(and pharmacological conditions). No doubt, however, the extra resolution will eventually prove helpful in building (and falsifying) appropriate molecular models of the nonlinear channels.

Several papers in the book use wide-band signals to study membranes, and Fishman, Moore, and Poussart describe a new easy way to generate these signals. Measurements in the frequency domain are significantly improved if wide-band signals are applied to the membrane, since such signals contain significant energy over a wide band of frequencies. They allow simultaneous measurement of the membrane response at many frequencies. Any increase in speed of measurement is of great practical importance in physiological measurements, since all preparations have properties that vary with time, slowly drifting to death after their isolation from the animal. Wide-band signals have not been used as much as they might be, perhaps in part because of their misleading name; they are often called pseudo-random binary signals whereas they must be strictly periodic if they are to be of much use. In fact, the signals actually applied are usually strictly periodic, nearly Gaussian signals, almost a complete inversion of their usual name.

As pleasant as is the occasion commemorated in this volume, and as promising as are some of the contributions, I regret that the book does not present a balanced perspective of the state of the field, or of the work of Cole's collaborators and friends. The ubiquitous contributions of A. L. Hodgkin, Cole's collaborator in the 1930's and the foremost user of the voltage clamp method, are not represented. The exciting contributions of Armstrong and Bezanilla are given little space: the discovery and description of gating currents produced (presumably) by conformational changes in the channel proteins are hardly described. Similarly, the work of J. W. Moore on the voltage clamp of axons and of W. K. Chandler on the voltage clamp of axons and "gating" current in muscle fibers is not represented.

Without the contributions of so many important workers, the mainstream of electrophysiology is not well represented and the book is not the contribution the occasion deserved. We are given, nonetheless, a compilation of interesting work to accompany the lovely portrait of Cole that is the frontispiece of the book.

ROBERT S. EISENBERG
Department of Physiology,
Rush Medical College,
Chicago, Illinois 60612

Peptide Messenger Molecules

Cellular Basis of Chemical Messengers in the Digestive System. Papers from a symposium, Santa Monica, Calif., Jan. 1980. MORTON I. GROSSMAN, MARY A. B. BRAZIER, and JUAN LECHAGO, Eds. Academic Press, New York, 1981. xviii, 360 pp., illus. $28. UCLA Forum in Medical Sciences, no. 23.

This book of symposium proceedings deals primarily with peptide molecules that may transmit information in the process of neural and endocrine control of gastrointestinal function. The book is dedicated to one of its editors, Morton I. Grossman, who died on 26 May 1981.

The existence of a diverse array of putative peptide messenger molecules common to neurons and endocrine cells of both the central nervous system and the gastrointestinal tract now receives a great deal of attention. The popularity of the peptides is directly related to advances in immunochemistry and derives to a great extent from the rapidity with which they can be immunochemically identified in a variety of tissues. Information on immunocytochemical identification and characterization of these peptides has swelled into a flood. Neuroendocrinological and gastrointestinal biology are in the peptide era, and the 28 papers in the book offer a good update on these fields.

After four papers on introductory topics, including one on phylogenetic relationships, the papers are grouped into sections on methods; structural and functional classification of endocrine-paracrine cells; structural and functional classification of nerves; pathological aspects; and experimental aspects. Most of the papers are short, well-edited, and lucid summaries of the authors' work. Many are condensations of the authors' previously published papers.

With the exception of M. D. Gershon's nicely prepared paper on serotonergic neurons in the enteric nervous system and some discussion of purinergic neurons, all of the material in the book involves one or another aspect of peptidergic cells.

Papers on identification and biological actions of the gut peptides by authors such as J. M. Polak and A. M. J. Buchan, J. B. Furness *et al.*, and R. Håkanson *et al.* overlap somewhat. This is difficult to avoid, for many of the authors have worked with the same peptide.

After reading a paper entitled "Human gastroenteropancreatic endocrine-paracrine cells: Santa Monica 1980 classification," which presents the consensus of a panel chaired by E. Solcia, one suspects that another scheme bloated with abbreviations and morphological hairsplitting is evolving. Furness, in a two-page paper on terminology for gastrointestinal nerves, wisely concludes that present knowledge is insufficient for a useful classification scheme of enteric neurons.

Several presentations of techniques for immunocytochemical identification of peptides and uses of cultured tissues and cells for studies of release of peptides are included in the book. Especially timely is a discussion by L.-I. Larsson of the gold-labeled antigen detection (GLAD) technique. Two different bioactive peptides are known to exist in the same cell; it is not known, however, if two different messenger molecules occupy the same storage vesicle. The GLAD technique could answer the important question of whether two neurotransmitters exist within the same synaptic vesicle.

