REVIEWS AND NOTICES OF BOOKS

High Energy Lasers and Their Applications—Physics of Quantum Electronics (Vol. 1). S. F. Jacobs, M. Sargent III, and M. O. Scully (Editors). (Addison-Wesley, U.S.A.), 1974, Pp. x + 411. Price $ 17.50.

This book is based on lectures delivered by well known scientists during the 1973 Summer School on the Physics of Quantum Electronics sponsored by the University of Arizona. The first part of the book contains contributions on laser physics. The second section is a review of some aspects of laser fusion, which, the title notwithstanding, is the only laser application discussed.

In Chapter I (46 pp.), M. Sargent III presents a survey (unfortunately marred by several typographical errors) of one- and two-mode strong signal laser theory, using both the rate equation and the semiclassical approach. The plausibility arguments and numerical illustrations that replace detailed derivations usefully complement the more formal papers of Lamb and co-workers. H. Shih, M. O. Scully and S. F. Jacobs (Chapter II, 29 pp.) describe an ingenius new model of the unstable resonator that enables a generalised and integrated analysis to be made of the effects of the active medium, non-linear mode coupling and diffraction, and the mode behaviour to be continuously predicted through the stable-unstable transition. F. A. Hopf (Chapter III, 100 pp.) reviews laser amplifier theory for homogeneously, inhomogeneously and power broadened media. Illustrative examples are drawn from actual systems, but the section on multiline molecular laser amplifiers is now slightly outdated. This masterly survey contains a great deal of information not available in scientific journals. In Chapter IV (70 pp.), C. B. Hogge considers the effects of turbulence and thermal blooming on laser beams propagating through the atmosphere, with supporting experimental results and computer simulations of the effects of thermal blooming on the density profile. The laser physics section concludes with Chapter V (46 pp.) by P. V. Avizonis on the inversion and relaxation processes occurring in electrical and gas dynamic CO_2 lasers and the chemical HF laser. The surprising neglect of the fundamental Treanor, Bray, and Sharma-Brau theories of vibrational relaxation, and the electron distribution calculations of Nighan weakens an otherwise adequate discussion.

The section on laser induced fusion (LIF) begins with a lucid semi-qualitative description by K. Beyer (Chapter VI, 40 pp.) of the physics of initiating thermonuclear fusion by light absorption, the capabilities of available Nd : Glass and CO_2 lasers, and the design constraints of LIF reactors. J. R. Murray and P. W. Hoff (Chapter VIII, 58 pp.) compare the characteristics of the hypothetical laser ideal for LIF with both presently available as well as futuristic lasers. A calculation by R. Morse (Chapter VIII, 16 pp) to estimate the magnitudes of quantities important in LIF concludes the book.

By presenting recent developments (some of the material is just beginning to appear in scientific journals) in the field of lasers in an insightful and informal style, this book bridges the gap between the text book and the scientific journal. It should prove useful to workers in quantum electronics wishing to keep abreast of areas outside their own specialisation.

Since most of the discussions start from first principles, this book should also provide students interested in the field, with a sound base from which to embark into the literature.

J. P. PICHAMUTHU.

Pattern Recognition Principles. By J. T. Tou and R. C. Gonzalez. (Addison Wesley, Reading, Mass., U.S.A.), 1974. Pp. xi + 377. Price U.S. $ 19.50.

In 1965, there were only two books that could be considered as text books for pattern recognition (PR)—Nilsson's 1965 monograph and Sebestyen's 1962 work. Today there is a score of books to choose from. (*See* T. M. Cover, *IEEE Trans. IT*, Nov. 1973 for an excellent review of the previous books.) This new book is a welcome addition to this set.

The book is divided into eight chapters. Chapter 1 introduces the reader to the problem *via* the information explosion of twentieth century and the evolution of a methodology to cope with the enormous data arising in a large number of situations. Examples from OCR, remote sensing, finger print classification and nuclear reactor surveillance provide excellent motivation for the student. Chapter 2 and Chapter 3 deal with decision functions, distance functions and some clustering techniques and their applications to the pattern classification. Pattern classification by likelihood

functions and Bayes techniques are considered in Chapter 4. Chapters 5 and 6 deal with trainable pattern classifiers, covering gradient algorithms, potential functions and stochastic approximation. Chapter 7 considers the important problem of pattern preprocessing and feature selection. Chapter 8 introduces the new approach based on Syntactic Pattern Recognition and is interesting.

Thus, the book introduces a large number of techniques in a simple manner with neat diagrams and explanations. The book is particularly suitablt for a graduate course in view of the problems provided at the end of each chapter and adequate coverage of a number of useful topics.

However, some of the important concepts such as results concerning dimensionality, sample size and error estimation, fuzzy sets are not considered. Also a particular application should have been highlighted althrough like the scene analysis in Duda and Hart's (Wiley, 1973) book.

B. L. DEEKSHATULU.

Biological Transport. By H. N. Christensen. (Second Edition, Revised, Enlarged and Reset), Publishers : W. A. Benjamin, Inc., Reading, Mass., U.S.A.

Living cells have developed membranes to separate two phases. Implicit in this design is the transport of materials across. Membranes have become barriers and carriers at the same time and intrinsically selective. Transport phenomenon is universal and concerns all biological materials from simple protons to complex macromolecules, all aspects of life processes from intestinal absorption to nerve conduction, and all branches of biosciences from phenomenological description to molecular characterization. This is one field wherein botanists, zoologists, geneticists, microbiologists, nutritionists, physiologists, biochemists, neurochemists and biophysicists have all contributed, and, as claimed by the author, caused "fragmentation of the subject among the disciplines with particular emphasis on molecular approaches". This book true to the claim has put the whole subject together and synthesized the common features of transport in biological systems. It has surveyed the scope of the problem of transport, described the architecture of the membranes and discussed the thermodynamics and kinetics of transport processes. It has considered the transport systems of different solutes, the approaches from genetic studies and the specific binding proteins. Group translocation which is a form of transport with the distinction of alteration of chemical form—vectorialization of a chemical reaction—has been aptly included. The multiple ATPases in membranes have been described and an attempt is made to understand their participation in the energy transactions incidental to transport. A full chapter is devoted to transport in mitochondria. The incisive discussion on the techniques in transport studies and some procedures at the end of the book are likely to prove the most useful for those who wish to embark on the experimental work. The terms such as "transport", "active transport", "permease" and "efflux" have been subjected to semantics and the author attempts to give guidelines for terminological clarity. The book has a personalized style as though a teacher is talking to students in a class-room—asking question and giving answers and thus giving away the subject matter. All through, the chapters are characterized by an "introductory" statement which projects the basis of the subject, and by a "concluding" or "summary" comment which not only is an epitome of the essay but posed the problems yet unsolved. In fact one gets a glimpse of the whole book by reading these two items. This is a commendable new style. For an "Advanced Book Program" from an international publishers, W. A. Benjamin, Inc., the quality of production should have been better. For instance, the figures in some places are out of proportion and the reproduction of the lines poor, and the indexing of the pages (360–406 and 442–452) was wrong in step by 1–2 pages, which causes a momentary irritation to the reader. Notwithstanding this, the book serves as an excellent companion for a teacher giving a course or a research workers as a reference source.

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