kan" and "Penutian" groupings, or even of his narrower "California Penutian"; but they include a chapter on "Hokan inter-branch comparisons" by William H. Jacobsen, Jr., who speaks of "the Hokan family" as "rather comparable to Indo-European in its time depth" (p. 545), and a chapter in which Michael Silverstein states that "California Penutian . . . is established or at least virtually certain" (p. 675). On the whole, the book shows too much insistence on genetic pigeonholing, whether of the lumping or the splitting school, and too little recognition of the possibility—frequently referred to by Franz Boas and by more recent students of areal linguistics—that some similarities between languages may reflect shared history, but at such a remote historical period that we cannot distinguish the effects of borrowing from those of common origin.

A notice on the verso of the title page states: "For reasons of economy and speed this volume has been printed from camera-ready copy furnished by the editors and contributors, who assume full responsibility for its contents." In fact, the goal of economy is poorly served by the format, which is mostly that of double-spaced typescript: the purchaser of the volume is paying for too much white space, and for a correspondingly bulky volume. In some sections, faults of typing, spelling, grammar, and style are fairly numerous. On the positive side can be mentioned the full and useful index of language names. Apart from such technical matters, and in spite of its more substantive shortcomings, this book is an essential and authoritative reference guide to current research on the historical study of North American Indian languages.

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Molecular Genetics

Genetic Recombination. Thinking about It in Phage and Fungi. FRANKLIN W. STAHL. Freeman, San Francisco, 1980. xiv, 334 pp., illus. $25.

Bacteriophage and fungi provide most of the best systems for studying genetic recombination. Their respective contributions are complementary. The fungi are an unrivaled source of detailed information about the end results of meiotic recombination in what we hope are representative eukaryotes. Some aspects of the data on fungi, especially those relating to gene conversion, postmeiotic segregation, and the correlation of these with crossing-over, invite speculation about molecular mechanism—speculation that, however, is difficult to check at the molecular level. Bacteriophages, with their readily accessible genomes of more tractable size, provide unrivaled opportunities for the physical isolation of recombination intermediates and even for the reconstruction in vitro of some of the steps through which these intermediates are formed and resolved. The hope is that the physical and enzymic mechanisms revealed in phage experiments will eventually be found to apply to eukaryotes also. Conversely, genetic phenomena revealed by data on fungal tetrads may be found to have their counterparts in phage; gene conversion, interpreted as heteroduplex correction, is a case in point.

There are few better qualified than Stahl to pull these different threads together, and in this book intended for "anyone with some background in genetics and a willingness to work" he attempts to do so.

The book contains more algebra than biochemistry, even though the latter aspect is not neglected. The author is mainly concerned with exploring the logic of the models that have been advanced from time to time to explain recombination in its various aspects. He shows in a number of instances that a rigorous working through of the algebra can sometimes uncover implications of the models different from the ones that intuition initially suggested. So as not to overburden the text, many relevant sets of data and working examples are presented in the form of problems at the ends of the chapters. A novel feature is the inclusion of a number of problems arising from the published mistakes of the author's (former?) friends and colleagues. Stahl does something to preserve his reputation for fair play by including an error of his own. In spite of some effort, this reviewer has so far been unable to discover any more errors in the present book.

This is hardly a book for mass purchase by college undergraduates. The issues dealt with are often difficult (though the author makes them as clear as possible), and the subject matter may strike some as too esoteric for a wide readership. But the book will be valuable at at least three different levels. It will be compulsory reading for specialists in the genetic analysis of recombination mechanisms, who number perhaps only a few hundred worldwide. It will be attractive to a much wider audience of biologists with a liking for puzzles and elegant reasoning. And it will be of value as a means of providing bright students with some insight into the value and limitations of precise model-building as a means of coming to grips with a complex piece of cellular mechanism.

The book is excellently illustrated and written in a style that, though never sloppy, is pleasantly informal. It comes as close to being light reading as its subject matter allows.

