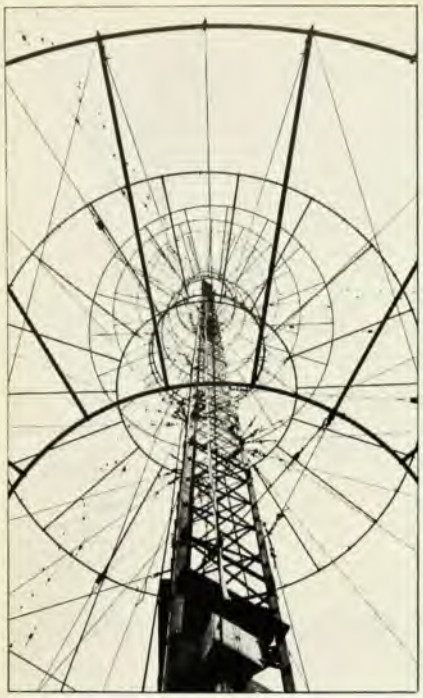

Antenna systems receive thorough treatment in J. D. Jackson's text; this monopole radio antenna developed by ITT Electro-Physics Laboratories applies the principles of electromagnetic-wave propagation discussed by the author.

specific level. A much clearer and more careful treatment of macroscopic phenomena (in Chapter 6) has been installed, which should pacify those of us who consider the old derivations too imprecise. Augmentations in the "applications" chapters (7, 8 and 9) lead the student one further step toward the exciting frontier of research fields.

Personally, I (and presumably many who plan to "use" special relativity, such as high-energy physicists) appreciated most the essentially new chapters on the special theory of relativity. The metric has been changed to the more widely accepted one (+, −, −, −), and the use of contra- and covariant tensors lifts the general haze that clouded the previous Chapter 11. Misleading diagrams (such as figures 11.11 and 11.12 of the first edition) have been deleted. Desperately needed clarifications of common misconceptions (see, for example, section 12.2) have been added. A thorough analysis of stress tensors has replaced the old, makeshift version. The list of valuable additions and alterations continues into the final chapters, ending with the often used formulae reproduced in the flyleaves. What I have mentioned here is like the tip of an iceberg.

It would not be fair to end this review without any mention of some room for improvements. Apart from the elusive, omnipresent typos, there still exist some minor errors, confusing points and irritating approaches. As an example of an irritation, I refer to the otherwise wonderful section on magnetic monopoles. It takes no more than two *simple* lines of algebra to demonstrate the vanishing of the total momentum of the fields. Instead, there is a line and a half of rhetoric (immediately after equation 6.158). Further, it is somewhat sadistic to lead a student through the complicated integrals thereafter and then to drop him with the sentence "The double integral [has the value] . . . unity." Again, it takes no more than five lines to analyze the situation simply and convincingly. Perhaps the author is trying to make a subtle point: Interesting *new* physics is the reward of hard calculations!

To summarize, I re-emphasize that this new edition—though not perfect—is much, much farther along the road than the first. In particular, I expect it to dispel the misgivings about the old text on the part of a large portion of the physics community teaching graduate courses in electromagnetism. I for one have certainly benefitted from and enjoyed (author's words) this book. Although $20.95 is a nontrivial sum (especially for graduate students), I believe that any person seriously pursuing physics will not regret spending the money for this text.

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A Unified Theory of the Nucleus

K. Wildermuth, Y.-C. Tang
389 pp. Vieweg, Wiesbaden, German Federal Republic, 1977. DM 92.00 (Also available from Academic, New York, for $38.50)

How like human behavior is that of nucleons congregating within a nucleus! How natural to suppose that clustering occurs, as groups form and reform with a dynamic vivacity that is heightened by the approach of a newcomer, whose arrival occasions an excitation of the assembly and promotes the formation of new clusters. A ripple of activity permeates the throng of participants; in due time members disperse and regroup, individuals or groups leave, the aggregate takes on a fresh identity: the interaction has run its course.

