Hall, J.C. University of Washington, Seattle, Washington. Non-independence of primary non-disjunction for the sex and fourth chromosomes in D. melanogaster.

Rates of primary non-disjunction in males and females are virtually always reported for the sex chromosomes only. However, if the flies being tested have marked 4th chromosomes - and if the flies to which they are crossed carry marked attached-4th chromosomes - then it is possible to measure simultaneously rates of primary non-disjunction for the sex chromosomes and the 4th chromosomes. This has been done recently in several different experiments, in some of which there is heterozygosity for one or more inversions in the females or males being tested. In the majority of cases, and for all experiments summed, it is observed (Table 1, Table 2) that the frequency of double exceptions is much greater than what one would

Table 1. Primary non-disjunction in females; marked females with and without heterozygosity for inversions were crossed to $\overline{XY}$, vfB/0; RM(4), ci ey^R/0 males.

Inversions present	Single exceptions		Double exceptions		Total	Source
	X	4	obs.	exp.		
1) none	6	5	2	.002	14,099	Sandler et al (1968)
2) none	4	3	0	.001	13,419	" " "
3) none	14	27	2	.006	6,316	Davis, B.K.
4) none	3	14	0	.004	11,904	" "
5) none	1	2	1	.0002	8,462	Hall, J.C.
6) d1-49	26	16	11	.025	16,496	" "
7) SM1	14	10	1	.009	15,262	Sandler et al (1968)
8) SM1	5	8	2	.009	4,377	" " "
9) SM1	5	20	5	.013	7,751	Hall, J.C.
10) TM2	9	12	1	.007	16,020	Sandler,et al (1968)
11) TM2	4	14	0	.010	5,724	" " "
12) SM1; TM2	1	8	0	.001	16,017	" " "
13) SM1; TM2	3	12	0	.007	5,470	" " "
Totals	95	151	25	.101	141,317	

Table 2. Primary non-disjunction in males; marked males with and without heterozygosity for inversions were crossed to y pn; RM(4), ci ey^R/0 females.

Inversions present	Single exceptions		Double exceptions		Total	Source
	sex	4	obs.	exp.		
1) none	26	7	2	.017	10,600	Sandler et al (1968)
2) none	9	5	1	.007	6,312	Davis, B.K.
3) none	9	10	0	.017	5,267	"
4) SM1	50	7	0	.021	16,345	Sandler et al (1968)
5) TM2	19	8	1	.011	13,671	" " "
6) SM1; TM2	25	11	2	.017	15,992	" " "
Totals	138	48	6	.097	68,187	

expect if the sex chromosomes and the 4's were non-disjoining independently (i.e. the product of the two frequencies of single exceptions). The excess of double exceptions seen here does not result from non-homologous pairing, since it is observed in males and because, for the females, there is among the double exceptions no preponderance of the nullo-X, double-4 or double-X, nullo-4 classes. The high coincidence could result from a situation in which the sex and 4th chromosomes are in fact non-disjoining independently, but only in a small fraction of meiotic cells in which meiosis goes awry such that, for example, the sex chromosomes and the 4's move to the poles at random at anaphase I. It should also be noted that there is a rather high degree of variability among experiments.

Reference: Sandler, L. et al., Genetics, 60: 525-558.