The fourth member of this cluster of complementation groups is that associated with 1(3)G5 which has two alleles (Table 1).

The most distal complementation group in the 87D2-4-87E12-F1 interval is that associated with 1(3)ml12. The complementation map of the alleles of this group is presented in Fig. 4. Although 1(3)H24 and 1(3)H25 are indicated as noncomplementary to 1(3)ml12, they do, in fact, weakly complement. The heterozygotes 1(3)H24/1(3)ml12 and 1(3)H25/1(3)ml12 are of 40% and 24% mean viability, respectively; however, unlike other complementing allele combinations of this locus, surviving heterozygotes are associated with a mutant visible phenotype of short, very thin bristles and irregularly arranged ommatidia. Df(3R)ry^{1168} separates 1(3)ml12 from the complementation groups to the left.

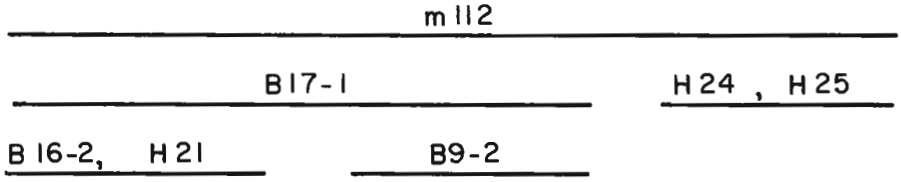

Fig. 4. Complementation map of the 1(3)ml12 group.

Overall, we have observed 21 complementation groups within the 87D2-4 to 87E12-F1 interval, a polytene chromosome segment of 23 or 24 chromomeres.

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Hilliker, A.J. Univ. of British Columbia, Vancouver, British Columbia. Meiotic effects of second chromosome heterochromatic deletions.

It has been suggested by a number of authors (reviewed in Yunis and Yasmineh 1971) that centromeric heterochromatin may promote the initiation of meiotic pairing of homolgous chromosomes and, further, protect the centromere from the "rigors of meiosis"--presumably the terminalization of chiasmata and subsequent reductional segregation of homologous dyads. These hypotheses suggested the following experiments, as they predict that heterozygosity for second chromosome heterochromatic deficiencies may result in appreciable second chromosome nondisjunction and/or chromosome loss. The proximal deficiencies studied were Df(2R)M-S2^{10}, which is deficient for the 2R heterochromatic block and Df(2L)C', which is undoubtedly deficient for much of the 2L proximal heterochromatin (Hilliker 1976).

Df(2R)M-S2^{10}: Virgin females heterozygous for Df(2R)M-S2^{10} and b pr cn were crossed, singly, in vials, to C(2L)VH1,lt; C(2R)P,px males and brooded for six days. As these compound-second autosome bearing males produce nearly equal frequencies of the four classes of C(2L); C(2R); nullo-2; and diplo-2 sperm (Gibson 1977); nullo-2 and diplo-2 female gametes, the consequence of second chromosome nondisjunction or chromosome loss, may be recovered as viable zygotes with 25% efficiency. Thus by the use of control (multiplier) crosses to estimate the total number of fertilized eggs one may assay second chromosome loss and nondisjunction in Drosophila females by mating them with compound second autosome bearing males.

From an estimated 4844 fertilized eggs, no nondisjunctional progeny were recovered. Thus neither chromosome loss or nondisjunction of chromosome two is associated with heterozygosity for Df(2R)M-S2^{10}. The absence of chromosome loss is in contradiction to the theory of the protection of centromeres by flanking heterochromatin. No newly induced isochromosome bearing exceptions (a possible consequence of chromosome "breakage") or patroclinous progeny were observed. Clearly the M(2)S10 chromosome is stable despite the absence of the 2R heterochro-

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matic block. The upper 95% confidence limit of second chromosome loss, and therefore chromosome instability, is 0.25%.

Nor did M(2)S10/b pr cn heterozygotes prove particularly sensitive to radiation-induced nondisjunction. From mating Df(2R)M-S2^{10}/b pr cn females irradiated with 2000 rads of gamma radiation to C(2L)VH,1t;C(2R)P,px males only one matroclinous progeny was observed in an estimated 44,269 fertilized eggs, although 33 patroclinous progeny and 15 newly induced compound second autosome bearing exceptional progeny were recovered. Indeed, M(2)S10 heterozygotes appear to be resistant to radiation induced disjunction. Gibson (1977) found the frequencies of matroclinous progeny from +/1t pk cn females irradiated with 2000 rads to be 0.053%, a frequency an order of magnitude greater than that observed for M(2)S10/b pr cn females.