The surmise that clustering might occur in atomic nuclei has therefore long been prevalent, and especially so in the case of alpha-particle clusters inasmuch as these are obvious candidates for an interpretation of $A = 4n$ configurational and interactional characteristics. However, not until the 1950's and 1960's had these considerations advanced sufficiently to offer an adequate quantitative approach to clustering phenomena based upon a soundly substantiated physical basis. At the forefront of these developments was Karl Wildermuth, the first author of the present text and co-editor (with P. Kramer) of the monograph series (in English) on *Clustering Phenomena in Nuclei*, of which this is the first annual volume. Wildermuth, together with Th. Kanellopoulos and later with Yau-Chien Tang, the second author of this work, laid the foundations of a comprehensive theory of particle clustering in nuclei. In the course of some 20 years, the cluster model has been brought to the point of providing a unified description of nuclear structure and interactions in an impressively consistent and all-embracing scheme whose salient features are cogently laid out in explicit detail within the pages of this timely monograph. The book admirably fills the need for a topical, synoptic survey of the past progress, present status and future potentialities of this interesting and valuable nuclear model.

To bring out the full flavor of this approach, the authors have taken pains to provide an abundance of specific examples that illustrate the applications of the underlying formalism and to set out to make the occasionally very complicated mathematical treatment palatable and comprehensive to the discerning reader. Subtleties in the reasoning are well elucidated, there is a proper degree of emphasis upon the crucial physical and mathematical ramifications, formal rigor is subordinated to ease of understanding and the text methodically leads one to an appreciation of the power, generality, flexibility—and hidden pitfalls—of the theory in its full scope. The authors have consciously set out to provide "experimentalists and theorists alike" with the means to employ rather sophisticated methods with understanding, confidence and assurance. This is a persuasive presentation, providing commendably thorough coverage without becoming tediously protracted; the book is directed to almost every facet of a nuclear practitioner's realm of interest.

Highlighting the dominant role exerted by the Pauli Exclusion Principle, that majestically simple, crystallizing insight into the organization of systems at the fundamental level, Wildermuth and Tang build up the formalism into an edifice that exploits the requirements of antisymmetrization and translational invariance in wave functions comprising cluster expansions. The authors provide a microscopic description of nuclear states in terms of the properties of many-particle Schrödinger equations, or coupled systems of wave equations. Particle clustering is thereby able to provide a natural and satisfactory explanation of nuclear structural characteristics, including shell and collective behavior, hard-core effects, binding and resonance properties and a general description of low-energy interaction processes over an extensive do-

main. Single-particle and composite-particle interactions with nuclei are treated within the framework of the complex optical potential, covering scattering, reactions and heavy-ion transfer processes in explicit detail. Some discussion of time-dependent phenomena, fission and nuclear matter is also included. The whole combines to yield a picture of nuclei and their response to disturbances that at the very least offers qualitative insights into hitherto disparate evidence; in many instances, in addition, this picture furnishes excellent quantitative agreement with experimental findings in a richly assorted variety of phenomena.

Past publications by these and other authors, prolifically referenced in this monograph, have served to delineate the finer points of the cluster model throughout its development, but this volume draws the threads together and illustrates more clearly than ever before the generality and interconnection of many of the underlying considerations. It presents a unified, updated account of progress in the utilization of the cluster model that by its authoritative, informative and stimulating nature is likely to whet the appetite for further study. Its contents clearly fall within the province of most nuclear theoreticians and many of the more thoughtful nuclear experimentalists. The level is by no means beyond that of graduate or even senior undergraduate students, for whom the text might, indeed, be well suited as an educative and enriching one-semester course—always providing that students would not be adverse to taking on trust the results of Wildermuth's and Tang's sometimes lengthy and devious algebra or computation.

There is much to be learned from this monograph, including much of a practical nature. The authors always keep the physics in mind, and repeatedly draw attention to the inferences that may be drawn from observations. They have taken evident care to make the subject as comprehensible as possible and have clearly succeeded in their aim of conveying their visualization to others who may be non-specialists in this field. The progress in this even nowadays over-specialized subject becomes evident when the exposition is compared with the early pedagogic review by Wildermuth in 1959 (CERN 59-23), or with the survey by Wildermuth and W. McClure in 1966 (*Springer Tracts in Modern Physics, Vol. 41*), to say nothing of the Proceedings of various meetings and of the two international conferences on clustering phenomena in nuclei (Bochum, 1969, and Maryland, 1975). In the present text a lot of ground is covered—concisely, comprehensively and stimulatingly. The cluster model has really come into its own, and especially for light nuclei it offers the wherewithal for a long-sought unified treatment that has generality, flexibility and elegance. Truly, the cluster has luster.

