

implications and consequences that may or may not become visible to the respective investigator. However, this kind of empirical epistemology and constructivism should not be confused with genuine philosophical constructivist approaches as proposed, e.g., by Ernst von Glasersfeld (1995), Edmund Husserl (who is not labeled a “constructivist,” but whose phenomenology is often quoted by Luhmann (e.g., Luhmann 1987: 93, 122, 153, 201, 357, 367, 368), or as proposed more recently by Arne Kjellman (2002, 2006). Philosophical constructivism and epistemology come into play only once the researcher becomes aware and takes into account that his own research activity on such cognitive issues is subject to the same mechanisms he is investigating in others.

« 7 » While Strategies 2 and 4, interdisciplinary and participative research, are not new either, Strategy 3 can be considered genuinely second-order because in literature surveys it includes the historical dimension as well as the feedback on the effect that the studies and theories reviewed have had on the scientific community and on society at large. The systematic inclusion of the historical dimension, which turns circular (causality) processes into evolving spirals of iterations, is a bridge between nomothetical (natural) sciences and historical or ideographic (social) sciences. So far, this has been considered another split in the unity of science.

« 8 » There is one disagreement I have with Umpleby. This concerns the role he assigns to variables in §27 as one of the four basic elements for describing systems. Umpleby's Figure 5 depicts these elements as belonging to the same category. However, this mixes quite different levels of analysis that should be kept distinct. To combine these into a “theory of social change” (§27) is at least misleading. Ideas, representing culture, and groups are certainly sociological categories that could be considered variables at the sociological level. Events, however, are a much more general category that should go along with the categories of process and structure, three concepts that are of use in any science, although at a quite abstract level. In a sociological context, it should rather read “social action,” “social process” or “social events.” Umpleby prob-

ably wants to refer to these after all. Variables, finally, are part of a mathematical framework (although many sociologists like to forget that) and go along with constants and equations. At the level of a substantial science, e.g., sociology, these need to be interpreted, e.g., as ideas, social action, etc.

« 9 » The ambition of Umpleby to argue in favor of the unity of science, i.e., including the natural sciences and the social sciences, or what are also called the humanities, and to make a case for second-order cybernetics and its practical application in a second-order science is laudable and important. However, the question remains: How can scientists not familiar with second-order cybernetics be convinced of the usefulness of this approach in science at large? The point where a genuine breakthrough could be expected, i.e., the “methods for doing second-order science,” remains sketchy at best, with only a few references to some ideas of the author and two references to literature. Substantial progress could be achieved at this point, both with regard to the existing deficit in empirical research and with regard to providing a full package of practically applicable methods.

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RECEIVED: 20 OCTOBER 2014

ACCEPTED: 27 OCTOBER 2014



Observer Effects in Research

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> Upshot • The evaluation of what (we think) we know is an urgent and evolving issue. The issues discussed by Umpleby have been raised earlier, particularly in the social sciences. Arguably, in some quarters they are exaggerated. But an awareness of observer effects is of great importance and is greatly enhanced by second-order cybernetics applied more widely as second-order science.

« 1 » In order to understand Stuart Umpleby's discussion of “second-order science,” it is necessary to go further back than the work of Heinz von Foerster, as referenced by Umpleby in §7. Thus, in many contemporary contexts it is necessary to defend the very possibility of knowledge from emphasis on the various effects of the observer on the system observed and the kinds of bias that an observer may introduce. Modern learning theory, going back to the work of Jean Piaget (e.g., 1930), suggests that all concepts are “constructed” as a result of experience by the learner or passed on as a products of social construction in a given social context. Arguably, an awareness of alternative ways of constructing reality first arose in contexts of profound cultural difference, leading investigators to an awareness of the arbitrariness of their own assumptions.

« 2 » The emphasis on knowledge as socially constructed within a given context is often discussed in *post-modernism*, where it is used to question the validity of cross cultural observations or interpretations made of another social context or era. It is important to note that, although the observer effect is most significant for the social sciences, it can be recognized in descriptions of the physical world as well, as in the example to which Umpleby refers of the concept of the “ether” (§22) or the contrasting constructions of the physical world of Aristotle and Lucretius, as described in Greenblatt (2011).

« 3 » It was a significant advance for sociology and psychology when the Western Electric Hawthorne Studies recognized the

Hawthorne effect¹ created by Elton Mayo's study in 1924–1933 of the responses of factory workers to changing conditions.

