

A wide host of instruments are mentioned, and a brief description of their characteristics is given. The book provides a fine cross-section of the types of measuring instruments available, and deals to a lesser extent (though adequately) with some of the more common recording instruments.

However, I do not feel that this book could serve as an adequate textbook in an engineering science curriculum, because it does not deal with fundamentals and basic theory in sufficient depth to be useful to students working towards professional degrees; nor does it deal with modern usage of instrumentation systems. It does not, for example, dwell in depth on the more recent transducer developments; methods of tape recording and signal processes are not mentioned and, more importantly, the book does not deal with the control potential of instrumentation systems. In my opinion, the future of instrumentation—at least for the professional engineer—lies not in the measurement functions of instruments, but in the signal processing and control potential.

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Science and Archeology

Archaeology and the Microscope. The scientific examination of archaeological evidence. Leo Biek. Lutterworth, London, 1963. 287 pp. Illus. 45s.

Leo Biek, a physical chemist, is head of the Ancient Monuments Laboratory, Ministry of Public Buildings and Works, London. He and his small group try to keep just ahead of the bulldozers and other earth movers which, in advance of road building, pipelines, and urban expansion, are disturbing many of the still buried archeological sites of Great Britain. I have seen Biek's crowded workshop where heaps of rusted iron, bone fragments, potsherds, and artifacts made of all kinds of materials are brought for examination. The title of the book is figurative; the chapter headings are whimsical; the contents are in a way autobiographical. Biek tells how, with the help of experts from almost every branch of science and technology, he tries to wring from the scraps and oddments that are re-

covered from excavations every last bit of information they will yield. The book abounds in examples of knowledge gained from chemical analysis, radiocarbon analysis, chromatography, magnetic dating, and x-radiography.

The author is concerned with the basic philosophy behind the gathering of facts and their interpretation. He has a special interest in the effect of earth environment on both organic and inorganic materials and is concerned with such questions as why human and vegetable remains survive in some soils and almost completely disappear in others. In chapter 6, "Polyphenols ubiquitous," he tells of a pre-Conquest site in the Hungate district of York and of a Roman well in the Chew Valley where artifacts, especially those of iron, are surprisingly well preserved. This seems to be the result of the presence of tannates and phosphates in the soils. There is a long discussion of the relationship between podzolic profiles and the survival of artifacts. The last chapter is a summary of the modern scientific tools and investigative techniques now available, and Biek makes clear to the archeologist the kind of aid and assistance that he can expect from his scientific colleagues. The book is interesting reading. There is a good bibliography and an author index.

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Cuzco to Pizarro

Empire of the Inca. Burr Cartwright Brundage. University of Oklahoma Press, Norman, 1963. xviii + 396 pp. Illus. \$6.95.

Empire of the Inca, volume 69 of the excellent series entitled "The Civilization of the American Indian," is a history of the Inca from their earliest legendary arrival in Cuzco to their final overthrow by Pizarro in 1533. Apparently the author, professor of history at Florida Presbyterian College, has not hitherto concerned himself with Peruvian studies, but his book is based on a complete and fresh evaluation of the primary sources, the Spanish Chroniclers. In his notes on sources, he states that he has generally eschewed reference to secondary works, with the major exception of those of John Howland Rowe. The result is an excellent

and very readable history that considers the eight early, rather sketchily known reigns and continues through that of Viracocha Inca; following this the great Pachacuti and his successors are given a detailed treatment. To supplement the historical account, there is a chapter on basic forms of Peruvian religion and another on Peruvian creation myths that are important for an understanding of the ways in which the later Emperors took advantage of religious beliefs and mythology in strengthening their power and prestige.

Brundage, following Rowe, although quite independently, uses what might be called the short chronology of Inca history, in which the real expansion of the Empire does not begin until about the middle of the 15th century. This chronology, in contrast with those in vogue 30 years ago (which were based on historically less reliable sources), seems to have been now fully accepted by Peruvianists in this country. It is not only historically the most logical and believable chronology, but is strongly supported by archeological findings.

One of the factors that makes for readability of this highly scholarly work is the treatment of notes on the sources used by the author. They fill 61 pages, arranged by chapters and topics, all at the end of the book; thus the notes do not obtrude as footnotes or other distractions in the text, yet they fully document it. There is also a useful genealogy of the Inca dynasty, a list of dates of major events, and an index.

In summary, this is an important and most welcome addition to the literature on the Inca, and one that can be read with pleasure by anyone with an interest in the American Indian.

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Social Anthropology

The Structure of Chin Society. A tribal people of Burma, adapted to a non-western civilization. Illinois Studies in Anthropology, No. 3. F. K. Lehman. University of Illinois Press, Urbana, 1963. xx + 244 pp. Illus. Paper, \$3.

