researchers from a variety of disciplines and the avoidance of "excessive empiricism and excessive theoreticality." After a useful summary of relevant natural scientific techniques, she discusses models as a means of bringing such techniques to bear upon archeological issues. Her move away from rigid empiricism is apparently an attempt to transcend the limited, often univariate, nature of past models in the northeastern literature and to achieve a level of comprehensiveness more in accord with her ecological perspective.

As an example of her approach, she tackles the issue of Paleo-Indian subsistence and states: "We cannot escape the conclusion that Paleo-Indian peoples were far more likely to have been generalist foragers than specialists in big game." Unfortunately, those who disagree with this conclusion, and there will be many, may overlook the real advantages of the approach she espouses.

Snow's contribution to the volume, "Approaches to cultural adaptation in the Northeast," resembles arguments by Diener and others advocating the macroevolution model of biological speciation as an analog for quantum cultural change. Invoking Liebig's law of the minimum, Snow suggests that apparent cultural discontinuities in the Northeast may have resulted from "short term episodes of environmental stress" that led cultural systems to quantum change or to total collapse and replacement by "systems expanding from adjacent areas." He goes on to suggest that such discontinuities can be modeled by catastrophe theory. At times, Snow carries his argument to extreme, as for example when he states that "general environmental trends such as climatic episodes are important to us not in and of themselves . . . but to the extent that they increase the frequencies of such rare catastrophes."

The verifiability of Snow's neocatastrophism model depends upon our ability to detect the short-term phenomena that supposedly caused cultural change. Snow himself seems unsure whether this is possible, but even if it is the model will enlighten us only about the timing and magnitude of such changes. The process of subsequent readaptation remains unaddressed. Finally, Snow's stated intent is to develop models scaled down to levels appropriate for the region's archeological data base. In fact, however, models such as macroevolution and catastrophe theory cover broader ranges of phenomena than those now represented in the literature.

William Starna's "Old data and new models: bridging the gap" summarizes the literature on models and their role in scientific inquiry. His concise and readable presentation will serve as a handy pocket guide to models in the North American literature. Starna devotes a surprising amount of attention to "old boy networks," which he calls "controlling models" and which operate to restrict outsiders' access to unpublished data, working assumptions, and the like. In other fields, such as history and literary criticism, such models may prevail, but Starna credits them with far more influence among archeologists than they have. Data remain too long unpublished more often because of research programs imbalanced toward data recovery and because of lack of support for analysis and publication than for any other reason. However, in those cases where controlling models are operative, the cause may lie in a phenomenon which, to his credit, Starna broaches in this paper, that is, the recent emergence of a "division of labor between those who formulate hypotheses and those who test them." Could it be that "controlling models" sometimes arise when one's customary right to first publication of recently acquired data or newly developed interpretations is abrogated by someone else's publication of a hypothesis inspired by them?

Douglas Ubelaker's "Approaches to demographic problems in the Northeast" briefly reviews past efforts in northeastern paleodemography and asserts that future progress will depend upon systematic analysis of skeletal data. Debra Schindler *et al.* discuss some physical anthropological aspects of skeletal remains in "Biocultural adaptation: new directions in northeastern anthropology." The authors feel that past attempts to measure genetic distances between skeletal populations in the Northeast failed on either technical or theoretical grounds. Instead, they espouse the use of skeletal material to study prehistoric adaptation.

Finally, Francis McManamon's paper describes a multiyear, multistage archeological survey of Cape Cod National Seashore. He lays out the goals, research methods and techniques, and results of the project clearly and concisely. This paper exemplifies well-designed and well-executed field survey.

Since these papers were prepared, financial support for archeological research in North America has waned. Unfortunately, the impact is likely to fall heavily upon the more dynamic strategies advocated in this volume, designed as they were for maximizing creativity, not cost-effectiveness. But even if we are forced to forgo for a while large data-recovery projects in Iroquoia and complex multidisciplinary research endeavors, this collection will remain useful in polemical and instructional contexts because of its varied perspectives on regional methodological and theoretical issues.

BRUCE J. BOURQUE
Maine State Museum, Augusta 04333

Color Vision in Vertebrates

Comparative Color Vision. GERALD H. JACOBS. Academic Press, New York, 1981. viii, 210 pp., illus. $24. Academic Press Series in Cognition and Perception.

