6. Nonrandom pairing in trisomics with two standard chromosomes 3 and one chromosome 3 treated with ethyl methane sulfonate or nitrosoguanidine.

Standard trisomic 3 plants were crossed with F_2 material derived from pollen treated with EMS or NG by Neuffer (MNL 45: 146). The trisomic hybrids had two standard chromosomes 3 marked with $\underline{a}_1$ and the mutagen-treated chromosome 3 carrying $\underline{A}_1$. These were crossed as male parents with $\underline{a}_1$. Numbers of plants with various percentages of $\underline{A}$ gametes are given in Table 1. At the bottom of the table are given the numbers of plants having percentages of $\underline{A}$ gametes significantly lower and higher than 33%.

The results are similar to those found when the odd chromosome was irradiated (MNL 40: 109-114) in that there seems to be an equal number of cases in which the percentage of gametes is higher than 33%. Occasionally, cases were found in commercial Corn Belt inbred line-standard trisomic hybrids (MNL 43: 127-129) where this phenomenon also occurred.

In the past, no hypothesis could be advanced to explain this "negative preferential pairing."

Now it appears that there might be a very simple explanation. Nonrandom pairing of chromosomes in polyploids is caused by two factors: The first is differential affinity resulting from structural nonhomology. The second factor involves differences in the time of synaptic activation. The following assumptions are made:

1. Chromosomes are capable of synapsis only at zygonema.
2. Chromosomes undergo a secondary structural change at the beginning of zygonema. This change will be called synaptic activation.
3. Only two chromosomes which both have synaptically activated homologous segments can synapse.
4. The time of synaptic activation is under genetic control. Homologous or homoeologous chromosomes from different races of a species may have different times of synaptic activation.
5. Synaptic activation will not be synchronous in all sporocytes. The frequencies of sporocytes with synaptically activated chromosomes will be distributed (probably normally) about a point in time.

Table 1

Nonrandom pairing in trisomes 3 with two standard chromosomes 3 and a chromosome 3 treated with a chemical mutagen. Numbers of plants with various percentages of $\underline{A}_1$.

Percent A / Family No. →	1	2	3	4	5	6	7	8	9	10	11	12	13
10	1	-	-	-	-	-	-	-	-	-	-	-	-
13	1	-	-	-	-	-	-	-	-	-	-	-	-
16	1	-	-	-	-	-	-	-	-	-	-	-	-
17	3	-	-	-	-	-	-	-	-	-	-	-	-
18	1	-	-	-	-	-	-	-	-	-	-	-	-
19	1	-	-	-	-	-	-	-	-	-	-	-	-
20	1	1	-	-	-	-	-	-	-	-	-	-	-
21	2	-	-	-	-	-	-	-	-	-	-	-	-
26	-	1	-	-	-	-	-	-	-	-	-	-	-
27	1	1	-	-	-	-	-	-	-	-	-	-	-
28	-	2	2	-	-	1	-	-	-	-	-	-	-
29	-	-	-	-	1	1	1	-	-	-	-	-	-
30	-	-	-	-	1	-	1	-	-	1	1	2	2
31	-	-	-	-	2	-	1	-	-	-	1	2	-
32	-	-	2	-	3	1	1	-	-	-	1	1	-
33	-	-	1	4	3	1	3	2	-	1	-	1	2
34	-	-	1	1	-	-	-	-	1	5	2	-	-
35	-	-	1	2	1	-	-	1	1	2	-	-	-
36	-	-	-	1	1	-	1	1	2	1	-	-	3
37	-	-	5	1	-	-	-	2	1	1	-	-	-
38	-	-	-	1	-	-	-	2	-	-	-	-	1
39	-	-	-	-	-	-	-	-	-	-	-	-	-
40	-	-	-	1	-	-	-	-	1	-	-	-	-
Total	12	5	12	11	12	4	8	8	6	11	5	4	8
-	12	5	2	0	2	2	1	0	0	1	1	0	2
N	0	0	6	7	9	2	7	5	3	9	4	4	4
+	0	0	4	4	0	0	0	3	3	1	0	0	2

6. In the case of trisomes, if the odd chromosome has an earlier time of synaptic activation than the standard chromosomes, then the frequency of sporocytes with an odd chromosome and one of the standard chromosomes activated will be greater than the frequency of sporocytes with the two standard chromosomes activated. Consequently, more synaptic associations between an odd chromosome and a standard chromosome will be formed than would be expected on a random basis.

   If the time of synaptic activation of the odd chromosome is later than that of the standard chromosome, then there will be more standard-standard associations than at random.

   In tetraploids, precocity or retardation of synaptic activation would produce only homogenetic associations. The phenomenon of "negative preferential pairing" is peculiar to trisomes.

7. The control of the time of synaptic activation is very mutable. Irradiation and chemical mutagens can shift the time (backward or forward) of synaptic activation.

G. G. Doyle

7. Telocentric 6L trisomes and their possible use in the commercial production of hybrid corn.

A preliminary report on this project has been given (MNL 46: 142-146). Additional data have been collected and will be presented.

The telocentric 6L chromosome arose spontaneously in a culture of primary trisomic 6, probably by the transverse division of a univalent chromosome 6 at meiosis.

The telocentric is apparently stable; conversion into an isochromosome has not yet been observed, but only 59 plants have been examined cytologically. It is possible that isochromosomes are formed in chimeric (Y-y) kernels if the telocentric behaves like the B^9 chromosomes described by Carlson. Individuals from chimeric kernels have not yet been examined. However, some sort of change has been occurring in the telocentric chromosome because the trivalent frequency is quite variable and, perhaps related to this, the rates of male and female transmission are also variable.