always have done justice to Lee Boltin's original plates.

If the reader has already passed beyond the introductory stage in this branch of archeology, he may feel that the author's choice of what has to be omitted, given the space available, is sometimes questionable. To take a particular example, the special techniques used for producing hand-ax and cleaver blanks in the African Acheulian, which are a vital key to any understanding of the typology of the finished implements, are not mentioned. On a more general level, chapter 6, which contains most of the information on Mesolithic and Neolithic implements, is entitled "Microliths and ground stone tools," which, since it is an accurate description of the principal contents, may perhaps indicate how serious are the omissions here in presenting a balanced picture of the ordinary range of lithic tools and weapons of, for example, the Western Neolithic of the Old World. There are other places in the book where space limitations rule out the possibility of proper discussion of controversial points, but this is more or less inevitable, and in any case the provision of such a comprehensive bibliography largely offsets this deficiency. Apart from such limitations, this remains a very useful introduction to one of the basic studies of the prehistoric archeologist, and it would be unfair while commenting on omissions not to remark that on the other hand there are plenty of things which it is excellent to see included—for example, the work of Crabtree on the effect of heat treatment on the flaking properties of flint, which deserves to be much more widely known.

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Big Machines

Linear Accelerators. PIERRE M. LAPOSTOLLE and ALBERT L. SEPTIER, Eds. North-Holland, Amsterdam; Elsevier, New York, 1970. xxii, 1204 pp., illus. $61.

One can only admire the ambition of the editors in attempting in a single volume to "describe in enough detail theoretical as well as technological aspects of linear accelerators in general and briefly cover the various types constructed and their applications." To this end, they have enlisted the help of 50 specialists. The result is a volume of some 1200 pages which comes close to describing the state of the art of linear accelerators in 1967.

The principal sections of the book are devoted to electron linear accelerators (540 pages) and proton linear accelerators (440 pages). In the section on electron linear accelerators, there are chapters describing positron accelerators, the racetrack microtron, and radio-frequency separators which should have interest to some readers. Two other, shorter sections of the book describe heavy-ion linear accelerators and superconducting linear accelerators. These last two types have seen a large amount of activity in the last three years, which is unfortunately unreported.

A large variation in the skill with which the authors carry out their assignments is apparent. A few examples are worthy of mention for their usefulness. The Stanford Linear Accelerator group has done an excellent job on chapters dealing with electron accelerating structures, particle dynamics, beam breakup, and the technology of accelerating structures. G. Dôme's (CERN) review and survey of proton linac accelerating structures is a complete, unifying presentation that will serve as a reference for future investigations. For the chapter on preinjectors Huguenin and Vosicki (CERN) have done considerable research to compile comparative information on ion sources and accelerating columns. Unfortunately, this chapter had to be submitted for publication in 1968, before much information on the testing of the new generation of high-gradient accelerating columns was available, so the reader is left stranded. (The editors' note at this point is not much help and, in fact, is erroneous in reporting the design features of the National Accelerator Laboratory accelerating column.) C. S. Taylor (CERN) has reduced to print some of the lore associated with radio-frequency problems, in particular multipactoring and sparking phenomena, known only by a few in the linac fraternity and usually rediscovered at start-up time on new linacs. The chapters on technology bear special mention because laboratory reports on linear accelerator engineering problems and techniques are rare. The attempts to cover these subjects in this volume are commendable, though sometimes falling short—for example, one might have expected some discussion of mechanical engineering problems associated with the Alvarez structure and in particular drift-tube fabrication and alignment, where ingenious methods have been used to meet technical requirements.

Several good books are in existence describing circular accelerators, but the space devoted in them to linear machines has been relatively small. A few recent publications have provided more information on linear accelerators, but the best sources of information on them have existed in the form of internal laboratory reports and conference proceedings. This book is another step in meeting the needs of those who seek specific information in this growing field, although it may be questioned whether it will obliterate the necessity for reference to laboratory reports.

The main shortcoming of the book, recognized by the editors, stems from the difficulty of integrating the chapters into a coherent presentation. This has resulted in repetition and in some cases annoyances; for example, in four consecutive chapters different symbols are used for effective shunt impedance. Another manifestation of this problem is the nonuniform treatment of the references in the chapter bibliographies, and the final author index accentuates the problem. The subject index proves to be too abbreviated to be very useful. I fear that with all its virtues the book will fall short of fulfilling the hope expressed by the editors that it "should have a chosen place . . . on the shelves or on the desks of all scientists in laboratories where linear accelerators are either being built or used."

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Chromatography

Ion Exchange in Analytical Chemistry. WILLIAM RIEMAN III and HAROLD F. WALTON. Pergamon, New York, 1970. xiv, 296 pp., illus. $17.50. International Series of Monographs in Analytical Chemistry, vol. 38.

The authors of this volume have attempted to take a wide view of ion exchange in its application to analytical chemistry. In this they have been successful, in that the book is not written from a limited practical point of view but presents synthetic and theoretical information and devotes a good deal of space to the less well known applications of ion exchange materials.

