so considers the related problems of gene differentiation among subpopulations and between pairs of subpopulations and presents estimates of genetic distance for different taxonomic relationships. D. L. Hartl and R. D. Cook expand on their earlier work on models in which fitness values vary randomly with time and consider the role of this form of temporal heterogenity on the maintenance of polymorphisms. In an effort to study the phenomenon of genome "crystallization," the spreading of regions of linkage disequilibria observed in multilocus simulation studies, C. Strobeck analyzes models of multiplicative selection in a three-locus model. In a relatively brief paper, C. C. Cockerham adds generality to an earlier theoretical conclusion that the number of heterozygotes left by a neutral gene progressing toward fixation is independent of the structure of the finite population in which the gene occurs.

The paper by C. Matessi and S. D. Jayakar is an attempt to weld population genetic theory with population ecology theory. The authors utilize the classical Lotka-Volterra model of interspecific competition in a study of density- and frequency-dependent selection among genotypes of a single species and interpret their results in terms of the concept of niche expansion. I Eschel and D. Cohen present a mathematical model that both formalizes and expands on the concept of inclusive fitness and consider how the model can account for the genetic evolution of such socially positive and intuitively unlikely phenomena as altruism among unrelated individuals. Unfortunately, as is the case with much of this theory, the analysis is presented in terms of fitness gains and losses and coefficients of relatedness rather than in the—to a geneticist—more tangible terms of changes in allele frequency.

Owing, presumably, to the editing, the discussion section of the book reads somewhat like an array of isolated pronouncements and lacks give-and-take. The section is worth reading carefully, however. Much of the discussion revolves around the nature and role of theory and strategies of model construction. What is the value of a general theory that is not amenable to testing in specific cases? Of what general use are models developed for very specific situations? Should mathematical models be used only as an aid to intuition in the development of theory, or should one be able to estimate their parameters in specific systems and explore the validity of the resulting theory by comparing predicted and observed behaviors? Of what value is an equilibrium theory in a generally nonequilibrium world? Also, in this discussion, a number of the participants offer their views of what the significant unsolved problems in population genetics are and how they should be attacked. Although I question many of their priorities and believe there are a number of significant problems they have not considered, I agree with the general message. Wright, Fisher, and Haldane did not solve all the really big problems in evolutionary genetic theory. The empirical problems of this field will require more than just a source of direct current for their resolution.

In summary: As measured by the density of good, up-to-date articles dealing with fundamental problems, this is a very important collection. It is, however, a collection for professional population biologists. I do not believe that the number of pedagogically useful papers is sufficient to warrant its purchase by any but the most advanced students.

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A Great Fluvial System

The Nile. Biology of an Ancient River. JULIAN RZÓSKA, Ed. Junk, The Hague, 1976. xx, 418 pp., illus. Dfl. 120. Monographiae Biologicae, vol. 29.

The modest title of this book belies the magnitude of its task. For the Nile is more than just a river. It is an immense system that means the difference between life and death for a substantial portion of Africa. The editor's characterization of it as a "life artery" evokes a proper image to convey its importance.

This great river has two major tributaries. The Blue Nile originates in Lake Tana in the high mountain ranges of Ethiopia and surges through the chasms of the Great Abbai Gorge, steadily gathering the tremendous sediment load known as the "gift of the Nile," which supports agriculture in the delta more than 600 kilometers to the north. (In the late 1790's Napoleon's engineers calculated that this accumulation averaged 0.1 centimeter a year, and recent determinations have shown this figure to be accurate within 10 percent.) The White Nile arises near the equator in the vicinity of the Great Lakes George, Albert, Victoria, and Kioga. These natural reservoirs serve to stabilize the water flow, so that the White Nile provides a continuous if somewhat fluctuating contribution throughout the year. The White Nile travels more than twice the distance of its sister tributary before reaching the Mediterranean. On its way north it passes through the Sudd, whose name in Arabic means "blackage," a vast and formerly impenetrable region of floating papyrus mats and associated aquatic vegetation. This was the great disease-ridden swamp that was the main and often lethal obstacle in the way of the 19th-century European explorers seeking that elusive goal that captivated the imagination of Victorian England, the source of the Nile. The two great water sources unite at Khartoum and continue northward, joined by other tributaries and passing at last through the great northern deserts whose expansion, especially during the last 3000 years, has truly separated Egypt from the rest of Africa. This, then, is the environment this book deals with: no single river, but a series of lakes, rapids, swamps, falls, tributaries, and river sections that cover thousands of miles and together contribute in time and space to what we call the Nile.

The book itself covers the biological aspects of all these features in encyclopedic fashion. The many contributions range from archeology to zoogeography, from a treatment of the characteristics of the river's water to a fascinating account of the cultivars and domesticated animals of ancient Egypt. Not every possible topic is considered, but it appears that all areas for which there is a reasonable amount of information available are covered. For readers seeking more detail, there are bibliographies at the end of each of the 27 chapters or groups of chapters. The editor has woven these varied styles and contributions together into a whole that is both cohesive and interesting.

Within the last decade considerable changes in this ancient system have been effected by man, primarily through the building of dams, and also through the introduction of new species. Since the book draws heavily on data from the period before these changes occurred, it may well be invaluable as a baseline study for future generations of scientists assessing their long-term effects. In his section on the fish fauna of the Nile, P. H. Greenwood comments that owing to man's recent interferences the next hundred years could well see changes as profound as those that have taken place over the last million on this venerable river. It will be interesting to read an updated edition of this volume 25 years hence.

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