The principal topic of the book is immunocytochemical identification of peptides in nervous and endocrine structures. Many of the authors are histologists with a tendency toward overenthusiasm about the functional significance of the presence of a multitude of peptides and a bewildering number of molecular variations in forms of the same peptide in nervous and endocrine structures. These authors speculate freely on functional significance. Nonetheless, the recurring conclusion is that functional significance cannot be deduced from morphological identification in a particular cell type and that the functional significance of the presence of most of the interesting immunoreactive peptides in neural, endocrine, and other structures is unknown. The overall impression this book gives is that histochemical investigation of peptides has surged far ahead of physiological investigation. A few efforts to establish functional importance are reported in the book. The observations of Håkanson and co-workers of changes in topographic distribution of gastrin cells in response to experimental alteration of *p*H gradients in the gastric antrum are especially interesting.

Two papers are devoted to the significance of malfunction of peptide messenger mechanisms in gastrointestinal disease. One of these deals with the presence of a number of well-known immunoreactive peptides in ovarian carcinoids, and the other summarizes alterations of peptide content of gut nerves in Chagas's, Hirschsprung's, and Crohn's diseases and in ulcerative colitis.

Several revered concepts receive particular attention in the book. A. G. E. Pearse skillfully presents justification for

classification of the APUD (amine precursor uptake and decarboxylation) cell series as a unique entity. One senses a struggle to hold the concept together, for with the realization, documented well in the book, of the ubiquity of potential peptide messengers in neurons (including gastrin-cholecystokinin, insulin, substance P, vasoactive intestinal peptide, and somatostatin in somatic nerves) the APUD concept may be disintegrating into generalism. Both Geoffrey Burnstock's purinergic nerve hypothesis and H. H. Dale's principle of one neuron, one transmitter come under attack in the book. The proponents of peptidergic neurotransmission propose that Burnstock's purinergic nerves are misidentified peptidergic neurons. Dale's principle is questioned on the grounds that a neuron contains more than one bioactive molecule.

The book, in general, is a timely contribution that is not too far behind the forefront of a rapidly advancing field. Students who are interested in the neuroendocrinological biology of the gastrointestinal tract and those who wish an update on the field will find it profitable reading. Established investigators will find little that is new.

JACK WOOD
Department of Physiology, University of Nevada School of Medicine, Reno 89557

Nuclear Physics

Nuclear Structure. Proceedings of a summer school, Dronten, Netherlands, Aug. 1980. K. ABRAHAMS, K. ALLAART, and A. E. L. DIEPERINK, Eds. Plenum, New York, 1981. x, 432 pp., illus. $49.50. NATO Advanced Study Institutes Series B, vol. 67.

Research on nuclear structure is exceptionally broad. Until rather recently, much of it centered on efforts to understand the motions of single nucleons (protons or neutrons) among the other nucleons that make up the nucleus, the correlations in these motions, and the collective modes that arise because of these many-body effects. The research dealt primarily with low-lying nuclear states and with a select group of special higher-lying ones (giant resonances, pairing vibrations, and so on). Research on this "classic" realm of nuclear structure is still active and, indeed, has recently experienced a thorough renaissance largely owing to the advent of the so-called interacting boson model (IBM). Concurrent with this, in the last decade, enormous advances in experimental techniques and the advent of new accelerators have greatly expanded the purview of the field. Now, the availability of high-energy beams of heavy ions of innumerable nuclear species and of pionic and muonic probes, to name just a couple of examples, has allowed access to states of extremely high spin and has revealed glimpses of "microscopic" aspects of the nucleus, involving details of the nucleon-nucleon force and even the subnucleonic quark degrees of freedom.

This collection of papers from a summer school is a superb volume with a slightly optimistic title and one or two important omissions. Though the title implies a completeness of coverage impossible to attain in a single volume, a truly broad variety of topics is nevertheless considered. These range from the shell model and the effective interactions crucial to it through collective models such as the IBM and the study of giant resonances and low-energy and muon-induced fission to the use of heavy-ion reactions and inelastic scattering (including multiple Coulomb excitation), as well as electron-scattering techniques, to disclose hitherto inaccessible information and phenomena not known in quiescent nuclei.

