Annan, Murvel E. Some lasting effects of X-rays on individual D. robusta females as measured by fecundity and fertility.

Ten- or seventeen-day-old virgin D. robusta females were exposed to either 5000 or 2500 r units of X-rays, or served as untreated controls. After treatment each female was placed in a vial with two untreated males. Food strips were changed daily for 20 days and the eggs were counted and cultured. The data on fecundity (mean number of eggs laid per day per female) and fertility (percentage of eggs which became adult) are presented in the following table for 5-day periods. n = number of females in each group.

Days after treatment		0 - 5			6 - 10		11 - 15		16 - 20	
		n	Fecundity	Fertility	Fecundity	Fertility	Fecundity	Fertility	Fecundity	Fertility
Control	Old	9	10.6	16.2%	27.2	30.2%	35.3	31.5%	47.8	28.8%
	Young	10	11.4	23.3%	25.5	32.4%	43.6	31.9%	61.7	29.3%
2500 r	Old	10	8.4	1.1%	6.1	11.8%	18.7	25.2%	21.3	26.8%
	Young	10	9.2	1.1%	7.6	13.5%	17.6	25.1%	27.3	27.9%
5000 r	Old	5	0.8	0	2.9	0	0.8	0	1.2	0
	Young	10	8.3	0	1.4	0	0	0	0.1	0

In spite of the use of somewhat inbred stocks (minimum F value = .50), individual variation was high. The differences in fertility and fecundity associated with the age of the female at treatment are generally not significant. The 2500-r series had a higher fecundity than did the controls for the first 3 days. This initial increase in fecundity was followed by first a decrease and then a gradual increase. On the other hand, the fertility was quite low at first but increased to approximately the same level as that of the controls.

Examination of the flies on the 21st day showed that the ovaries of females receiving 5000 r had disintegrated, so that only a few (in some cases, none) of the egg strings remained. The ovaries of females receiving 2500 r seemed to have had the number of egg strings materially reduced, while the remaining egg strings appeared normal.

Barigozzi, C., Castiglioni, M. C., and Di Pasquale, A. Pseudotumors in D. melanogaster.

Ten spontaneous stocks carrying melanotic masses have been submitted to both phenogenetic and formal genetic investigation. A first approach to the histological structure of the melanotic masses proved that there is no relation between them and the melanomas known in vertebrates; therefore the so-called melanotic tumors in Drosophila are referred to as pseudotumors. Two stocks have been more thoroughly analyzed, and show that factors located in the second chromosome, as well as modifiers in other chromosomes, are responsible for producing pseudotumors. This confirms the data of previous investigators. In all stocks there is great variation in incidence. Pseudotumors develop from clumps, which later melanize. The time of melanization varies with the stock, and ranges from the first instar larval stage to late third instar. Pseudotumors can be produced in pseudotumorless stocks by injecting hemolymph from pseudotumorous larvae. The rate of induction of pseudotumors is related to

the incidence in the stock donor of hemolymph. Incidence of pseudotumors appears to be influenced to a great extent by the general conditions of the cultures. Old cultures have a higher incidence.

Basden, E. B. Drosophilidae in Ireland. An examination of specimens in the National Museum of Ireland, Dublin, and the conducting of a limited but widespread trapping campaign showed the following eighteen species to be present in Ireland. Many of the Haliday specimens in the Museum have no dates, but the months of capture of other specimens are given in parentheses. D. subobscura Coll. and D. obscura Fall (v, vii-ix), D. tristis Fall (v, viii, ix), D. ambigua Pom. (viii), D. silvestris Basden n.sp. (v, viii, ix), D. helvetica Burla (viii, ix), D. deflexa Dud. (viii, ix), D. funebris (Fabr.), (vi-ix), D. melanogaster Mg. (viii, ix), D. phalerata Mg. (vii-ix), D. transversa Fall., D. littoralis Mg. (viii), D. cameraria Hal (viii), D. fenestrarum Fall., D. forcipata Coll. (vii), Scaptomyza graminum Fall. (i.e., the species with four rows acrostichals) (vii), S. apicalis Hardy, and Parascaptomyza disticha Duda (two rows acrostichals) (x). The specimen of D. ingrata Haliday bearing Haliday's original label is almost certainly D. subobscura with shortened hind tarsi.

Basden, E. G. Drosophilidae in Scotland. Monthly occurrences of adult Drosophilidae in Scotland, and whether found indoors or outdoors, are presented in the accompanying table. "Indoors" means inside any building (house, fruit store, glasshouse, animal shed, etc.) or transport vehicle, whether in the windows or elsewhere. "Outdoors" means outside buildings and transport vehicles. Additional records from published data and museum specimens are shown as X, as it is not always definite whether such flies were caught indoors or outdoors.

Most trapping and collecting was done in the Edinburgh district (95.5% of the total of 43,633 Scottish specimens being obtained there), and so the figures give some measure of the relative abundance of different species and of their seasonal abundance in that area. Some flies were collected from toadstools, sap exudates, and windows, or by sweeping, but the majority were trapped at fermenting fruits. Since the traps were usually exposed for a period of one week, some overlapped the end of one calendar month and the beginning of the next. In such cases the results were credited to the second month unless the day of collection was the first of a month, when they were credited to the former month.

Only D. subobscura and perhaps D. obscura can be expected outdoors every month of the year in Scotland, and only D. funebris indoors. The fewest species are found in January and February and the most species from July to September.

The composite table on the following pages shows: (a) The monthly occurrences indoors (I) and outdoors (O) and from previous records and specimens (X) for all Scotland. (b) Monthly totals of specimens trapped and collected (not reared) in the Edinburgh district only, March 1950 to August 31, 1952.

I or O in parentheses ( ) shows that the species was not found in that month but is very likely to be, as it occurred either at the end of the preceding or at the beginning of the following month.

