Theory of Atomic Spectra on the grounds that it was too unfamiliar to physicists of that era. Although it remains true that much of theoretical atomic structure can be analyzed by algebraic methods alone, group theory has now become an integral part of the education of chemists and physicists.

The omission of these two techniques from the 1935 monograph loomed large over the years, and Condon often expressed his intention of revising the book to incorporate them. Rumors of such an undertaking had circulated for at least a decade before Condon died in 1974. Ultimately the efforts of Halis Odabaşı, first as a postdoctoral assistant and then as a coauthor, brought forth the present monograph.

As it turned out, Condon and Odabaşı's *Atomic Structure* is (intentionally) not simply a modern Condon and Shortley. It is a very different book, in outline, in format, and in style.

The present volume (intended as the first of two) concentrates upon a particular aspect of atomic structure: the theory of steady-state unexcited behavior of bound electrons subject only to electrostatic forces. For a broader perspective on atomic structure—encompassing electromagnetic transitions, electromagnetic forces, external perturbations, and the origin of spectral lines—one might select the comprehensive *Introduction to the Theory of Atomic Spectra* (1972) by I. I. Sobel'man or the smaller *Quantum Mechanics of Atomic Spectra and Atomic Structure* (1970) by M. Mizushima. Each of these uses Racah methods and would make a satisfactory textbook, reference work, or self-study source book.

Following a historical review of the development of quantum mechanics and a presentation of conventional quantum theory and angular-momentum eigenstates (which they term "proper states"), Condon and Odabaşı devote the bulk of the book to Racah methods and group theory.

Their treatment of Racah methods is particularly lengthy (although it makes no mention of graphical methods) and includes laboriously detailed examples of particular cases, written out as lengthy equations. These make the book more usable as a companion to a self-study course than as a reference or a refresher. Although it is useful for the diligent student to be able to check his or her algebraic manipulations against worked examples, it hardly seems necessary to set in type all of the special cases; an occasional exercise for the reader would not be amiss. The tabulation in an appendix of formulas relating configuration average energies to Slater-Condon radial integrals may well be the most useful portion of the book.

The treatment of group theory is, in essence, a precis that attempts to define many of the terms that occur in the application of group theory to atomic physics. The symmetric group and Lie groups, rather than the point groups needed by quantum chemists, receive emphasis here, so that the exposition serves primarily as an aid to understanding the work of Judd on equivalent-electron configurations. There is no mention of the Gelfand representations of the unitary groups, which offer powerful means of greatly simplifying the calculations of atomic structure.

As there was in *The Theory of Atomic Spectra*, there is discussion here of the radial distribution of electron charge (complementing the angular distribution derived from the spherical harmonics of angular momentum theory), first in the Thomas-Fermi approximation of an electron gas and then in the self-consistent field (SCF) approximation of Hartree, Fock, and Slater. There is no mention of other effective model potentials. Although the intervening years have greatly enlarged the number of solved examples, the basic equations and physics remain as described in the 1935 book or, in more detail, in J. C. Slater's *Quantum Theory of Atomic Structure* (1960).

The final chapter of the book, like that of *The Theory of Atomic Spectra*, examines some of the experimental and theoretical (SFC) regularities in configuration energies and ionization potentials. The discussion here seems somewhat outdated. For example, although the authors have referred in an earlier chapter to Layzer's 1959 theory of complexes, they do not here show how this form of configuration degeneracy accounts for deviations from elementary predictions for energy term spacings. There is no mention of the powerful perturbation techniques based upon treating the inverse nuclear charge $1/Z$ as an expansion parameter, nor is there any treatment of configuration mixing.

The Theory of Atomic Spectra was important for its presentation of a systematic approach to the treatment of many-electron atoms, and particularly for its presentation of angular momentum theory. During the intervening years other books have appeared that treat this subject; Condon and Odabaşı list several of them. Perennials such as *Advances in Atomic and Molecular Physics* or the *Annual Review of Astronomy and Astrophysics* provide valuable summaries of contemporary research. Numerous monographs deal with applications of Racah methods to atomic structure and the number of books treating elementary atomic structure is legion. Within this literature Condon and Odabaşı's book will take its place as a useful specialized treatment of the free-atom many-electron electrostatic-interaction problem as it appeared in the early 1960's.

