Among fourteen plants of selfed progenies of T2-8 heterozygotes six plants were normal in fertility, eight plants were semi-sterile.

A second case of spontaneous reciprocal translocation was found in a progeny of maize-Florida teosinte derivatives. In this translocation, the long arms of chromosomes 6 and 7 were involved. It is designated as T6-7. The points of exchange between the arms are shown in Table 5. Among the eight plants of the selfed progenies of T6-7 heterozygotes, four plants were normal in fertility, four plants were semi-sterile.

A study of the other aspects of the above two reciprocal translocations is in progress.

10. The origin of abnormal chromosome 10 in maize.

During the year 1956 a cytological study was made of a number of F_1 crosses of maize varieties collected from Latin America with inbred strains from the United States. In these F_1 crosses Mangelsdorf had previously found high percentages of aborted pollen and chromosome irregularities were therefore suspected.

At pachytene, B-chromosomes varying from one to six in number were observed in 25 plants from nine crosses. No B-chromosomes were found in eighteen plants from six crosses. In one additional cross not included in the above categories, involving a Peruvian variety as one parent, a B-chromosome was found in two plants, while a third plant in the same progeny lacked the B-chromosome, but was heterozygous for an abnormal chromosome 10.

It was further found that the entire extra piece of heterochromatin attached to the chromosome 10 resembled closely the terminal one third of the B-chromosome found in the two sister plants. This extra piece involved the pycnotic or knob-like region and its adjacent regions on both sides including the terminal spindle fiber attachment region which was often not apparent.

At metaphase 1 of the microsporocyte divisions in the plant heterozygous for this abnormal chromosome 10, secondary centric regions on more than one bivalent were observed in many sporocytes. The number of these secondary centric regions varied from one to four on a single bivalent. At anaphase 1 the continuation of the secondary centric regions was found. Dyads carrying one or more secondary centric regions tended to lead the way poleward in the chromosome movement. The other dyads which did not carry the secondary centric regions showed no aberrant configurations.

At metaphase 2, the secondary centric regions on certain dyads showed precocious poleward movement, and sometimes the arms of these dyads were extensively attenuated. At anaphase 2, the secondary centric regions often imparted a V-shaped configuration to the monads, with the primary centric regions lying toward the equatorial plane.

These unusual features found at meiotic divisions in the plant heterozygous for this abnormal chromosome 10 were about the same as those previously found in the other materials either heterozygous or homozygous for an abnormal chromosome 10.

In 1957 twelve additional plants of this same cross were studied cytologically with the following results: One plant was heterozygous for an abnormal chromosome 10; it had no B-chromosome. One plant had a trivalent of B-chromosomes, while the other chromosomes were normal. Six plants had a single B-chromosome and the remaining chromosomes in these plants were normal. The remaining four plants had an unusual chromosome 9 and they lacked the B-chromosome. In these four plants one of the chromosomes 9 had an extra piece of heterochromatin, resembling the bulging pycnotic region of the regular B-chromosome, attached to the distal end of its short arm. At pachytene this extra piece of heterochromatin appeared like a large terminal knob. However, unlike the effect of abnormal chromosome 10, precocious movement of dyads and secondary centric regions on the bivalents, dyads, and monads were not observed in the sporocytes possessing the unusual chromosome 9.

The above observations suggest that the extra piece of heterochromatin of the abnormal chromosome 10 came from a B-chromosome by simple translocation, and that the chromosome 9 with a terminal large piece of heterochromatin on the short arm originated in a similar way. This piece of heterochromatin often appeared like a large terminal knob.

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(The first ten sections of this report from Harvard University are based on research supported by a grant from the National Science Foundation.)

11. The blotching system involving the c locus.

In the previous reports it has been stated that there are four genes involved in the blotching system which causes blotches of color to develop in the aleurone in cc genotypes. This conclusion was based on six ears which appeared to be segregating in a ratio of 243:781 (MNL, 1955) and which were therefore assumed to be heterozygous for four Bh loci as well as the R locus.

In subsequent experiments we have isolated testers for three Bh loci but have not been able to find a stock which is recessive for a fourth Bh gene. It now appears that there are only three Bh genes involved in the system and that the ratios reported earlier which seemed to indicate the existence of four genes resulted either from