Species	Jan. 1951-52	Feb. 1951-52	Mar. 1950-52	April 1950-52	May 1950-52	June 1950-52
1 D. subobscura Coll.	0 243	0 968	0 691	0 980	0 523	I 0 1160
2 D. obscura Fall. (= obscuroides Pom.)	-	0 12	0 21	0 1692	0 6624	0 2152
3 D. tristis Fall.	-	(0)	0 4	0 76	0 573	0 64
4 D. ambigua Pom.	-	-	-	-	-	2 0
5 D. silvestris n.sp.	-	-	-	2 0	474 0	292 0
6 D. deflexa Duda	-	-	-	-	-	5 0
7 D. funebris (Fabr.)	I 50	I 44	I 0 57	I 0 25	I 0 13	I 0 113
8 D. buskii Coq.	-	-	-	-	-	(0)
9 D. melanogaster	(I)* (2)*	-	-	-	-	I 0 6
10 D. simulans Sturt.	-	-	-	-	I 1	I 4
11 D. ananassae Dol.	-	-	-	-	-	-
12 D. phalerata Mg.	-	-	-	-	0 7	0 17
13 D. transversa Fall.	-	-	-	-	X	0 1
14 D. cameraria Hal.	-	0 9	0 4	0 1	0 2	-
15 D. littoralis Mg.	-	-	-	-	-	-
16 D. immigrans Sturt.	-	-	-	I 1	-	-
17 D. hydei Sturt.	-	-	-	-	-	-
18 D. forcipata Coll.	-	-	X	X	I 0 2	-
19 D. fenestrarum Fall.	-	-	-	X	X	X
20 D. Scaptomyza apicalis Hardy	-	-	-	X	X	I #(0) 1
21 S. graminum (Fall.)	-	-	X	X	I 0 2	I 2
22 S. trochanterata Coll.	-	-	-	-	X	-
23 S. ?montana Wheel.	-	-	-	-	-	-
24 S. griseola (Zett.)	-	-	-	-	-	-
25 Parascaptomyza disticha (Duda)	-	0 1	0 2	-	I 1	I 2
26 Chymomyza costata (Zett.)	-	-	-	-	-	X
27 C. distincta Egg.	-	-	-	-	-	-
28 Amiota alboguttata (Wahl.)	-	-	-	0 1	0 19	0 6
29 Species indet.						

*Trap out from Dec. 19 until Jan. 3. **Larvae in Aug., adults emerged in laboratory in Sept. #Larvae May 26, adults emerged in laboratory in June.

July 1950-52	Aug. 1950-52	Sept. 1950-51	Oct. 1950-51	Nov. 1950-51	Dec. 1950-51	Total for Edinburgh district	
I 0 1817	I 0 2445	I 0 209	I 0 612	0 3530	0 2022	15,200	1
I 0 2237	I 0 1966	0 34	0 71	0 148	0 19	14,976	2
0 47	0 65	0 3	0 3	0 52	0 8	905	3
I 0 7	I 0 4	0	-	(I) 0 3	I 2	18	4
0 1141	0 188	0 375	0 935	0 98	0 1	4,506	5
0 40	0 35	0 7	0 1	-	-	88	6
I 0 468	I 0 507	I 0 12	I 0 363	I 0 470	I 0 97	2,219	7
I 0 11	I 0 48	I 0 1	I 5	-	-	65	8
I 0 133	I 0 183	I 0 23	I 0 404	I 559	I 36	1,346	9
I ?0 190	I (0) 113	(I) 0 1	I 2	I 5	-	316	10
I 1	I 6	-	-	-	-	7	11
0 89	I 0 199	0 41	0 34	0 19	0 1	407	12
0 3	0 5	0 2	0 1	0 2	-	14	13
0 4	0 9	X	(0)	0 1	0 4	34	14
-	-	(0)** 4	-	-	-	4	15
I 6	I 11	I 10	I 97	I 258	I 17	400	16
-	I 0 5	I	-	I 3	I 3	11	17
I 1	I 3	I 1	-	-	-	7	18
X	-	-	-	-	-	-	19
I 4	I 3	X	-	-	-	8	20
I 10	I 0 4	X	I 1	-	0 1	20	21
X	-	-	-	-	-	-	22
X	0 11('53)	0 12('53)	-	-	-	23	23
X	-	-	-	-	-	-	24
I 1	I 0 9	0 5	-	-	0 1	22	25
I 1	0	0	-	-	-	1	26
-	-	X	-	-	-	-	27
0 3	0 134	(0)	-	-	-	163	28
						929	29

Basden, E. B. The vertical distribution of Drosophilidae in Scottish woodlands.

Traps of apple were placed at different heights in four deciduous trees and at their bases over a thirteen-month period. (See Technical Note.) Examination of the thousands of flies caught has not been completed, but preliminary generalizations can be made. When the trees were bare most flies were caught on the ground, but when the trees were in leaf the great majority of flies were caught in the upper part (30-54 feet up) of three mature trees. In the case of one younger tree in a narrow wood-belt of uniform height (40-50 feet), however, most flies occurred always (as far as have been examined) in the ground-level traps. Traps were also placed in a 65-foot conifer prior to leaf-fall of the deciduous trees, and these showed that Drosophila remained in this sheltered crown when they had long forsaken the bare crowns of the latter. Except for Amiota alboguttata (Wahl.), which was not trapped below 27 feet, all the commoner tree-haunting species (mostly of the obscura group) occurred at all levels. There was a definite indication that the two sexes sometimes occurred in different proportions at different heights in the same tree.

Bastock, Margaret The role of wing display in the courtship of D. melanogaster.

In D. melanogaster, males whose wings have been removed are much less successful in courtship than are normal males. In experiments in which five males were exposed to ten females for two hours (after ageing), there were found to be 70% fertilized females if the males were normal and 32% if the males were wingless. Comparable figures were obtained when the experiments were performed in the dark: 76% for normal males and 28% for wingless. This suggests that females are strongly stimulated by the wing display of the males, but that the relevant stimulus is not a visual one. However, if the antennae of the females are removed there ceases to be a significant difference in the mating success of these two types of male. Experiments run concurrently with those above gave 39% success for winged and 44% for wingless males in the light, the figures in the dark being 31% and 22% respectively. Thus the important stimulating elements of the wing display are received by the antennae of the females, although it has not been determined whether they are olfactory or auditory in nature.

Yellow males, which have been shown by analysis to have a lower proportion of wing display in their courtship than wild males, nevertheless are still less successful than wild males in fertilizing wild females, even when the latter lack antennae. Therefore the wing display is probably not the only stimulating factor of the courtship, and the yellow males must be deficient in at least one other factor not perceived by the antennae. Since they also show a lower proportion of licking, this seems a likely possibility.

Bender, M. A. An aberrant class of males in the F_1 progeny of X^cy/M-5 females.