BRUCE W. SHORE
Lawrence Livermore National Laboratory, Livermore, California 94550

Plant Growth and Development

Genome Organization and Expression in Plants. Proceedings of a NATO Advanced Study Institute, Edinburgh, July 1979. C. J. LEAVER, Ed. Plenum, New York, 1980. xii, 608 pp., illus. $59.50. NATO Advanced Study Institutes Series A, vol. 29.

Much of the work reported in this useful volume results from the application of the techniques of nucleic acid hybridization, DNA cloning, DNA sequencing, and restriction endonuclease mapping to long-standing questions of genome organization. Several papers (for example, "Contrasting patterns of DNA sequence organisation in plants," W. F. Thompson, M. G. Murray, and R. E. Cuellar; "On the evolution and functional significance of DNA sequence organisation in vascular plants," Arnold J. Bendich and Bernard L. Ward; and "The evolution of plant genome structure," R. Flavell *et al.*) deal with the large amount of DNA in the plant genome, the large variations, even within a genus, in the amount of DNA, and the organization of DNA in repetitive and single-copy sequence lengths. The general conclusions of these papers are that there is little relationship between DNA sequence organization and organismic complexity, that much of the DNA in the larger genomes has no direct role in the organism and is therefore free to change rapidly through amplification, translocation, mutation, and deletion, and that much of the DNA that behaves as nonrepeated during renaturation has evolved from families of repeated sequences. The structural gene sequences are a small percentage of the total nonrepeated DNA sequences.

The DNA content of plant mitochondria is several times greater than that of animal mitochondria and about twice that of yeast mitochondria ("Physico-chemical and restriction endonuclease analysis of mitochondrial DNA from high plants," Francis Quetier and

Fernand Vedel). This fact plus the lack of evidence that there are any more structural gene sequences in plant (and in yeast) mitochondria than in animal mitochondria makes the plant mitochondrial genome of interest ("Mitochondrial genome expression in higher plants," C. J. Leaver and B. G. Forde) over and above its expected (and observed) interactions with the nuclear genome.

Restriction mapping of maize ribulose bisphosphate carboxylase large subunit gene, of two other structural genes, and of maize 16S, 23S, 4.5S, and 5S ribosomal RNA genes, together with information about how and when these genes are transcribed, constitutes an exciting start toward an understanding of the maize chloroplast genome ("Organisation and transcription of maize chloroplast genes," Lawrence Bogorad *et al.*, and "The organisation in higher plants of the genes coding for chloroplast ribosomal RNA," Tristan A. Dyer and John R. Bedbrook). Twenty genes corresponding to transfer RNA's for 14 amino acids have been located on the map of the spinach chloroplast DNA ("Transfer RNAs and aminoacyl-tRNA synthetases in plant organelles," G. Burkard *et al.*)

The rapid and exciting progress in the collection of data about the organization of the plant cell genomes is nearly matched by the new information on the regulation of the expression of these genomes. The precision of the questions being asked about the effect of time, light, hormones, invading and symbiotic bacteria, and viruses and viroids (each of these topics is dealt with in one or more chapters) on such organization and regulation is evidence that the subject of plant growth and development has matured to a stage attractive for picking by the intellectually curious.

J. E. VARNER

Department of Biology,
Washington University,
St. Louis, Missouri 63130

Books Received

Animal Agriculture. The Biology, Husbandry, and Use of Domestic Animals. H. H. Cole and W. N. Garrett, Eds. Freeman, San Francisco, ed. 2, 1980. xii, 740 pp., illus. $19.95. A Series of Books in Animal Science.

