many educational and career opportunities. The relaxation of such restrictions during a period immediately following the Revolution made it possible for Luria to follow a career that had formerly been only a dream. Second, Luria reveals how the Revolution ushered in a period of enthusiasm and creativity in psychology (as well as other disciplines) that probably has not been matched anywhere else during the 20th century. Although this period was destined to end in the late 1930's, Luria never forgot the headiness of these early days: "My entire generation was infused with the energy of revolutionary change—the liberating energy people feel when they are part of a society that is able to make tremendous progress in a very short time" (p. 17).

Luria views the evolution of his career and of Soviet psychology in general in terms of a "pre-Vygotskian" and a "Vygotskian" period. To be sure, Luria was not idle before he met Vygotsky in 1924. The events mentioned in the first two chapters, including his early correspondence with Freud and his research aimed at creating "an objective approach to behavior that concentrated on real-life events" (p. 25), reveal that he brought impressive credentials to the partnership. However, it is clear that he viewed these early efforts simply as preparation for his meeting with Vygotsky—an event that he describes as "a turning point in my life as well as in the lives of my colleagues in Soviet psychology" (p. 37). All of Luria's subsequent research efforts were based on the theoretical framework developed during this period. The power of this framework begins to become apparent when one considers that it defined issues Luria investigated bearing on such diverse subjects as the neuropsychology of the frontal lobes, the ontogenesis of language and thought, and cross-cultural differences in the use of sign systems.

One of the most important reasons for Luria's impressive accomplishments is that he combined the insights from his extensive clinical experience with the theoretical advances from a variety of academic disciplines. His last chapter ("Romantic science") reflects the wisdom that emerged from this marriage of theory and practice. In this chapter he inveighs against imprecise and theoretically uninformed clinical speculation, but he obviously sees an even greater danger in overly reductionist laboratory research. He issues a plea to investigators in both clinical and laboratory settings to remember that sophisticated methods and instruments cannot replace a broad theoretical perspective and a humanistic understanding of patients and subjects. For example, in connection with physicians he writes:

> The physicians of our time, having a battery of auxiliary laboratory aids and tests, frequently overlook clinical reality. . . . Physicians who are great observers and great thinkers have gradually disappeared. . . . I do not intend to underrate the role of instrumentation in medicine. But I am inclined to reject strongly an approach in which these auxiliary aids become the central method and in which their role as servant to clinical thought is reversed so that clinical reasoning follows instrumental data as a slave follows its master [pp. 176–177].

Michael and Sheila Cole have done an admirable job of editing this volume. While I have some reservations about Michael Cole's point concerning similarities between Soviet and American policies regarding science, I found that his introduction and epilogue provided extremely useful insights. The volume presents us with a rare perspective on the forces that shaped one of the century's great scientific minds.

JAMES V. WERTSCH
Department of Linguistics, Northwestern University, Evanston, Illinois 60201

Wright's View of Evolution

Evolution and the Genetics of Populations. Vol. 4, Variability within and among Natural Populations. SEWALL WRIGHT. University of Chicago Press, Chicago, 1978. x, 580 pp., illus. $37.50.

This is the fourth and final volume of the magnum opus of Sewall Wright, one of the great zoologists of the 20th century. The earlier volumes of the work were devoted to the biometrical description of variation of biological systems as the basis for population genetics (volume 1), the theory of gene frequencies in its relation to population structure and the study of variability (volume 2), and laboratory studies and their implications for Wright's "shifting balance theory" of evolution (volume 3). The concern of this last volume is with studies of the amounts of genetic and chromosomal variation within and among local populations of species in nature. The existence of such local differentiation is a prerequisite for the operation of the shifting balance theory.

Here Wright provides a detailed synthesis and discussion of the vast body of data on biochemical variations in natural populations, which has grown exponentially since the introduction of electrophoretic techniques to population genetics. Wright's synthesis is comprehensive, original, and unique. Few authors have ever possessed such a complete and far-reaching view of evolution combined with consummate theoretical and statistical skills and painstaking attention to detail. The shifting balance theory serves as the organizing principle in this synthesis and, indeed, is the unifying theme of all four volumes.

The assumptions fundamental to Wright's grand theory concern the nature of the relationship between the genome and complex characters. These seven basic assumptions are presented early in volume 1 (pp. 60–61): (i) the multiple-factor hypothesis, that characters in general are affected by a great many loci; (ii) the principle of universal pleiotropy, that each locus in general affects many characters; (iii) the uniqueness of alleles in their array of effects; (iv) the relativity of dominance; (v) the universality of interaction effects; (vi) the dependence of phylogenetic homology on similar chains of gene-controlled reactions; and (vii) the existence of multiple peaks of selective value. In light of the evidence presented for a diverse array of characters in many species, these assumptions must be viewed as firmly established hypotheses. This relationship between gene and character is summarized in Wright's conviction that "the existence of complex patterns of factor interactions must be taken as a major premise in any serious discussion of population genetics and evolution" (volume 1, p. 105).