In crosses of heterozygous ring-X females reported by previous workers, the progeny included patroclinous males, in addition to the normal classes. The frequency of these patroclinous males is reported to increase with increasing doses of irradiation. In the cross X^cy/M-5 females by M-5 males, an unexpected class of males appears. In this cross patroclinous males would not be detectable. The new class of males shows the scute bristle effects associated with the Muller-5 chromosome, but does not show y, w^a, or B. The frequency of these "+" males, in an F_1 progeny of 21,129 flies, was 3.4%, whereas the reciprocal class of y w^a B males did not occur. Irradiation of the female parent did not increase the frequency of either class. Out of 24 "+" males tested, all proved perfectly fertile. Crossover data indicate that all the "+" males tested carry a

rod-X. Preliminary cytological examination also indicates that a rod-X occurs in these flies. In the cross y/y females by "+" males, no yellow females are found in the F_1. In view of these data, it seems likely that the rod-X carried by the "+" males must be derived from the $X^c y$ chromosome, with a portion which includes y^+ derived from the M-5 chromosome. Studies are now under way to determine the exact nature and origin of this aberrant class of flies.

Braver, G. A method for determining the existence of chromatid interference in D. melanogaster.

An ordinary crossover experiment gives information about three kinds of crossover classes: the noncrossovers, the singles, and the doubles (the triples and quadruples being relatively rare). From these values it is possible to estimate the frequencies of no-, one-, and two-exchange tetrads. Within the two-exchange class, there are 2-, 3-, and 4-strand doubles. Radical deviations from the commonly accepted 1:2:1 ratio of these three types may, to some extent, be excluded (Weinstein), but the most probable ratio of the three types in any experiment cannot be determined directly from the data.

In crossover runs involving heteromorphic homologues where there is nonrandom disjunction, there are not three but six classes: the noncrossover, single, and double crossovers recovered as the shorter and as the longer homologue. Since these classes receive disproportionate contributions from the three kinds of double exchanges, and only one--the three-strand double--produces heteromorphic dyads, it seems conceivable that the assumption of a 1:2:1 ratio would not fit the data but that some other ratio (indicating chromatid interference) would be more appropriate. The equations to be used for this analysis are those given in nonrandom disjunction in Drosophila (Genetics, 1951, p. 274). Since in these equations chromatid interference is assumed to be absent, one would expect to get inconsistent values for c (the coefficient of nonrandomness) from the different equations if chromatid interference were in fact present. In this case, revised equations not assuming the 1:2:1 ratio but retaining the unknowns E_2-2s, E_2-3s, and E_2-4s could be used to determine the frequencies of those types.

This approach involves the assumption that nonrandomness is manifest only in the single and three-strand double exchanges, and that it has the same value in both cases. Consequently, deviations from the 1:2:1 expectation might be interpreted as an indication, not of chromatid interference, but that nonrandom disjunction is operating in some way distinctly different from that described in the above-named reference.

Nonrandom disjunction has been tested in parallel runs of $In(1)\ sc^8/In(1)sc^4\ sc^8$ females, in which one set carried In(1)AB on the $sc^4\ sc^8$ chromosome, substantially eliminating double crossovers (23 recovered in a total of 33,994). Values of c were calculated for the female progeny, from the none, single, and double crossover strands recovered in the $y^{31d}\ sc^8\ f\ cv\ w^a\ sc^8/y\ sc^4\ v\ sc^8$ experiment (N = 17,026), and from the none and single crossover strands recovered in the $y^{31d}\ sc^8\ f\ v\ cv\ w^a\ sc^8/y\ sc^4$ AB sc^8 experiment (N = 33,994). For the cross without In(1)AB, values of c were .727, .668, and .762 from no-, single-, and double-exchange tetrads, respectively. For the cross with In(1)AB, corresponding values were .733 and .672 (c was not calculated for the infrequent double exchanges).

Whether the inconsistencies in the c values arise from chromatid interference, or from some extraneous factors like viability effects or inconsistent behavior of the different types of tetrads with respect to nonrandomness, remains to be determined.

Braver, G. Phenotypic detection of heterozygosity for w^a in v/v.

Among progeny from a cross of y w^a/y cv v f females to y cv v f males, the v females appeared to be of two types. One type appeared to be of normal v phenotype, while the other was off-shade, appearing slightly more orange. The distribution of mutants in these females indicated that the diluted v might be due to the presence of one dose of w^a. Crosses of both kinds of females to appropriate males indicated that this was the case (the v females were v w^+/v w^+; the off-shade females were v w^+/v w^a).

Brun, G. Existence of CO_2-sensitivity virus in natural populations of D. melanogaster.

Heretofore, CO_2-sensitivity virus had been found in a single laboratory stock of flies carrying the gene ebony. Recently several strains bred from individuals captured in different parts of France and in Rothamsted (England) were tested for CO_2-sensitivity. About one-third of them were found to harbor the virus, which accordingly is able to maintain itself in the wild.

Burdette, Walter J. Effect of defective ring gland on tumor incidence.

It is reasonable to suppose that humoral factors controlling the growth of larvae may also affect the development of tumor cells, since tumors usually arise in Drosophila during the larval stage. Any interference with metamorphosis may therefore alter the incidence of tumors, the growth of which may well be limited because of the holometabolous nature of the animal in which they occur. This was tested by comparing the incidence of tumors in tu^{wps} and se e^{11} tu^{49h} tumor stocks, with the 1(2)gl gene heterozygous, to those with the 1(2)gl gene homozygous. The results given in the table below indicate that tumor incidence in both tumor stocks was higher for giant larvae than for their heterozygous siblings.

	Homozygous 1(2)gl			Heterozygous 1(2)gl		
Tumor strain	Tumor-bearing	Population	Percentage tumors	Tumor-bearing	Population	Percentage tumors
tu^{wps}	135	550	24.5	58	2630	2.3
tu^{49h}	174	526	33.0	8	1668	0.5

Burla, H. What is called D. monitium today is not identical with the type specimen.

D. monitium is maintained in genetics laboratories, and studied cytologically and otherwise by various workers. It now proves to be different from the true D. monitium as described by de Meijere, the type specimen of which was kindly lent for comparison by the Zoological Museum of Amsterdam. There are some marked differences in characteristics of the external morphology, and the male genital apparatus is different in important details, in spite of similar general features that indicate close relationship. The laboratory species will ge given a new name.

Another species erroneously called D. montium occurs in Africa. It is different from both the above-mentioned species, as well as from D. auraria,

which it resembles most, but is the same as D. séguyi Smart = D. subobscura Seguy.

A sex-limited polymorphism--viz., dark and light females--occurs, differently expressed, in the laboratory species from Brazil, in D. séguyi, and in D. auraria, but has not been found in the oriental form of the laboratory species. Studies with samples of different geographical origin of each of the three species showed the existence of geographical variation in characteristics of the genital apparatus.

Cross experiments between D. séguyi, D. auraria, and the laboratory species were wholly negative.

