BOOK REVIEWS

A Practical Approach to Sedimentology, by Roy Lindholm, (Published by Allan and Unwin, Exclusive distributors in India, Hindustan Book Agency (India), 17 U.B. Jawahar Nagar, Delhi 110 007) 1987, pp. 276.

The book gives a detailed description of sedimentary features and the methods used to evaluate them. It includes eleven chapters: (1) Description of sedimentary structures, (2) Analysis of sedimentary structures, (3) Primary grain fabrics, (4) Trace fossils, (5) Particle morphology, (6) Mineral identification using X-ray diffraction, (7) Grain size, (8) Sedimentary rock classification, (9) Heavy minerals, (10) Rock colour, (11) Environmental analysis. In general the mode of presentation is simple, direct and, where analytical methods are involved, instructional. A good point of the book is that every chapter is followed by examples and exercises to be completed by an aspiring sedimentologist.

Chapter 1 is a description of sedimentary structures classified as upper surface, internal structures, structures on the lower bedding surface and soft sediment deformation.

Practical applications of sedimentary structures in plaeo-current and basin analysis are given in chapter 2. Some statistical significance tests, along with sine and cosine, as applied to plaeo-current analysis, are illustrated, but some more advanced ones, such as those developed by Watson (Jour, Geol, 1966), might have been included.

Chapter 3 deals in a very elementary way with the problem of pebble, sand grain, intraclast and fossil orientation methods of analysis. Since orientation, especially of sand grains, plays such an important role in determining reservoir properties of oil- and gas-bearing classic rocks, a slightly longer chapter would have been very useful, especially to petroleum geologists.

Chapter 4 on trace fossils is well illustrated for identification and a scheme of classification is presented for environmental study purposes. This is a highly useful chapter.

The chapter on particle morphology is succinct and presents the classical concepts of shape definition and methods of analysis. Fourier shape analysis, developed recently, might have been included.

Chapter 6 (Mineral identification using X-ray diffraction) is extensive, gives introductory ideas of X-ray diffraction, and extensive *2θ* tables for identification of a wide array of minerals occurring in sedimentary rocks. Another useful feature of the chapter is the presentation of X-ray diffractograms of important clay and carbonate minerals.

Chapter 7 (Grain size) and chapter 8 (Sedimentary rock classification) are self-explanatory and quite up-to-date. However, inclusion of loose grain size analysis by microscopic methods would have added to the list of currently available techniques.

In Chapter 9 (Heavy minerals) the study of accessory minerals is exhaustively treated. The chapter is useful especially for sedimentologists associated with the oil industry.

A distinctive feature of the book is the chapter on rock colour, rarely or not at all included in many textbooks on methods in sedimentary petrography. Rock colour, if intelligently analysed, is a useful indicator of sedimentary environments.

Environmental analysis (chapter 11) is the very objective of sedimentology, especially as applied in fossil fuel and mineral exploration. Straightforward methods are clearly illustrated and can be easily understood and applied to solve specific problems.

A lacuna in the book is the absence of chapters on model analysis of clashic rocks, staining of carbonate minerals in thin section, peel techniques, and study of insoluble residues. The information gained from these techniques would also immensely contribute to environmental analysis. The author, however, has his own reservations on the ommission of these topics in the text.

The text is well illustrated by block diagrams, line drawings and photographs. A researcher and/or student can easily follow the text. It is one of the few highly readable books available in sedimentology. In the reviewer's opinion, it must be a book on the shelf of every aspiring and professional sedimentologist.

C. GUNDU RAO

1628/1294, I Cross
Rammohanpuram
Srirampuram P.O.
Bangalore 560 021

Annual Review of Nuclear and Particle Science, Vol. 38, 1988, pp. 819, (ed.) J. D. Jackson (Published by Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94306, USA), Price: USA $ 49, Elsewhere $ 53.

Over the years *Annual Review of Nuclear and Particle Science* has been making available to scientists valuable review articles on various topical subjects in the field of nuclear and particle science. The present volume continues that tradition, and contains excellent review articles covering frontline topics in the areas of nuclear physics, particle and high energy physics, nuclear astrophysics, accelerators and particle detectors.

While the original shell model of Mayer and Jensen provided the basic foundation for a theoretical understanding of the properties of nuclear states, the modern multiconfiguration shell model approach has been quite successful in providing a theoretical understanding of the complete spectroscopic characterization of nuclear levels. The status of the nuclear shell model, with particular reference to model spaces and effective Hamiltonians, Gamow–Teller and magnetic dipole matrix elements, electric quadrupole matrix elements, higher-multiple matrix elements and electron scattering form factors, has been comprehensively reviewed in an article in this volume. In recent years, the availability of energetic heavy ion beams has opened up a way to study the structure of fast-rotating nuclei, and these studies have revealed superdeformed shapes at high angular momentum in several regions of the nuclear chart. This subject, of much topical interest in nuclear physics research with heavy ion beams, has been reviewed in another article, which brings out the experimental and theoretical status of this field with particular regard to the superdeformed bands in ^{152}Dy and the cerium–neodymium region. In another article aspects of chaos in nuclear physics are brought out, which should be of much interest to those engaged in studies of statistical nuclear theory. The present status of manifestations of the D-state in light nuclei are reviewed in another article in the domain of nuclear physics. This article presents various evidences for the D-state in ^{3}He/^{3}H, ^{4}He and ^{6}Li, and also discusses the role of the D-state in capture reactions.

