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1. The fl^a gene and its percentage of lysine.

The gene fl^a (allele of fl_1) differs from fl_1 in that it is recessive in two doses in the endosperm (Maize News Letter 41:86-87). As a result of preliminary studies by Dr. Alix V. Paez, fl^a appears to be similar to the gene opaque-2 (o_2) in its percentage of lysine content.

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1. A survey of B^9 instability in the sporophyte.

The B^9 chromosome is less stable in both the endosperm and sporophyte than members of the regular (A) complement (1). The instability is observed as a loss of the dominant alleles present on the B^9 chromosome and appearance of recessive sectors. Two general types of instability have been observed which produce either a fractional or a mosaic pattern of gene loss. (Fractional refers to the appearance of a single recessive sector; mosaic indicates a pattern of repeated loss of the dominant allele.) Both types of sectoring have been studied with TB-9b (2,3). Concurrent investigations of mosaic kernels have been reported with TB-4a (4). The indication is that fractional loss represents formation of an isochromosome of the B^9 during development of the endosperm or sporophyte, and the mosaic pattern results from transmission of a ring B^9 chromosome by the male parent. However, patterns of loss are not easily separated into fractionals and mosaics. Many intermediate types are seen that, for example, may have two sectored losses rather than one. Whether this is a mosaic pattern, or a fractional pattern with a re-arrangement of embryonic cells is open to

question. In addition, some unusual plants have recessive areas that cover more than one-half of the plant or endosperm, but appear to be single events. Therefore, a survey of sectored plants found in one set of TB-9b crosses is being made. The parental cross was: yg sh bz wx X 9^{wx} 9^{BWx} $B9^{Yg}$ Sh Bz $B9^{Yg}$ Sh Bz. The Sh Bz Wx progeny were selected, planted, and the Yg-yg sectored seedlings kept for classification of root tips. Of twenty-five sectored plants, the chromosomes of fourteen have been analyzed. Despite the wide range of patterns found, only two chromosome changes seem to have occurred; isochromosome formation and ring formation. Below are listed the sector types and the abnormality responsible:

	Fractional Plant (½-¼ yg)	Mosaic Plant	Intermediate between Fractional and Mosaic	Plant more than ½ yg
Number of Plants	7	3	3	1
Classification	all isochromosome	2-ring 1-isochromosome	2-isochromosome 1-ring	isochromosome

(The classification of the ring chromosome is done with some reservation. The chromosomes are very small and rounded. They are much smaller than a normal B^9 and must be reduced derivatives. However, the chromosomes are too small in present preparations to visualize the ring structure. Classification during meiosis may yield more positive identification.)

Apparently two types of chromosome rearrangement are responsible for all B^9 instability in the sporophyte. It is possible, in addition, that these two chromosomal changes have a common origin: centromere misdivision at the second pollen mitosis. B-type chromosomes undergo nondisjunction at a high frequency in the second pollen mitosis. This nondisjunction probably consists of two steps: centromere fixation, and unipolar migration. If the second step fails to occur, misdivision of the centromere is likely, and an unstable telocentric can result. In the case of the isochromosome, this telocentric would then form an isochromosome during early development of the embryo. (An alternate suggestion is that centromere misdivision occurs in the sporophyte and

gives rise directly to the isochromosome--reference 2). The origin of ring chromosomes is more difficult to explain. However, the first step in ring formation may also be centromere misdivision at the second pollen mitosis. This would provide one of the two broken ends required for ring formation, and eliminate the need to postulate high rates of breakage in the minute short arm of the chromosome. (Origin of the second break in the long arm is not understood). Consistent with this idea is the fact that the Yg-yg mosaics identified were derived from seeds with a stable Bz and Sh phenotype. Therefore, the sperm that fertilized the egg differed in stability from the one that fertilized the polar nuclei, suggesting an origin of the ring at the second pollen mitosis. However, the previous report on B^9 mosaicism (3) gave contrary results. In the previous experiment, selection of endosperm mosaics and self pollination of the resultant plant often resulted in transmission of the mosaic character, indicating that the B^9's of both sperm were unstable. The main difference between the two experiments was the presence or absence of the 9^B chromosome. The implications for centromere misdivision are several:

1. In the absence of 9^B, the B^9 does not undergo nondisjunction at the second pollen mitosis (5). It is unlikely, therefore, that misdivision would occur at this time in the absence of 9^B.
2. The 9^B B^9 pollen type can tolerate gene deficiencies of the B^9 only in the sperm, and ring formation must, therefore, be restricted to the second pollen mitosis. On the other hand, the 9 B^9 pollen type is duplicate for genes on the B^9 and may gain in viability by loss of duplicate genes (ring formation) prior to the second pollen mitosis.
3. In the 9 9 9^B B^9 B^9 plants, the B^9's have pairing partners and should divide properly in meiosis. In 9 9 B^9 plants, the B^9 may be excluded from pairing. Centromere misdivision may then occur.

The factors listed suggest that ring formation in the absence of the 9^B may begin with centromere misdivision in meiosis. In conclusion,

centromere misdivision may be the primary factor in production of derivatives of the B^9 chromosome. Experiments are underway to test the validity of this idea.

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1. <u>The effect of B chromosomes on a chromosome translocation during endosperm development</u>.

In MNL 43: p. 70 it was reported that a chromosome segment of a 1-3 translocation (1L.95; 3L.35) was lost during endosperm growth. This could be detected by following a marked segment ($\underline{A_1}\,\underline{Sh_2}$) on the translocated arm.

In testcrosses of this translocation $\underline{TA_1}\,\underline{Sh_2}/\underline{a_1}\,\underline{sh_2}$ not all the colored-round progeny were sectored since both sectored and non-sectored colored kernels were observed. It was assumed that a second factor was necessary for sectoring behavior and that, from the frequency of sectored and non-sectored kernels, this second factor was assorting independently of the translocation. It was suspected that B chromosomes represented the second factor. This was tested by crossing non-sectored kernels on