The mountainous and other relatively inaccessible parts of Southeast Asia are inhabited by peoples, some of whom are not well known, with cultures that

are markedly different from those of the people whose societies and governments constitute the national states of this troubled corner of the world. The Chin of the hill regions in western Burma are such people. In some ways the Chin are primitive and tribal in culture and society, but in other ways they resemble the peasantries of emerging industrial nations in other parts of the world. Lehman calls Chin society and culture "subnuclear" because it adjoins with and is heavily dependent upon the Burman civilization of the plains, yet the Chin maintain their distinctive cultural tradition, which is marginal to Burman civilization, and do not actively participate in the political affairs of the Burman state. In this monograph the author attempts to delineate precisely and in detail the distinctive ways in which the Chin relate to Burman culture and society.

The author's approach is ecological, but ecological in two senses of the word. There is the relation of various Chin groups to the resources of their territories. Historically, differences in resources as well as different adaptations to and exploitations of resources have produced notable differences among Chin groups. These differences among Chin societies have also resulted in different social ecologies—that is, relationships to Burman civilization upon which all Chin are firmly dependent. In this analytic framework, differences between northern and southern divisions of the Chin peoples with respect to land use and tenure, social structure, economics, religion, and ethos as well as differential responses to contemporary stimuli are described and compared.

Despite its brevity the monograph covers a great deal of material, clearly and concisely. It is written for anthropologists who are already familiar with the basic writings on the Chin and related peoples and with current theoretical trends (and controversies) in British and French social anthropology. It is, therefore, more technical than general. Its ecological emphasis, which is derived from the Studies of Cultural Regularities (a project at the University of Illinois), is well suited (and well applied) to the difficult task of describing differences among the Chin as well as their differing social, cultural, and economic relationships to Burma and the Burmese.

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Physical Chemistry

Ion Association. C. W. Davies. Butterworth, Washington, D.C., 1962. viii + 190 pp. Illus. \$7.50.

C. W. Davies, in the more than 30 years that he has devoted to the study of electrolytes in solution, has emphasized interpretations that involve ion association.

This brief book is a worthwhile summary of the field *from the point of view that accepts ion association as the principal explanation for diverse anomalous properties of electrolyte solutions*. The author admits several times that this approach may be open to question, but the point is not adequately discussed, and this is the book's main fault. Certainly the point of view adopted is very different from that expressed by T. F. Young—for example, see his articles in volumes 3 and 13 of *Annual Review of Physical Chemistry*.

An impression of the scope of this book may be gained from the chapter titles: "Introduction," "Conductivity methods," "Activity measurements," "Spectrophotometric methods," "Electrometric methods," "Other methods," "Review of results in water," "Results in mixed solvents," "Non-aqueous solutions," "The dissociation minimum," "Colloidal solutions," "Thermodynamic properties of the ion-pair," "Kinetics and mechanisms of reactions involving ions and ion-pairs," and "Theories of ion association." An appendix gives dissociation constants for more than 400 ion-pairs, but whether such a value as

$$[\text{Cs}^+][\text{Cl}^-]f_{\pm}^2/[\text{CsCl}]f_{\pm} = 2.5,$$

one of the tabulated values, is a chemically meaningful quantity is open to question.

The equation for the mean ionic activity coefficient of an electrolyte,

$$-\log f_{\pm} = 0.50 Z_1 Z_2 \left(\frac{I^{1/2}}{1 + I^{1/2}} - 0.20 I \right),$$

which was proposed by Davies in 1938, has been widely used. The author now modifies this equation by substituting 0.30 for 0.20 as the coefficient of ionic strength in the linear term, a modification that he bases on the consideration of a larger number of electrolytes.

Approximately one-quarter of the literature references are to papers published in 1957 or later, but only a few refer to papers published in 1960 and

1961. There are important omissions, among them several that would give the presentation a more critical flavor: Redlich's discussion of criteria for association of ions to form molecules [*Chem. Revs.* **39**, 333 (1946)], Mayer's theory of ionic solutions [*J. Chem. Phys.* **18**, 1426 (1950)], and the discussion by Frank and Thompson of the limitations of the Debye-Huckel theory [*J. Chem. Phys.* **31**, 1086 (1959)].

The lack of a more completely balanced picture of this important area of physical chemistry mars the usefulness of this book.

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Notes

Ornithology

Birds of Hampshire and the Isle of Wight (Oliver and Boyd, Edinburgh, 1963. 290 pp. 30s.), a local "ornithology" by Edwin Cohen, covers an area in England whose bird life was first extensively reported in a book (by Kelsall and Munn) published in 1905. The present volume brings together the data recorded by many observers since 1905 and carefully compares the present conditions and the current status of the included avian species with the reports published in the earlier work.

Although the main body of the text is in the form of a detailed annotated catalog, the book differs from many regional works in that it includes nine introductory chapters, written by several authors.

D. W. Wray writes on the geology of the area and A. K. Hunt on the botany. D. F. Billett contributes a chapter entitled "Survey of the south-east corner of the County." E. L. Jones discusses birds and land-use in north-west Hampshire, and J. S. Ash, the distribution of birds in relation to habitat in the Fordingbridge area. Several chapters on the birds of special parts of the region were contributed by J. H. Taverner, J. Stafford, and the main author, Cohen. The book is thus of wider usefulness than are most purely regional catalogs, although it is to be expected that its main body of readers will be local.

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