vations on captive juvenile western scrub jays. Young scrub jays in a large outdoor aviary along with juvenile gray-breasted (Mexican) and pinon jays matured more rapidly than the other two species and sometimes responded to the gaping and vocalizations of members of those species by feeding them. Helping behavior is unknown in western scrub jays; thus these observations do suggest a basic sort of stimulus-response interaction in this species.

To conclude, I strongly recommend this monograph. The data and analyses are excellent, as are the layout and appearance of the book. Here is a wealth of information that should be of great interest to students of behavior, demography, and sociobiology and in fact to all biologists interested in any aspect of vertebrate life history strategies.

J. DAVID LIGON
Department of Biology,
University of New Mexico,
Albuquerque 87131

Geomagnetism

The Earth's Magnetic Field. Its History, Origin and Planetary Perspective. RONALD T. MERRILL and MICHAEL W. MCELHINNY. Academic Press, Orlando, Fla., 1983. xii, 404 pp., illus. $67.50; paper $30. International Geophysics Series, vol. 32.

This volume records the measure of its authors' success in bridging the gap between theories of the mechanism of generation of the earth's magnetic field (dynamo theory) and the study of paleomagnetism. By insisting that there had been continental drift and by recognizing a historical sequence of reversals of the geomagnetic field, the paleomagnetists of the 1950's set in motion a revolution in the earth sciences that is now essentially complete. This was accomplished by an entirely empirical study of the magnetism of rocks and the inferred behavior of the magnetic field on a geological time scale. It is most unlikely that plate tectonics, sea-floor spreading, and all that follows would yet be widely recognized without paleomagnetism. But nearly four decades of study of the earth's magnetic history have had rather little impact on our understanding of the processes that generate the field.

It is the contention of Merrill and McElhinny that the massive quantity of paleomagnetic data now available contains sufficient information to provide important constraints on dynamo theories. They have therefore set about the daunting task of writing a monograph that will simultaneously make dynamo theory comprehensible to paleomagnetists and inform dynamo theorists of the possibilities and limitations of paleomagnetism.

Some of the inferences concerning the dynamo that derive from paleomagnetism are widely known and accepted, but it is important not to overlook their significance. Averaged over a period of order 10^5 years, the earth's magnetic field closely approximates a dipole at the center of the earth, with its axis aligned with the rotation axis. On a shorter time scale there is a secular variation that appears as non-dipole features that grow and decay, as well as a wandering of the dipole about the geographic axis and fluctuations in its strength. For the past few centuries of direct observation the non-dipole field has drifted westward at about 0.2° of longitude per year, but the paleomagnetic record indicates that this drift is not a permanent feature. Reversals of the field have occurred irregularly at intervals of order 10^5 years, but there have been some very prolonged periods of constant polarity. During a reversal the dipole field is weakened for a period of about 5000 years (which is comparable to the free decay time for an unmaintained field). The average intensity of the field 2.5 billion years ago was no more than marginally stronger than at present, but for an extended period in Cambrian time (roughly 500 to 300 million years ago) the field was very weak.

Merrill and McElhinny draw attention to some more sophisticated observations that one hopes will suggest means of discriminating between rival dynamo theories. One is that the time-averaged field is not perfectly dipolar. There are systematic higher multipole (especially quadrupole) components that account for the "far-sidedness" of paleomagnetic poles that was first reported by R. L. Wilson. Another concerns the randomness in time of reversals; for periods of order 10^8 years the intervals between reversals appear random and the average frequency is constant (in spectral terms the time series is stationary) but there are sudden changes in frequency. It is not clear what other geophysical effects may be related to these switches between apparently different regimes, but they may coincide with changes in the mantle convection pattern.

It is difficult to imagine that more than a very few highly selected practitioners of paleomagnetism will be able to digest the principles of magnetohydrodynamic dynamo theory, and still less that they will identify details of the alternative theories that their data may allow them to test. As Merrill and McElhinny recognize, the gap between disciplines must be bridged the other way, by making clear to dynamo theoreticians what paleomagnetism can do and has done. Progress is perceptible, but it is still appropriate to echo the words of W. M. Elsasser more than 20 years ago: "There are too many ways in which the core can be made to convect to permit an unambiguous interpretation."

