Lectures by Zinn-Justin and Parisi give a very accessible introduction to lattice gauge theories and to the numerical methods that have profitably been used in the last few years to obtain non-perturbative results. Somehow more formal, the lecture by Baulieu on algebraic properties of gauge theories requires a lot of effort on the part of the reader not already familiar with the field. Lectures by Nanopoulos on supersymmetry and supergravity go through a labyrinth of models in which the superficial reader may easily get lost. Simple and informative, lectures on hadronic spectroscopy and Kaluza-Klein theories by Martin and Wetterich are pleasant to read. The last theoretical lecture, by Glashow, gives a nice overview of the field.

The experimental lectures occupy a larger portion of the volume. In them the physics of e^+–e^- collisions is prominent. An account by Wu of the experimental results obtained at PETRA, the electron-positron accelerator at the DESY laboratory in Hamburg, is a book within the book. More contained but also very informative, lectures by P. Franzini and J. Lee-Franzini give a good panorama of e^+–e^- experiments at the Cornell storage rings. Photons, muons, and neutrinos capture the stage in the remaining lectures, by Treille, Smadja, Turlay, Guyot, and Charpak, which present excellent detailed accounts of a variety of recent important results.

Conspicuously absent from the experimental lectures is a contribution on hadronic collisions, and this precisely in the year when, as the editors remark in the preface, the experimentalists were "proud to announce" the discovery of the intermediate vector bosons, $W^{\pm}$ and Z^0, at the p-$\bar{p}$ collider at CERN. The overall presentation of the experimental lectures thus appears heavily tilted toward leptonic physics. An even bigger sense of imbalance is derived from the disparity of extent of the various lectures. The editors are hardly to blame for this: the writing of lecture notes is a burdensome task for lecturers who are heavily engaged in research. The outcome is necessarily conditioned by the material already available, and reducing a previously compiled review may be as time-consuming as writing something new. Still, the fact remains that a volume in which the contributions were better balanced in scope and detail would have been more satisfactory. Leaving this consideration aside, the reader will find in the present volume a very useful and informative account of some of the most active topics in particle research.

CLAUDIO REBBI
Brookhaven National Laboratory, Upton, NY 11973

Vertebrate Evolution

Evolutionary Biology of Primitive Fishes. R. E. FOREMAN, A. GORBMAN, J. M. DODD, and R. OLSSON, Eds. Plenum, New York, 1985. viii, 463 pp., illus. $79.50. NATO Advanced Science Institutes Series A, vol. 103. From a workshop, Bamfield, British Columbia, April 1985.

This volume attests to widespread interest in the earliest radiations of vertebrates. The term "primitive fishes" as used by the editors refers loosely to forms that retain many primitive characters; in practice, the living agnathans (lampreys and hagfishes) are a particular focus of the book. The book's 23 chapters are written by authors from many fields. Much of the emphasis, however, is on comparative physiology and biochemistry.

Nearly one-third of the book concerns comparative endocrinology. These chapters cover many recent ideas on the evolution of vertebrate endocrine systems. For example, Gorbman and Tamarin point out that the agnathan adenohypophysis does not form via a Rathke's-pouch–like invagination but rather by the budding off of cells from the roof of the nasopharyngeal canal, a process misunderstood (or at least misrepresented in diagrams) by previous authors. Noting that the adenohypophysis of hagfishes develops from endoderm, whereas that of lampreys and all other vertebrates arises from ectoderm, they suggest this as possible evidence of the homology of the vertebrate adenohypophysis and the ascidian subneural gland. Nozaki presents new immunocytochemical data on the tissue distribution of neuropeptides in agnathan brains and pituitary. Here again, there are some striking differences between the two lineages: lampreys show most of the pro-opiocortin–related peptides, whereas hagfish do not. Fontaine's chapter is a general review of the hormonal peptides of vertebrates. Several chapters (Vigna; Plisetskaya; Emdin, Steiner, Chan, and Falkmer; and Thorndyke and Falkmer) concern the hormones of the brain-gut axis and the increasing evidence of the great antiquity of many of these systems. In this context, Emdin *et al.* present three alternative models of the origin of the insulin gene from a serine protease gene.

Reviews of other topics in comparative physiology are another strong point of the volume. These include thermoregulation (Prosser), respiration (Burggren, Johansen, and McMahon), reproduction (Dodd and Dodd), osmoregulation (Griffiths), urea synthesis and retention (Brown and Brown), metamorphosis (Youson), blood (Fänge), and cardiovascular function (Nishimura). Agnathans and chondrichthyans are the focus of most of these contributions, although some authors—in particular, Burggren *et al.*—make broad and detailed phylogenetic comparisons to help identify primitive and derived states for multiple sets of characters. This is very helpful. There are many highlights in these chapters, and all of them provide critical summaries and direct access to the extensive literature of these subfields.