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book notes

Introduction to Ergodic Theory. Ya. G. Sinai. 144 pp. Princeton U. P., Princeton, 1977. $6.00

Originally published in Russian in 1973 by the USSR's Erevan State University, this volume is the eighteenth in a series of informal lecture notes edited by Wu-chung Hsiang, John Milnor and Elias M. Stein. In his book Yakov Sinai examines a number of examples "popular" in ergodic theory; the author says that anyone with a knowledge of the general facts of measure theory and probability theory should be able to follow his lectures, a few of which are concerned entirely with mathematics while the rest are physics-related. Some of the topics covered are linear Hamiltonian systems, ergodic theory of ideal gases and Gaussian systems. This volume is not proof-oriented, but Sinai does end his book with a proof that the entropy of billiard balls inside a polygon is equal to zero.

Physics of Semiconductors (Proc. of the 13th Int. Conf., Rome, August–September 1976). F. G. Fumi, ed. 1328 pp. North-Holland, Amsterdam, 1976. $95.00

This volume contains all of the invited and contributed papers—about 300 in total—presented at the most recent in a series of conferences on semiconductors sponsored by IUPAP and others. The topics covered include excitons and exciton condensation, superlattices, new and disordered materials, optical and surface properties, hot carriers, transport and magneto transport, recombination and luminescence, and low-dimensionality systems. The conference dealt with fundamental physical properties of semiconductors for the most part, but it also conducted a special session on their applications in solar-energy and microwave devices, opto-electronics and other fields. The volume is intended primarily for semiconductor physicists.

Encyclopedia of Physics, Vol. 49, Part 5 (Geophysics III, Part 5). K. Rawer, ed. 407 pp. Springer-Verlag, Berlin, 1976. $81.20

Five articles dealing with phenomena of the upper atmosphere make up this fifth volume in a series whose previous entries have treated—among many other topics—aurorae, lunar tides in the ionosphere and Earth's radiation belts. The first contribution, "La luminescence nocturne (The Nightglow)" by Arlette and Etienne Vassy (in French), is concerned with natural optical emissions that occur under magnetically quiet conditions. Willis L. Webb's "Dynamic Structure of the Stratosphere and Mesosphere" is a consideration of the general thermal structure, as well as detailed structure, of the upper atmosphere, with sections on stratospheric circulation, tides and clouds. In "Linear Internal Gravity Waves in the Atmosphere," Walter L. Jones takes up problems associated with linear wave equations in an atmosphere at rest, the isothermal atmosphere and other topics.

The longest contribution is Jakov L. Al'pert's "Wave-Like Phenomena in the Near-Earth Plasma and Interactions with Man-Made Bodies," at 132 pages. Al-'pert deals with phenomena associated with vehicles passing through the plasma of near-Earth space. The book ends with "Some Characteristic Features of the Ionospheres of Near-Earth Planets" (meaning Venus and Mars) by Konstantin I. Gringauz and Tamara K. Breus, in which the authors discuss methods for investigating planetary ionospheres via spacecraft, experimental results in the Martian and Cytherean cases and models of the two planets' ionospheres. Researchers and students in atmospheric and space physics constitute the book's likely audience. —FCB

new books

Particles, Nuclei and High-Energy Physics

In-Beam Gamma-Ray Spectroscopy. H. Morinaga, T. Yamazaki. 527 pp. North-Holland, Amsterdam, 1976. $61.50

Neutron Physics (Springer Tracts in Modern Physics, Vol. 80). L. Koester, A. Steyerl. 135 pp. Springer-Verlag, New York, 1977. $26.30

Atomic, Molecular and Chemical Physics

Molecular Symmetry and Group Theory. A. Vincent. 156 pp. Wiley, New York, 1977. $13.50 clothbound, $5.95 paperbound

Dynamics of Polymeric Liquids: Vol. 1, Fluid Mechanics; Vol. 2, Kinetic Theory. R. B. Bird, O. Hassager, R. C. Armstrong, C. F. Curtis (Vol. 2 only). 740 pp. Wiley, New York, 1977. $29.95 and $26.95, respectively

The Chemical Physics of Surfaces. S. R. Morrison. Plenum, New York, 1977. $39.50

Introduction to the Electron Theory of Small Molecules. A. C. Hurley. 329 pp. Academic, London, 1977. $26.25

Electron Correlation in Small Molecules