Book Review

Maria José Esteves de Vasconcellos (2020) Systems Thinking: The New Paradigm of Science. São Paulo: Vorto Books

Introduction

The distinctive feature of this book is that the author advocates systems thinking as "the new paradigm of science".

Her text is mostly descriptive, but it also has normative traits: the new paradigm is already palpable, but it is as well something that still emerges. The author conceives of it as a force that should orientate theory-building in all sciences.

In our day, many voices keep announcing a new wave of systemic practice, which is supposed to be sufficiently pervasive as to be called "paradigmatic".

Esteves de Vasconcellos (henceforth abbreviated: EDV) chooses a different strategy. She spots a trend: the need for a turn in the way of thinking induces many individuals and organizations to revise their mindsets and reframe their actions or even their identities. But she argues at a different level. Her point of entry is epistemology. Epistemological changes or transformations can lead to a new and better science. And it can be surmised that a superior way of theorizing will pave the way to better practice: a practice in tune with ecological, social and economic needs, which would help in overcoming the crises which shatter the globe.

Many have addressed a paradigm shift in the sciences, but EDV got to the heart of that topic.

The opus is divided in an introduction, three parts and six chapters. The content follows a straightforward argumentation. In the Introduction, the author delves into her professional background. She is a psychologist with a long career as a professor, consultant, author and systems thinker committed to the cultivation and diffusion of the discourse on epistemology. Family therapy is a field in which she has reached prominence in Brazil: the community of psychologists calls her "our epistemologist".

EDV introduces the topic of the book, observing "profound repercussions of what has been identified this paradigmatic revolution of science in course" (p. 27). She also maintains "that this paradigm shift will necessarily entail deep and large transformations in our practices and in our relations" (p. 28).

One is immediately prone to ask: "What do we need a paradigm shift for?" or "Why does such a new paradigm emerge?" The author's answer is that science has not been effective in leading the human civilization towards a sustainable future; it is not sufficient or suitable for diverting humanity's course towards its own extinction. "The dominant paradigm of science is in crisis" (p. 34). "Traditional science is inadequate to deal with complex and unstable situations" (p. 35). In contrast, the systems approach has developed a line of thinking that provides a new perspective out of the impasse. Apparently, the implicit purpose of this book is to help bringing the new paradigm to full fruition.

PART I–Tracing the origins of the scientific knowledge paradigm

In Chapter 1, the notions of paradigm and epistemology are reflected extensively, and illustrated with didactical devices such as Heinz von Foerster's Blind Spot. EDV considers both notions as equivalent, and as fundamental aspects of the worldview, shared beliefs and values of a community of scientists.

In Chapter 2, the evolution of the conception of scientific knowledge, since antiquity, is traced. The chapter is a splendid, parsimonious essay on the history of science. It includes

Kybernetes
Vol. 51 No. 8, 2022
pp. 2669-2671

0368-492X
DOI 10.1108/K-08-2022-993

sections about Greek and medieval philosophy and finally "the thinking of the modern man" (p. 78). The author asserts that "there is a way of thinking scientifically, which is recognized and distinct from other ways of thinking", which is new and identified as Systems thinking scientifically" (p. 67). Thereupon many concepts are listed, which are somehow coupled with scientific thinking (Box 7, p. 68). It would have been useful to discuss more concretely the nature of scientific knowledge, what is special about scientific work and what are the necessary and sufficient conditions of scientific statements.

EDV makes two important points. First, that we are experiencing a discontinuity in the history of science, given an epistemological break. Second, that old theories are integrated into new ones, as a novel paradigm emerges.

PART II – Following the transformations of the paradigm of science

In Chapter 3, the "traditional paradigm of science" is outlined. The chapter contains a learned review, a reflection on the state of the art before the paradigmatic change came about. The author's analysis would also be suitable as a tutorial for students of the topic. Her review is both a description and a well-founded critique of the traditional paradigm.

The shortcomings of the old paradigm manifest themselves by increasingly counterproductive modes of operation in the scientific domain, e.g. reductionism, fragmentation of views, compartmentalization of knowledge.

EDV describes that paradigm in terms of three dimensions:

(1) Simplicity (of the microscopic)

(2) Stability (of the world)

(3) (Possibility of) Objectivity

These are assumptions, which the author announces to be superseded by distinct assumptions in the new paradigm.

