Nonlinear Dynamics, Psychology, and Life Sciences, Vol. 16, No. 4, pp. 498-500.

Book Review

New Thinking in Complexity for the Social Sciences and Humanities: A Generative, Transdisciplinary Approach by Ton Jörg. New York, NY: Springer, 2011. ISBN 978-94-007-1302-4.

Once we acknowledge living in a complex world, it follows that we need to reflect on our pre-conceived notions about how reality works and re-think the way we do science. This book offers a thoughtful appreciation of this challenge. The author notes that established scientific practices (normal science) trivialize complex phenomena through reductionist methodologies: objects and agents are removed from their systemic context, observations are frozen in time, and unidirectional cause and effect relationships are assumed without feedback processes. The imposition of these paradigmatic limitations, it is argued, marks a crisis in our scientific thinking because it results in an incomplete understanding of our surroundings. This state of affairs requires a paradigm shift in the Kuhnian sense, and the mission of this book is to lay the groundwork for such a shift. To this end, the book sets out to address two basic issues: the conceptualization of real-world complexity (as opposed to complexity as a mathematical abstraction), and the development of a vocabulary that could be used to address complex processes and issues.

Central to Jörg's thesis is the notion of *generative complexity*, i.e., the self-organization of complex systems to adapt to their environments and regenerate themselves in a continuous process of innovation and self-perpetuation. Systems are autopoietic and have emergent properties, in other words, and the methodology we use to study those systems should capture those properties. Given the current state of science, there are three implications to consider. First, we need to re-conceptualize *interaction* as a process of mutual causation between systemic components, rather than in terms of action and reaction chains. Second, and related, we need to re-think *causality* as a reciprocal rather than a unidirectional process. Lastly, we need to re-think the *unit of study* such that self-organizing networks becomes the focus of attention rather than the behavior of individual agents within those networks.

The discussion of all three implications is framed toward the beginning of the book by a quote from 1924 about human relations by Mary Parker Follett that presages R. D. Laing's knots and Gregory Bateson's metalogues by a number of years: "I never react to you but to you-plus-me; or to be more accurate, it is I-plus-you reacting to you-plus-me" (p. 58). In other words, the interactional history that shapes an alliance or subsystem is already incorporated in the exchanges taking place within that alliance at a given point in time. This

use of communication as a self-organizing tool is very consistent with our contemporary notions of how social systems work: top-down and bottom-up feedback loops in the communicative flow maintain the system and its constituent components in an ongoing interrelationship. This hierarchical conceptualization is particularly important to our recent attempts to understand emergence and the origins of novelty in systemic behavior.

To scholars in the field of nonlinear dynamical systems, most of the ideas expressed in this book are not new. Where this volume differs from most other work in this area is in its scope. The idea of generative complexity is presented as a *transdisciplinary* notion, which is to say that its relevance is not specific to certain academic disciplines but should be seen as a theory of the social sciences and humanities more in general. While there is a long-standing tradition of multidisciplinary work in nonlinear scholarship (e.g., Wiener, Kauffman, Prigogine), this book takes the challenge of complexity to our disciplinary confinements one step further by making the boundaries disappear completely and present a new meta-theory of science informed by the principles of generative complexity. The reference to Kuhn's notion of scientific revolutions is appropriate here: complexity represents a paradigm shift that has the potential to affect the field of social sciences and humanities in its entirety.

By any standard, this is an impressive work, in its scope and ambition as well as in its articulation of the basic principles of complexity. It is indeed very courageous to build up a conceptual framework from the scratch, relying mostly on broad-based philosophical texts, rather than adding incrementally to existing work in nonlinear dynamical systems science that focuses on specific areas of inquiry. In fact, the lack of reliance this latter type of work is by design rather than by omission, and the resulting open-endedness of the endeavor is part of what gives the book its freshness and its unique value. It is a source of frustration as well, however, when one wants to position existing work in complexity and nonlinear dynamics within the framework discussed in this book. For example, when discussing the key concept of interaction, Jörg states that "an adequate *concept* of interaction has not been developed in the social sciences yet" (p. 148). It is not clear where that leaves the accomplishments of the likes of Shannon, Lewin, Bateson, Watzlawick, Vallacher and Novak and others who have extensively investigated the applicability of dynamical systems theory to communication.

This book relies heavily on the work of Vygotsky, whose identification of a crisis in psychology is highly relevant to the Kuhnian conception of a paradigm shift in response to crisis, as pursued in this analysis. Vygotsky provides quite a few eloquent observations about the state of the field of psychology in his time, its 'old habits of thought' (p. 29), and the challenges it faces as a discipline: 'whether psychology is possible as a science is, above all, a methodological problem" (p. 85). Their acuity notwithstanding, these observations were uttered quite a long time ago, and it is not clear to what extent Vygotsky's diagnosis is still current, particularly in light of the recent applications of nonlinear dynamical systems in psychology. A similar argument

can be made for other areas of knowledge, where lots of dynamical work has been done, the status of which as part of the problem or part of the solution remains undetermined in Jörg's analysis. This lack of precision demarcating the crisis significantly undermines the case for a scientific revolution based on generative complexity.

Jörg's choice to use structural equation modeling (SEM) principles to articulate causal principles is interesting but non-obvious. In its original form, the technique is correlation-based, and not particularly well-suited to detect or model nonlinearity. While SEM can handle longitudinal information, as is shown in this book, its ability to deal with endogenous processes, systemic hierarchy, and feedback loops is relatively unexplored terrain, which has received some attention in the recent literature (e.g., Boker, Molenaar), but requires a much more detailed discussion than is provided here.

With regards to causality, the absence of any reference to Piaget in this book is also remarkable. Many consider his work in developmental psychology as a prime example of a successful application of dynamical principles to the articulation of causal mechanisms: stage transitions in the cognitive development of children are caused by disequilibrium followed by accommodation or reflective abstraction, and these transitions can be predicted and empirically investigated even by the most unwavering linear research designs. Piaget's genetic epistemological position is also very relevant to this book: the adaptive process of the organism to its environment involves the intellectual construction of cause and effect relationships to form a frame of reference for the interpretation of reality. This constructivist notion of reality itself, and the role of science trying to understand it, is remarkably similar to that of Prigogine as cited in this book, and the addition of Piaget's epistemology therefore would have provided a stronger justification of causality and interaction as the main tenets of an explanatory framework for generative complexity.

Aside from these issues, this book effectively captures some of the excitement and the sense of possibility that comes with the exploration of new paradigms with potentially major implications across the board, and it stimulates readers to develop their own thoughts about how the paradigm shift could materialize. The many wonderful illustrations of non-linear and fractal shapes and concepts (e.g., M. C. Escher's drawings, Frank Gehri's architecture) are helpful in this context. They provide a welcome antidote to the generally high level of abstraction that comes, perhaps inevitably, with transdisciplinary scholarship.

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