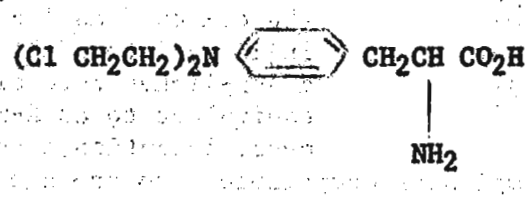
Castiglioni, M. C. Paper chromatography for fluorescent substances in D. melanogaster. Paper chromatography for fluorescent substances has been applied to the study of the eye pigments in the following genotypes of D. melanogaster: w/w; w^i/w^i; w^{bf}/w^{bf}; w^{bf}/w; wa/w; w^{bl}/w; w^e/w; w^+/w; w^{bf}/w^i; w^a/w^a; w^{bl}/w^{bl}; w^e/w^e; w^+/w^+; w^i/w; w^a/w^i; w^{bl}/w^i; w^e/w^i; and w^+/w^i. A remarkable correspondence has been found between amount of pigment granules (on histological sections) and intensity of fluorescence. Heterozygotes are clearly intermediate for intensity of fluorescence between the homozygotes from which they derive. Analysis of the chromatograms has so far been only qualitative.

Di Paolo, Joseph A. Test for mutagenic action of desoxypyridoxine. Hans Selye has pointed out that desoxypyridoxine belongs to a group of compounds known collectively as pressor amines or stressor compounds. Five other compounds of this series capable of initiating the General Alarm Syndrome have been shown to have definite mutagenic results. Desoxypyridoxine, however, does not continue the parallelism of being a stressor and mutagenic agent under the conditions tested. Adult, wild Oregon males were injected intra-abdominally with sublethal doses of desoxypyridoxine (5×10^{-3} M in 0.7% saline) and the sex-linked recessive lethals were determined by the Muller-5 technique.

Compound Tested	No. Chromosomes Tested	No. Lethals	% Lethals
Desoxypyridoxine	997	1	0.1%
Desoxypyridoxine + cold shock	600	2	0.3%

Dresden, D., and Oppenoorth, F. J. Some properties of a gamma HCCH-resistant strain. Further experiments were carried out with the gamma HCCH-resistant strain mentioned in DIS-26. The resistant and susceptible flies proved to be significantly different upon injection of gamma HCCH - peanut oil emulsions. This difference was not caused by a difference in size. An attempt was made to evaluate the dominant and semidominant effects of the individual chromosomes. This was made possible by an adequate use of the test strain y; bw; e; ci ey^R. By comparing the susceptibility of flies with a number of chromosomes from either the susceptible or the resistant strain, the role of the different chromosomes could be traced. It appeared that none of the chromosomes was responsible for the whole resistance. Owing to the fact that the level of resistance is rather low, it was not possible to determine how much each chromosome contributes to it. Only a significant effect of the second could be shown.

Fahmy, M. J., and Fahmy, O. G. Chemical mutagenesis in D. melanogaster. Investigation of the mutagenicity of a new series of chemical inhibitors of the rat Walker tumor has been started. This series consists of aromatic nitrogen mustards derived from amino acids and various low-molecular-weight peptides. The first compound tested is a mustard derivative of phenylalanine, p-di-(2-chloroethyl)-amino-phenylalanine:



Three concentrations of the sodium salt of the compound were dissolved in isotonic saline and injected into the haemocele of two-day-old Oregon-K males. The rates of induction of recessive lethals were determined by the Muller-5 technique, and are shown in table 1.

Table 1

Conc. (%)	Survival after injection (days)	Chromosomes tested	No. of lethals	% lethals
0.17	< 13	1793	35	2.0
0.25	< 9	1147	20	1.6
0.5	< 7	885	78	8.8

Unlike most of the alkylating mutagens so far tested in our laboratory, this compound does not show a consistent increase of mutagenic activity with increased concentration. It must be noted, however, that this compound has a very marked delayed toxicity effect on Drosophila, which increases with concentration. The lack of correlation between mutagenicity and concentration could easily be the outcome of toxicity complications.

Lethals induced by the above compound and four other alkylating mutagens have been tested against 63 known "visible" mutations of the X chromosome, in an attempt to determine the frequency with which these loci are being eliminated by different agents (table 2).

Table 2

Compound	No. of lethals tested	Markers involved in deficiencies	
		No.	%
2:4:6-tri(ethyleneimino)-1:3:5-triazine	398	64	16.1
1:2,3:4-diepoxybutane	89	9	10.1
1:4-dimethanesulphonoxybutane-2-yne	69	12	17.4
p-di-(2-chloroethyl)-amino-phenylalanine	131	8	6.1
NN-di-(2-chloroethyl)-p-amino phenyl butyric acid	50	3	6.0

The number of lethals tested is not yet sufficient to permit any definite conclusions about distribution, except perhaps for the triazine. The data suggest that the X loci most frequently affected by the triazine are the same as those which respond most frequently to X-radiation.

Fahmy, O. G., and Fahmy, M. J. The effect of dose on mutagenicity and chromosome breakage induced by 2:4:6-tri(ethyleneimino)-1:3L5 triazine.

The triazine is one of the strongest chemical mutagens for Drosophila. A concentration of the compound as low as 4.0×10^{-4} M (.008%) injected into adult Oregon-K males, induced a sex-linked recessive lethal rate of 18%, equivalent to an X-ray dose of 6000 r. Moreover, injection experiments using the same molar concentration on males of comparable size and age yielded almost equal mutation rates. It appeared, therefore, that the injection technique was sufficiently consistent with the triazine to justify the investigation of the effect of the variation of dose on mutagenicity and chromosome breakage. It has been possible to establish that the total lethal rate increases linearly with dose, and that lethals with major chromosome rearrangements increase more than linearly, and those without increase less. These relationships are qualitatively similar to that which has been established for X-radiation. Quantitatively, however, the proportion of lethals with major rearrangements at any mutagenic level is higher for X-rays than for the triazine.

An analysis has also been undertaken of the variation in frequency of major chromosome rearrangements as determined in the salivaries of the F_1 larvae. About 200 wild-type Oregon-K males were injected with each of the tested concentrations, and half of them were subjected to the Muller-5 test for determination of the rate of sex-linked recessive lethals and the other half mated to wild-type females for cytological analysis. Only the X chromosomes in the salivaries of the F_1 female larvae were analyzed. For each concentration 200-300 X chromosomes were observed. The results, interpreted in terms of X-chromosome breaks, are summarized in the table.

