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.

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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.

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Effects of Disease on the Physiology of the Growing

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