their maize homologues. Chromosome behavior at anaphases I and II was regular.

Y. C. Ting
Francine Torres
E. Dancewicz

2. Chromosome inversion of a maize tester plant.

During last year a cytological examination of a maize tester strain was made. The marker genes of this strain are $\underline{j}$ $\underline{v}_{16}$ $\underline{ms}$ (hetero). This tester was obtained from Professor P. C. Mangelsdorf of Harvard University. At pachytene a paracentric inversion was found in the short arm of chromosome 8 of one of the plants. This inversion was practically terminal and it appeared the same as the In8 found in certain other strains of maize (McClintock, 1933, 1959) and in some Mexican teosintes (Ting, 1958). The length of the inverted segment was equivalent to about 50 per cent of the length of the short arm. Evidence of crossing over, such as bridges and fragments at anaphase I and bridges at anaphase II, was found.

Since the chance of the occurrence of two identical inversions in nature is practically nil, the existence of these aberrations can be used as a reliable marker of germplasm interchange among distinct species as well as among different varieties of the same species. Therefore, the In8 in this maize tester is considered as one more evidence of introgression between maize and teosinte. The direction of the introgression and the effect of this inversion on the frequency of crossovers in the heterologous chromosome pairs are under investigation.

Y. C. Ting
Francine Torres

3. Further study of the selfed progenies of a variegated-leaf homozygote (vl/vl).

Last year the selfed progenies of a variegated-leaf homozygote (vl/vl) were under further investigation. A total of 129 plants was available. Four of these were practically albino and died while they were at the seedling stage. This is completely different from a previous study (Maize News Letter, 1963) in which no albino seedlings were observed. The remaining 125 plants resembled average maize plants in size. However, it was found that the degree of variegation in the leaf-chlorophyll content of this mutant varied very strikingly. Subsequently these plants were classified into four classes by the size of the chlorophyll-deficiency area in per cent of the total leaf area.

Class A had three plants with 85 per cent of the total leaf-area deficient in chlorophyll. Class B had 21 plants with 75 per cent of the leaf-area deficient in chlorophyll. Class C had 44 plants with 50 per cent of the leaf-area deficient in chlorophyll. Class D had 57 plants with 25 per cent deficient.

Through this observation it appears likely that the variations in the area of the leaf chlorophyll deficiency might be regulated by a second nuclear element in addition to the structural genes in the chromosome. This element inhibits the synthesis of chlorophyll by inactivating the enzyme catalyzing the reaction of chlorophyll synthesis. The time of operation of this element varies from plant to plant in accordance with the cellular environment. For the albino seedlings, the inhibiting element functions when the seeds just start to germinate. For the Class A plants this element starts to function later than that of the albino seedlings. Likewise, the element of Class B plants acts later than that of Class A plants, and that of Class C, later than that of Class B, and that of Class D, later than that of Class C.

Y. C. Ting

The studies reported above were supported by the American Philosophical Society grant No. 3272.

BROOKHAVEN NATIONAL LABORATORY*

Upton, New York
Department of Biology

1. Progress towards perennial Zea diploids.

Experiments were reported last year which show that one can make steady progress in increasing the perennial expression of maize-teosinte derivatives at the 4N level by the simple breeding technique of repeated mass selection for perennialism. Thus at the 50% maize level, it has been possible to increase the incidence of perennial segregates from an original level of about 0.3 to 0.75 in only 4 cycles of selection. Similarly, the production of basal branches, an attribute of perennialism, was increased from about 4.4 per plant to about 10.0. At the 75% maize level, only two generations of selection have increased the incidence of perennial segregates from 0.0 to about 0.35. Unhappily, either genetic or agronomic investigations of perennialism are difficult, if not meaningless, at the 4N level.

The situation is entirely different when working at the diploid level. As outlined, one can easily obtain large populations of maize-perennial teosinte diploids by producing the F_1 triploid generation, backcrossing this triploid to maize, and then intercrossing the resultant array of aneuploids. The chromosome number is rapidly stabilized at 20 because of gametophyte selection for euploidy. Due to the high degree of preferential pairing in the F_1 triploid, the first post triploid generation carries a high theoretical proportion of perennial chromatin, somewhere between 40 and 45%, depending upon certain assumptions.

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*Research carried out at Brookhaven National Laboratory under the auspices of the U.S. Atomic Energy Commission.