Breakage frequency in the X chromosome in relation to dose

Dose (Molar Conc. $\times 10^{-4}$)		1.0	1.5	2.0	3.0	4.5
Lethals (%)		3.6	6.6	9.4	12.8	19.6
Breaks (%):	effective	2.1	7.7	9.9	12.4	22.1
	potential	3.4	11.8	15.6	15.9	23.3
	total	5.5	19.5	25.5	28.3	45.4

It was soon realized that the frequency of mosaic rearrangements was extremely high, compared with those induced by mutagenically equivalent doses of X-rays. Care was taken, therefore, to confine observation to preparations of larval salivaries showing a large number of analyzable nuclei. Breaks that are involved in mosaic (fractional) rearrangements are scored as "potential," to distinguish them from "effective" breaks that give rise to rearrangements in all cells of the gland. The frequency of effective breaks in the X chromosome is slightly lower than that induced by mutagenically equivalent doses of X-rays. But if potential breaks are taken into consideration, the total breakage frequency induced by the triazine is significantly higher than that induced by X-rays. Chromosome breaks induced by the triazine, like those induced by X-rays, seem to increase more than linearly with dose. The full data and a more extensive analysis of the mechanism of chromosome breakage under the effect of triazine will be published elsewhere.

Freire-Maia, A., and Freire-Maia, N. Mating preference in D. ananassae. Experiments on the sexual activity of two strains of D. ananassae, one from Recife (in the northern state of Pernambuco) and the other from Passagem (in the southern state of Paraná), the first being the same as that already used in another test (see DIS-26, pp. 99-100), revealed that the Passagem flies were sexually more active ("sexual activity index" = 2.35), showing a highly significant tendency to copulate within the same strain. The sexually less active strain (Recife), with an SAI of 0.92, nevertheless showed a clear tendency (although significant only for the females) to copulate with the Passagem flies. This behavior is similar to the phenomenon named "one-sided mating preference" by Dobzhansky. As the previously published data were obtained with flies from the same localities and presented quite different results, it seems that there is a marked variation within a population regarding sexual activity.

Freire-Maia, N. Frequencies of the two color forms of the Brazilian D. montium in natural populations. Natural populations of D. montium from Brazil and Hawaii are polymorphic with regard to color and pattern of abdominal tergites. Two genetically pure forms (a light and a dark one) have been isolated, the gene for the dark pigmentation being dominant over its allele for the light one. Besides this polymorphism, D. montium presents also a sexual dimorphism, the effects of the gene for the dark form being much more apparent in the females than in the males, where an overlapping of the phenotypes has been discovered. For this reason, in order to obtain accurate information about the frequencies of the two alleles in natural populations as well as in artificial populations maintained in the laboratory, only the females have been analyzed. In the latter, the three genotypes were always present with frequencies in accordance with the Hardy-Weinberg formula.

The following table summarizes the data we have obtained from 1947 up to now, regarding the frequencies of the two color forms of D. montium in some Brazilian populations, from the hinterland to the southern coastal regions. In many localities, as in Salvador and Ilhéus in the state of Bahia, Cuiabá in the state of Mato Grosso, Boa Esperança and Uberlândia in the state of Minas Gerais, etc., the species has not been found at all.

Interestingly enough, the total sample from Paranaguá presents a quite different composition from those of Morretes and Antonina, although they are neighboring towns. The samples from the southern localities taken together (Paranaguá, Itajaí, Gaspar, Florianópolis, and Porto Alegre) also show a genetic structure different from those collected in the other localities. The chi-squares calculated for the two comparisons are highly significant; 20.79 for the first and 30.06 for the second.

(see next page for table)

Localities	Time of collection	Females			Light females (%)	
		Light	Dark	Total		
Goiánia, Go	September, 1953	21	4	25		84.00
Belo Horizonte, MG	September, 1953	21	5	26		80.77
São Paulo, SP	June, 1947	127	41	168	75.60	
São Paulo, SP	March, 1949	63	10	73	86.30	80.14
São Paulo, SP	June-July, 1949	40	6	46	86.96	
Antonina, Pr	November, 1951	18	4	22	81.82	84.00
Antonina, Pr	March, 1952	3	0	3	100.00	
Morrestes, Pr	March, 1947	31	2	33	93.94	
Morretes, Pr	May-June-July, 1951	15	1	16	93.75	
Morretes, Pr	September, 1951	28	6	34	82.35	
Morretes, Pr	Oct.-Nov.-Dec., 1951	27	7	34	79.41	85.80
Morretes, Pr	March, 1952	5	0	5	100.00	
Morretes, Pr	August, 1953	17	5	22	77.27	
Morretes, Pr	October, 1953	16	2	18	88.89	
Paranaguá, Pr	March, 1952	8	5	13	61.54	
Paranaguá, Pr	September, 1952	99	49	148	66.89	64.94
Paranaguá, Pr	October, 1953	6	7	13	46.15	
Itajaí, SC	June, 1952-1953	4	5	9	44.44	
Gaspar, SC	June, 1952	6	8	14	42.86	53.33
Florianópolis, SC	November, 1952	1	1	2	50.00	
Porto Alegre, RGS	March, 1952	5	0	5	100.00	
	TOTAL	561	168	729	76.95	76.95

Freire-Maia, N. New data on the incidence of pericentric inversions in Brazilian populations of D. ananassae. Besides the three pericentric inversions previously found in some Brazilian populations of D. ananassae and already reported in DIS-26 (pp. 100-101) we have discovered two new ones in other localities. The present situation may be summarized as follows:

Localities	Region	Number of individuals examined	Time of collection	Pericentric inversions	No. of times
Passagem, Pr	South	54	June, 1951	A	1
Recife, Pe	North	35	July, 1951	B	1
Antonina, Pr	South	62	March, 1952	C	2
Antonina, Pr	South	25	November, 1951	-	0
Paranaguá, Pr	South	67	September, 1952	D	1
Paranaguá, Pr	South	46	March, 1952	-	0
Uberlândia, MG	Center	29	March, 1953	E	1
Others	North, Center, and South	611	---	-	0
		929		5	6 (0.65%)

Inversions A, B, C, and E are located in the 3rd chromosome, and inversion D in the 2nd chromosome. It is interesting to note that the number of pericentric

inversions found in D. ananassae is higher than that detected in the natural populations of all the other Drosophila species taken together.

Frisch, Rose E. An attempt to modify the phenotype of mutant Drosophila larvae by feeding wild-type pupae and specific chemicals.

Drosophila larvae of mutant stocks vestigial, aristapedia, lethal giant, Glued, and Bar were fed crude preparations of wild-type pupae in an attempt to modify the phenotype of the mutant adults toward the wild type, as had been done for the eye-pigment mutants v bw and cn bw by Beadle and Law (Proc. Soc. Exp. Biol. & Med. 37, 1938). A total of 902 larvae of varying ages were fed different types of crude preparations of wild-type pupae; 458 (51%) survived. The results were negative.