In the book's only microevolutionary analysis, Beamish notes that nonparasitic freshwater lampreys are believed to originate from parasitic ancestors either directly from anadromous forms or through an intermediate freshwater parasitic form. Beamish favors the latter hypothesis, but, as he points out, either case requires major reorganizations of development and metamorphosis. Because freshwater forms have evolved more than once, this might be a fruitful area for ontogenetic and phylogenetic studies.

Mallatt summarizes his analysis of alternative models for the evolutionary origin of vertebrate feeding systems. In one, the larvae are depicted as suspension feeders, while the adults are predators. In the other, the larvae are predatory, while the adults are suspension feeders. Support for the first idea comes from the observation that the earliest vertebrates had well-developed sensory systems, as proposed three years ago by Northcutt and Gans in their analyses of the origin of vertebrates. Although the Northcutt-Gans hypothesis retains much of its appeal, Mallatt argues that adult suspension feeding is in better accord with the fossil record of agnathans.

Northcutt reviews a great deal of information on the comparative anatomy of the nervous system and sense organs of agnathans and discusses his results in a cladistic framework. Loaded with new facts and interpretations, this chapter is important because it makes so many specific phylogenetic predictions. As a general conclusion, many of the confusing features of the nervous system of hagfishes appear to be autapomorphies that do not offer much insight into the conditions in the earliest vertebrates.

In their introduction, the editors state that one goal was to produce "a picture of the probable line of evolution of the prototype primitive fishes." Though the book makes progress, that goal is not realized here because systematic and phylogenetic considerations are seriously deemphasized. Gans, writing in the first chapter, states a critical point: comparative biologists must explicitly match their findings against cladograms before constructing evolutionary scenarios. Few of the authors do this, however, and such key topics as relationships among agnathans—as paraphyletic a group as any—

are scarcely touched upon. If the goal is phylogenetic prediction, then more rigorous phylogenetic comparison is needed. A related and also disappointing aspect is that more morphologists and paleontologists were not included. As a result, many exciting and directly relevant ideas about lower vertebrate phylogeny were overlooked.

The book's interdisciplinary nature and timely reviews make it of interest to a wide audience including endocrinologists, comparative physiologists, vertebrate morphologists, and paleontologists. Most of the papers are well written and carefully edited. The text, drawings, and photographs are attractively produced, and the three-page subject index is a helpful addition.

WILLIAM E. BEMIS
Department of Zoology,
University of Massachusetts,
Amherst, MA 01003

Some Other Books of Interest

One Hundred Years of Psychological Research in America. G. Stanley Hall and the Johns Hopkins Tradition. STEWART H. HULSE and BERT F. GREEN, JR., Eds. Johns Hopkins University Press, Baltimore, 1986. xviii, 414 pp., illus. $35. From a conference, Baltimore, Oct. 1983.

In 1883 G. Stanley Hall, as one of the editors of this volume puts it, "formalized the beginning of the [psychological] research enterprise in this country by founding the first laboratory of psychology in America at Johns Hopkins." To commemorate the event the Department of Psychology at Johns Hopkins convened the conference of which this volume is the proceedings. The opening section of the volume is explicitly historical. In the first of its four chapters Mortimer Herbert Appley, one of Hall's most recent successors as president of Clark University, summarizes and offers some reflections on Hall's career. Philip J. Pauly, Alphonse Chapanis, and the editors then provide a history of psychology at Johns Hopkins up to the present era. Part 2 of the volume consists of three biologically oriented essays: Philip Teitelbaum on the effects of lateral hypothalamic damage and their implications with respect to motivated behavior, Richard F. Thompson *et al.* on the localization of the memory-trace system in the mammalian brain, and Solomon H. Snyder and Pamela B. Sklar on the effects of caffeine. Part 3 is devoted to cognitive and social psychology: Wendell R. Garner on stimulus-organism interaction in perception, Roger Brown on linguistic relativity, George A. Miller on ways in which the study of cognition has been "dismembered," and Doris R. Entwisle on a behavioral study of Cesarian delivery. The volume concludes with an essay by William R. Bevan on the current state of general experimental psychology.—K.L.

Assessment of Depression. NORMAN SARTORIUS and THOMAS A. BAN, Eds. Published on behalf of the World Health Organization by Springer-Verlag, New York, 1986. xviii, 376 pp. $49.