In those species that have been carefully studied, color vision is achieved by specialized receptor cells with different spectral sensitivities and by comparing the responses of these receptors in antagonistically organized neural networks. Color vision varies across species because of differences in the number of receptor types and their spectra and also because of associated differences in the number and character of the antagonistic neural networks.

This book begins with a discussion of the most important methodological problem in the field: How does one determine that an animal does in fact have color vision? Any discrimination can potentially be made by responding to brightness differences instead of color differences. Indeed, as Jacobs points out, animals whose color vision has been established beyond doubt sometimes prefer to make choices on the basis of brightness. Such animals may need encouragement before they adopt a color-based strategy. The methodological discussion, emphasizing the need to settle the brightness question, provides the background for the research that will be emphasized by Jacobs. He mainly covers data from those species that have been studied in properly designed experiments. Work that does not satisfy rigorous criteria is only mentioned in passing.

Jacobs then presents those fundamental facts of psychophysics and neurophysiology that are relevant to color vision. These chapters are tightly written and presuppose a general background in sensory psychobiology.

The heart of the book is a comparative

survey of color vision in those cases where the work has been properly done. Organisms covered in detail include frogs, turtles, fish, birds, squirrels, rats, cats, apes, monkeys, and prosimians. The main conclusion that emerges is that all of these organisms have some color discrimination ability. This may be somewhat surprising to readers who have heard the widely repeated view that most mammals are color blind. Jacobs carefully describes how this view arose, showing that it reflects the fact that animals with reduced color discrimination abilities require that the investigator be proportionally more determined before they will yield positive and convincing evidence that they have some ability to discriminate colors.

On the other hand, behavioral evidence has accumulated that suggests that certain birds are capable of making discriminations that are not possible for humans. Birds are perhaps tetrachromats or maybe even pentachromats or hexachromats. Further, physiological data suggest that birds may have the most highly differentiated photoreceptor system. The full extent of the advantage of certain birds over humans has not yet been completely worked out, and Jacobs indicates where additional information would be valuable.

Jacobs concludes with frankly acknowledged speculations, both his own and those of other investigators, on the evolutionary origins and functional utility of color vision. Though the quality of the evidence in support of the speculations varies, the section is provocative because it points out questions for which satisfactory answers do not exist.

The book does suffer from one serious flaw; Jacobs explicitly declined to include data on invertebrates. He justifies this omission by appealing to the differences that are known to exist between vertebrate and invertebrate visual systems. Such differences do exist and are quite well known. But the pertinent question would have to be whether they make a difference as far as color vision is concerned. Would one conclude from a review of both research domains that the principles of organization that are used by invertebrates have no counterparts in those used by vertebrates? Are there not invertebrate preparations that can serve as useful model systems to answer questions that are not readily resolvable when one limits one's attention to vertebrates? An example of such a question is one that recurs throughout Jacobs's book: What is the role of prereceptor ocular filters in modifying or influencing color vision? Jacobs is unable to provide a definitive answer to this question, and it is unfortunate that he fails to inform the reader of the highly relevant experiments done with invertebrates by a number of investigators.

This criticism notwithstanding, Jacobs has written an excellent summary of vertebrate color vision. It should be valuable as a reference or as a textbook for advanced students.

GERALD S. WASSERMAN
Department of Psychological Sciences, Purdue University, West Lafayette, Indiana 47907

Books Received

The Anthropological Circle. Symbol, Function, History. Marc Auge. Translated from the French edition (Paris, 1979) by Martin Thom. Cambridge University Press, New York, and Editions de la Maison des Sciences de l'Homme, Paris, 1982. viii, 132 pp. Cloth, $24.95; paper, $9.95. Cambridge Studies in Social Anthropology, 37.

Anthropologists at Home in North America. Methods and Issues in the Study of One's Own Society. Donald A. Messerschmidt, Ed. Cambridge University Press, New York, 1981. x, 310 pp. Cloth, $24.95; paper, $12.95.

Applied Biochemistry and Bioengineering. Vol. 3, Analytical Applications of Immobilized Enzymes and Cells. Lemuel B. Wingard, Jr., Ephraim Katchalski-Katzier, and Leon Goldstein, Eds. Academic Press, New York, 1981. xiv, 314 pp., illus. $42.50.