In a second group of experiments a total of 2259 larvae of mutant stocks Bar, Glued, and eyeless^2, and of L-S wild type were fed specific chemicals: hydantoin, histamine dihydrochloride, histamine diphosphate, uric acid, urea, 4-ketoamyltriethyl ammonium iodide and 4-ketoamyltrimethyl ammonium iodide, and tryptophane. The first three of these substances, particularly hydantoin, had been listed by Khouvine, Chevais, and Gregoire (C. R. Acad. Sci. Paris 217, 1943) as being active in increasing facet number when fed or injected into Bar larvae. The larvae were exposed to a range of concentrations of the chemicals and at varying ages. Flies were checked only for large changes in facet number, that is, 50 or more facets. None of the substances tested had any effect on the facet number of the adult flies with the possible exception of 4-ketoamyltriethyl ammonium iodide, which gave four Bar males with greatly increased facet number (2 times normal) out of the 83 (35%) which survived the feedings. This effect could not be reproduced. (In general, yeast in the medium with the chemicals being fed caused great variability in the results and in their reproducibility.) The failure of hydantoin, histamine dihydrochloride, and histamine diphosphate to increase facet number was inexplicable. It may be that different stocks of Bar vary in their reaction to these substances.

In the course of the experiments with the pupae and chemicals it was noted that there was a marked reduction of facet number in Bar (10 ♀ - 25 ♂ facets instead of the 70 ♀ - 90 ♂ of normal Bar flies) when the larvae had been starved. In addition there was often a marked division of the facets into anterior and posterior lobes, with pigmented but unfaceted areas between and around the lobes. The eyes of Glued flies starved as larvae also were reduced in size from one-half to two-thirds normal, and were flattened and glassy looking. They showed pigmented but unfaceted areas irregularly spaced in the eye.

It has been pointed out (Steinberg, Genetics 26, 1941, and Chevais, Bull. Biol. de la France et de la Belgique 77, 1943) that the changes in facet number which accompany the feeding of Calliphora extract or changes in temperature during a critical period in Bar are most probably due to a change in the labile determination of some of the cells of the eye disc from head hypoderm to facet, or from facet to head hypoderm (as when there is a reduction in facet number with increase in temperature). It is an interesting possibility that starvation of the larvae at a critical period also might change the destiny of some of these indeterminate cells of the eye disc from facet to hypoderm.

Fujii, S., Kawabe, M., Okuda, Y., Kimoto, Y., and Kanehisa, T. Decrease of facet number in Bar eyes by chemicals.

An attempt was made to decrease the facet number of Bar eyes in D. melanogaster by adding various chemicals to the culture medium (meal, 50 g; sugar, 20 g; agar, 5 g; water, 400 cc). The results are shown in the following table. From this it seems that acriflavine, scarlet, and butter yellow reduce the facet number of Bar eyes, and that boric acid, phloroglucinol, and Sudan III reduce them in some degree.

Chemicals	Concentration	♀♀ Obs. No.	♀♀ Facet number Min.-Max.		♀♀ Mean	♂♂ Obs. No.	♂♂ Facet number Min.-Max.		♂♂ Mean
Control		10	34	45	39.2	10	40	69	53.6
Formalin	0.08%	20	22	35	28.4	20	26	49	38.5
Control		9	32	47	40.2	10	35	61	45.2
Dinitrophenol	(1/5,000 M	9	31	49	40.4	3	43	51	45.6
	(1/10,000 M	10	23	39	30.3	9	38	55	44.2
	(1/50,000 M	20	19	40	30.9	19	25	75	49.7
Control		17	25	79	55.2	17	45	105	75.2
Phloroglucinol	(0.2%	3	51	56	53.3	6	64	74	70.6
	(0.1%	6	30	46	36.3	12	49	78	60.6
Hydroquinone	0.2%	15	49	68	54.6	8	60	73	68.4
Phenol	(0.2%	6	36	62	49.5	8	64	76	70.2
	(0.1%	15	35	67	45.9	10	64	102	82.7
Control		9	53	87	64.4	6	60	85	74.5
Acriflavine	0.01%	10	39	50	42.7	11	35	66	50.3
Scarlet	(0.5*	4	35	39	37.0	11	51	96	70.2
	(0.3*	3	37	42	39.3	10	44	87	60.7
	(0.1*	10	37	55	45.4	10	26	55	45.4
Control		20	46	103	65.1	19	50	92	72.7
Sudan III	(1.0*	5	33	42	38.1	3	44	65	55.6
	(0.5*	10	44	61	52.7	9	58	80	70.3
	(0.3*	7	58	75	66.4	5	65	75	70.0
Butter yellow	(0.05%	11	27	46	33.8	9	39	60	47.6
	(0.02%	10	39	80	55.7	10	51	98	75.1
Boric acid	0.01%	2	32	43	37.5	11	44	77	60.2
Acriflavine	0.03%	12	28	48	41.6	8	53	77	66.2

*cc of saturated alcohol solution in 10 cc of culture medium.

Glass, B., and Schmukler, M. Attempt to detect pseudoallelism at the dumpy locus (2-13.0).

An attempt was made to determine whether vortex and oblique are pseudoalleles. The mutants used were dp^v, showing only thoracic vortices, and dp^{o2}, showing only shortened wings (like dumpy in degree). [dp^{v51}--appeared in 1951 in stock X-rayed in 1949. dp^{o2}--origin unknown; kept in stock (John Hopkins, No. 18) since 1944.] dp^{o2} was crossed with dp^v, and the F_1 females were test-crossed to dp/Cy males, dumpy showing both thoracic vortices and shortened wings. The progeny included 779 oblique, 757 vortex, 44 "dumpy," and 6 wild-type flies; total, 1586.

The apparent crossovers were tested by backcrossing to dp/Cy. Thirty apparently dumpy flies and five apparently wild-type flies were tested. The

former yielded dumpy and oblique offspring in every case; the latter yielded dumpy and vortex in every case. It is therefore clear that no true cross-overs had been obtained. The oblique allele tested had thus showed reversed dominance (vortex dominant over nonvortex) of the dumpy-vortex effect in 5.35% of dumpy/oblique flies. The vortex allele had showed a lack of penetrance of the vortex effect in vortex/dumpy flies amounting to 0.8%. The attempt to detect pseudoallelism, therefore, proved impractical, and was abandoned.

Hinton, Claude W. The production of superfemale-female mosaics. About 25 mosaic females comparable to the one described by Hinton (DIS-26) have been incidentally recovered from a variety of crosses involving Catcheside's unstable ring chromosome. It is evident from the mutants involved that these mosaics began as superfemale zygotes, in which subsequent elimination of the ring chromosome occurred; the ring chromosome may be either maternal or paternal in origin. Although the area of 3X hypodermal tissue was sometimes small, only two of twelve mated superfemale-female mosaics have produced offspring. One of the fertile ones transmitted the y w spl sn, the In(1)dl-49, y w lz^s, and the $In(X^{c2})w^{vc}$, f chromosomes, verifying her 3X constitution. Despite their poor fertility, these superfemale-females provide a natural experiment analogous to Beadle and Ephrussi's transplantation of superfemale ovaries into regular female hosts.

Hollands, Keith G., and Cole, Kathleen M. An investigation of the mutagenic effect of colchicine on D. melanogaster, using the aerosol technique. The apparatus consisted of a modification of the type used by Demerec in his work and was composed essentially of a magnetic valve, an electric timer, a glass nebulizer, tubing, and treatment bottles. With this technique, a solution of colchicine in water gave indications of a positive mutagenic effect. Colchicine applied in this fine spray exercised a retarding effect on the development of the progeny of treated adult D. melanogaster. Further investigations are warranted.

Hollingsworth, M. J. Intersexes in D. subobscura. The external and internal anatomy of intersexes in D. subobscura (DIS-25 and 26) has been studied in detail. Females homozygous for the gene ix become male-like in varying degrees, depending on the genetic background. Since a complete range of types from extreme female-like to extreme male-like has been obtained, it has been possible, by using these intermediate forms, to homologize the structures in the female external genitalia with those of the male. The conclusions arrived at differ on some points from those reached by Dobzhansky, Ferris, Goldschmidt, and Newby in their studies on the genitalia of Drosophila.

A positive correlation has been found between the degree of development of the male and the amount of reduction of the female structures, and between the changes in the anal plates in the male-like direction and the degree of development of male structures. There is no correlation between the degree of maleness of the external genitalia and the degree of maleness of the gonads.

Internally, the male and female ducts develop from different regions of the genital disc, those of the male being posterior to those of the female.

No effect of maternal age on the degree of maleness of intersexes has been observed. The 39 intersexes from one pair, in a period of 20 days, were very uniform. The 38 intersexes from another pair, in a period of 15 days, became somewhat more female-like.

Ishihara, T., Momma, E., and Makino, S. Diurnal activity of some Drosophila species.

Collections of flies were made with the use of banana traps. The results of observations made in the Botanical Garden, Sapporo (an altitude of about 15 m), from July to August, showed that D. auraria, D. nigromaculata, and D. transversa were bimodal in their diurnal activity. Observations made in Mt. Asahidake (having an altitude of 1060 m) in July showed that D. bifasciata had a clear bimodality of diurnal activity, whereas D. nigromaculata was incompletely bimodal. With the light less than 4 lux, or at temperatures below 10° C, flies became mostly dormant, either before sunset or after sunrise. On cloudy and rainy days when the humidity was higher than 90%, diurnal activity was incompletely bimodal.

Judd, Burke H. Studies concerning the lethality of T(1;4)w^{258-21}.

Investigation of the translocation T(1;4) w^{258-21} has shown that the lethality of this rearrangement is probably due to a variegation effect directly associated with the translocation, and is not due to a lethal closely linked to the break points. This rearrangement shows variegation for Notch, diminutive, split, and white. Two males hemizygous for this translocation and probably carrying extra Y chromosomes have been recovered. The presence of extra Y's could not be confirmed, since these males were sterile. The eyes of these males were slightly smaller than normal and the facets were somewhat irregular; there was no variegation for white. Several thoracic bristles were missing (dorsocentrals and scutellars), and the microchetes were rather sparse and irregularly distributed. The over-all size of these males was somewhat less than that of their sibs.

Further evidence against a closely linked lethal comes from the crossover products recovered from the translocation. These show that if a separate lethal is present it must lie to the right of split and to the left of echinus, since all other regions of the X chromosome have been recovered in normal males.

Studies using females of constitution T(1;4)w^{258-21}/In(X^{c2})w^{vc}, f show that the translocation is also cell lethal. The In(X^{c2})w^{vc}, f chromosome is frequently eliminated to give gynandromorphs. No elimination was observed in females of the above constitution, whereas sisters (Complete/In(X^{c2})w^{vc}, f) gave a high frequency of gynandromorphs. The presence of a Y chromosome in these females seems to have no effect on the cell lethality; however, females known to carry two extra Y chromosomes were not studied.

Kanehisa, T. Tumors found in wild strains of D. virilis and other Drosophila species.

Tumors similar to that in the Maruyama strain (DIS-25) were found in wild strains collected at Otaru, Otsu, Izushi, and Daimanji in Japan. The number of tumor individuals actually found in these strains is given in the table. Expressivity of these tumors is lower than that of Maruyama. Similar types of tumors were also found in wild strains of D. immigrans, D. nigromaculata, and D. funebris collected in Japan.

Strains	Tumors	Total flies investigated
Otaru	149	1243
Otsu	26	325
Izushi	10	195
Daimanji	69	627
New York	110	648

Kikkawa, H. A new substance inducing an eye color in Drosophila. In collaboration with a chemist, Dr. S. Senoh of the Osaka City University, the effect of various substances relating to kynurenine on the eye color of v, bw; cn, bw; st, bw; and w of D. melanogaster was examined. The substances used were as follows: benzoylalanine, 2-hydroxybenzoylalanine, 3-hydroxybenzoylalanine, 2,3-dihydroxybenzoylalanine, 2,3-dihydroxybenzoic acid, 5-hydroxykynurenine, 3,4-dihydroxykynurenine, 3,5-dihydroxykynurenine, and 3,6-dihydroxykynurenine.

The effect of 2,3-dihydroxybenzoylalanine was very specific, that is, it gave rise to a deep yellow eye color in the cn, bw mutant. But the substance was nearly ineffective in the v, bw mutant. Furthermore, it gave a negative result in the white-1 mutant of Bombyx mori, which was assumed to be homologous to the cinnabar mutant of Drosophila.

