be expected to occur in real life).

But these points are minor, and one must conclude by saying that this is a most impressive book, wherein a master of the subject of population genetics has stated without equivocation his opinions on the subject. As a consequence of this unequivocal approach there are several points which one might disagree with, and which one might even claim go against the broad current of thought in the subject. But one is prepared to overlook these qualifications, since all too seldom does a great scientist summarize as well as Wright has done his own detailed and considered views on his subject.

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Genic Polymorphism

Genetic Load. Its Biological and Conceptual Aspects. BRUCE WALLACE. Prentice-Hall, Englewood Cliffs, N.J., 1970. xii + 116 pp., illus. $5.95. Concepts of Modern Biology Series.

The development of enzyme electrophoresis brought to population genetics the first experimental theater in which its complex body of theory could be put to a general test. When the new technique revealed widespread genic polymorphism, no plausible mechanism seemed to exist for its maintenance. Heterosis, selection favoring heterozygotes, appeared too costly for any population to bear. The resolution of this paradox is important to population genetics and should be of interest to all biologists.

The book begins with an introduction to population genetics. Good use of experimental examples, always a virtue in Wallace's books, is evident. The continuous focus on cost, echoing the initial confrontation, helps make the issue clear. And the rather comfortable style of writing and the patient organization make the book easy to read. The tables are not all instantly clear, and some diagrams seem ambiguous.

Genetic Load illustrates clearly the vast amount of genetic variation that exists in nature. The role of selection is discussed, as well as the fact that the differential survival—or differential killing—of genotypes entails a cost to the population. While the computation of cost for one locus for one generation can easily be made, the proper method of combining many such costs (to calculate their overall impact on the population) was not at first clear. Wallace suggests that with the proper calculation of the total cost of selection, the vast genic polymorphism in nature *can* be reconciled with a selective mechanism. He makes the important distinction between competitive and noncompetitive selection models. As it progresses, however, the book becomes a theme and variations rather than reaching a clear resolution. The generally fallacious practice of multiplying fitnesses associated with each locus (this implies independent, separate selection, locus by locus, of individuals on the basis of their genotypes) is repeatedly resurrected and never explicitly dispatched. The continuing ambiguity is typified by the sentence (p. 106) ending ". . . the positions are filled by individuals with the highest fitness available." Fitness is the wrong word. Table 16, which begins with a misprint, is nonsense.

Papers by Sved (*American Naturalist* **102**, 283 [1968]) and by Maynard Smith (*Nature* **219**, 1114 [1968]) should have been considered; and the now customary triple reference to Sved, Reed, and Bodmer; King; and Milkman implies that they say the same thing. They don't, though they all show that previous cost estimates were far too high. Indeed, the story begun so well in *Genetic Load* is continued in the 1968 literature; but I venture to say that even most population geneticists will gain from having read this book first.

As Wallace mentions, perhaps too briefly, some people believe that genic polymorphism is maintained without cost by mutation of no adaptive significance ("neutral mutations"). Even a selective mechanism, frequency-dependent selection, can operate, in theory at least, at almost no cost, in contrast to the conclusions drawn from the examples in this book (p. 55). So alternatives to heterosis are still regarded as possible in some quarters.

Concern is expressed for certain human population problems; Wallace's remarks provide a bridgehead for further exploration of these subjects.

Genetic Load may not be the last word, and it does suffer from a lack of critical editing, but its central theme provides a most appropriate entrée into population genetics. And it looks like a good book to teach with: as usual, Wallace leaves room for thought. All in all, it's well worth the time for a broad spectrum of biologists.

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A Dualism in Biology

Symmetry and Function of Biological Systems at the Macromolecular Level. Proceedings of the 11th Nobel Symposium, Södergarn, Lidingö, Sweden, Aug. 1968. ARNE ENGSTRÖM and BROR STRANDBERG, Eds. Interscience (Wiley), New York, and Almqvist and Wiksell, Stockholm, 1969. 436 pp., illus. $29.50.

Such biological macromolecules as proteins and nucleic acids are built from geometrically asymmetric units. Moreover, the biological functions of the macromolecules depend on specific asymmetric arrangements of these asymmetric units—such, for example, as the three-dimensional deployment of amino acid side chains at the active site of an enzyme. Information and dynamic function depend on asymmetry, whereas ordered (in the sense of being predictable) and symmetrical structures contain minimal information and are suitable for static or structural functions. It is not the neat symmetrical arrangement of columns and lines of type on a printed page that conveys information, but rather the asymmetric sequence of letters in the lines; similarly, the sequence of nucleotides rather than the symmetrical helical structure of DNA embodies biological information. Yet symmetries of various kinds are found throughout biology, at nearly every level from nucleic acid or protein helices to the gross shapes of organisms. These observations suggest two general questions: (i) Is there continuity in kind between the symmetries seen at the levels of the molecule, the organelle, the virus, the cell, the organism? (ii) Are these symmetrical arrangements really useful only structurally, or might they