« 4 » Carl Jung made an important contribution to our understanding of mental phenomena with his distinction between *pleroma* and *creatura*, corresponding roughly to Popper's Worlds 1 and 2 (§4), which was further developed by Gregory Bateson (1970) in his exploration of mental phenomena in self-corrective systems.

« 5 » Anthropologists working in isolation within preliterate communities have for a long time been aware of the psychological effects on themselves of such isolation, (often described as "culture shock"), in which what has been learned as "common sense" is no longer valid, and also of the inevitable effect of their presence on the community studied. Recently, the analysis of the observer's experience has become the focus of much ethnographic writing under the term "reflexivity" (Fischer & Marcus 1999), dealing with the way in which observers seek disciplined subjectivity by becoming aware of their responses and effects as participants in the systems they study, an awareness crystallized in the description of ethnographic method as "participant observation."

« 6 » Umpleby's reference to climate change (§33) might well be supplemented by a discussion of how "denial" – the desire *not* to know – can distort observation and rational decision making, often for the economic or political advantage of the decision maker.

« 7 » Second-order cybernetics has an immensely important potential role to play for all the social sciences in reinforcing awareness that observation is itself a form of participation. This awareness is advanced through the emphasis on circular (as opposed to linear) causation and the importance of feedback. Umpleby offers a number of useful approaches in training researchers to this awareness, which has implications not only for philosophy of science but also for all fields dealing with causation in living systems, especially ethics, which one might hope would be relevant in management,

1| Also known as the "observer effect," it describes the fact that individuals change their behavior when they become aware of being observed (Landsberger 1958).

economics, and political science. In living systems, including human societies and ecosystems, simple linear causation may be the exception rather than the rule, because such systems are responsive to differences, which leads to a need for a more complex theory of causality and systematic attention to circular loops and side effects such as environmental pollution and disruption (Bateson 2004).²

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RECEIVED: 16 OCTOBER 2014

ACCEPTED: 29 OCTOBER 2014

Second-Order Observation in Social Science: Autopoietic Foundations

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> Upshot • Second-order science requires a specific methodology. It thereby reverses the classical observer-observed relation in favor of the observed – i.e., the first-order observers – if the principle of autopoiesis is acknowledged.

« 1 » Karl Popper wanted to "exorcise the ghost called [...] 'the observer'" (Popper 1967: 7). This was not to deny the importance of the observer but to clarify its role.

2| See also my dinner speech "Living in cybernetics – making it personal" at the 2014 Annual Meeting of the American Society for Cybernetics, http://asc-cybernetics.org/2014/?page_id=121

An observer tests theories since each observation is guided by a theory as a self-made instrument of thought (Popper 1989: 157). With this clarification, Popper justifies second-order thinking. That is, the inclusion of the observer in what is observed. Another observer could choose another theory and observe something different in the same situation (without being wrong). The observer is "inside the box," as Gregory Bateson and Margaret Mead formulate it (Brand, Bateson & Mead 1976: 38 or "a person who considers oneself to be a participant actor," in the words of Heinz von Foerster (2003: 289).

« 2 » Since the inclusion of the observer changes the scope of the object of investigation, Stuart Umpleby is quite right to emphasize the importance of particular second-order theories and methods. He sketches a program for second-order science by addressing specifically the social sciences. As a sociologist, I am very much in favor of such an undertaking because "participant observation" is a basic methodology in sociology, with early use in empirical investigations such as "Mariental" or "Street Corner Society," which became sociological classics.

« 3 » There exist a broad variety of methodological considerations addressing participant observation. Umpleby lists some of them, and others could be added such as grounded theory or stakeholder theory (Glaser & Strauss 1967; Freeman et al. 2010). Niklas Luhmann's theory of social systems could also be instrumental for the further elaboration of second-order science, since it already took up basic ideas of second-order observation (Luhmann 1989, 1993). Both the observed system and the observing system are here conceptualized as autopoietic entities constituting themselves and constructing the reality of their world through self-referential operations. Thereby, the observed system's mode of attribution – i.e., the observed actor is the first-order observer – is distinguished from the observer's mode of attribution – i.e., the second-order observer. In the following, the examples of "Mariental" and "Street Corner Society" are first used to illustrate aspects of second-order science and then to show how the notion of autopoietic systems can be applied.