, it is an uneasy perspective as it seems to take away any firm ground. So does the radical constructivist perspec-

tive imply that we could be mere brains in a vat? Not only, again, would we need to have a "God's Eye view" to verify or falsify such a scenario, the argument also builds on the implicit but misleading assumption that knowledge construction is a material process, and its product, experiential reality, is an ontological realm. As Maturana pointed out, the observer (who is supposed to make the comparison) «is not a physical entity, and observing is not a physical process» but rather a relational process taking place «in the realization of the living of the kind of living beings that we human beings are – that is, living beings which exist in languaging» (Maturana 2000: 460). For a cognitive subject to talk about the existence of an object, that object needs to be part of the subject's experiential reality, hence constructed: «The question of whether this table exists or not is an assertion that neither adds to, nor subtracts from, existence» (Schmidt, quoted in Poerksen 2004: 134). We live our daily (and scientific) lives without being able to ground our concepts and actions in a mind-independent reality: «We living systems do not need the supposition of an external independent reality to live» (Maturana 2006: 94).

In Riegler (2007) I argued that the fact that for a cognitive subject the experiential reality is stable does not necessarily imply the existence of stable structures in any metaphysical material reality. What may sound like the old Aristotelian idea of *causa formalis*, i.e., that there are formal causes to phenomena, was found in the behavior of formal network models. Stuart Kauffman (1993) showed that in complex networks of interdependencies, order arises "for free" without selection by external forces. Working with simulations of binary networks, i.e., networks whose nodes have only two states, Kauffman noticed that networks of a vast number of binary nodes display the tendency to move into a few recurrent cycles of activity. The dynamics of these circles can even be so stable that external forces cannot seriously perturb these systems. Already in a very simple setting of networks of n nodes where each node has 2 inputs and outputs from and to other nodes, the number of states that can be occupied by the network is as big as $2n$ while the number of cycles of activity these n nodes eventually arrive in is only $\sqrt{n}$. This means that there is a high degree of stability in such networks (which could be interpreted as metabolic networks or as networks of cognitive processes), even in the absence of force from outside the network (such as entities in the world that allegedly are the object of cognitive processes). The general formal character of this result suggests that the emergence of stability is *formally inherent* in systems and no *causa materalis* (material causality) need be assumed.

6. *Social construction?*

There is yet another implication of von Glasersfeld's claim that in order to avoid inconsistency any constructivism must be thorough. Since construction permeates all of a subject's cognition and hence all her knowledge is the result of an ongoing construction process, in her experiential reality not only are non-living entities constructions but also living beings including other human subjects (Glasersfeld 2008). If, however, other humans are constructions, how can an assumed totality of humans, i.e., a social group or society, be held responsible for constructing nature? In this vein, what are "projections of social interests" (cf. quote in the beginning) other than a concept attributed to the externalization of repeated observation of the experiential elements a subject refers to as her peers?

In this sense, radical constructivism subscribes to a *perspectivist* view, in which a subject's own experiences are the only source of her knowledge construction. This relieves constructivism from the inherent threat that an idea such as the "projection of social interests" may pose for realists, and which could be easily associated with the unpredictable force of a mob having no regard for individual interests, those of nature included. Ever since Stanley Miligram's experiments, the effect of feeling embedded in social groups and subordinated to authority, both of which seemingly relieve the individual of any responsibility, have been a subject of scientific research.

In contrast to that, in a radical constructivist understanding, neither a mind-independent reality nor an individual-transcending society can be held responsible for constructing that which a subject refers to as nature; only that subject herself can do so. This means that ethical issues linked with the concept of nature, such as environmental protection, are the individual's responsibility and cannot be delegated to an entity, living or non-living. This is because any such entity has an existential quality only in the experiential reality of the subject. Delegating to society proper would mean trusting to a metaphysical authority to which we have no access.

Conclusion

In the course of this paper, I characterized the three different meanings of "nature" from a constructivist position. For logical (and empirical) reasons, this position must necessarily be consistent, which leads to the rejection of (a) the idea of social construction of nature (for society is already

the product of constructing) as well as (b) the possibility of a third position between realism and constructivism (for it is tantamount to realism). The remaining constructivist position, radical constructivism, has a strong ethical component when it comes to discussing concepts such as environmental protection. In any theocratic society, God was the original mover; in enlightened societies the role was taken over by Nature, referred to as "*machina mundi*". In postmodern societies, society itself became the ultimate reason. In the radical constructivist view, however, the baton of responsibility is handed over to the individual cognitive subject.

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Abstract

For a realist, nature embodies the ultimate arbiter, while for social constructivists nature is the projection of social interests. In this paper, the highly ambiguous term "nature" is discussed from yet another position, i.e., radical constructivism. It is argued that this position is incompatible with realism and, for reasons of consistency, also with social constructivism. Furthermore, from an ethical perspective, the radical constructivist conception of nature shifts responsibility further away from God, nature, and society to the individual.

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