The Genetics of Wheat Species.

Recent years have witnessed important advances in our knowledge of the wheats, which are now recognised to fall into three well-marked groups, differing in their chromosome numbers and rust resistance, and showing inter-sterility when members of different groups are crossed. Much genetical work has been devoted, not only to crosses between hexaploid and tetraploid or tetraploid and diploid species, but also to crosses between species having the same chromosome numbers. In the latter series of crosses, in which there is relatively full fertility, various investigators, including Tschermak, Nilsson-Ehle, Engeldow, Percival, Kajanus, and Malinowski, have taken part. The results of these crosses between wheat species having the same chromosome numbers have been much simpler than might have been anticipated, and they raise some interesting questions concerning the relationships between these species, the nature of the differences involved, and the manner in which these differences are germinally represented.

Some of these questions are discussed in a recent paper by Prof. E. Malinowski (*Jour. of Genetics*, vol. 17, No. 2), in which he propounds the view that the phenomena can be explained by assuming linkages between different pairs of chromosomes. Such linkages would resemble in some respects those which are known to occur between many of the chromosomes of Oenothera species. Such connexions between chromosomes have not yet been described as regular occurrences in the wheats, although much cytological work has been done on this group, and there are other difficulties with the hypothesis proposed, which, nevertheless, will doubtless lead to a further analysis of the differences between species of wheats.

In 1914, Malinowski found that a cross between the two hexaploid wheats, *Triticum Spelta* and *T. vulgare* (each with 42 chromosomes), gave an intermediate F_1 and an F_2 which contained *T. Spelta*, the intermediate type, and *T. vulgare* in the ratio 1 : 2 : 1, although an independent factor for *T. compactum* (club wheat) was also present. Kajanus confirmed the 1 : 2 : 1 result. Now *T. Spelta* has longer ears than *T. vulgare*, and its glumes and spikelets also have a different shape. Hence, in spite of the monohybrid behaviour, it appears probable that a number of (linked) genetic differences are involved. Whether it is necessary to assume that these factors reside in independent chromosomes which have become linked, as Malinowski suggests, remains to be seen.

In crosses between *T. polonicum* and *T. dicoccum*, both tetraploid species with 28 chromosomes, the same 1 : 2 : 1 ratio is obtained in F_2, although here again an independent factor for long or short glumes may be present. The same ratio obtains when *T. polonicum* is crossed with *T. durum*, another tetraploid species.

When a tetraploid is crossed with a hexaploid wheat, the results are much more complicated. For example, in *T. polonicum* × *T. vulgare* the F_1 pentaploid hybrid is intermediate, but the F_2 segregates into a great variety of types, including *T. dicoccum*, *T. durum*, and *T. polonicum* ($4n$ chromosomes), as well as *T. Spelta* and *T. Vulgare* ($6n$). Some of the F_3 families show segregation between two species in a 1 : 2 : 1 ratio. But they are always both tetraploid or both hexaploid species, *i.e.* they might be *durum* and *polonicum*, or *dicoccum* and *polonicum*, or *vulgare* and *Spelta*. The least complicated segregation between forms having different chromosome numbers is in crosses between *T. dicoccum* and *T. Spelta*. This yields in F_2 *dicoccum*, *Spelta*, and two other types which resemble these respectively.

In his explanatory hypothesis Malinowski assumes that the tetraploid wheats have two linked chromosomes, while the hexaploid forms have three, and that certain of these linked chromosomes are common to different species, *e.g.*, *T. dicoccum* having *a* and *c* linked, while *T. Spelta* has *a*, *c*, and *e* linked. As it seems probable that the hexaploid wheats have arisen at some time through a doubling of the chromosomes in a sterile hybrid between a diploid and a tetraploid species, the tetraploid and hexaploid wheats might be expected to have certain chromosomes in common. Whatever the explanation, these apparent linkage phenomena in wheat species are of much interest, and their elucidation may well mark another step in the advance of genetic theory.

Tschermak and Bleier (*Ber. Deut. Bot. Gesells.*, vol. 44, p. 110) have recently obtained a constant fertile octoploid hybrid by crossing *Aegilops ovata* with *Triticum dicoccoides* and *T. durum*. This they believe supports Percival's hypothesis that the hexaploid wheats arose from crosses of *T. dicoccoides* with Aegilops. But Percival (*Jour. Genetics*, vol. 17, p. 60) has found that Aegilops itself contains species with $2n$, $4n$, and $6n$ chromosomes.

Another set of results bearing closely on these problems is derived from the work of Prof. G. C. Meister with his wheat-rye hybrids (*Saratov Agr. Exp. Station*, I, p. 220, 1923). Six generations have been grown from the original natural crosses and a multitude of forms has been obtained, but the 'F_2' consisted of uncontrolled back-crosses with the parents. The parent wheat was hexaploid and the rye diploid, the hybrid F_1 being tetraploid. Chromosome studies combined with genetical examination of the later generations should make possible an analysis of what is happening—whether merely recombination of factors already present or whether germinal changes of various possible kinds are responsible for the appearance of some of the new types. How, from a single species of wheat when crossed with rye, a whole series of wheat species and varieties, some of which are already well known, should arise, is not at present clear; but the elucidation of this problem should add much to our understanding of the relationship between different species of wheat. One of the forms thus obtained is very similar to *T. persicum*, a tetraploid wheat. A full study of the chromosomes in these hybrids may be expected to throw light on the relation between crossing and mutation, and also on the relationships between wheat species.

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The Recolonisation of Krakatau by Animal Life.

The gradual recolonising of the island of Krakatau with plants and animals subsequent to the catastrophe of 1883 is a subject of great biological interest. Dr. K. W. Dammerman, of the Buitenzorg Museum, tells us that after studying the new fauna of Krakatau it was desirable to compare it with that of some similar neighbouring island which had remained unaffected by volcanic convulsions. After taking various islands into consideration, the nearest suitable *terraine* for such comparison appeared to be Durian—a member of the Rhio-Lingga archipelago. It has about the same area as Krakatau and is situated between the bigger island of Sumatra and the Malay Peninsula (just as Krakatau lies between Java and Sumatra). The whole island is clothed with virgin forest, it has been little interfered with by man, and,