Second chromosome nondisjunction, and loss, was also assayed in males heterozygous for Df(2R)M-S2^{10} and In(2LR)SM1. Df(2R)M-S2^{10}/In(2LR)SM1 males were crossed to B^{S}Y;C(2L)P,b;C(2R)P,px virgin females, singly in vials and brooded for 9 days. B^{S}Y is a Y-chromosome carrying a small duplication of the X-chromosome including a dominant allele of the Bar (B) locus (see Lindsley and Grell 1968 for further details). B^{S}Y;C(2L)P,b;C(2R)P,px females produce 40% second chromosome nonsegregational progeny when crossed to compound second autosome bearing males. Thus 20% of the female gametes are diplo-2 and 20% are nullo-2. Consequently, nondisjunction for chromosome 2 may be assayed in males by mating them to B^{S}Y;C(2L)P,b;C(2R)P,px females.

In order to estimate the number of nondisjunctional female gametes produced per female per vial, a sample of B^{S}Y;C(2L)P,b;C(2R)P,px virgin females were crossed to C(2L)SH3,+;C(2R)SH3,+ males. As these males produce approximately 25% diplo-2 and 25% nullo-2 sperm (Holm 1969), the nondisjunctional progeny represent 1/4 of nondisjunctional female gametes. Thus, the number of nondisjunctional female gametes per experimental vial may be estimated as 4 times the number of nondisjunctional progeny per multiplier vial. However, in the cross to the Df(2R)M-S2^{10}/In(2LR)SM1 males a nondisjunctional (diplo-2 or nullo-2) sperm fertilizing a nondisjunctional female gamete has a 50% chance of resulting in a viable, diplo-2 zygote.

Thus chromosome-2 nondisjunction per experimental vial may be estimated as 2 times the number of exceptional (i.e., nondisjunctional) progeny per experimental vial divided by 4 times the number of nondisjunctional progeny per multiplier vial. In the experimental series, an estimated 8810 nondisjunctional female gametes resulted in no diploid nondisjunctional progeny. (The only exceptional progeny recovered were one triploid female and 2 intersexes.) Thus a 95% upper confidence limit on chromosome-2 nondisjunction in Df(2R)M-S2^{10}/In(2LR)SM1 heterozygotes of 0.068% is established. With chromosome-2 nondisjunction and chromosome loss less than 0.1% in males and 0.3% in females heterozygous for Df(2R)MS-10, the loss of the heterochromatic block to the right of the centromere of chromosome-2 clearly does not result in any meiotic instability of the second chromosome.

We do not consider these data to indicate the absence of sites important for meiotic pairing in the 2R heterochromatin. If a number of pairing sites are distributed throughout the second chromosome heterochromatin and/or euchromatin, deleting one or even several sites may not be sufficient to induce nondisjunction.

However, the absence of chromosome loss among M(2)S10 heterozygotes argues strongly that centromeric heterochromatin is not important for chromosome stability.

Heterozygosity for Df(2R)M-S2^{10} is associated with a reduction in exchange in 2R. If one examines crossing-over in M(2)S10/b pr cn heterozygotes, where b and pr lie in the proximal euchromatin at 48.5 and 54.5 (Lindsley and Grell 1968) and cn lies in the proximal 2R euchromatin at 57.5, crossing-over is reduced in the pr cn interval nearly fivefold relative to the control. As most crossovers in the pr cn interval occur in proximal 2R euchromatin between stw and cn (T. Yeomans, pers. comm.) and as crossing-over in the b pr interval is not reduced, these data suggested that heterozygosity for M(2)S10 affected exchange in 2R euchromatin. Exchange in 2R was then examined in M(2)S10/cn bw heterozygotes, where bw at 104.5 near the tip of 2R and cn in the proximal euchromatin span most of 2R. Recombinant progeny were recovered at a frequency of 28%, well below that observed in the control (48%). Thus M(2)S10 appears to have a significant effect on meiotic recombination in the 2R euchromatin despite the fact that the region deleted, the 2R heterochromatin, is not a region in which appreciable crossing-over occurs. It should be noted that save for the deltion of 2R heterochromatin the M(2)S10 chromosome is associated with no visible chromosomal aberrations, thus the meiotic effect noted is probably the result of deleting the 2R heterochromatin.