The editors of this compendium report that it is estimated that 100 million people worldwide suffer from clinically recognizable depression and speculate that changes in the psychosocial environment and the increasing prevalence of chronic somatic diseases make it likely that the number will increase. They believe that the prospects for successful treatment of depression have improved but that the diversity of methodologies used to assess depression gives progress in that direction "a certain chaotic quality" and impedes multidisciplinary and multicentric research. They thus set out to bring together "authoritative descriptions of the most frequently used and recommended assessment instruments." The volume contains 31 chapters in all. The first eight report on the assessment of depression in particular geographic areas or groups of nations: German-speaking, French-speaking, Spanish-speaking, and Eastern European countries, Scandinavia, Japan, Italy, and Africa. These are followed by more detailed accounts of the various scales used (World Health Organization instruments, Hamilton's Depression Rating Scale, Beck's Depression Inventory, and some dozen others). The volume concludes with discussion of assessment of depression in the young and the elderly, the relative utility of ratings by nurses, physicians, and patients, and several other special issues.—K.L.

Kurt Gödel: Collected Works. Vol. 1, Publications 1929–1936. SOLOMON FEFERMAN, editor-in-chief. Clarendon (Oxford University Press), New York, 1986. xviii, 474 pp., illus., + plates. $35.

This volume inaugurates what is intended to be a comprehensive edition of the works of "the most outstanding logician of the twentieth century." The purpose of the editors, Feferman writes, is to make Gödel's writings accessible to as wide an audience as possible. To that end they have provided introductory notes to individual papers or groups of papers and English translations to accompany the German texts. Volume 1 includes, in addition to more easily available publications, Gödel's doctoral dissertation, "On the Completeness of the Calculus of Logic" (University of Vienna, 1929). Introducing the volume are a general essay by Feferman on Gödel's life and work, photographs of Gödel, and a "Gödel chronology" compiled by John W. Dawson, Jr. Volume 2 will complete the published works (1937–1974), with subsequent volumes to present unpublished materials including lecture notes, correspondence, and extracts from Gödel's scientific notebooks. The edition is being prepared under the auspices of the Association for Symbolic Logic, with funding from the Sloan Foundation and the National Science Foundation.—K.L.

Reprints of Books Previously Reviewed

Beyond Mechanization. Work and Technology in a Postindustrial Age. Larry Hirschhorn. MIT Press, Cambridge, MA, 1986. Paper, $6.95. *Reviewed* **230**, 1031 (1985).

Dimensions of Darwinism. Themes and Counterthemes in Twentieth-Century Evolutionary Theory. Marjorie Grene, Ed. Cambridge University Press, New York, and Editions de la Maison des Sciences de L'Homme, Paris, 1986. Paper, $14.95. *Reviewed* **223**, 923 (1984).

The Global Climate. John T. Houghton, Ed. Cambridge University Press, New York, 1985. Paper, $19.95. *Reviewed* **225**, 1466 (1984).

Renormalization. An Introduction to Renormalization, the Renormalization Group, and the Operator-Product Expansion. John C. Collins. Cambridge University Press, New York, 1986. Paper, $24.95. *Reviewed* **229**, 44 (1985).

Books Received

The Evolutionary Ecology of Ant-Plant Mutualisms. Andrew J. Beattie. Cambridge University Press, New York, 1985. x, 182 pp., illus. $24.95. Cambridge Studies in Ecology.

Examining Holistic Medicine. Douglas Stalker and Clark Glymour, Eds. Prometheus, Buffalo, NY, 1986. 406 pp., illus. $20.95.

Experiments in Physical Sedimentology. J. R. L. Allen. Allen and Unwin, Winchester, MA, 1985. 63 pp., illus. Paper, $9.95.

Ferrohydrodynamics. R. E. Rosenzweig. Cambridge University Press, New York, 1985. xvi, 344 pp., illus. $69.50. Cambridge Monographs on Mechanics and Applied Mathematics.

First Steps toward Space. Frederick C. Durant III and George S. James, Eds. American Astronautical Society, San Diego, CA, 1985. xii, 307 pp., illus. $45; paper, $35. AAS History Series, vol. 6. From symposiums, Belgrade, Sept. 1967, and New York, 1968.

Growth of Crystals. Vol. 13. E. I. Givargizov, Ed. Consultants Bureau, New York, 1986. xii, 374 pp., illus. $55. Translated from the Russian edition (Moscow, 1980) by V. I. Kisin. E. A. D. White, Transl. Ed.

A Guide to Practical Radiochemistry. An. N. Nesmeyanov, Ed. Mir, Moscow, 1985 (U.S. distributor, Imported Publications, Chicago). Two volumes. Vol. 1, 312 pp., illus. $9. Vol. 2, 447 pp., illus. $9. Translated with revisions from the Russian edition (Moscow, 1980) by G. Leib.

A Guide to the Vegetation of Britain and Europe. Oleg Polunin and Martin Walters. Oxford University Press, New York, 1985. x, 238 pp., illus., + plates. $29.95.

(Continued on page 118)