of the gametes has two of these chromosomes; its partner none. If fertilization were at random one would expect the hyperploid and the deficient gametes to fertilize the egg with equal frequency. Actually the egg receives the hyperploid gamete more frequently than the deficient one, and a low rate of regular disjunction occurs in the second microspore division. As a consequence, three types of kernels are expected: (1) normal chromosome complement both in embryo and in endosperm because of normal disjunction, (2) hypoploid endosperm with hyperploid embryo or, (3) vice versa, hyperploid endosperm with hypoploid embryo because of non-disjunction. The relative frequency of the three kernel types can easily be determined by crossing TB-A translocation stocks on testers possessing two recessive markers in the segment homologous to the translocated A-segment. One marker should affect an endosperm character; the second one a seedling trait.

The multiple tester for the short arm of chromosome 9 yg C sh_1 bz wx has been pollinated by a TB-9b stock. Because the break in chromosome 9 occurs somewhere between bz and wx loci, the resulting endosperms should be classified according to their phenotypes in the classes sh_1 bz and Sh_1 Bz. The figures found were 237 and 231 respectively. As expected, the first class turned out to be all regularly green, Yg with ten exceptions due possibly to hetero-fertilization or to some other unusual event. The second class gave 116 yg and 100 Yg. The high proportion of the Yg seedlings in the Sh Bz class may be accounted for by regular disjunction of the B9 chromosome in the division of the generative nucleus. These results, as compared with those reported by Roman (Proc. Nat. Acad. Sci. 34. 2: 36-42) who, using C-c segregation, found very low B9 regular disjunction, indicate that disjunction occurred in an appreciable rate and suggest that the residual inheritance may affect the behavior of the chromosomes at the second division of the microspore. A fairly high disjunction has to be postulated, too, in later results by Roman and Ullstrup (Agron. Jour. 43: 450-454) in the case of TB-1a, and may be inferred in Randolph's findings (Genetics 26: 608: 631).

6. Balanced lethals for determining linkages.

The methods of locating inherited factors on the chromosomes in maize are based (1) on multiple testers with at least a marker for each of the 10 chromosome pairs, (2) on the use of a series of reciprocal translocations, (3) on the exploitation of the characteristics of A-B chromosome translocation stocks used as pollinator.

An additional method may rely on a series of balanced lethal systems, one for each chromosome pair. The defective endosperm factors may be useful for this purpose. Such balanced lethal stocks can be crossed with the unplaced mutants. In the non-lethal class of the following selfed progenies an excess of the mutants is expected, as

compared with the usual 25%, when they are in repulsion with respect to the lethals. Further tests are, of course, needed to verify the linkage which is indicated by an excess of mutants.

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1. Estimating pollen restoration.

In the process of converting inbreds to the cytoplasmic pollen sterile condition and the conversion of these sterile inbreds to restorers it is necessary to have some reliable measure of normal pollen production. The examination of anthers from small pieces of tassel under a low power microscope gives a fairly accurate measure of the amount and degree of pollen abortion. The staminate flowers are collected shortly before the time of normal dehiscence and usually preserved in acetic-alcohol until they can be examined. The proportion of normal, well filled pollen grains can be determined approximately but this method is slow and tedious. It also gives no information about dehiscence and ability of the pollen to function.

Pollen examinations over a period of years indicated that there was a close correlation between the amount of normal pollen produced and the time and pattern of pollen shedding. Tassels with anthers well filled with normal pollen grains begin shedding at the time of first silk emergence or before. Anthers that had any unusual amount of partially filled or completely aborted pollen were usually delayed in appearance until after the first silks appeared, and the anthers did not follow the usual pattern of emergence. The normal pattern of pollen shedding is for the anthers to be extruded first below the tip of the central spike. Extrusion then extends evenly to the tip and the base of the central spike, followed or accompanied by the appearance of anthers on the lateral branches near the tips of the upper branches extending evenly to the tips and the bases of all the branches. Any delay in the appearance of anthers beyond the appearance of the first silk on any part of the tassel, or the first appearance of anthers on the lateral branches or at the tip or base of the main spike, or gaps without anthers is usually an indication of some degree of pollen abortion. In some partially or completely sterile plants the anthers may be well filled with normal appearing pollen grains but these anthers are not extruded, or if extruded the pollen may not be released.

By using these manifestations plants can be easily and quickly classified in the field at the time of silking. We usually put the plants in a segregating population in four arbitrary categories: