In 2-6f x 2-6(8786) (2L.79, 6L.87 x 2S.90, 6S.77) there were 28 cells with an association of four chromosomes and 10 with 10 "pairs." In the latter, there were either two nucleoli, each associated with a "pair" of chromosomes, or a single nucleolus with two "pairs" attached. In these "pairs" the mid-segments are homologous, and the end segments are non-homologous. In this cross the total mid-segment length was about 5 times that of the end segments. In the cross described in the first paragraph the two were about equal.

Other combinations of 2-6 and 1-5 interchanges will be grown for further studies.

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1. Tetrasporic embryo sac development in trisomic sectors.

A reconsideration of the apparent grouped crossovers and trisomics from the heterozygote $\underline{\alpha}$ $\underline{a}$ $\underline{sh}/\underline{a}^{m}$ $\underline{Sh}$ reported in the Maize News Letter No. 31 has revealed an interesting explanation. When the above heterozygote which was prepared with 4 different alleles in the $\underline{a}^{m}$ position was crossed by an $\underline{a}^{s}$-$\underline{sh}$, $\underline{Dt}$ pollen parent, a number of crossover types occurred as would be expected if $\underline{a}^{m}$ paired with either $\underline{\alpha}$ or $\underline{a}$ and normal exchange took place. The frequencies were low therefore the cases as expected usually occurred as single seeds; however, there were a few in groups of two or more including one with 5 dilute dotted nonshrunken seeds arranged so that there was little likelihood of their being due to coincident occurrence of single rare events. Hence, the earlier conclusion of groups of crossovers. On test it was discovered that the dilute nonshrunken cases ($\underline{\alpha}$ $\underline{a}^{m}$ $\underline{Sh}$, $\underline{\alpha}$ $\underline{a}$ $\underline{Sh}$ and $\underline{\alpha}$-$\underline{Sh}$) included in addition to the usual crossovers some that had trisomic or parental type embryos. Furthermore the 5 seeds in the sector described above had some of both. The number of these noncrossovers (Table 1) was 48 trisomics, 40 $\underline{\alpha}$ $\underline{a}$ $\underline{sh}$ parentals, and 42 $\underline{a}^{m}$ $\underline{Sh}$ parentals or roughly 1:1:1.

Explaining the occurrence of dilute nonshrunken endosperms with trisomic embryos is easy if we invoke nondisjunction and the production of trisomic and monosomic daughter cells in the germ line. However, this will not explain noncorresponding embryos unless we admit further nondisjunction in the embryo sac developed from an n + 1 megaspore. If this does occur it provides at best 2 tetrasomic : 1 $\underline{\alpha}$ parental : 1 $\underline{a}^{m}$ parental embryo which is not what we observed.

If we assume occasional trisomic megasporocytes with an extra chromosome 3 we can explain the noncorresponding embryos by further assuming

Table 1

Distribution of All the Dilute Nonshrunken (a Sh) Cases from the Heterozygote a a sh/a^m Sh Pollinated by a^s sh

Allele Tested	Seeds Examined	Total a Sh	Dilute Nonshrunken Cases Analyzed							
				Crossovers			Non Crossovers			
								Parentals		
			Total	a a^m Sh	a a Sh	a-Sh	Trisomic	a a sh	a^m Sh	Lost
a^m-1	312057	251	155	20	35	61	13	11	15	96
a^m-3	131448	32	28	0	0	5	10	5	8	4
a^m-4	40501	26	24	0	5	6	3	5	5	2
a^s	307090	287	166	0	43	68	22	19	14	121
Total	791096	596	373	20	83	140	48	40	42	223

that all four meiotic products are included in the development of the embryo sac. If we work out the frequencies and types of endosperms and embryos from tetrasporic embryo sac development we find that we may expect dilute dotted nonshrunken endosperms associated with 4 $\underline{\alpha}$ $\underline{a}^m$: 1 $\underline{\alpha}$ $\underline{\alpha}$: 1 $\underline{a}^m$ $\underline{a}^m$: 3 $\underline{\alpha}$: 3 $\underline{a}^m$ embryos. This of course is not our expected 1:1:1 ratio; however, it was recognized that when the data were collected $\underline{\alpha}$ $\underline{\alpha}$ $\underline{a}^s$ or $\underline{a}^m$ $\underline{a}^m$ $\underline{a}^s$ trisomics would not be distinguished from $\underline{\alpha}$ $\underline{a}^s$ or $\underline{a}^m$ $\underline{a}^s$ parentals and would be classified as such in the tables. A recheck of the remaining test ears of the parental cases confirmed that some were indeed misclassified trisomics. By combining these groups we again have a 1:1:1 ratio. The data provide a good fit as shown by a χ^2 of .8000 and a P value of .68.

From this we conclude that when nondisjunction for chromosome 3 occurs in mitotic divisions of the germ line to produce a trisomic sector, this provides a condition where tetrasporic embryo sac formation occurs with the resulting production of tetrasomic endosperms and trisomic and noncorresponding parental type embryos.

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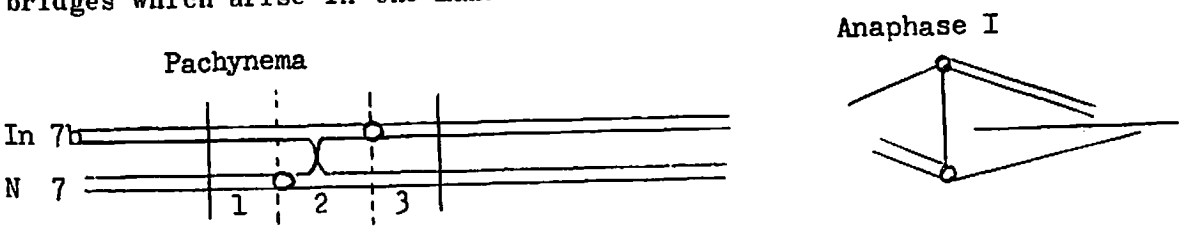
1. The detection of non-homologous crossing over.

In the 1961 News Letter it was suggested that the occurrence of non-homologous crossing over could be detected by the use of pericentric inversions which exhibit a high frequency of non-homologous pairing. Non-homologous crossing over may be detected by the observation of anaphase bridges which arise in the manner shown below:



A crossover in region 2 will lead to the formation of a bridge and a fragment at the first anaphase of meiosis. This is something not normally expected in a pericentric inversion heterozygote. Since anaphase bridges may also arise from short heterozygous paracentric inversions which may be present in the material and may be difficult to detect cytologically, it is necessary to examine normal sibs of the pericentric inversion heterozygotes and to determine if there are bridges present without the pericentric inversion. In Table 1 data are presented for In 7b (S.32-L.30).