REVIEWS

GENETICS IN PLANT BREEDING. Brookhaven Symposia in Biology, No. 9. Brookhaven National Laboratory, New York. Pp. i-ix, 1-236. \$1.25.

This report, which is the ninth in the series of symposia arranged by the Brookhaven National Laboratory, introduces most of the important current research on plant breeding being done in the U.S.A. It includes sessions on aspects of cytology, biometrics, reproduction and mutation which are basic to the methods of plant breeding. The subject matter emphasises the fundamental approach and preserves a fine balance between the many different techniques and mental approaches that have a place in the planned improvement of crops. As a result of limiting the number of participants, the contributions achieve a high standard throughout and the lengthy discussions which are printed in full testify to a degree of interest and stimulus which is quite rare. Apart from a few irritating statements like "Evolution proceeds by producing new species" on p. 123 and a tiring discussion on whether induced mutations are "progressive" or "retrogressive" on p. 174 the report is very readable and well edited. The contributions are well documented and provide valuable points of reference.

Two contributions are outstanding. They are E. R. Sears's account of the successful transfer of leaf rust resistance from *Aegilops umbellata* to wheat, and J. R. Harlan's treatment of the utilisation of natural variability in cultivated plants. In an elegant piece of cytological research Sears achieved the transfer of rust resistance from a related genus through the use of an amphidiploid of *Triticum dicoccoides* and *A. umbellata* as a "bridge" to *T. aestivum*. An intercalary segment bearing resistance, but lacking deleterious characters was incorporated in the wheat genome, producing an entirely new genotype whose morphological expression was indistinguishable from the wheat parent. The consequence of this single transfer will probably be felt ultimately in all the wheat breeding programmes of the world and its importance to the economy of the wheat producing areas must be obvious. This example of "chromosome building" using widely related species represents the most deliberate attempt to date at directing the evolution of chromosomes in the service of man, and is one that must have immense possibilities for the future.

Harlan's contribution deserves special mention because it demonstrates the achievements of utilising the world's reservoir of variability in crop plants. The "composite cross" method as applied to barley is described as a means of exposing new collections to recombination and selection. One such cross involving 28 parents and grown continuously for 29 generations yielded valuable information on the most profitable sources of variation and showed that these need not coincide with centres of maximum diversity. That this is what one would expect is no excuse for the principle to have been overlooked in previous discussions on this subject. In addition the method has achieved practical breeding success, and segregating populations subjected to over twenty years of natural selection have yielded isolates which exceed the standard variety by as much as 56 per cent.

Four contributions deal with the production of economically valuable mutations by the use of radiations. Although much of the work reported on this subject is not convincing, the demonstrations by D. Lewis of the disruption of the breeding system in self-incompatible species, and by C. F. Konzak of the induction of resistance to Victoria blight in susceptible oat varieties, illustrate that mutagenic agents have definite possibilities in plant breeding. The success of both attempts at achieving valuable mutations depend on their well defined genetic objective and on an efficient screening technique for the isolation of the mutant genotype.

The symposium achieved what it set out to do, namely to highlight recent developments in genetic research which are of potential value to plant breeding. These are impressive and one hopes that readers will find it no longer necessary to cite "hybrid corn" as the sole contribution of genetics to agriculture.

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CHROMOSOME ATLAS OF FLOWERING PLANTS. 2nd Ed. By C. D. Darlington and A. P. Wylie. London: George Allen and Unwin. 1955. Pp. 519+xix. 60s.

CHROMOSOME BOTANY. By C. D. Darlington. London: George Allen and Unwin. 1956. Pp. 186+xii. 16s.

The second edition of the invaluable *Chromosome Atlas of Cultivated Plants* has been widened in scope to include all flowering plants, hence the change of title. It covers the chromosome numbers of nearly double the number of plants represented in its predecessor. The genera with uniform chromosome numbers have been abbreviated, the variable ones being given in detail, including reference to the presence of B chromosomes. The families, numbered and in the order of Hutchinson's *Families of Flowering Plants*, are divided into 25 groups of orders, each being preceded by an illustration of the chromosomes of a member of the group. The rich data convey to systematists the value of chromosome numbers for classification, suggest to plant breeders the breeding system and the limits within which interspecific crosses might be attempted, and show cytologists what has been done and what remains to be done.

Issue may be taken with the reasons given for omitting authors' names from the species listed. These are part of the name of the abstract taxonomic concept embodied in a diagnosis. Truly the type specimen's chromosome number is only conjecturally that of the specimens observed, but presumably these resemble, *i.e.* conform to the diagnosis of, the taxonomic species whose name is used in the Atlas. We surely need to know in whose specific taxonomic sense the name is used.

The interpretation of the material in the Atlas, formerly in its introduction, is incorporated in the companion volume on *Chromosome Botany*, which discusses the laws of chromosome variation. It is a stimulating book, which treats the chromosomes of plants as broadly as possible, consistent with the omission of the reciprocal connection with formal genetics. The intricacies are avoided partly by a descriptive treatment and partly by pointing to problems, rather than expounding their solutions. This method of presentation is undoubtedly well suited to students of botany, accustomed to descriptive analysis, who should study this book closely. Nevertheless the description is sometimes so couched as to suggest that no problems