*General systems theory: **Mathematical foundations***, by M. D. Mesarovic and Y. Takahara, Mathematics in Science and Engineering, Vol. 113, Academic Press, New York, 1975, xii + 268 pp., $20.00.

Historically, serious mathematical research on systems theory is traceable to solutions of difficult physical problems in dynamics connected with so-called systems of the world based on efforts by Ptolemy, Copernicus, Kepler, Galileo, Newton, Euler, Laplace, and Gauss, among others. These scientific investigations provide an interesting mixture of knowledge for its own sake and knowledge for the sake of commerce in the form of improved navigational techniques. In more recent times, systems theory, orienting itself still more with technology, has been influenced by physico-mathematical inquiries underlying the operation and design of hardware associated with power-plant governors (J. C. Maxwell); the position control system of the steering engine of ships (N. Minorsky); extrapolation servomechanisms and other cybernetic systems (N. Wiener); communication systems, secrecy systems, and digital switching systems (C. E. Shannon); general linear filters (R. E. Kalman); and adaptive or self-organizing control systems (W. R. Ashby, R. E. Bellman and L. A. Zadeh).

The purpose of the research monograph under review is to provide a unified and formalized mathematical approach to all major systems concepts. Neither practical applications nor philosophical ramifications of general systems theory are discussed. The authors promise to present these elsewhere. Special attention is devoted to formal aspects of deterministic input-output systems. Learning systems, decision-making systems, and goal-seeking systems, *per se*, are discussed only incidentally in the appendices. The point of entry for the authors' development of a general systems theory is the identification of a *system* with a set-theoretical relation. This approach certainly has the feature of generality and abstractness to it. With this degree of generality and abstraction one might expect, and rightly so, little content in the results. Indeed, the authors prove little that does not depend on the use of more formidable algebraic structure for the sets; e.g., that the sets are linear spaces over the same ground field. However, by adding algebraic structure prematurely, the authors miss a wonderful opportunity to apply the deep mathematical theory of ordinal relations (not necessarily finite), as developed by C. S. Peirce, E. Schröder, and A. Tarski, to the theory of general systems. The authors profess to develop an *axiomatic* approach to systems theory based on set-theoretical concepts. Nevertheless, they fall short of this desirable goal on two counts. First, they could have reduced their prime notion of a *relation* to a purely set-theoretical concept (say, by using Wiener's definition of a relation or Kuratowski's modification) and, then, used a suitable axiomatic set theory to underpin their whole edifice. Thus, a system becomes a set of sets (the notion of a relation being redundant) in, say, ZF set theory. This proposal has a hidden bonus: it more completely aligns systems theory with an axiomatic set theory; a link that might have pleased Minkowski, but saddened Hardy. Then it becomes