Chapter 3 introduces the basic concept of Nyquist's criterion. Control systems with a right half-plane pole are considered. This kind of pole is easily overlooked, and thus one may get wrong results while using this criterion.

In Chapter 4, the Bode diagram and the Nichols chart are used for frequency domain analysis. A few illustrations for low-order transfer functions are clear and helpful for understanding these two methods.

In Chapters 5 and 6, by the manipulation of the curves in Bode diagrams, the design methods for compensators are considered. The effects of a compensator with a pair of complex zeros are also considered.

From Chapter 7 to Chapter 11 (the second half of the book), the root-locus method is presented in detail, with new ideas of applying this method introduced. It is true, as the author states in the preface, "The treatment given to the root-locus method is the most complete I have seen anywhere."

In conclusion, this text book can help students learn useful information easily, without leading them to a fancy ivory tower and wasting their time.

General Systems Theory: Foundations, Developments, Applications Ludwig von Bertalanffy (New York: Braziller, 1972 revised edition, 280 pp.). *Reviewed by John W. Sutherland, Departments of Mathematics and Psychology, University College, Rutgers University, New Brunswick, N.J. 08903.*

Ludwig von Bertalanffy may properly be called the father of general systems theory. Several decades ago he gave biology the concept of the "open" system, i.e., one whose viability depends on the constant interchange of resources with its environment and with the dynamics of the process intelligible in terms of entropic changes. More importantly perhaps, he suggested long ago that science would do well to cease its atomization in the name of strict empiricism and turn, instead, to a consideration of similarities among broad classes of phenomena. Specifically, von Bertalanffy postulated instances of isomorphisms, on a high level, among entities of widely different properties. In concept, these isomorphisms may lead to the generation of analogic models that could make, say, a social system intelligible in much the same terms as a biosystem, or allow us to learn about an entire class of system by examining certain generic structural and/or functional commonalities. At no point, however, did von Bertalanffy suggest that all science should turn away from specifics and emphasize generics; all he really asked was that some scientists consider this long-neglected dimension of knowledge. The scientists who did so would thus become general system theorists. Without doubt many significant thinkers and researchers have followed his lead, drawing their direction and inspiration largely from the concepts and studies contained in this book.

In these pages, von Bertalanffy emerges as a man of immense erudition and intellect. He challenges subjects as diverse as the psychopathology of schizophrenia, the information-entropy interchange, the mechanics of open systems, theoretical biology, and the nature of the cybernetic model as a common base point for both the natural and social sciences. In the process of examining these subjects, he offers some tangible bases for a revaluation of the role and methods of science itself. General systems theory, as outlined by von Bertalanffy, may take its proper place as one of the major paradigms of scientific enterprise, roughly equivalent to the empiricism of Bacon or the phenomenology of Husserl. In this sense, then, von Bertalanffy's book becomes a work of great epistemological significance.

One must, however, ask if the paradigm is perhaps not an idiosyncratic one, a perspective unique to von Bertalanffy himself rather than a methodological platform that can be formalized and transmitted intact to others. In part, sympathetic though I am to his ambitions and intentions, I must agree that the revelations are uniquely personal ones for the most part. One must constantly ask if a genius rather than a system is at work here, a set of personal insights rather than transportable algorithms. The basic question must be this: can we, ourselves, read this book and in some way alter our thinking to approximate the brilliance and protean sensitivity of von Bertalanffy? Is this possible, or are we really reading an autobiography recollective of the paeans carved in stone on the triumphant pillars of the Persian generals of ancient times? Von Bertalanffy is not modest, either about his accomplishments or his influence on others. Yet the nature of this influence is somewhat obscured by his failure to draw back from anecdotes about his own insights and give us a formal logical consistent capsule of what general system theory really is—a new epistemology, a new way of thinking. Thus some of my students have read this book and been motivated toward a kind of personal emulation of this Renaissance-like scholar; others have been confused, unable to identify the ties that bind the various chapters of the book (which really represent papers completed over a span of some thirty years). To these latter, the book emerged as something of a running nonsequitur, with the promise of a new system of thought left unrealized at its conclusion.

Yet I think now, as I first thought, that they missed the essential import of the work. This is to be found in two areas. First, for biologists, sociologists, engineers, etc., the concepts that von Bertalanffy set out represent advances in the theoretical state of the art. Secondly, and I think this is vastly more important, he is living proof of the contributions available to science and the world we serve from the synthesizer, the man who is able to blend, manipulate, superimpose, and otherwise operate on concepts drawn from many different disciplines—the importance of the scientist who can work with Gestalt-like patterns rather than being restrained to the mechanical treatment of isolated parts of phenomena.

Perhaps this skill is one that really cannot be ordered in a logical precise way. Perhaps we can raise science to a new level of comprehension, extend the bounds of its rationality, only by way of personal example. In this sense, von Bertalanffy has emerged as a signal success, as a self-contained institution in his own right, and as a most promising rallying-point for those dissatisfied with the reductionism of modern science but lacking von Bertalanffy's own resources for rising above it.

At any rate, the work of von Bertalanffy serves, for a large and increasingly potent group of scientists, much the same function that mathematics serves for science at large—it acts as a repository for a common set of concepts and a shared set of perspectives and sensitivities. No serious scholar can afford to absent himself from the basic vocabulary and syntax of the Bertalanffian school; nor should any of us lose this opportunity to view, firsthand, the heights of intellect which an unfettered, curious, and assiduous human mind can attain. In short, for most of us, von Bertalanffy's book may provide a well-deserved dose of humility. Yet for a few, it may be the springboard to a new level of appreciation altogether. Surely, it is to these potential academic comets that von Bertalanffy speaks most poignantly, to those who will take the seeds that von Bertalanffy has sown, and nurture them to the truly general systems theory we must still seek. In this case, sadly as in life in general, the sower cannot always be the reaper.

Discrete-Time Systems: An Introduction with Interdisciplinary Applications—James A. Cadzow (Engelwood Cliffs, N.J.: Prentice-Hall, 1973, 440 pp.). *Reviewed by Naresh K. Sinha, Department of Electrical Engineering, McMaster University, Hamilton, Canada.*

This book has been written for "students of engineering, computer science and technically-based disciplines," including "biology, business management, economics, mathematics and social science." The objective "of thoroughly developing the basic concepts of linear discrete-time systems," is rather ambitious though commendable, considering the diversity of the audience. The author has tried to overcome this difficulty by including a number of appendices, including one on complex numbers and another on power series.

The book has 12 chapters covering topics like the z transform, system response and transfer function, design of digital filters, and the application of state-space representation to determine the response of linear systems. The style of the exposition is very good and should be of con-