Evolution by natural selection occurs as a result of the interaction of phenotype and environment. In Wright's view there are many different kinds of natural selection depending upon the levels of biological organization and the degree of variation existing at any level. The levels of organization discussed by Wright range from single genes and individuals to families and entire demes. He considers the most important evolutionary force to be selection among more or less randomly differentiated local populations. This interdeme selection is brought about by the differential dispersion of those local populations in which random genetic drift and directional mass selection have established a "system of interacting genes of superior fitness." This is Wright's shifting balance theory of evolution, and in volume 4 he abundantly documents the fact that the genetic differentiation of local populations, necessary to his theory, is widespread in nature.

Although many evolutionary biologists and geneticists at the present time

accept Wright's major premise regarding the complex relationship of gene and character, they disagree with his views on the levels of selection. In particular, most consider selection at the level of single genes and individuals to be the major, if not the only, important mode of evolution by natural selection. This contrasting and widely held worldview is perhaps best exemplified in the following excerpt from G. C. Williams's *Adaptation and Natural Selection* (1966, p. 56):

> Obviously it is unrealistic to believe that a gene actually exists in its own world with no complications other than abstract selection coefficients and mutation rates. The unity of the genotype and the functional subordination of the individual genes to each other and to their surroundings would seem, at first sight, to invalidate the one-locus model of natural selection. Actually these considerations do not bear on the basic postulates of the theory. No matter how functionally dependent a gene may be, and no matter how complicated its interactions with other genes and environmental factors, it must always be true that a given gene substitution will have an arithmetic mean effect on fitness in any population. One allele can always be regarded as having a certain selection coefficient relative to another at the same locus at any given point in time. Such coefficients are numbers that can be treated algebraically, and conclusions inferred from one locus can be iterated over all loci. Adaptation can thus be attributed to the effect of selection acting independently at each locus.

In the area of sociobiology this reductionist viewpoint has been developed to the extreme of caricature with the concept of the "selfish gene" and the methodology of "looking at evolution from the gene's point of view."

Although Wright himself developed much of the theory of gene frequencies, few of its modern adherents see its limitations as clearly as he. He considered a theory of evolution at the gene or individual level based on the properties assigned to single genes to be "very inadequate" for explaining the evolution of highly interactive genetic systems. The reasons for Wright's views and the limitations of single-gene theories are a major point of discussion throughout this work.

The only obstacle to the reader of these volumes is the density of Wright's prose, but it is an obstacle well worth surmounting. Wright's massive tome has become a touchstone for many of my colleagues working on diverse problems in population biology and evolution, from the sexual selection of quantitative characters (R. Lande) to the evolution of vertebrate feeding behaviors (S. Arnold). I am certain that as the recent trend of evolutionary argument from metaphor and plausibility is reversed these volumes will become a major reference.

For these reasons, I recommend this work to all with research interests in genetics and evolution, not only as an important and comprehensive synthesis of evolutionary theory but also as a useful and timely reference.

MICHAEL J. WADE
Department of Biology,
University of Chicago,
Chicago, Illinois 60637

Books Received

Acousto-Optics. J. Sapriel. Translated from the French edition (Paris, 1976) by Simon Francis and Barbara Kelly. Wiley-Interscience, New York, 1979. xvi, 126 pp., illus. $20.

Advanced Logical Circuit Design Techniques. Antonin Svoboda and Donnamaie E. White. Garland STPM Press, New York, 1979. xviii, 280 pp., illus. $22.50.

Advances in Cyclic Nucleotide Research. Vol. 10, Current Methodology. Gary Brooker, Paul Greengard, and G. Alan Robison, Eds. Raven, New York, 1979. xii, 260 pp., illus. $24.

Advances in Shock Research. Papers from a conference, Airlie, Va., June 1978. Liss, New York, 1979. Vol. 1. Allan M. Lefer, Thomas M. Saba, and Leena M. Mela, Eds. xviii, 286 pp., illus. $30. Vol. 2. William Schumer, John J. Spitzer, and Bryan E. Marshall, Eds. xx, 298 pp., illus. $30.

Alcoholism. A Multidisciplinary Approach. Papers from a symposium, Amsterdam, May 1978. J. Mendlewicz and H. M. van Praag, Eds. Karger, Basel, 1979. vi, 138 pp., illus. Paper, $36. Advances in Biological Psychiatry, vol. 3.

Algorithmic Aesthetics. Computer Models for Criticism and Design in the Arts. George Stiny and James Gips. University of California Press, Berkeley, 1979. xii, 220 pp., illus. $15.75.

An Analytical Approach to Cultural Resource Management. The Little Colorado Planning Unit. Fred Plog, Ed. Arizona State University Department of Anthropology, Tempe, 1978. xviii, 286 pp., illus. Paper, $9. Arizona State University Anthropological Research Papers, No. 13. USDA Forest Service Cultural Resources Report No. 19.

