Leaves were borne oppositely, 2 per node, those of one node being rotated 90° to those of the preceding node, in perfect symmetry. Leaves were of normal size and conformation, with the nodal pair being of equal rank to each other. Being id/id, the plant was not ear fertile, but it produced pollen which was used to outcross. Selfed progeny is available for observation in the summer of 1967.

D. L. Shaver

4. When is hybrid vigor? (a)

Maize workers are accustomed to the fact that the $F_1$ between two inbred parents is not only much larger because of hybrid vigor, but flowers 10 to 14 days earlier than its parents.

In two summers of work in the unique Salinas Valley climate, it has been found that earliness is not an aspect of hybrid vigor. While $F_1$ progenies show the typical increase in plant size, they flower at the same time as their inbred parents. If a cross is made between an early and a late line, the $F_1$ flowers at a time intermediate to its two parents. Rather than condition of vigor, the number of plant parts to be cut off, in other words, leaf number, is the more reliable index to maturity.

A typical midsummer day in the Salinas Valley has a high of 82° which occurs as a rather sharp temperature peak soon after midday. Nightly temperature invariably drops into the low 50's. It would appear that this regime imposes a limitation upon the growth cycle which is not relieved by heterosis.

Only one important exception to this generalization has been found. F6, an apparently heat-loving Florida line, grows more slowly than its leaf number would predict. It spends much of its juvenile period in a condition of nearly stagnant terminal growth while tillers are freely produced. These grow out rhizome-like, showing little or no geotropism. Finally both the primary and secondary culms become geotropic, elongate rapidly, and flower, the tillers being equal in size to the first culm, each bearing two normal ears. The production of 10 large ears per seed planted was not unusual.

D. L. Shaver

5. When is hybrid vigor? (b)

Crosses between Florida teosinte and maize are typically freely tillering. The Salinas Valley environment accentuates this tendency both in maize and in its hybrids with Florida teosinte. In one case, however, the $F_1$ of a cross between Mangelsdorf tester and Florida teosinte produced no tillers at all among a progeny of 15 plants. Each leaf produced by this hybrid had limited viability. As judged by the formation of anthocyanin, sugar translocation was so impeded that each leaf died in turn, and only 4 or 5 functioning leaves were present at one time. Both parents were growing in the nursery in adjacent locations. The teosinte parent (Shaver's Florida teosinte inbred 2) grew normally, though slowly, and produced a typical teosinte plant with many branches and a high degree of vegetative luxuriance. The Mangelsdorf tester likewise grew normally and was ear-fertile. Moreover, the cross between Wf9(T)MS and Florida teosinte grew normally into huge, highly tillered plants.

There is no question as to the identity of the unusual $F_1$ progeny described here, as the progeny was grown from a composite of two Mangelsdorf tester ears pollinated by teosinte. Also, the "ears" produced by the hybrid were distichous, the seeds were borne enclosed in a bony rachis as is typical of this cross, and the plants otherwise perfectly resembled maize-teosinte hybrids.

D. L. Shaver

6. Agronomic effects of the cytoplasm.

Early 20th century literature records undoubted cases where cytoplasmic inheritance affects a multitude of plant characters which would be considered agronomic in a crop plant. In maize, however, results have been contradictory, except in the case of male sterility, particularly that involving the "S" cyto steriles. In this case, early workers in the hybrid corn "sterile revolution" often noted that Wf9(S)MS showed chlorotic striping and plant dwarfing, a condition greatly accentuated, in the writer's experience, in the cooler winter Florida environment.

In keeping with the suggestion implicit in this experience, the Wf9 nucleus has been inserted into the cytoplasm of several exotics, in a search for other agronomic effects. Two extractions of cytoplasm were made from perennial teosinte, and $BC_7$ progenies were grown out in 1966. In one extraction, the recovered Wf9 is considerably dwarfed and is male sterile. This dwarfing was greatly increased during the long, unremitting cold of Florida's 1965-1966 winter season, so that the cyto-altered version of Wf9 made less than 1/3 the dry weight growth of normal. In the other extraction, the recovered Wf9 is male fertile and appears to be a superior seed producer by comparison with the original Wf9. Since both extractions were made from the one original clone of perennial teosinte (E16515), one must conclude that the process of extraction was accompanied by (or preceded by) cytoplasmic mutation. A careful check of records and remnant seeds reveals no error of identification which could provide an alternative explanation.

A conflict exists in the literature over the question of whether maize bearing annual teosinte cytoplasm exhibits agronomic modification. The work reported here pointing to cytoplasmic mutation during extraction provides a workable protem resolution. However, the author has not discovered any evidence of cytoplasmic modification of Wf9 in two separate extractions from annual teosinte.

It is interesting that apparent mutation in the cytoplasm reported here provides new evidence on the nature of cytoplasmic male sterility.

D. L. Shaver