The initial chapters present infor-

mation on the synthetic procedures used for commercially available resins and discuss the general properties of these resins. A mathematical treatment of the bases of equilibrium, kinetics, and chromatographic plate theory forms the theoretical core of the book. This treatment is presented with adequate experimental support, including detailed descriptions of the manner in which supporting data were acquired. The subject of ion exchange chromatography is treated the most extensively from this mathematical point of view, and it is the authors' obvious intention to integrate analytical ion exchange into a generalized view of chromatography.

Since chromatography is the principal subject of the work and the one of most interest to analytical chemists, the theoretical treatment is accompanied by descriptions of techniques and tables of separations for both inorganic ions and organic compounds. The tables provide rapid reference for the practicing chemist. References run through 1967.

The separation of organic compounds by the use of ion exchange resins, where the underlying principles are not ion exchange at all but depend on van der Waals or Donnan forces, receives considerable attention. Salting out and solubilization chromatography are treated at length, and a comparison with gas-liquid chromatography is attempted. The authors maintain enough perspective to note that only in special cases is elution through exchange resins advantageous over gas-liquid methods.

The application of less common exchange materials is also detailed. These include macroreticular resins, ion retardation resins, ion exchange membranes and papers, liquid ion exchangers, and inorganic exchangers of the hydrous oxide types. The coverage here is extensive enough to allow the reader to become aware of the many existing possibilities.

The book is well printed and contains only a few errors in typography. Indexes and references are adequate. The authors have made a comprehensive study of ion exchange theory and capabilities and have exercised sufficient restraint so that the reader may obtain a realistic view of ion exchange among the many branches of chromatography.

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Biological Spectroscopy

Fluorescence Assay in Biology and Medicine. Vol. 2. SIDNEY UDENFRIEND. With a contribution by J. D. Winefordner, P. A. St. John, and W. J. McCarthy. Academic Press, New York, 1969. xii, 660 pp., illus. $19.50. Molecular Biology series.

Fluorescence spectroscopy, once the province of the analytical chemist, has recently emerged as an important technique for the study of macromolecules. It is gratifying that the second volume of *Fluorescence Assays in Biology and Medicine* has been expanded to satisfy the needs of newcomers interested in this aspect of fluorescence.

This monograph is actually a compromise between a second volume and a new edition of the previous book. Whole sections have been rewritten and considerable new information has been introduced, and the volume stands as a complete entity and may easily be read independently of the previous version.

Initial chapters give an excellent review of the basic concepts of fluorescence and phosphorescence couched in nonmathematical terms, providing a readable and rewarding introduction to fluorescence for graduate students and other novices in the field. The section on instrumentation is extensive and has been updated since the first volume. It gives detailed information regarding various commercial spectrophotofluorometers and also includes descriptions of several laboratory-constructed instruments.

The recent literature abounds with the presentation of uncorrected fluorescence spectra. Frequently the possibility of various artifacts has been ignored. It is fortunate that this volume includes a clear and detailed discussion of the practical aspects of spectrophotofluorometer calibration and some proposals for standardization of the reporting of fluorescence spectra. The discussion of several of the artifacts common to fluorescence measurements should be extremely helpful, particularly to those who have newly become interested in the technique.

In recent years there has been a renewed interest in fluorescence lifetime measurements. Advances in instrumentation and theory have led to novel applications of this technique in studies of macromolecules. It is unfortunate that this aspect of fluorescence is treated only in a cursory manner.

The main portions of the monograph are devoted to detailed descriptions of the fluorescence of amino acids, lipids, coenzymes, and drugs, as well as of carbohydrate and nucleic acid derivatives. There is also considerable information regarding the fluorescence of proteins and peptides, including the relation of fluorescence to protein structure.

The novel subject of fluorescence probes is treated in some detail; new sections on probes per se and on fluorescence polarization and energy transfer provide more detail than was available in the first volume.

The monograph will continue to be useful as a reference work for those who are interested in a particular assay as well as for those who desire a general introduction to fluorescence.

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Embryological Technique

Organ Culture. J. ANDRÉ THOMAS, Ed. Translated from the French edition (Paris, 1964) by the Express Translation Service. Academic Press, New York, 1970. xiv, 512 pp., illus. $29.50.

The practice of organ culture owes a great debt to Etienne and Emilienne Wolff and the group that has worked under their direction at the Institute of Embryology and Experimental Teratology in Paris for about a quarter of a century. J. A. Thomas, himself a pioneer in tissue and organ culture, edited (for publication in French in 1964) a series of lectures delivered in 1963 by the members of this group. The present book is a translation of that work. Each chapter has been supplemented with an addendum reviewing work since 1964. It is a measure of the rapid growth of the use of organ culture techniques that, for example, the chapters on synthetic media, on hormones and inhibitors, and on invertebrate organ culture have smaller bibliographies than their respective appendices.

Though the emphasis is on the work of the Paris school, from which most of the examples and the numerous illustrations are drawn, relevant studies elsewhere are adequately covered by most of the contributors. No other book dealing so extensively with the many manifestations of organ culture is available. The perspective of the