Applied Multidimensional Systems Theory. N. K. Bose. Van Nostrand Reinhold, New York, 1982. xviii, 412 pp., illus. $29.50. Van Nostrand Reinhold Electrical/Computer Science and Engineering Series.

Aquaculture Development in Less Developed Countries. Social, Economic, and Political Problems. Papers from a workshop. Leah J. Smith and Susan Peterson, Eds. Westview, Boulder, Colo., 1982. xvi, 152 pp. $22.50. Westview Special Studies in Agriculture/Aquaculture Science and Policy.

Biosaline Research. A Look to the Future. Proceedings of a workshop, La Paz, Mexico, Nov. 1980. Anthony San Pietro, Ed. Plenum, New York, 1982. xiv, 578 pp., illus. $65. Environmental Science Research, vol. 23.

The Biosynthesis of Secondary Metabolites. R. B. Herbert. Chapman and Hall, London, 1981 (U.S. distributor, Methuen, New York). x, 178 pp., illus. Cloth, $29.95; paper, $13.95.

Biotechnology. A Comprehensive Treatise. Vol. 1, Microbial Fundamentals. H.-J. Rehm and G. Reed, Eds. Verlag Chemie, Deerfield Beach, Fla., 1981. xii, 520 pp., illus. $309.

Blackflies. The Future for Biological Methods in Integrated Control. Marshall Laird, Ed. Academic Press, New York, 1981. xiv, 400 pp., illus. $58.

Cellular Pacemakers. Vol. 1, Mechanisms of Pacemaker Generation. David O. Carpenter, Ed. Wiley-Interscience, New York, 1982. xii, 332 pp., illus. $45.

Cerebral Microcirculation and Metabolism. Papers from a symposium, Berlin, Sept. 1979. J. Cervós-Navarro and Emmanuel Fritschka, Eds. Raven, New York, 1981. xxvi, 474 pp., illus. $55.

Chemiosmotic Proton Circuits in Biological Membranes. In Honor of Peter Mitchell. V. P. Skulachev and Peter C. Hinkle, Eds. Addison-Wesley Advanced Book Program, Reading, Mass., 1981. xviii, 634 pp., illus. $29.50.

Chemistry 2 Checkbook. P. J. Chivers. Butterworths, Boston, 1981. vi, 162 pp., illus. Cloth, $19.95; paper, $8.95. Butterworths Technical and Scientific Checkbooks.

Clinical Approach to Infection in the Compromised Host. Robert H. Rubin and Lowell S. Young, Eds. Plenum, New York, 1981. xxiv, 654 pp., illus. $59.50.

Clinical Bladder Cancer. Proceedings of a symposium, Antwerp, Sept. 1980. L. Denis, P. H. Smith, and M. Pavone-Macaluso, Eds. Plenum, New York, 1982. xii, 202 pp., illus. $29.50.

Electroencephalography. Basic Principles, Clinical Applications and Related Fields. Ernst Niedermeyer and Fernando Lopes da Silva. Urban & Schwarzenberg, Baltimore, 1982. x, 752 pp., illus. $88.

Electromagnetism and Life. Robert O. Becker and Andrew A. Marino. State University of New York Press, Albany, 1982. xiv, 212 pp., illus. Cloth, $33.50; paper, $10.95.

Electronic Devices and Circuit Theory. Robert Boylestad and Louis Nashelsky. Prentice-Hall, Englewood Cliffs, N.J., ed. 3, 1982. xvi, 752 pp., illus. $23.95.

Essays in Applied Microbiology. J. R. Norris and M. H. Richmond, Eds. Wiley, New York, 1982. Variously paged, illus. $48.95.

Evolution of the Earth. Papers from a seminar, London, Ontario, Canada, Sept. 1979. R. J. O'Connell and W. S. Fyfe, Eds. American Geophysical Union, Washington, D.C., and Geological Society of America, Boulder, Colo., 1981. vi, 282 pp., illus. $19. Geodynamics Series, vol. 5.

Expectations and Actions. Expectancy-Value Models in Psychology. Norman T. Feather, Ed. Erlbaum, Hillsdale, N.J., 1982. xii, 436 pp. $39.95.

Garbage in the Cities. Refuse, Reform, and the Environment, 1880–1980. Martin V. Melosi. Texas A&M University Press, College Station, 1982. xvi, 268 pp. + plates. $21.50.