Annual Review of Birth Defects, 1978. Proceedings of a conference, San Francisco, 1978. Liss, New York, 1979. Three volumes, illus. Part A, Diagnostic Approaches to the Malformed Fetus, Abortus, Stillborn, and Deceased Newborn. Mitchell S. Golbus and Bryan D. Hall, Eds. xvi, 190 pp. $22. Part B, Penetrance and Variability in Malformation Syndromes. James J. O'Donnell and Bryan D. Hall, Eds. xiv, 382 pp. $42. Part C, Risk, Communication, and Decision Making in Genetic Counselling. Charles J. Epstein and four others, Eds. xvi, 376 pp. $36. Birth Defects: Original Articles Series, vol. 15, No. 5A-C.

Annual Review of Psychology. Vol. 31. Mark R. Rosenzweig and Lyman W. Porter, Eds. Annual Reviews, Palo Alto, Calif., 1980. xii, 700 pp. $17.

Approximate Identities and Factorization in Banach Modules. Robert S. Doran and Josef Wichmann. Springer-Verlag, New York, 1979. x, 306 pp. Paper, $19.40.

Archaeological Investigations in the Cave Creek Area, Maricopa County, South-Central Arizona. T. Kathleen Henderson and James B. Rodgers. Arizona State University Department of Anthropology, Tempe, 1979. xii, 198 pp., illus. Paper, $8. Arizona State University Anthropological Research Papers No. 17. Technical Paper No. 2.

Basic Handbook of Child Psychiatry. Joseph D. Noshpitz, Ed. Basic, New York, 1979. Four volumes. Vol. 1, Development, xiv, 730 pp., illus. Vol. 2, Disturbances in Development. xii, 750 pp. Vol. 3, Therapeutic Interventions. xiv, 704 pp. Vol. 4, Prevention and Current Issues. xvi, 696 pp. Each volume, $35.50; the four-volume set, $138.

Basic Physiology and Anatomy. Ellen E. Chaffee and Ivan M. Lytle. Lippincott, Philadelphia, ed. 4, 1980. xvi, 628 pp., illus. $19.95. Laboratory Manual. Ellen E. Chaffee and Janet M. Valazquez. xii, 222 pp., illus. Paper, $8.95.

Catalysis in Chemistry and Biochemistry. Theory and Experiment. Proceedings of a symposium, Jerusalem, Apr. 1979. Bernard Pullman, Ed. Reidel, Boston, 1979 (distributor, Kluwer Boston, Hingham, Mass.). x, 390 pp., illus. $45. Jerusalem Symposia on Quantum Chemistry and Biochemistry, vol. 12.

Catharsis in Healing, Ritual, and Drama. T. J. Scheff. University of California Press, Berkeley, 1980. xvi, 246 pp. Cloth, $12.95; paper, $3.95.

Cereal Straw. A. R. Staniforth. Clarendon (Oxford University Press), New York, 1980. xii, 176 pp., illus. $29.95.

Chance in Nature. Papers from a symposium, Canberra, Australia, Apr. 1978. P. A. P. Moran, Ed. Australian Academy of Science, Canberra City, 1979. 92 pp., illus. Paper, A$3.95.

Chemical Thermodynamics. M. L. McGlashan. Academic Press, New York, 1979. xx, 346 pp., illus. $41.50.

Classical Dynamics and Its Quantum Analogues. David Park. Springer-Verlag, New York, 1979. viii, 340 pp., illus. Paper, $18. Lecture Notes in Physics, vol. 110.

Earth in Crisis. An Introduction to the Earth Sciences. Thomas L. Burrus and Herbert J. Spiegel. Mosby, St. Louis, ed. 2, 1980. xiv, 550 pp., illus. $17.95.

Ecology and Evolution of Lek Mating Behavior in the Long-Tailed Hermit Hummingbird. F. Gary Stiles and Larry L. Wolf. American Ornithologists' Union, Washington, D.C., 1979 (order from G. E. Woolfenden, Department of Biology, University of South Florida, Tampa). viii, 78 pp., illus. Paper, $8.50. Ornithological Monographs No. 27.

The Economics of Sex Differentials. Cynthia B. Lloyd and Beth T. Niemi. Columbia University Press, New York, 1979. xviii, 356 pp., illus. $16.50.