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Paleobotany: Lives and Works

The Fossil Hunters. In Search of Ancient Plants. HENRY N. ANDREWS. Cornell University Press, Ithaca, N.Y., 1980. 442 pp., illus. $28.50

This book is an unusual and engaging history of paleobotany based on Andrews's 40 years of collecting at innumerable localities, visiting laboratories, using the literature, and studying biographical accounts, diaries, and letters. It is a sampling both of workers and of their contributions. It is the antithesis of a ponderous chronological account. Its style is informal, presenting our predecessors as human beings variously adapted to their roles in science and viewed sympathetically in the light of their times. This results in many human interest stories that can be used advantageously by teachers seeking to enliven the historical aspect of the subject. Andrews's fondness for reminiscences adds an intriguing autobiographical flavor to the narrative.

Forgoing the work of the Ancients, Andrews commences with the late 1600's, when fossils were regarded by many as "formed stones" or "freaks" or "sports of Nature," although some, such as Robert Hooke, understood that fossils had been living plants that were petrified in water. There are numerous accounts of the struggles of several less well known workers and of the early interpretations of the time of year in which the Great Flood occurred. Those who found fossils preserved in the vernal state were convinced that it was spring; those who collected mature seeds or fruits knew autumn was the answer.

The relatively sparse work of the 1700's is followed by the remarkable productivity of the 19th and 20th centuries. Chapters are devoted to men and their

times, such as Brongniart and Sternberg, or to geographic regions, such as Central Europe or Scandinavia and the Arctic, or to topics, such as seeds and fruits.

The chapter on Brongniart and Sternberg, often called the "fathers of scientific paleobotany," typifies the approach of the book. Andrews discusses the state of paleobotany when these men's great works were being published, 1820–1838. He includes the critical work of William Smith, the British geologist, who wrote *Strata Identified by Organized Fossils* (1816–1819). He compares Brongniart's excellent classification of plants with Sternberg's more comprehensive, better-illustrated work that is the official starting point for nomenclature. He emphasizes the importance of Schlotheim's *Die Petrefaktenkunde* (1820) and the possibility that it, rather than Sternberg's work, might have been selected as the starting point. He writes of the men's travels, of the colleagues they knew, and of the political climate in which they lived.

Here one will find tributes to great anatomists, such as Williamson and Scott; to compilers, Seward, Berry, Krystofovich; to many women in paleobotany, Maria Neuberg, Marie Stopes, Eleanor Reid, Marjorie Chandler, Hanna Czecott, Suzanne Leclercq; to splendid lecturer-teachers, Solms-Laubach and Buckland; to the physically handicapped Nathorst and Lesquereux, who were deaf; to some who were outstanding in their manipulating of techniques, Witham, Nathorst, Halle, Florin, Leclercq; to those whose work was done under unfavorable conditions, Renault and Long; to outstanding collectors such as James Hutton; to self-made men such as E. W. Binney; to great intellects, Robert Hooke and Nicolaus Steno.

There are innumerable stories of interest: Solms-Laubach and the parrot who ate with him at the table; D. H. Scott, who allowed women to attend his lectures; L. F. Ward, who first used the term "paleobotany" and who left the field for a career in sociology; Jongmans, whose lectures drove students away; Gardner, who (1844) admonished workers to "collect while the collecting is possible"; Bowerbank, who founded the "London Clay Club"; Zalessky, from interior Russia, who reveled in the seaweeds along the British seacoast; Brongniart and Williamson, who disputed the significance of the cambium in arborescent lycopods; Bertrand and Renault, who supported the algal origin of boghead coal against the interpretation of Jeffrey and Thiessen that spores were the primary contributors to its formation; Carruthers and Dawson, who disputed the nature of *Prototaxites*.

It should be obvious that this book will appeal to a far broader audience than paleobotanists. Historians of science, botanists in general, and many geologists will find much of value here.

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Hybridoma Technology

Monoclonal Antibodies. Hybridomas: A New Dimension in Biological Analyses. ROGER H. KENNETT, THOMAS J. MCKEARN, and KATHLEEN B. BECHTOL, Eds. Plenum, New York, 1980. xxii, 424 pp., illus. $29.50.

