proofs concerning the existence of solutions and their properties but does not in general produce explicit formulas or generate numerical computations directly.

There are now available several readable books, most notably those by Lions and his many collaborators, explaining in detail the basic theory of variational inequalities and identifying applications of all sorts. Kinderlehrer and Stampacchia's book complements these texts nicely, as its emphasis is much more on the really hard analysis required in bringing the abstract theory to bear on specific problems. As such, the larger part of the text will undoubtedly prove difficult going for most potential customers from outside mathematics, who may be best advised to begin with Lions's books and turn here only when more powerful tools are called for. But readers with some mathematical sophistication in functional analysis and partial differential equations will certainly appreciate this book's careful exposition of many powerful and important techniques available up to now only in the research literature.—*L. C. Evans, Mathematics, University of Maryland*

Computer Networks. Andrew S. Tanenbaum. 517 pp. Prentice-Hall, 1981. $28.99.

Tanenbaum, to whom we all owe a great debt for his extremely useful and readable *Structured Computer Organization*, has done it again. In a literature generally characterized by parochial or insubstantial presentations, this book stands out as a fairly general and pedagogical presentation of the emerging technology of data communication. Written as a text intended for "juniors, seniors, and graduate students," it is well organized, includes problems and a bibliography, and will be useful as a course text or for self-teaching. The book reads easily and interestingly, and is well illustrated.

As in *Structured Computer Organization*, the author uses a basic organizational model to tie together his discussions of various approaches to intercomputer communication. That model, based on the ISO Reference Model, is explained in the first chapter, which also offers overview discussions of the issues involved in networks and examples of several existing network schemes. This first chapter links the rest of the book together and should be read carefully.

The remainder of the book discusses network topology and the various logical levels, or layers, in network protocols. Imbedded in this framework are treatments of the basics of graph and queueing theory, frequency and time domain multiplexing methods, routing, and a variety of other theoretical issues. Several local networking methods are discussed. Both public and proprietal networks are discussed in considerable detail. The last chapters offer a discussion of the appearance of the network to higher-level processes, including security and compression, virtual terminal and file transfer protocols, and distributed processing. The bibliography is quite extensive and is organized by topic, with brief summaries.

There is a great deal of information in this book, presented in an accessible way. It is not a handbook nor definitive presentation of any particular network scheme. Rather, it is a volume which will enable its readers to approach handbooks, standards, sales pitches, and bull sessions with a broad perspective and a good deal of detailed knowledge.—*John G. Zornig, Electrical Engineering, Yale University*

A Book of Problems in Ordinary Differential Equations. M. L. Krasnov, A. I. Kiselyov, and G. I. Makarenko. 332 pp. Moscow: Mir, 1981. $6.80.

One of a series of inexpensive translations of Russian scientific texts, this is a useful and comprehensive collection of nearly 1,000 problems. All the classical types of technique and equation are included. Theorems are stated precisely but without proof, and analytic solution techniques are briskly described, with examples and counterexamples. The problems are largely direct, though not always simple, providing application of whatever technique has just been described. The "word problems" run heavily to the old technical or geometric type, with dissolving salt, flying bullets, and enveloped curves. The translation is workmanlike but sometimes idiosyncratic, arcane, or plain wrong: conditions are "broken" rather than violated, orders are "depressed" rather than reduced, "spinodes" and the "taclocus" appear, and on pages 189 and 190 "convergent" means "divergent."

The book's only concession to the 20th century is Lyapunov stability theory; otherwise it has the pleasant Victorian flavor of a world unsullied by numerical methods and programming techniques. The small format is handy, but an index would be welcome.—*Richard Beals, Mathematics, Yale University*

Universal Algebra, 2nd ed. P. M. Cohn. Mathematics and Its Applications. 412 pp. D. Reidel, 1981. $44.50 cloth, $19.50 paper.

The idea of a "universal algebra" attracts the interest of teachers, geometers, computer scientists, and others who are in need of a unifying key to mathematics. Often they are disappointed, because too many practitioners of universal algebra are less than universal, perhaps emulating too much Alfred North Whitehead, who coined the phrase but provincially limited himself to Platonism and Bergsonism as his "key." Fortunately, the classic texts by Birkhoff, on lattice theory (with its fascinating connections with the wave equation and everything else), and by Kurosh, on general algebra, contain much of value and interest. Cohn's book, as could possibly have been predicted on the basis of the review of the first edition by Isbell (*Math. Rev.* 31:224, 1966), has justly assumed its place on many shelves alongside these two classics.