FRANK D. STACEY
Physics Department,
University of Queensland,
Brisbane, Queensland 4067, Australia

Soviet Psychology

Psychology in Utopia. Toward a Social History of Soviet Psychology. ALEX KOZULIN. MIT Press, Cambridge, Mass., 1984. xii, 179 pp. $17.50.

Although this is not the first treatment in English of the history of psychology in the Soviet Union, it does provide a new approach. Soviet writers on the subject have focused on the relationship of psychology to Marxist-Leninist ideology, and Western scholars have discussed it as part of a general analysis of science in the Soviet Union or have concentrated on psychological theory to the exclusion of historical analysis. Kozulin's book, though not claiming to be definitive, is a broad examination of the major currents in Soviet psychology since 1917 in which the evolution of the field of knowledge is placed in its cultural and political context. As Kozulin succinctly puts it, he has written "a socially informed study of Soviet psychology that [distinguishes] between the actual conditions of its development and those secondary interpretations that are invented in order to present these conditions in ideologically coherent form" (p. 2).

Kozulin approaches his subject by first drawing a portrait of the four generations of Soviet psychologists. He then investigates in greater depth the activities of the leading figures in the field. In particular, a good deal of attention is devoted to the work of Vladimir Bekhterev, Nikolai Bernstein, Lev Vygotsky, Ivan Pavlov, Alexander Luria, and Pavel Blonsky.

Russian psychology was founded prior to the Revolution by a generation of individuals strongly influenced by developments in Europe and America, especially those associated with Wilhelm Wundt, Pierre Janet, William James, and

John Dewey. The Russian orientation was dominated by the behavioral and neurophysiological approach of Bekhterev, whose Psychoneurological Institute (established in 1907) became the national center for empirical research in psychology. With the Revolution, ideological and political forces were generated that both inspired and restricted scientific research. Psychology found itself at the center of these conflicting forces as both psychologists and party officials sought a new methodology based on a Marxist-Leninist psychology of man. Before Stalinism closed the door on this inquiry, a fascinating array of psychological research was conducted in diverse areas from the neurology of brain functions to psychoanalytical dream analysis.

During the 1920's, Bekhterev's prominence was overshadowed by the experimental research of Pavlov and his followers. After receiving the Nobel Prize in 1904 for his study of the nervous mechanisms in the digestive glands, Pavlov formulated his theory of reflexes, which was later developed into an empirical methodology for the study of human motivation and behavior. From his animal experiments, he postulated two distinct types of reflexes—unconditional (those which always recur in a similar physiological manner) and conditional (reproducible responses dependent upon specific stimuli). Pavlov went on to introduce the term "signalization" to designate the connection between sensory input and motor output in the physiology of the nervous system. This research was then further expanded into other realms of human behavior, particularly psychological dysfunctionalism. Thus, Pavlov's experimental work served as a model for the psychological examination of cognitive problems (such as verbal communication and writing) as well as for a whole range of diagnosed psychiatric disturbances.

At the same time, other work was being carried out in directions not anticipated by Pavlov. Nikolai Bernstein conducted a series of interesting experiments at the Central Institute of Labor in Moscow during the 1920's and 1930's on the mechanics of body movements. By attaching small sources of light to his subjects' bodies at the joints and then recording their movements on film, he was able to produce a theory of "kinematic activity" that anticipated by decades recent developments in the West on feedback, programming, and cybernetics.

Also at this time, Alexander Luria conducted experiments combining aspects of psychoanalysis, which was a subject of widespread interest during the 1920's in the Soviet Union, with his efforts to better understand certain problems in the motor responses of his subjects. One of the most brilliant figures from this era was Lev Vygotsky, who created an "instrumental method" for research on the origins of our acquisition of psychological tools, of which he considered language the most significant because of its role in the construction of thought structures. Vygotsky's experiments and theoretical papers on the relationship between internal functions (symbolic tools) and external actions (social relations) are examples of some of the most innovative and original work ever done in Soviet psychology.

