Book Reviews

The Groundwork for a Genetic Study

Evolution and the Genetics of Populations. A Treatise in Three Volumes. SEWALL WRIGHT. Vol. 1, Genetic and Biometric Foundations. University of Chicago Press, Chicago, 1968. x + 469 pp., illus. $15.

The long-awaited book in the genetic world has appeared. Two years ago when I learned from a friend at the University of Wisconsin that Sewall Wright was planning to write three books instead of one, I, trying to be agreeable, said: "Three small books are probably better than one big book." My friend corrected me with a sigh: "Not three small books; three big books!" And so they are, if the first is any indication.

Although the formal title of the work includes the word "evolution," the author states at the outset, "The central topic is population genetics." It would be preferable to treat the work as a whole, but volume 2, which will be concerned with mathematical theories of change in gene frequency, and volume 3, which will give general conclusions on the bearing of population genetics on evolutionary theory, will not appear in the immediate future.

Volume 1 itself is, in fact, a combination of two books: one on the genetic foundation and one on the biometric foundation of population genetics. "Foundations" are to be distinguished from "introduction." Wright is not writing an elementary textbook in general genetics, or an introductory text in statistical methods. He surveys and summarizes both fields with succinctness, insight, and depth in a characteristic style that can only be described as Wrightian. A novice must turn to other books to gain sufficient background to appreciate the masterful presentation of and commentary on the various topics covered under the heading of Foundations.

The first five chapters (105 pp.) are descriptive and deal with genetics in a broad sense. The historical account of the theories of heredity and evolution includes the early metaphysical and vitalistic views as well as those pertinent to modern genetics. The author then traces the development of the cell theory and the parallel principles in genetics and cytology, thus firmly establishing the chromosome and gene theory of heredity. Then he discusses the properties of the gene itself. A separate chapter is devoted to nongenic heredity in both microorganisms and higher organisms. The relationship between the gene and the character is discussed at great length and illustrated by diagrams. This chapter even includes a brief account of the specificity of the DNA and its ultimate translation into protein by means of the various forms of RNA.

One may wonder if everything covered by the first five chapters is relevant to the central topic of population genetics. I will not try to justify the inclusion of this material but will point out that Wright is a geneticist first and a biometrician second, unlike those who are trained primarily in mathematics and merely look for an exercise under the guise of population genetics. If one remembers Wright's early work on the physiology of the gene, one would not be surprised that such "irrelevant" materials are included in the all-embracing treatise.

Then comes a transitional chapter—a transition from genetics to biometrics. This chapter gives many different types of observed biological frequency distributions, thus demonstrating the need for statistical analysis of biological phenomena. Each distribution is taken from published data, on guinea pigs, cows, and other species. A considerable portion of these data come from the author's own work.

The next nine chapters give the biometric foundations. One of the possible obstacles to some readers is the author's symbolism, which is very different from that adopted in the current literature in statistics. Another may be the extreme brevity. A subject that might occupy a full chapter in a textbook is here condensed to one page or even one paragraph. Such condensation has enabled the author to survey the entire field of statistical theory and methods in a few chapters. Topics include percentiles, kurtosis, semi-invariants, characteristic functions, truncated normal distribution, confidence interval, deviations from normality, correlated binomial factors, nonadditive effects and interaction, transformation of variables, analysis of variance, and multivariate distributions. A separate chapter is devoted to actual applications of these methods to biological (not necessarily genetic) data. Again, many of the illustrations and examples are taken from the author's own observations.

The truly unique part of the "biometric foundations" is the three chapters entitled "Path analysis: theory," "Interpretation by path analysis," and "The genetics of quantitative variability." These are the creation and specialty of Wright and have never been duplicated by any other author. Although the substance of these three chapters has appeared previously several times in Wright's various old and new publications, it is good to see one continuous and up-to-date account in book form. It should be reiterated that these are merely the foundations. The genetic applications, for example, of path coefficients to systems of mating, are deferred to later volumes.

The usual misprints, such as the omission of a negative or a summation sign, misplacement of brackets, and the exchange of superscripts and subscripts have not spared this book, but they are surprisingly few considering the complicated nature of the mathematical expressions.

The final chapter, entitled "Conclusions," is an 11-page, chapter-by-chapter summary of the book which emphasizes that "the ultimate character with which population genetics is concerned is selective value itself."

It is superfluous to say that this is a very valuable reference and source book for workers, teachers, and advanced students in population genetics. We look forward to the pleasure of studying the subsequent volumes.

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