As suggested by Eilenberg and MacLane the decisive abstract general relations of universal algebra are provided by the simple notions of category, functor, and natural transformation; more particularly, the theory of adjoint functors and the basic properties of categories having finite Cartesian products have proved crucial. This development was anticipated by Cohn in the first edition (1965) but continued in the 1960s in the form of the intimately intertwined doctrines of algebraic theories and of monads, with their application to clarifying and guiding calculations in algebraic topology and differential geometry. A text on algebraic theories is still lacking, however, despite the misleading title of a useful book by Manes, which is really about monads and some specialized applications. A general negative mood about the possibilities of using category theory to clarify and develop mathematics has been observed in recent years, but those who study and use mathematics have continued to demand simple, clear concepts to guide them through the thicket of "difficult problems" favored by some influential mathematicians (who of course themselves freely continue to use whatever guiding concepts they have happened to learn). For the moment readers wishing to see useful theorems about or applications of this simple notion (which is a natural generalization of the notion of "ring") must still refer to the basic papers, which include those found in my *Theory of Models* (1964) and *Springer Lecture Notes in Mathematics, 61* and works by Freyd (*Colloq. Math.* 14: 89–106) and by Wraith (Aarhus *Lecture Note Series*, 22, rev. 1975), as well as Isbell's article in *Rosprawy Math. 36*, (1964) and those in Springer LNM, 80 (1960).—*F. William Lawvere Mathematics, SUNY-Buffalo*

Engineering and Applied Sciences

Science and Technology Policy: Priorities of Governments. C. A. Tisdell. 222 pp. Methuen, 1981. $25.

This book is, in effect, a primer or brief textbook dealing with governmental policies concerning science and technology. It was prepared as the result of a request to the author, a professor of economics at the University of Newcastle in New South Wales, Australia, by an agency of the government. Apparently, most of the basic materials used were derived from reports provided by a number of governments and international organizations such as the OECD. In general, he has used the reports selectively to draw generalizations and to emphasize distinctions among basic policies in different countries. The book has benefited from critical review by colleagues in Australia and England.

Primary attention is given to the United Kingdom, the United States, Germany, and Japan among the larger industrial countries and to Belgium, Canada, The Netherlands, Sweden, and Switzerland among the second-tier nations. Unfortunately France was not included in the group, although it has undergone a remarkable development since the 1950s. Also excluded are discussions of countries such as Taiwan and South Korea, which have done so much in a short time with the use of science and technology.

The book has a slightly pedantic quality, although it is by no means devoid of novelty since it does encompass a fairly wide range of issues. Of the six chapters, the first five deal in a straightforward but professional way with material derived from the reports, with editorial comments by the author. His observations will be of interest to anyone experienced in the field, for they have a freshness derived from the fact that he is dealing with the analysis of countries other than his own.

The last chapter, "Retrospect and Prospect," contains Tisdell's interpretation of the larger design of modern societies based on science and technology. In it he notes the ever-tightening priorities, which inevitably require compromise between the practical and the aesthetic. Tisdell suggests that, on the basis of trends of the 1970s, concerns on these two fronts may lead to the de-emphasis of matters such as defense and space research. The jury is still out on this matter in the open world. The Soviet Union obviously has its own views.

Tisdell raises the question of where the emphasis on science and technology is leading society and whether the ends are "appropriate." Fortunately or otherwise, the pressures of everyday living will probably not allow us to resolve this question.—*Frederick Seitz, The Rockefeller University*

Holography and Coherent Optics. L. M. Soroko. Trans. Albin Tybulewicz. 818 pp. Plenum, 1980. $59.50.

This book grew out of a set of undergraduate course notes and seminar lectures given at the Moscow Physicotechnical Institute in 1966–67. The original Russian manuscript was completed in 1969 and was published in Russian in 1971. Thus, considering that it deals with a rapidly evolving subject, the book is dated. The English-language version contains an appendix consisting of three papers by George Stroke and his coworkers whose purpose is, according to Stroke in his foreword, "to assure that its fundamental nature be completely updated." The Stroke papers are reprints from easily obtained journals and deal with holographic image deblurring and optical image reconstruction of side-looking synthetic aperture radar.

Despite the size of the book, there isn't anything in it that hasn't been covered elsewhere, often better. Before describing what the book discusses, let me first cite what it doesn't discuss. It does not deal with holographic recording materials, industrial and scientific applications of holography, and "exotic" holography such as rainbow or 360-degree holography. It is anything but a practical manual where the amateur can really learn how to make holograms. Now, what does it discuss?

After a brief qualitative and historical discussion of holography, Soroko embarks on a lengthy discussion of signal and systems theory more or less at the level of discussion of a senior course on linear systems. This is followed by a brief discussion of random signals in which, unfortunately, the author makes the fundamental error of defining the power spectrum of a random process in terms of a *time-average* of the magnitude-square of the Fourier transform of the truncated sample, without taking an ensemble average. (As is well known, that quantity is not the power spectrum and doesn't converge for many processes, including the Gaussian process.)

There is a welcome discussion of coherence theory, but it is not strongly integrated with the theory of holography. Quantitative discussions of holography and optical information processing are relegated to the last two chapters of the book, but these are indeed quite lengthy. The theory of holography is covered in great detail, starting with simple holograms of point objects and plane waves and proceeding to the general case. In my opinion, a better approach would have been to consider an arbitrary planar hologram as a diffraction grating and to explain its imaging properties by a direct application of the diffraction integral. The section on optical information processing, taken together with the three Stroke papers, summarizes most of the results that gave the field of coherent optics such a boost in the 60s and early 70s.

In reading Soroko's book, I couldn't help comparing it to *Optical Holography*,