The discovery in 1975 by Köhler and Milstein of means of producing monoclonal antibodies in continuously proliferating cells (hybridomas) is a landmark in biology. The availability of unlimited quantities of pure monospecific antibodies directed against virtually any antigenic substance has already begun to revolutionize the treatment and analysis of biological materials studied in such diverse fields as immunology, developmental biology, histology, toxicology, oncology, and pharmacology. *Monoclonal Antibodies* is an account of the first generation of the production and analysis of these reagents and specialized uses to which they have been put.

The volume is a compendium of anecdotal accounts of scientists' experiences with this technology, and it covers virtually all that has been published in the scientific literature. A section on the analysis of immunoglobulin structure describes the uses of hybridoma technology for studying the chemical basis of idiotypic determinants and analyzing the antibody repertoire. There are several papers employing the hybridoma products for genetic analysis of the antigens they recognize.

The most interesting and informative sections of the book deal with materials for which monoclonal antibodies have been the only viable means of study. These sections include analyses of viruses and their genetic variants and descriptions of newly discovered surface antigens on normal and neoplastic cells. A paper reporting early studies of the use of monoclonal antibodies for immunotherapy of leukemia in mice is perhaps the most novel contribution. The results reported for this and other systems would suggest that some optimism is warranted at this stage. Each contribution contains information or references to the literature on the methodology for the production and analysis of the hybridoma products used.

The quality of the papers is variable. Some papers are little more than synopses of previously published work, and others are full of new information that gives the reader new insights into the use of these reagents. Though there is little or no critical appraisal of the papers and readers are left to ferret out the important information for themselves, this is an impressive collection. It has the freshness and enthusiasm of original work presented by scientists at the bench.

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Books Received

Advances in Atomic and Molecular Physics. Vol. 15. David R. Bates and Benjamin Bederson, Eds. Academic Press, New York, 1979. xx, 544 pp., illus. $52.

Advances in Catalysis. Vol. 28. D. D. Eley, Herman Pines, and Paul B. Weisz, Eds. Academic Press, New York, 1979. xii, 404 pp., illus. $42.50.

Advances in Child Development and Behavior. Vol. 14. Hayne W. Reese and Lewis P. Lipsitt, Eds. Academic Press, New York, 1979. xii, 344 pp., illus. $27.50.

Advances in Chromatography. Vol. 17. J. Calvin Giddings, Eli Grushka, Jack Cazes, and Phyllis R. Brown, Eds. Dekker, New York, 1979. xiv, 336 pp., illus. $36.50.

Advances in Electronics and Electron Physics. Vol. 49. L. Marton and C. Marton, Eds. Academic Press, New York, 1979. xii, 378 pp., illus. $42.

Advances in Nuclear Science and Technology. Vol. 12. Jeffrey Lewins and Martin Becker, Eds. Plenum, New York, 1980. xii, 338 pp., illus. $39.50.

Advances in Protein Chemistry. Vol. 33. C. B. Anfinsen, John T. Edsall, and Frederic M. Richards, Eds. Academic Press, New York, 1979. viii, 318 pp., illus. $29.50.

Agriculture in Semi-Arid Environments. A. E. Hall, G. H. Cannell, and H. W. Lawton, Eds. Springer-Verlag, New York, 1979. xvi, 342 pp., illus. $49.80.

Algebraic Number Theory. Ian Stewart and David Tall. Chapman and Hall, London, and Halsted (Wiley), New York, 1979. xviii, 258 pp. $19.95.

Alientation in Pervasions. M. Masud R. Khan. International Universities Press, New York, 1979. 246 pp. $20.

Amaranth. From the Past for the Future. John N. Cole. Rodale Press, Emmaus, Pa., 1979. xxii, 312 pp., illus. $8.95.

Animals as Monitors of Environmental Pollutants. Proceedings of a symposium, Storrs, Conn., 1977. National Academy of Sciences, Washington, D.C., 1979. xii, 422 pp., illus. Paper, $20.50.

Annual Reports on Fermentation Processes. Vol. 3. D. Perlman and George T. Tsao, Eds.