Book reviews

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Facets of Systems Science

Second Edition.
ISFR International Series on Systems Science and Engineering, Volume 15.
Kluwer Academic / Plenum Publishers, New York – Boston – Dordrecht –
– London – Moscow 2001.
xviii + 740 pages.
ISBN 0–306–46623–6.

Systems Science (called also General Systems Theory) emerged in the second half of the 20th century. Although there is a number of journal contributions to this field, and also several research monographs, there are is only a few introductory yet well-covering books. The book under the review is one of them.

This book is a second edition (revised and updated) of a classical textbook on Systems Science. Compared to the first edition, the new edition contains some important changes (a number of exercises is included, chapters are broken into more sections, there are new references added to the bibliography, there are new papers included in Part II). The book is divided into two parts. Part I, entitled "Systems Science: A Guided Tour" (234 pages), presents a self-contained introduction to Systems Science. Part II, entitled "Classical Systems Literature" (495 pages), contains 37 papers on systems science containing important contributions to the field. The book originated from a course given by the author since 1989.

Part I starts with answering the questions "What is systems science?" and "What is a system?" (Chapters 1, 2). The author states explicitly that his attitude to epistemic problems is a constructivist one ("Every system is a construction based upon some world of experiences, and these, in turn, are expressed in terms of purposeful distinctions made either in the real world or in the world of ideas.", p. 23) and that the constructivist view underlies the whole of Part I. Chapter 3, entitled "Systems Movement" brings up important milestones in the development of systems science. The ideas and directions that influenced the formation of systems science are reviewed and commented. The further chapters deal with particular aspects of systems science. Chapter 4 describes basic conceptual frameworks for describing systems. Chapter 5 is devoted to systems methodology (systems problems, systems modeling), Chapter 6 to systems metamethodology. Chapter 6 focuses on systems knowledge as the knowledge concerning knowledge structures. Chapter 8 deals with complexity from systems point of view. Presented are general remarks on complexity and information, Bremermann's limit, and computational complexity. Chapter 9 focuses on the problem of simplification in the context of systems science. An important class of systems, so-called goal-oriented systems, are discussed in Chapter 10. Chapter 11, entitled "Systems Science in Retrospect and Prospect" focuses on some critical arguments against systems science and on replies to these arguments. Furthermore, the impact of systems science on traditional sciences is outlined and discussed. A final section is devoted to the future of systems science where some of the current trends are identified.

As mentioned above, Part II is a collection of 37 papers on various aspects of systems science that were selected by the author as ones of the most important and representative. As it is not possible to go into these papers in this review, I only list them as listed in the book: R. Rosen: Some comments on systems and system theory; I. M. Havel: Scale dimensions in nature; E. von Glasersfeld: An exposition of constructivism: why some like it radical; K. E. Boulding: General systems theory – the skeleton of science; W. R. Ashby: General systems theory as a new discipline; P. B. Checkland: Science and the systems paradigm;

R. Rosen: Old trends and new trends in general systems research; G. Bateson: Cybernetic explanation; J. A. Goguen, F. J. Varela: Systems and distinctions; duality and complementarity; R. Rosen: The challenges of system theory; L. A. Zadeh: From circuit theory to system theory; R. L. Ackoff: Science in the systems age: beyond IE, OR, and MS; G. J. Klir: Systems profile: the emergence of systems science; M. L. G. Shaw, B. R. Gaines: Eliciting the real problem; B. R. Gaines: Methodology in the large: modeling all there is; A. G. Barto: Discrete and continuous models; G. J. Klir: Reconstructability analysis: an offspring of Ashby's constraint analysis; L. A. Zadeh: The role of fuzzy logic in modeling, identification and control; W. R. Ashby: Requisite variety and its implications for the control of complex systems; R. C. Conant: Laws of information which govern systems; W. Weaver: Science and complexity; H. A. Simon: The architecture of complexity; R. Rosen: Complexity and system descriptions; I. Prigogine: New perspectives on complexity; R. Rosen: The physics of complexity; G. M. Weinberg: The simplification of science and the science of simplification; W. R. Ashby: Introductory remarks at panel discussion; R. C. Conant, W. R. Ashby: Every good regulator of a system must be a model of the system; W. R. Ashby: Principles of the self-organizing system; R. Rosen: Anticipatory systems in retrospect and prospect; F. G. Varela, H. R. Maturana, R. Uribe: Autopoiesis: the organization of living systems, its characterization and a model; W. R. Ashby: The self-reproducing system; H. H. Patee: Universal principles of measurement and language functions in evolving systems; M. Bunge: The GST challenge to the classical philosophies of science; R. Rosen: Some systems theoretical problems in biology; K. E. Boulding: Economics and general systems; J. G. Miller: Can systems theory generate testable hypotheses? From Talcott Parsons to living systems theory.

The book can serve very well for two purposes: First, it can serve as a base for a one-semester course in Systems Science. The lectures of the course can copy Part I with possibly emphasizing or adding on some aspects and shortening on others, according to the needs of a particular program of study. Part II is especially valuable: The particular papers can be assigned to students who present and discuss their content in exercises. Moreover, and this takes us to the second immediate purpose for which the book can be used, Part I and Part II particularly give an excellent overview of ideas, conceptions, and opinions of the prominent systems researchers. Everyone interested in an introduction to systems science, in its development, and opinions of the most prominent systems researchers will find the book an invaluable and very accessible source of information.

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