These topics are so diverse that one cannot expect the reader to have a background in each, and thus it is desirable that each paper begin at an elementary point and build up to a rather thorough up-to-date assessment. It is remarkable that nearly every one of the papers in the book is pitched at this ideal level. Nearly all provide comprehensive yet easily understandable reviews. Particularly impressive in this regard are papers on effective interactions by Elliot, heavy ion reactions by Schiffer, and the IBM by Iachello and two papers on fission by Nifenecker and Polikanov. In the last two, for example, the relation between observed features and the shape and structure of the fission barrier is exceptionally well presented. Only a paper on pion-nuclear many-body problems starts at a specialist level and never descends from it; it will be comprehensible to only a few readers. The papers are all current up to approximately mid-1980.

My principal adverse comment about this generally excellent compendium is that there is some lack of balance in what I earlier termed the realm of "classical" nuclear structure, especially as regards the low-lying collective excitations of heavy nuclei, where a recent surge of activity has shown that our understanding has barely and almost literally merely scratched the (nuclear) surface. Moreover, topics of great current interest, for example, cluster vibrational states, the interplay of collective and single-particle degrees of freedom at both low and extremely high spins, and the concepts of coexistence and intruder states, are hardly mentioned. The paper by Iachello, of course, deals with some of these issues, and that on Coulomb excitation by Schwalm touches on them, but there is no paper discussing the broad variety of geometrical or "shape" models of these nuclei such as the model of Bohr and Mottelson that has been the staple framework in this field for so long. Given the controversy surrounding these topics, such a paper might profitably have been substituted for one of the rather extraneous "applied" papers that appear, really out of context, near the end of the book. The papers on tritium stratospheric tracers, for example, though well written, could easily have been omitted.

RICHARD E. CASTEN
Department of Physics, Brookhaven National Laboratory, Upton, New York 11973

Books Received

The Antigens. Vol. 6. Michael Sela, Ed. Academic Press, New York, 1982. xiv, 454 pp., illus. $56.

Archaeoastronomy in the Americas. Papers from a conference, Santa Fe, N.M., 1979. Ray A. Williamson, Ed. Ballena Press, Los Altos, Calif., and Center for Archaeoastronomy (University of Maryland), College Park, 1981. 406 pp., illus. Paper, $19.95. Ballena Press Anthropological Papers no. 22.

The Architecture of Solids. George E. Bacon. Wykeham, London, and Crane, Russak, New York, 1981. viii, 142 pp., illus. Paper, $16.50. The Wykeham Science Series, 58.

The Arms Race. The Political Economy of Military Growth. Miroslav Nincic. Praeger, New York, 1982. xiv, 210 pp., illus. $21.95.

Biomass as Fuel. L. P. White and L. G. Plaskett. Academic Press, New York, 1981. x, 212 pp., illus. $29.50.

Biomedical Sensors. Fundamentals and Applications. Harry N. Norton. Noyes, Park Ridge, N.J., 1982. xii, 130 pp., illus. $20.

The Coal Era in the United States. C. B. Reed. Ann Arbor Science, Ann Arbor, Mich., 1981. xii, 92 pp. Paper, $9.95.

Coding the Universe. A. Beller, R. Jensen, and P. Welch. Cambridge University Press, New York, 1982. viii, 354 pp. Paper, $34.50. London Mathematical Society Lecture Note Series, 47.

The Combustion of Organic Polymers. C. F. Cullis and M. M. Hirschler. Clarendon (Oxford University Press), New York, 1981. xii, 420 pp., illus. $59. International Series of Monographs on Chemistry.

Communications Tomorrow. The Coming of the Information Society. Selections from *The Futurist*. Edward Cornish, Ed. World Future Society, Bethesda, Md., 1982. 160 pp., illus. Paper, $6.95.

Dark Paradise. Opiate Addiction in America before 1940. David T. Courtwright. Harvard University Press, Cambridge, Mass., 1982. x, 270 pp. $20.

Defects and Fracture. Proceedings of a symposium, Tuczno, Poland, Oct. 1980. G. C. Sih and H. Zorski, Eds. Nijhoff, The Hague, 1982 (U.S. distributor, Kluwer Boston, Hingham, Mass.). xiv, 276 pp., illus. $42.90.

Economic Aspects of Natural Hazards. Alan L. Sorkin. Lexington (Heath), Lexington, Mass., 1982. xii, 180 pp. $23.95.

The Edge of Infinity. Where the Universe Came From and How It Will End. Paul Davies. Simon and Schuster, New York, 1982. x, 196 pp., illus. $13.50.

Effects of Disease on the Physiology of the Growing

(Continued on page 1144)