Gastrointestinal Cancer 1. Jerome J. Decosse and Paul Sherlock, Eds. Nijhoff, The Hague, 1981 (U.S. distributor, Kluwer Boston, Hingham, Mass.). xii, 452 pp., illus. $75. Cancer Treatment and Research, vol. 3.

Gauge Theory and Variational Principles. David Bleecker. Addison-Wesley Advanced Book Program, Reading, Mass., 1981. xx, 180pp. $17.50. Global Analysis, No. 1.

Gene Function. *E. coli* and Its Heritable Elements. Robert E. Glass. Croom Helm, London, 1982. xvi, 488 pp., illus. Cloth, £19.95; paper, £9.95.

Germs That Won't Die. Medical Consequences of the Misuse of Antibiotics. Marc Lappé. Anchor/Doubleday, Garden City, N.Y., 1982. xviii, 246 pp. $14.95.

Glycoconjugates. Proceedings of a symposium, Tokyo, Sept. 1981. T. Yamakawa, T. Osawa, and S. Handa, Eds. Japan Scientific Societies Press, Tokyo, 1981 (U.S. distributor, ISBS, Beaverton, Ore.). xxiv, 532 pp., illus. Paper, $43.

Graphs, Surfaces and Homology. An Introduction to Algebraic Topology. P. J. Giblin. Chapman and Hall, London, ed. 2, 1981 (U.S. distributor, Methuen, New York). xviii, 330 pp., illus. Paper, $15.95. Chapman and Hall Mathematics Series.

Hazard Assessment of Chemicals. Current Developments. Vol. 1. Jitendra Saxena and Farley Fisher, Eds. Academic Press, New York, 1981. xii, 462 pp. $49.50.

Herman Hollerith. Forgotten Giant of Information Processing. Geoffrey D. Austrian. Columbia University Press, New York, 1982. xviii, 418 pp. $19.95.

History and Systems of Social Psychology. William S. Sahakian. Hemisphere, Washington, D.C., ed. 2, 1982. xxii, 630 pp. Cloth, $24.50; paper, $16.95.

Intracellular pH. Its Measurement, Regulation, and Utilization in Cellular Functions. Proceedings of a conference, Santa Ynez, Calif., July 1981. Richard Nuccitelli and David W. Deamer, Eds. Liss, New York, 1982. xxxii, 594 pp., illus. $88. Kroc Foundation Series, vol. 15.

An Introduction to Composite Materials. Derek Hull. Cambridge University Press, New York, 1981. x, 246 pp., illus. Cloth, $45; paper, $16.95. Cambridge Solid State Science Series.

***Introduction to* Energy Technology**. Electric Power Engineering. V. A. Venikov and E. V. Putyatin. Translated from the Russian edition (1978) by B. Nikolayev. Mir, Moscow, 1981 (U.S. distributor, Imported Publications, Chicago). 304 pp., illus. $8.80.

Introduction to Forensic Toxicology. Robert H. Cravey and Randall C. Baselt. Biomedical Publications, Davis, Calif., 1981. xvi, 300 pp., illus. $62.50.

Introduction to Interactive Computer Graphics. Joan E. Scott. Wiley-Interscience, New York, 1982. xiv, 256 pp., illus. $24.95.

Introduction to Microcomputers. E. L. Dagless and D. Aspinall, Eds. Computer Science Press, Rockville, Md., 1982. xii, 244 pp., illus. $19.95. Digital System Design Series.

Liberalism Against Populism. A Confrontation Between the Theory of Democracy and the Theory of Social Choice. William H. Riker. Freeman, San Francisco, 1982. xxii, 312 pp. Cloth, $26.95; paper, $13.50.

Life in the Universe. Proceedings of a conference, Moffett Field, Calif., June 1979. John Billingham, Ed. MIT Press, Cambridge, Mass., 1982. xxii, 462 pp., illus. Cloth, $20; paper, $12.50.

Life on a Warmer Earth. Possible Climatic Consequences of Man-Made Global Warming. International Institute for Applied Systems Analysis, Laxenburg, Austria, 1981. xii, 66 pp., illus. Paper. Executive Report 3.

Linking Objects and Linking Phenomena. A Study of the Forms, Symptoms, Metapsychology, and Therapy of Complicated Mourning. Vamik D. Vol-

(Continued on page 764)