Second-Order Science, Unity of Science and Methods of Research

Bernd R. Hornung
Marburg University, Germany
hornung/at/med.uni-marburg.de

> Upshot • Umpleby's target article is important for bridging the gap between the natural and social sciences. While I agree with his claims, his proposals may not reach far enough. Concrete methods of empirical research, which are of crucial importance for a breakthrough, deserve further elaboration.

« 1 » While the title of Stuart Umpleby's target article, "Second-order Science: Logic, Strategies, Methods" is very promising as it points at bridging fundamental reflections on science with the practical application of methods, some readers may remain disappointed. Umpleby certainly makes a strong case for the unity of science and logic but in §32 he only briefly goes into the issue of strategies and even more briefly mentions methods. The key to further developing and especially expanding the acceptance and use of second-order cybernetics, and hence the importance of this article, lies, in my opinion, precisely in the issue of developing second-order cybernetic methods.[1]

« 2 » There are numerous publications on second-order cybernetic theory but serious empirical applications using methods to deal with specifically second-order issues seem rare. Such empirical applications require methods that, as Umpleby justly remarks, are suitable for meeting the requirements of the specific theory (§25, also §17, 18).

« 3 » The sociological theories of Niklas Luhmann are an example of the empirical application of a special kind of second-order cybernetics. They have been discussed seriously, going beyond the superficial issues, in both the framework of some of the Dubrovnik conferences organized by Gorm Harste and his colleagues[2] and the books published by a group of followers and students of Luhmann (e.g., Farias & Ossandon 2006). In both cases, however, the focus was on theory and empirical content rather than on methods of empirical research. At any rate, it may be doubted that Luhmann himself, being a lawyer by training, used "methods" in the usual sense of the natural and social sciences.

« 4 » In my own publications, I always stated that (socio-)cyberneticians and systems scientists can make use of any method of empirical (social) research and data collection that is useful for their research question (Hornung 2006a: 53; Hornung 1988: 38f). So I fully agree with Umpleby and support his statement that a newer theory, such as second-order cybernetics, does not make an older theory, such as first-order cybernetics, obsolete (§31) – very much like quantum theory did not render Newtonian physics invalid, wrong and useless. Within the new framework of the former, the latter is just a particular theory applicable to particular cases only and its limitations and drawbacks are known. Methods adapted to the older theory, however, may not be very useful for tackling the specific issues of the newer theory. Of course, the development of new methods and the identification of existing ones that are suitable for investigating empirically specific issues of second-order cybernetics beyond the reach of first-order theories and methods is a challenging task for the cybernetic and constructivist community.

« 5 » A scientific revolution and change of paradigm often means putting established knowledge in a new (here second-order cybernetic) framework and – which is not made very explicit by Umpleby – in a constructivist framework. Only a philosophical constructivist foundation permits resolving the problems the unity of science encounters from a realist's point of view (cf. Hornung 2006b). For the realist, Cartesian dualism, and in its wake the split between natural and social sciences, is an ontological given. For the philosophical constructivist, it is a human construction and hence could be replaced by a different – better – construction. The same could also be said for an idealistic, purely subjectivist position: if the world was only our subjective idea, we would have no problems changing it. Evidently this is not the case. In philosophical constructivism, however, we have both the flexibility of changing our constructions and a criterion for "truth" and for which constructions are better or worse. This is the pragmatic criterion of viability rather than the realist's criterion of truth in terms of correspondence with an external "reality."

« 6 » As in the case of a change of paradigm, some of the strategies listed at the end of the target article are not new but need to be seen – and applied – within a new, i.e., constructivist second-order cybernetic framework. For Strategy 1, the biology of cognition, incorporating its consequences into our (empirical) research would certainly be progress and innovation, and as such it deserves and needs further elaboration. On the theoretical side, however, it also needs to be connected more closely to philosophical constructivism and epistemology. This is a level quite different from empirical epistemology in the way it has been developed in Maturana & Varela's (1980) biology of cognition (to which, I assume, the cybernetician Umpleby refers), or by Jean Piaget or by sociological constructivists such as Peter Berger and Thomas Luckmann (1966). At least as a first step, such an empirical epistemology can be developed as first-order research: investigating how another human being perceives, how a child develops its cognitions or how human beings construct their social systems. It is clear, that, e.g., Maturana and Varela made the second step to the philosophical-epistemological level, including reflexively their own activity as scientific observers, while I cannot find this in Berger and Luckmann. Without the second step, these are empirical investigations and theories that nevertheless have philosophical

1| I shall continue to use the term "cybernetics." Umpleby, as a past president of the American Society for Cybernetics, presumably does not refer just to any kind of second-order science but to a cybernetic or systemic one. On the other hand, there was, for example, a period when sociology of sociology was quite fashionable. This is indubitably a second order – i.e., reflexive – discipline, but neither systemic nor cybernetic.

2| "Luhmann in Action, Empirical Studies of Structural Couplings," Conference at the Inter-University Centre (IUC), Dubrovnik, Croatia, 11–15 April 2011. See http://www.iuc.hr/conference-details.php?id=155

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, interdisciplinarity 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 probably 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.

Originally a researcher into computer modelling and social development at the Eduard Pestel Institute for Applied Systems Research, Hannover, Germany, **Bernd R. Hornung** did practical work for the UN in West Africa, before turning to healthcare and IT at the Institute of Medical Informatics, Marburg. A former president of Research Committee 51 on Sociocybernetics of the International Sociological Association (ISA) and a member of the ISA Executive Committee, he is currently responsible for data protection and security at the University Hospital Gießen and Marburg.

Received: 20 October 2014
Accepted: 27 October 2014

Observer Effects in Research

Mary Catherine Bateson
George Mason University (emerita), USA • mcatbat/at/gmail.com

> 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