in the text; there is an appendix with a valuable roster of Ostwald's unpublished manuscripts held by the Central Archives of the East German Academy of Sciences; and the bibliography following the editors' introduction is useful as a guide to secondary literature on Ostwald.

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Quantitative Genetics

Quantitative Genetic Variation. JAMES N. THOMPSON, JR., and J. M. THODAY, Eds. Academic Press, New York, 1979. xiv, 306 pp., illus. $19.50.

During the 1950's quantitative characters were the paradigm of population genetics, the component of genetic variance having almost the status of a conceptual primitive. All phenomena were to be explained by reference to variance components rather than genes. This heyday did not last long, as mathematical approaches based on components of variance reached their limits of usefulness and as electrophoresis and the study of human genetic diseases provided a source of single loci to study. As might have been expected, the glamour of these new pursuits pushed the study of quantitative characters into an undeserved obscurity.

With increased concern with human quantitative traits and with increased attention to polygenic characters in evolution and ecology, the balance is now changing. In this timely book Thompson and Thoday have collected 18 papers on methods of analyzing quantitative characters. The papers tend to be concise and to the point. They are predominantly experimental or discuss experimental methodology in a qualitative fashion. Though there is some mathematics, the emphasis is decidedly nontheoretical.

The contributors include Thoday, Mather, Parsons, Jinks, Rendel, Milkman, and Mukai. Many of the major theoreticians of quantitative genetics are noticeably absent, including the groups at Edinburgh, Iowa State, and North Carolina State. This may be due partly to the empirical emphasis, but perhaps also to the lack of concern in this volume with problems of animal and plant breeding, where quantitative genetic theory has been most elaborate and successful.

The range of organisms covered is wide, from mice to wheat to fungi, with an equally wide range of approaches. We hear a great deal about the mapping of polygenes, a Thoday specialty. A number of papers use or explain the "biometrical" approach, in which two inbred lines are crossed and the means and variances in the subsequent generations can be expressed in terms of quantities differing from the usual Fisherian additive, dominance, and environmental variance components. This approach is due to Mather and Jinks. It suffers from having its own notation and far too little explanation of how quantities like D, H, and E relate to the three components of variance found in outbred populations.

After reading the papers in this collection, one is vaguely uneasy. It is not at all clear what questions are being asked. Much effort is devoted to reminding us that these methods tell us only about those genes affecting the trait that are actually segregating in our populations or crosses. It is repeatedly emphasized that variation of a quantitative character may be largely due to a few segregating loci. Well and good, but there is no discussion of what biological questions are to be resolved by these studies, aside from questions arising from our interest in the particular characters under study.

I am being unfair. Many of the contributors to this volume believe themselves to be addressing general questions—it is just that I have difficulty in believing that these studies can resolve them. Quantitative genetics has passed through periods of enthusiasm in which it was imagined that rather murky studies at a highly aggregated level would provide insight into molecular processes. Thirty years ago it was often asserted that polygenes were more equal than other genes, and they were imagined as hiding in that repository of mysticism, the heterochromatin. Heterosis was likewise imagined to be a general biological principle, resulting directly from heterozygosity rather than from the phenotypic effects of the two particular alleles.

The belief that in quantitative genetic studies we obtain insights into molecular processes has been accompanied by a tendency toward nonmaterialist holism. This has been most visible in the belief in interactions so strong as to make effects of individual genes uninvestigable.

This volume shows those particular tides as having receded, but shows also that there is no less enthusiasm than before for the prospect of discovering general principles from data on quantitative characters. That quantitative variation may be due to only a few loci is indisputable, but I see no reason to believe that there is any general principle to that effect. It should depend entirely on the sort of character under consideration. It is unlikely that a character like body weight has most of its genetic variation at a few loci but quite plausible that sternopleural chaeta number in *Drosophila* will show such a pattern.

Interestingly enough, the very latest wave of enthusiasm is not much represented in the book. This is the suggestion that quantitative traits are varying as a result of variation at "regulatory" loci, with protein polymorphism mostly a result of structural loci. This is in effect the old polygene theory come back to haunt us. Perhaps the contributors to this volume are skeptical of this particular notion, if not of others.

It is to the credit of Thompson and Thoday that they have assembled a volume that gives a reasonably broad view of quantitative genetic studies, one capable of giving rise to such a degree of skepticism on the part of the reader.

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Vestibular Neurophysiology

Mammalian Vestibular Physiology VICTOR J. WILSON and GEOFFREY MELVILL JONES. Plenum, New York, 1979. xii, 366 pp., illus. $32.50.

In recent years, there has been a heightened interest among neurophysiologists in the workings of the vestibular system. The reasons are fairly obvious. The kinds of sensory information handled by the vestibular labyrinth are relatively simple, so that it has been possible to specify most aspects of the sensory coding process. There is a wealth of detail concerning the intrinsic structure and connections of the vestibular nuclei, and this has provided a challenge to the neurophysiologist interested in correlating structure and function. The vestibular nuclei are heavily interconnected with the reticular formation, the spinal cord, the oculomotor pathways, and the cerebellum. To many workers, the central vestibular pathways have seemed a particularly fruitful focus for the study of sensorimotor integration. Much of vestibular function is expressed in reflex pathways, which are particularly amenable to neurophysiological analysis. Many of the reflexes can be specified in