The Architecture of Small Computer Systems. Arthur G. Lippiatt. Prentice-Hall, Englewood Cliffs, N.J., 1978. xvi, 174 pp., illus. $14.50.

Arid-Land Ecosystems. Structure, Functioning and Management. Vol. 1. D. W. Goodall, R. A. Perry, K. M. W. Howes, Eds. Cambridge University Press, New York, 1979. xxviii. 882 pp., illus. $97.50. International Biological Programme 16.

Artificial Breeding of Non-Domestic Animals. Proceedings of a symposium, London, Sept. 1977. P. F. Watson, Ed. Published for the Zoological Society of London by Academic Press, New York, 1978. xxii, 376 pp., illus. $33.25. Symposia of the Zoological Society of London, No. 43.

Artificial Intelligence. An MIT Perspective. Vol. 2, Understanding Vision, Manipulation. Computer Design. Symbol Manipulation. Patrick Henry Winston and Richard Henry Brown, Eds. MIT Press, Cambridge, Mass., 1979. xvi, 486 pp., illus. $25. The MIT Press Series in Artificial Intelligence.

Astronomy. An Introduction for the Amateur Astronomer. Jacqueline Mitton. Scribner, New York, 1979. 142 pp., illus. $7.95.

Astronomy. From the Earth to the Universe. Jay M. Pasachoff. Saunders, Philadelphia, 1979. xviii, 476 pp., illus. + plates + appendixes. Paper, $15.95. Saunders Golden Sunburst Series.

Astrophysical Formulae. A Compendium for the Physicist and Astrophysicist. Kenneth R. Lang. Springer-Verlag, New York, 1978. xxviii, 736 pp. Paper, $29.50. Springer Study Edition. Reprint of the 1974 edition.

Atlas of Photomicrographs of the Surface Structures of Lunar Regolith Particles. O. D. Rode, A. V. Ivanov, M. A. Nazarov, A. Cimbalnikova, K. Jurek, and V. Hejl. Reidel, Boston, 1979 (distributor, Kluwer Boston, Hingham, Mass.). 76 pp. + plates. $39.

Atlas of Radiologic Anatomy. Lothar Wicke with the assistance of Wilhelm Firbas and Roland Schmiedl. Translated from the German edition (Munich, 1977). Urban & Schwarzenberg, Baltimore, ed. 2, 1979. 224 pp. $17.50.

Atlas of Wrist and Hand Fractures. Sigurd C. Sandzén, Jr. PSG Publishing Company, Littleton, Mass., 1979. xvi, 430 pp. $54.50.

The Atmosphere. An Introduction to Meteorology. Frederick K. Lutgens and Edward J. Tarbuck. Prentice-Hall, Englewood Cliffs, N.J., 1979. xvi, 414 pp., illus. $14.95.

Atractyloside. Chemistry, Biochemistry and Toxicology. R. Santi and S. Luciani, Eds. Piccin Medical Books, Padua, Italy, 1978. xxiv, 136 pp., illus. $12.

The Beginnings of Greek Mathematics. Arpád Szabó. Translated from the German edition. Reidel, Boston, 1978 (distributor, Kluwer Boston, Hingham, Mass.). 268 pp., illus. $47.50. Synthese Historical Library, vol. 17.

Behavior of Marine Animals. Current Perspectives in Research. Vol. 3, Cetaceans. Howard E. Winn and Bori L. Olla, Eds. Plenum, New York, 1979. xxii, 438 pp., illus. $37.50.

Behavior Therapy. Techniques and Empirical Findings. David C. Rimm and John C. Masters. Academic Press, New York, ed. 2, 1979. xvi, 538 pp., illus. $16.50.

Behavior Therapy. Toward an Applied Clinical Science. W. Stewart Agras, Alan E. Kazdin, and G. Terence Wilson. Freeman, San Francisco, 1979. xii, 174 pp. Cloth, $12; paper, $5.50.

Behçet's Disease. Proceedings of a symposium, Istanbul, Sept. 1977. Nihat Dilşen, Meral Koniçe, and Candan Övül, Eds. Excerpta Medica, Amsterdam, 1979 (U.S. distributor, Elsevier, New York). xiv, 308 pp., illus. $61.

Biochemical and Biophysical Perspectives in Marine Biology. Vol. 4. D. C. Malins and J. R. Sargent, Eds. Academic Press, New York, 1978. xii, 240 pp., illus. $35.25.

The Biochemistry of Atherosclerosis. Angelo M. Scanu, Robert W. Wissler, and Godfrey S. Getz, Eds. Dekker, New York, 1979. xxii, 548 pp., illus. $9.75. The Biochemistry of Disease, vol. 7.

Biology of the Fungi. Their Development, Regulation, and Associations. Ian K. Ross. McGraw-Hill, New York, 1979. xii, 500 pp., illus. $19.95. McGraw-Hill Series in Organismic Biology.

The Building of a Department. Chemistry at Southern Illinois University, 1927–1967. James W. Neckers. Southern Illinois University Press, Carbondale, and Feffer and