Table 2. Gametic output of two allotetraploids of *Zea*, similarly marked, but differing structurally.

Allotetraploid	"Phenotypes" of gametes A_1-Lg_2	A_1-lg_2	a_1-Lg_2	a_1-lg_2	No. of gametes
a_1 Inv. 3a lg_2 / a_1 Inv. 3a lg_2 / A_1 Lg_2 / A_1 Lg_2	95.6%	0.6%	0.2%	3.6%	2003
a_1 lg_2 / a_1 lg_2 / A_1 Lg_2 / A_1 Lg_2	85.4%	1.7%	6.8%	6.1%	2146

Seg. ratio for a_1 without inversion = 7.75:1
with inversion = 26.32:1

Seg. ratio for lg_2 without inversion = 12.82:1
with inversion = 23.81:1

The X^2 for the effect of the inversion upon the overall array of gametes is 464.356; P = <.0005.

For the effect of the inversion on segregation of a_1, X^2 = 147.370, P = <.0005.

For the effect of the inversion on segregation of lg_2, X^2 = 36.038, P = <.0005.

It can be concluded that the addition of structural divergence into newly formed allotetraploids would greatly increase preferential pairing and enhance the process of diploidization.

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3. Trivalent frequencies in several interspecific hybrids of *Zea*.

Since preferential pairing in polysomics has been used as a measure of phylogenetic relationship, it is of interest to apply this measure among species of Zea. Triploid hybrids were made by crossing 4n *Zea perennis* (perennial teosinte) by 2n *Zea mexicana* (Florida teosinte) and 3 strains of 2n *Zea mays*. Since trivalent pairing in these hybrids is non-preferential, and univalent-plus-bivalent pairing is preferential, one can use trivalent frequency as a measure of the degree of preferential pairing. These frequencies are shown in Table 3.

Table 3. Trivalent frequencies in several interspecific triploid hybrids of Zea.

Triploid hybrid	No. plants studied	No. sets of homologues scored[1]	Trivalent Freq.
perennial teosinte x Fla. teosinte	1	1340	3.597 ± 1.344
perennial teosinte x Gaspé Flint	1	1380	6.594 ± 1.412
perennial teosinte x Cuzco Flour corn	1	1330	6.143 ± 1.634
perennial teosinte x Kys pure line	2	1400	6.857 ± 1.563

[1]All data come from whole-cell analysis.

Taken at face value, these results lead to the surprising conclusion that the trisomic test for homology places maize and perennial teosinte closer together than perennial and annual teosinte. These data, however, need to be supported by observations from a larger number of plants. Moreover, it may be necessary to distinguish between the competition for pairing which is present in trisomics and the preference in pairing which is found in tetrasomics.

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4. Perennial diploid Zea?

Perennial diploid Zea would be useful for many reasons. However, Randolph found that parthenogenetic diploids of 4n Zea perennis were rarely produced, and never viable. If this inviability is due to accumulation of protected lethals in the tetraploid, it should be possible to obtain diploids from this material by crossing the triploid hybrid of 4n Zea perennis x 2n maize back to 2n maize. Since autosyndesis usually occurs in the 3n hybrid, it can be expected that diploids resulting from the backcross will be essentially F_1's having one Z. perennis and one Z. mays genome.

Twelve diploids and near-diploids have been produced by this process. These are viable, produce flowers, and set seed. Their growth habit ranges from apparently perennial to annual.

It should be a straightforward matter to produce fully rhizomatous and perennial diploids by genetic recombination within this group. The proportion of maize chromatin could then be gradually increased by further cycles of crossing and recombination.

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