Chapter 4 is a characterization of "the emerging paradigm of contemporary science" (p. 129ff). The author shows the evolution of science along the three dimensions distinguished in Chapter 3, "corresponding to advances in three epistemological aspects . . .

(1) From the assumption of simplicity of the microscopic to the assumption of *complexity* . . .

(2) From the assumption of stability of the world to the assumption of the world's *instability* . . .

(3) From the assumption of objectivity to the assumption of *inter-subjectivity* in the constitution of knowledge about the world" (p. 129).

On that basis, a "reference framework" is proposed, in which the paradigmatic transformation from "Traditional Science" to the "Emerging New-Paradigmatic Science" is described: from narrow analysis and linear causal relations to contextualization and recursive causal relations; from determinism/predictability and reversibility/controllability to indeterminacy/unpredictability and irreversibility/uncontrollability; from subjectivity between parentheses and "uni-versum" to objectivity between parentheses and "multi-versa" (p. 130).

EDV has a clear view about such a transformational development. She affirms that the characteristics of traditional science should not be merely superseded. They should rather be integrated in the new concept of science. Both is needed, analysis and synthesis, the observation of elements and relationships, etc.

When referring to the paradigmatic transformation, EDV invokes the thermodynamics of non-equilibrium. Prigogine's principle of Order through Fluctuation states that deviations at

microscopic level are often amplified, leading to structural changes at macrosystemic level. The fluctuations can have an internal or an external origin, i.e. they can be generated spontaneously by the system itself or caused by environmental perturbations. The insightful harvest of studying these new physics is the understanding that the new paradigm originates from both internal and external fluctuations. EDV attests that the environmental determinism of traditional science is refuted: "the environment does not have the power to determine the system" (p. 169).

Chapter 5 focuses on "Thinking systems thinking as the new paradigm of science" and "The new-paradigmatic scientist". EDV relates her theoretical stance with that of other systemists, Capra and his systems ecology and Maturana and Varela's biology of cognition, and others from the vanguard of the new paradigm. In this vein, a profile of the "new-paradigmatic scientist" is developed: s/he broadens the focus of observation, admits that s/he does not control the process, and acts in a process of co-construction, etc. (p. 189).

Finally, EDV highlights that also the new paradigm is subject to change: "it is no more than a consensual construction of scientists who reviewed effectively their conception of scientific knowledge" (p. 225).

PART III – A necessary addendum: systems theories

The addendum is Chapter 6, in which the origins of systems theoretical approaches are traced. The review concentrates on a small number of authors, starting with Bertalanffy, in 1925, and reaching until 1997 with Maturana. The cost of this parsimony is that pivotal authors are not included, e.g. Rapoport, Boulding, J.G. Miller. Also, the theory of dynamic systems, as Forrester's System Dynamics, is absent from the book. In a "reference framework for systems theories" (p. 235), EDV quotes "The New General Systems Theory" without further conceptualization.

EDV uses several powerful sources, from the 2000s and before, on which she draws heavily. She concentrates on the fundamental questions of paradigm formation. Therefore, she turns mainly to the classics, doing without many newer and fashionable publications, which is rather favorable for the quality of her analysis.

Synthesis

Maria José Esteves de Vasconcellos succeeds in delivering a compelling message: the proposal that Systems Thinking is the new paradigm of science, and that it should be made known widely.

She also contributes to the body of epistemology, in particular, the reflection of Systems Thinking. She does not claim to present a comprehensive concept of or framework for the envisioned new paradigm of science. EDV examines and deliberates a multiplicity of concepts, which is typical of and necessary in a period of transition, as the one we are living in. Accordingly, some of the concepts are defined very accurately, others rudimentarily, and part of them are not defined at all.

EDV's argument is coherent, and throughout focused on her claim of the new, systemic paradigm of science. She presents strong support for it, drawing on authoritative sources, some of which are seldom considered elsewhere, namely the French literature.

Finally, a noteworthy trait of this book is that it stems from a Brazilian author: In South America, several hotbeds of systems science have evolved. The works developed there are worth being brought to the attention of a wider public.

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