The book is weakened somewhat by the fact that the chapters appear to be separate thematic essays that have been linked together ex post facto. Also, there are unfortunate instances of cumbersome language ("physiologization," "Pavlovianization," and the like). In addition, the book lacks a conclusion in which the author synthesizes and evaluates the separate orientations he has discussed. The subtitle of the book is misleading since it is decidedly not a social history as that term is understood by contemporary social historians. This aside, Kozulin's discussions of the utopian expectations, the achievements, and the continuing unresolved problems of Soviet psychology over the last seven decades are intelligent, lucid, and engaging. This is an important book that should encourage further research into other aspects of Soviet psychology. It deserves a wide readership.

MARTIN A. MILLER
Department of History,
Duke University,
Durham, North Carolina 27708

Books Received

Ada: Language, Compilers and Bibliography. M. W. Rogers, Ed. Published on behalf of the Commission of the European Communities by Cambridge University Press, New York, 1984. Variously paged. $17.95. The Ada Companion Series.

Advances in Carbohydrate Chemistry and Biochemistry. Vol. 42. R. Stuart Tipson and Derek Horton, Eds. Academic Press, Orlando, Fla., 1984. xiv, 444 pp., illus. $65.

Advances in Heat Transfer. Vol. 16. James P. Hartnett and Thomas F. Irvine, Jr., Eds. Academic Press, Orlando, Fla., 1984. xii, 388 pp., illus. $70.

Atmospheric Electrodynamics. Hans Volland. Springer-Verlag, New York, 1984. x, 205 pp., illus. $35.50. Physics and Chemistry in Space, vol. 11.

Atmospheric Science and Power Production. Darryl Randerson, Ed. U.S. Department of Energy Office of Scientific and Technical Information, Oak Ridge, Tenn., 1984 (available as DE84005177 from National Technical Information Service, Springfield, Va.). x, 850 pp., illus. $29.50. DOE/TIC-27601.

The Atomic Nucleus. J. M. Reid. 2nd ed. Manchester University Press, Dover, N.H., 1984. 279 pp., illus. Paper, $8.50.

Autologous Bone Marrow Transplantation and Solid Tumors. J. Gordon McVie, Otilia Dalesio, and Ian E. Smith, Eds. Raven, New York, 1984. xvi, 192 pp., illus. $52. Monograph Series of the European Organization for Research on Treatment of Cancer, vol. 14.

Axonal Transport in Neuronal Growth and Regeneration. John S. Elam and Paul Cancalon, Eds. Plenum, New York, 1984. xvi, 284 pp., illus. $45. Advances in Neurochemistry, vol. 6. Based on a conference, Tallahassee, Fla., March 1983.

Azides and Nitrenes. Reactivity and Utility. Eric F. V. Scriven, Ed. Academic Press, Orlando, Fla., 1984. xiv, 542 pp., illus. $99.50.

Bacteria, Plasmids, and Phages. An Introduction to Molecular Biology. E. C. C. Lin, Richard Goldstein, and Michael Syvanen. Harvard University Press, Cambridge, Mass., 1984. xii, 316 pp., illus. $35.

Beginning Micro-PROLOG. J. R. Ennals. 2nd ed. Harper and Row, New York, 1984. 196 pp. Paper, $15.95.

The Biographical Dictionary of Scientists. David Abbott, Ed. Bedrick, New York, 1984 (distributor, Harper and Row, New York). Four volumes. Astronomers. iv, 204 pp., illus. Biologists. iv, 182 pp., illus. Chemists. iv, 203 pp., illus. Physicists. iv, 212 pp., illus. Each volume, $18.95.

