BOOK REVIEW

Robert Trappl, Editor, *Cybernetics: Theory and Applications*, Hemisphere Publishing Corporation, New York, 1983, xii + 455 pp., $80.00

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Every once in a while, cybernetics makes the press. With mixed feelings of admiration and suspicion, amusement and fear, we learn about world models of the Club of Rome and about robots that apparently run whole factories, and frequently we are reassured that the human brain is still a bit smarter than cold computers. Everybody seems to have heard about cybernetics, but who really knows what it is? Robert Trappl is an expert in the field and appreciates the difficulty of defining cybernetics. In the preface to his book, he tells the reader that there are more than 100 definitions, and one sentence later their number has grown again: "Cybernetics is the science, craft, and art of communication, computation, and control in the machine, the living being, and the organization." Some pondering about the constituents of this definition suggests that cybernetics includes an awful lot. In fact, it appears that most every study can be formulated as a cybernetical analysis. With this preconception of vagueness and generality in mind, the reader hopes that a book with a comprehensive title like *Cybernetics: Theory and Applications* would enlighten him as to what cybernetics is.

Knowing about the complexity of cybernetics, Trappl has asked 19 experts to contribute to his book, which is "intended to be both an introduction to the field of cybernetics and a reference." Besides "Introduction" and "Future," five chapters are devoted to different theories and basic concepts, ten to applications in biology, psychology and education, social sciences, health care, management and organization, engineering, linguistics, artificial intelligence, cooperative computation and society, and to global planning. Most chapters are well written, interesting, and informative, and provide reference for further reading; altogether there are about 750 references; 9 since 1980 and 450 from the 1970s.

The first part of the book carries the title "Theory." One contribution treats information theory, the remaining four deal with systems concepts. (Interestingly, "system" is not part of Trappl's definition.) The contributions are very fundamental and general and because they are almost bare of substantial examples, the reader waits in suspense to learn how at least some of the various theoretical concepts might be used to analyze the real-world problems described in the second part of the book. However, the reader is ultimately disappointed because none of the applications builds on the theoretical basis created in Chapters 1–5; rather, each author introduces an independent ad-hoc formalization, tailored to suit precisely his or her particular application. It is only of little




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comfort to read in J. Michael McLean's "Methods of Systems Analysis and Model Building" that no single method is sufficient anyhow and that "methodological pluralism should be an essential feature of any systems analysis" (p. 137).

The individual contributions vary greatly in character, style, length, and the level of formalization. Some are easily understood by the educated layman, e.g., the chapter on health care and the almost contemplative chapters on the cybernetic society, global planning, and the future. Other chapters expect the reader to be familiar with basic mathematics and sometimes strain his liking for succinct, abstract notation: The 33-page chapter on learning systems alone contains 170 equations, not counting numerous definitions interspersed in the text. Some contributions require knowledge of basic set theory or symbolism of control theory, and to appreciate fully the linguistic application the reader should even remember some German, because exemplary sentences like "Pantoffeln sind bei der Kasse erhältlich" are not translated. A few chapters, notably Henri Atlan's informative introduction to Shannon's concept of information, try to give a coherent overview of an area and show relationships to other fundamental concepts. Other chapters are very concrete; for instance, Donald Gause and Gary Rogers describe in some detail how to teach a computer conversation. Some authors write in plain English and could easily do without cybernetics, others introduce symbols merely as abbreviations in a simplified language, and again others make real use of formalization, for instance, by proving theorems. Examples of a nice balance between verbal description and formalization, between abstract conclusions and concrete examples with informative figures, are provided by Luigi Ricciardi's description of neuronal models and Manfred Peschel's analysis of discrete systems. In summary, the contributions are very heterogeneous in every aspect.

Each chapter is completely independent, which causes a good deal of overlap and repetition. Although several topics and even chapter titles are very similar, there are but two cross-references. Of course, self-contained chapters have their advantage and, in a way, support the double intent of the book as an introduction and a source book. The reader can choose to read only those chapters that are of particular interest to him without first having to learn definitions and concepts introduced somewhere else. Each chapter can be viewed as an introduction to an individual area and its literature.

After having read the book, the reader will certainly realize that the chapters represent only samples from a multitude of different methods and applications, and he might develop a feeling for what cybernetics—or is it just formal thinking—can do. I doubt though that the reader will be able to say what cybernetics is or what its bounds are. Setting bounds to (i.e., defining) cybernetics is not only difficult in peripheral detail, but it even appears hard to differentiate between the core of cybernetics and major established research areas like applied mathematics, automata theory, computer science, control theory, informatics, or systems theory, let alone the various applications that belong to cybernetics, as indicated by the title and content of this book. The close relationship to these

areas and the pluralism of concepts imply a fuzziness in the meaning of cybernetics and make the reader wonder whether a definition exists at all. Is "cybernetics" undefinable? Is "cybernetics" what a "cybernetician" declares it to be?

Except for Peschel's contribution, Trappl's book probably would not motivate the reader to apply cybernetic methods to his own problems. For such a purpose, the theory is too abstract and the applications are too specific. The book does provide a wealth of material from many different areas and is thus interesting to read.

Although printed in two columns, the pale single-space typewriter lay-out is tiring. The quality of the figures, insufficient figure legends, missing references, and over 120 typing mistakes and misspellings make the price of $80.00 appear high.

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