There are also review articles on subjects related to nuclear astrophysics. The article on the nuclear physics of the theory of supernovae is an excellent review of the present understanding of the nuclear equations of state (EOS) needed to describe superdense nuclear matter during the collapse of supernovae. After giving a general review of nuclear EOS, the article discusses the capture of electrons during the high-density nuclear phase reached in the collapse of supernovae to arrive at the high-density equation of state and concludes with a discussion on temperature dependence of EOS at high density. In another article, the exotic phases of hadronic matter and their astrophysical significance are discussed. The article also presents a review of the physics of strange matter, laboratory searches for strange matter, the astrophysics of strange matter, and the cooling of neutron/strange stars. This survey shows that low-energy quantum chromodynamics (QCD) remains a fertile area of research in particle physics and astrophysics. An interesting article on detection of cosmic dark matter includes discussions on weakly interacting massive particles, axionic dark matter and light neutrinos. Another article of much interest to both the high energy physics community and the astrophysics community reviews the subject of extensive air showers associated with discrete astrophysical sources. This article includes a discussion on observations of air showers of associated with Cygnus X-3 and other neutron star X-ray binaries and possible ultra-high energy γ-ray sources, and also various acceleration mechanisms.

There are two very informative review articles in experimental high energy and particle physics based on experiments with advanced high-energy accelerator facilities. One of these articles summarizes the first round of experiments at the low-energy antiproton ring (LEAR) at CERN. After a short survey on LEAR and its first round of experiments, the article discusses the antiproton–proton scattering and reaction, resonances in $p\bar{p}$ interactions antiprotonic atoms and antiproton–nucleus interaction. The other article reviews the results of many exciting and technically impressive experiments performed at the proton–antiproton collider at CERN. This article also discusses the implications of the above results for the standard model and for physics beyond the standard model. The main results on inclusive spectra and particle composition of hadronic jets in e^+e^- annihilation in the 10–40 GeV energy range are reviewed. The large amount of data on inclusive hadron production accumulated over the last years at the PEP, PETRA, CESR and DORIS machines are presented and discussed on the QCD-based models. A proper understanding of energy deposition in high-energy proton–nucleus collision is important

to have a clear picture of the processes that take place during the collision. The review on this topic also points out that knowledge of energy loss and energy densities attained in proton–nucleus collisions is intimately connected to a review of transverse momentum and rapidity distributions.

There are several articles that pertain to the areas of theoretical particle and high energy physics. The subject of meson production in two-photon collision has been reviewed in one such excellent article, which concentrates on the contributions of two-photon physics to meson spectroscopy. It is known that the details of J/ψ production and decay have lent strong support to QCD. The subject of hadronic and radiative decays of J/ψ has been reviewed. Another article reviews the mathematical framework and theory pertaining to lie algebraic treatment of linear and nonlinear dynamics. The subject of electroweak symmetry breaking has been comprehensively discussed, with particular regard to unitarity, dynamics and experimental prospects.

We know that neutrino masses are taken to be zero in the standard model, and are aware that discovery of a nonzero mass for any of the neutrino species would have significant impact on particle physics theory. Thus, there being great interest in the accurate determination of neutrino mass, the review of the topic of direct measurement of neutrino mass should be of great value. The volume includes two articles explicitly on instrumentation and techniques. The radiofrequency quadrupole (RFQ) accelerator is a new type of linear accelerator specially suited to the acceleration of low-velocity ion beams and has served to be a very powerful injector for high-current accelerators. The development of RFQ accelerators and their applications are discussed. Nuclear particle detectors are the backbone of experimental nuclear and particle physics. The most important factor that determines their resolution is the electronic noise of the detector set-up. The low-noise techniques exployed in detectors are comprehensively reviewed in another article. Starting from the basics of the working of detectors, the article discusses origin and properties of noise, noise amplification and charge, and signal processing, with illustrative examples of proportional and drift chambers, semiconductor detectors and ionization chamber calorimeters.

S. S. KAPOOR
Physics Group
Bhabha Atomic Research Centre
Bombay 400 085

Edited and published by Prof. S. Ramaseshan, Current Science Association, Bangalore 560 080.
Typeset and printed at Book-Makers (I) Pvt. Ltd., Bangalore 560 003.