Biological Magnetic Resonance. Vol. 6. Lawrence J. Berliner and Jacques Reuben, Eds. Plenum, New York, 1984. xviii, 300 pp., illus. $47.50.

The Biology of Idiotypes. Mark I. Greene and Alfred Nisonoff, Eds. Plenum, New York, 1984. xvi, 507 pp., illus. $59.50.

Biomaterials Science and Engineering. Joon Bu Park. Plenum, New York, 1984. xvi, 459 pp., illus. $35.

Cliniques de Thérapie Comportementale. O. Fontaine, J. Cottraux, and R. Ladouceur. Mardaga, Brussels, 1984. 456 pp., illus. Paper, 2410 BF.

Comets. A Descriptive Catalog. Gary W. Kronk. Enslow, Hillside, N.J., 1984. viii, 331 pp. Paper, $22.50.

The Communication of Emotion. Ross Buck. Guilford, New York, 1984. xviii, 391 pp., illus. $27.50. The Guilford Social Psychology Series.

Community Structure and the Niche. Paul S. Giller. Chapman and Hall, London, 1984 (U.S. distributor, Methuen, New York). x, 176 pp., illus. Paper, $11.95. Outline Studies in Biology.

Comparative Biochemistry and Physiology of Enzymatic Digestion. H. J. Vonk and J. R. H. Western. Academic Press, Orlando, Fla., 1984. x, 501 pp., illus. $80.

The Complete Book of Lisa. Kurt J. Schmucker. Harper and Row, New York, 1984. xii, 335 pp., illus. Paper, $17.95. A Tilden Press Book.

Comprehensive Treatise of Electrochemistry. Vol. 8, Experimental Methods in Electrochemistry. Ralph E. White *et al.*, Eds. Plenum, New York, 1984. xviii, 620 pp., illus. $89.50.

Comprehensive Treatise of Electrochemistry. Vol. 9, Electrodics: Experimental Techniques. Ernest Yeager *et al.*, Eds. Plenum, New York, 1984. xviii, 451 pp., illus. $65.

Computational Fluid Mechanics and Heat Transfer. Dale A. Anderson, John C. Tannehill, and Richard H. Pletcher. Hemisphere, Washington, D.C., and McGraw-Hill, New York, 1984. xii, 599 pp., illus. $39.95. Series in Computational Methods in Mechanics and Thermal Sciences.

Computational Group Theory. Michael D. Atkinson, Ed. Academic Press, Orlando, Fla., 1984. xii, 373 pp. $60. From a symposium, Durham, Aug. 1982.

Computational Methods for Optimizing Distributed Systems. K. L. Teo and Z. S. Wu. Academic Press, Orlando, Fla., 1984. xiv, 317 pp. $62. Mathematics in Science and Engineering, vol. 173.

Computer-Assisted Image Analysis Cytology. S. Donald Greenberg, Ed. Karger, Basel, 1984. x, 201 pp., illus. $58.75. Monographs in Clinical Cytology, vol. 9.

Computer Graphics and Applications. Dennis Harris. Chapman and Hall, London, 1984 (U.S. distributor, Methuen, New York). x, 174 pp., illus., + plates. $39.95; paper, $19.95.

Computer Mapping. Progress in the '80s. James R. Carter. Association of American Geographers, Washington, D.C., 1984. x, 86 pp., illus. Paper, $5. Resource Publications in Geography.

A Concept of Mathematical Physics. Models for Space-Time. Tamás Matolcsi. Akadémiai Kiadó, Budapest, 1984. 236 pp. $26.

Concepţia Biostructurală şi Teoriile Moleculare ale Materiei VII. Eugen Macovschi. Editura Ştiinţifică şi Enciclopeddică, Bucharest, Romania, 1984. 157 pp., illus. Paper, Lei 8.25.

The Constitutive Law in Thermoplasticity. Th. Lehmann, Ed. Springer-Verlag, New York, 1984. iv, 601 pp., illus. Paper, $31.30. CISM Courses and Lectures No. 281.

(Continued on page 1603)