Df(2L)C'. Virgin females heterozygous for Df(2L)C' and b pr cn were mated to C(2L)VH1,1t; C(2R)P,px males and brooded for 6 days. In an estimated 31,200 fertilized eggs, 2 matroclinous and 1 patroclinous progeny were recovered. The frequency of spontaneous second chromosome nondisjunction in Df(2L)C' heterozygotes is 4 x 3/31,200 or 0.038% with 95% confidence limits of 0.008% and 0.112% (Stevens 1942), well within the range observed for Drosophila females homozygous for normal second chromosomes (Gibson 1977).

Although Df(2L)C' is deficient for much of the 2L heterochromatin (Hilliker and Holm 1975; Hilliker 1976), cytological analysis of Df(2L)C' found a substantial block of heterochromatin to the left of the centromere, approximately equal in size to that normally associated with the 2L heterochromatin. This can be explained by the following hypothesis. In the construction of Df(2L)C' from the detachment of C(2L)SH3,+;C(2R)SH3,+ the acentric 2L fragment was generated by a break in the distal 2L heterochromatin (that this break was proximal to the secondary constriction at the 2L heterochromatin-euchromatic junction was clear, as Df(2L)C' was not deficient for this constriction) with the centric 2R fragment being generated by a break in the distal heterochromatin of 2R resulting in a centric 2R fragment duplicated for much of the 2R heterochromatin including the rl^+ locus. Df(2L)C' therefore would be a 2L proximal deficiency but a 2R proximal duplication with a rl^+ locus on each side of the centromere.

In order to test the hypothesis I constructed with radiation nonsister 2L compound autosomes (compound autosomes with one 2L chromatid from one second chromosome and the other 2L chromatid from its homolog) from females heterozygous for Df(2L)C' and b pr cn. If Df(2L)C' carries a rl^+ duplication in the left arm then compound left autosomes deriving one arm from the Df(2L)C' chromosome should more frequently carry rl^+ duplications of 2R than do compound lefts derived from normal second chromosomes. Of 21 nonsister compound left autosomes derived from Df(2L)C'/b pr cn heterozygotes, 17 were rl^+ whereas Yeomans (1972) found only 10 of 21 compound left second chromosomes derived from 1t stw^3/b pr cn heterozygous females were rl^+. Thus Df(2L)C' would appear to be duplicated for rl^+ and, therefore, much of the 2R heterochromatin. Additional genetic evidence is presented in Sandler (1977).

Interestingly heterozygotes for Df(2L)C' and b pr cn show normal levels of recombination in both the b pr and pr cn intervals. Thus unlike Df(2R)M-$S2^{10}$, Df(2L)C' has no marked effect on recombination in adjacent euchromatin. However, in this regard the duplicated 2R heterochromatin may substitute for the deleted 2L heterochromatin.

Further, again unlike Df(2R)M-$S2^{10}$ heterozygotes, Df(2L)C' heterozygous females showed no apparent resistance to radiation induced second chromosome nondisjunction. Df(2L)C'/b pr cn females were irradiated with 2000 rads of gamma radiation and crossed to C(2L)VH1H; C(2R)P, px. Among 56,890 estimated zygotes 27 matroclinous and 71 patroclinous progeny were recovered as well as 73 progeny bearing newly induced compound autosomes. The frequency of recovery of these progeny is similar to that obtained in females with standard second chromosomes given the same irradiation treatment and brooding (Gibson 1977).

The foregoing data have been extracted from Hilliker (1975).

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Hunter, A.S. Univ. of the Pacific, Stockton, California. Drosophila of Pompano Beach, Florida.

A small collection of Drosophila was made in December 1978 in Pompano Beach. The flies were collected by net sweepings over the fallen fruit under various citrus trees. The number of flies of the various species found are as follows:

D. melanogaster	54
D. simulans	12
D. cardini	134
D. acutilabella	5
D. willistoni	26
D. equinoxialis	10
D. sturtevanti	87
D. latifasciaeformis	48

In order to identify the females of the willistoni group, they were each isolated and the genitalia of the male offspring were checked. These data are reported here because I believe that this is the northernmost range of D. equinoxialis. Additional collections made in 1979 and 1980 in the same location contained the same species, although in different frequencies.

Reference: Spassky, B. et al. 1971, Evolution 25: 129.