Edinburgh LCF. A Mechanised Logic of Computation. Michael J. Gordon, Arthur J. Milner, and Christopher P. Wadsworth. Springer-Verlag, New York, 1979. viii, 160 pp. Paper, $11.80. Lecture Notes in Computer Science, vol. 78.

Electromagnetic Interactions in Elastic Solids. H. Parkus, Ed. Springer-Verlag, New York, 1979. vi, 426 pp. Paper, $38.10. International Centre for Mechanical Sciences Courses and Lectures, No. 257.

Food Trends and Prospects in India. Fred H. Sanderson and Shyamal Roy. Brookings Institution, Washington, D.C., 1979. xiv, 162 pp. Paper, $4.95.

The Fruited Plain. The Story of American Agriculture. Walter Ebeling. University of California Press, Berkeley, 1980. xiv, 434 pp., illus. $22.50.

Fundamentals of Maxwell's Kinetic Theory of a Simple Monatomic Gas Treated as a Branch of Rational Mechanics. C. Truesdell and R. G. Muncaster. Academic Press, New York, 1980. xxviii, 594 pp. $54. Pure and Applied Mathematics.

Fundamentals of Network Analysis. G. H. Hostetter. Harper and Row, New York, 1979. xx, 474 pp., illus. $18.95.

Genesis of Relativity. Einstein in Context. Loyd S. Swenson, Jr. Burt Franklin, New York, 1980. xvi, 266 pp. + plates. $21. Studies in the History of Science, 5.

The Genetic Imperative. Fact and Fantasy in Sociobiology. A bibliography compiled by Alan V. Miller. Pink Triangle Press, Toronto, 1979. x, 108 pp. Paper, $6. Canadian Gay Archives Publication No. 2.

Inborn Errors of Specific Immunity. Proceedings of a symposium, Albany, N.Y., Oct. 1978. Bernard Pollara, Richard J. Pickering, Hilaire J. Meuwissen, and Ian H. Porter, Eds. Academic Press, New York, 1979. xviii, 470 pp., illus. $34. Birth Defects Institute Symposia.

Instrument Enrichment. An Intervention Program for Cognitive Modifiability. Reuven Feuerstein in collaboration with Ya'acov Rand, Mildred B. Hoffman, and Ronald Miller. University Park Press, Baltimore, 1980. xxvi, 436 pp., illus. $24.95.

Integrated Technology Transfer. Jacques Richardson, Ed. Lomond Books, Mt. Airy, Md., 1979. xii, 162 pp., illus. $12.75. Reprinted from *Impact of Science on Society*.

Local Jet Bundle Formulation of Bäcklund Transformations. With Applications to Non-Linear Evolution Equations. F. A. E. Pirani, D. C. Robinson, and W. F. Shadwick. Reidel, Boston, 1979. viii, 132 pp. Paper, $11.85. Mathematical Physics Studies, vol. 1.

The North Burgos Archaeological Survey. Bronze and Iron Age Archaeology on the Meseta del Norte (Province of Burgos, North-Central Spain). Geoffrey A. Clark, Ed. Arizona State University Department of Anthropology, Tempe, 1979. xx, 308 pp., illus. Paper, $9.50. Arizona State University Anthropological Research Papers No. 19.

Oceanographic Atlas of the Bering Sea Basin. Myron A. Sayles, Knut Aagaard, and L. K. Coachman. University of Washington Press, Seattle, 1980. xii, 158 pp. $15.

Optimal Experiment Design for Dynamic System Identification. Martin B. Zarrop. Springer-Verlag, New York, 1979. x, 198 pp. Paper, $14. Lecture Notes in Control and Information Sciences, vol. 21.

Philosophical Perspectives in Artificial Intelligence. Martin Ringle, Ed. Humanities Press, Atlantic Highlands, N.J., 1980. xii, 244 pp. $17.50.

Photosynthesis Bibliography. Vol. 5, 1974.

(Continued on page 568)