Books

Genetics and Evolution

Selected papers of A. H. Sturtevant
Selected and edited by E. B. Lewis, with a foreword by G. W. Beadle.

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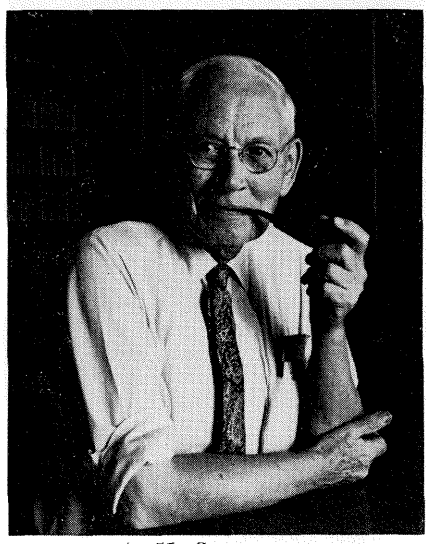
It is a curious fact that contributions in science often acquire anonymity at a rate, and to a degree, that is positively correlated with their importance. They are speedily incorporated into the "principles" sections of textbooks, where they are told and retold in successive editions and texts. As impersonal principles they need not be identified with persons, and because they are told in texts few students need to seek them out in their original sources.

As these sources retreat in time they become less accessible; it becomes harder to find them even if one chooses to look. They develop ramifications as their significance becomes apparent in various contexts. The original is screened by an army of extenders and consolidators, closer in time to the current student, and involved with more narrowly-defined and more easily-encompassed subareas penetrated by the ramifying original.

There are several such elements in modern genetics. The genes can be deduced from genetic data to be arranged in a linear array on the chromosomes, each gene in a particular position on a particular chromosome. Sometimes this order may be changed; for example by an "inversion," in which a whole segment of a chromosome, a whole block of genes, is broken out of the linear array, rotated through 180 degrees, and reincorporated in inverted sequence.

The existence of such inversions can be deduced from their action as suppressors of crossing-over in individuals carrying the two gene-orders on the two respective chromosomes of that pair, and can be confirmed by breeding data. They show unusual behavior in transmission through the female germ line; they pose complex problems for natural populations; they can



A. H. Sturtevant

be used to trace relationships among species in evolution. Sometimes, during the development of an individual, areas of mosaic tissue appear different in chromosomal and genic constitution from the remainder of that individual's body. Sex mosaics of this sort are currently coming to prominent attention in the medical genetics of man; they have been known for a long time in Drosophila.

From the behavior of a gene in mosaic tissue one can deduce whether the gene is limited in its effects to the cells in which it exists, or whether it has impact upon, or is dependent upon, the action of genes in other tissues. Clear observations in this category were the forerunners of modern developments in the field of biochemical genetics. Some aspects of development show "maternal effects," dependent upon genes possessed by the mother even though the developing individual may himself not have them. There are maternal effects on sex determination in hybrids. Particular genes may cause inter-sexuality.

We commonly think of genes in pairs, but numerous alternative forms exist for many genes in populations—and these "multiple allelomorphs" provide tools for studying the ultrastructure of genes. The effect of a gene may be dependent on what other genes are near it on the chromosome—the phenomenon of "position effect." Particular genes may affect mutation rates for other genes. Genetic changes are the raw material for evolution, and understanding the processes of evolution is dependent upon understanding and studying the consequences of many precise principles of genetics. Several of these principles appear at the population level, and offer complex interesting problems—for example, sexual selection and selection in social insects.

All of the above contributions, and others, were the work primarily of one quiet man who is retiring from the Caltech faculty, at the age of 70, at the end of the current academic year. This book is a reprinting of 33 of his contributions, about a quarter of his total output over the period from 1913 to the present. The book is a tribute to A. H. Sturtevant. It is an impersonal record of contributions by a most remarkable man. It makes accessible, to be studied afresh, many of the most important milestones of the history of genetics. The author's 1961 notes, which follow most of the papers, give this book a strong sense of history.

Especially with Beadle's foreword and Lewis's introduction, the book should communicate some of the sense of excitement of scientific discovery experienced by a person working in an active and enthusiastic group in which things are breaking fast, and in which "group discussion, argument, and speculation were so frequent that it was next to impossible to determine who had what ideas;" in which a list of the names of the people involved is a list of giants, to be accepted reverently, but which in those days included one who "often dropped in to take part in the discussions and to help himself to one of the bananas that were kept in constant supply as 'fly food'."

But this book is more than a tribute to Sturtevant, and more than a history; it is a book to be studied and referred to again and again. Its values, concepts, and content are as current today as they were when they first appeared, and assuredly the clear conciseness, the incisive penetration, the dignity, simplicity, and insight of Sturtevant's original thought and presentation have not been improved upon by the retelling that has been done by others in the interval.