Kikkawa, H., Ogaki, M., and Tsukamoto, M. Resistance to insecticides in D. melanogaster. Degree of resistance to DDT, BHC, parathion, and other insecticides was examined in isogenic strains collected from various localities in Japan. Generally speaking, strains obtained from localities where the insecticide had been frequently used showed high resistance. However, several mutant strains were found to have high resistance notwithstanding the fact that they had been cultured for a long time in the laboratory and had never been treated with insecticides. This fact seems to indicate that resistance to insecticides is not produced by treatment with insecticides, but is present as a spontaneous mutation. Stated another way, the mutation and selection hypothesis seems to apply in this case.

Genetic analyses employing resistant and nonresistant strains with visible genic markers, showed that the trait of resistance was dominant to nonresistance, and the major gene responsible for this trait was located near 70 in the second chromosome. It is of great interest that resistance to DDT, BHC, parathion, chlordane, nicotine, and other contact or nerve poisons seems to be controlled by the same dominant gene. This seems to explain the phenomenon of cross-resistance from a theoretical point of view. The chemical function of the major gene located near 70 in the second chromosome is being studied.

King, James C. Development of resistance to DDT in D. melanogaster. As part of a program for the study of the genetics of resistance to insecticides supported by the Research and Development Board of the Office of the Surgeon General (Contract No. DA-49-007-MD-327), work has been under way for about fifteen months toward developing stocks of D. melanogaster resistant to DDT. Adult flies are treated with an aerosol of DDT dissolved in tributyrin; dosage is measured in time of exposure, and survivors are used as parents of the succeeding generation. The ten selected lines being carried stem from two original stocks: one a laboratory Oregon-R, the other a wild stock collected in a grocery store in Syosset, New York, in July, 1952. The selected lines are distributed among three levels of selective intensity: one in which all the survivors of a dose killing approximately 50% of the treated flies are used as parents; another in which about ten pairs of flies, survivors of a dose killing 90% or more of those treated, are used as parents; and a third in which the parents are a single pair of survivors of a treatment resulting in close to 99% mortality. Since about a thousand flies are used for each treatment, the lines subjected to the two highest levels can be treated only in alternate generations. Every other generation must remain untreated in order to build up populations large enough for treatment.

The problem of measuring resistance is very complex. Many variables affect the results; some connected with the physiological condition of the flies, others involving the conditions of administering the insecticide. With the most meticulous techniques, there are still troublesome fluctuations in results; variances are high and errors large. After some twenty generations of selection, however, a picture of the response is emerging and some results are clear.

The lines stemming from the Ore-R stock show no measurable increase in resistance as compared with the control. The Syosset lines, on the other hand, have developed resistance. The most resistant lines are those carried at the 50% level of selective intensity. Here the LD_{50} now stands at approximately twenty minutes' exposure as compared with seven or eight for the control. The Syosset lines carried at higher levels of selective intensity lag behind those carried at the 50% level, but of course they have been subjected to selection in only half as many generations. A cross between one of the most resistant lines and the control gave an F_1 of intermediate resistance and an F_2 that showed no more resistance than the control.

The program is being continued and further results will be published as they become available.

Lefevre, G., Jr., and Farnsworth, P. Reverse mutation at the forked locus.

Through the courtesy of Dr. M. M. Green we have been provided with forked alleles of three different kinds: (1) f^1, spontaneous in origin and suppressed by Whittinghill's forked suppressor; (2) f^{36a}, spontaneous in origin but not suppressed; and (3) f^{51a4}, X-ray-induced but not suppressed. Males from each stock, carrying additional markers, were exposed to 5000-r doses of X-rays and were then mated to y^2 w^a v f, sc^8 dl-49 females. The F_1 females produced from this cross were closely inspected for straightened bristles, indicative of reverse mutation or suppression of the f locus. In the f^1 series, many F_1 flies with straightened bristles were found. Breeding tests showed that all but one resulted from dominant autosomal suppressors of forked. One reverse mutation was found, among 44,000 F_1 females, and this one was not fully wild-type but exhibited very weak f characteristics. Among 32,000 F_1 females in the f^{36a} series, not one fly with straightened bristles was observed. Apparently, f^{36a} does not respond to any suppressors of forked. Data on f^{51a4} are not yet complete, and more exposures are in progress. Spontaneous reversion at the f locus is also being investigated.

Levitan, Max. Crossing over adjacent to overlapping and included inversions.

Various authors have suggested that closeness of pairing is interfered with between homologues which differ by two or more overlapping or included inversions, and that this leads to reduction in crossing over in the area adjacent to these inversions. D. robusta females being analyzed for a study of chromosomal polymorphism in natural populations proved in many cases to be heterozygous for two overlapping or two included inversions on the left arm (all ending near the centromere) of chromosome 2, and also heterozygous for a cytologically terminal inversion in the right arm. This permitted a study of cytological crossing over in the area between the overlapping or included inversions and the terminal inversion, as compared to crossing over in the same region when the left arm was heterozygous for arrangements differing only by simple, one-step, inversions. The method used is analogous to the one described by Carson (Genetics 38: 168-186, 1953). The data to date show that in individuals of similar degrees of heterozygosity in the X and

third chromosomes, crossing over adjacent to the overlapping or included inversions in the second chromosome is of the same magnitude as, or occasionally even greater than, crossing over in individuals heterozygous for the simple inversions. The indicated results are being checked by Mr. W. Massie in this laboratory, with better control of aging and temperature than is possible with flies collected in nature.

Lindsley, D. L. Additional composite flies. The following are descriptions of the origin and phenotype of three sexually mosaic individuals which do not conform to expectations based on simple chromosome elimination.

(1) y w/Y ♀ x In(1)sc^{8L} EN^{R}, f/Y ♂ gave a bilateral gynandromorph, which was y w ♀ on one side and f ♂ on the other. This fly may have arisen as a result of multiple elimination from a triplo-X zygote nucleus, or from the fertilization of two egg nuclei, a y w-bearing egg nucleus by a Y-bearing sperm and a Y-bearing egg nucleus by an X-bearing sperm. The fly was definitely not triregional, which might be expected following double elimination.

(2) Ins(1)sc^{8L}, S, sc^{4R}, y w^{a} B/Y, sc^{19i}♂ x y w/sc^{8}·Y ♀ yielded a y w in which the region of the postfrons and the vertex was extreme sc and lacked ocelli; all the left eye and part of the right were w^{a}, the left eye being also B (resembling B/+, not B/+/+); and the left wing was smaller than normal and nicked. Both prothoracic legs lacked sex combs. Fertilization of two egg nuclei seems unlikely, since the fly was completely yellow, whereas multiple elimination in a y w/y w^{a} B embryo, with some superfemale tissue still remaining in the region of the abnormal wing, is consistent with most of the observations. The widening of the presumably B/O eye and the absence of ocelli are unexplained on this basis.

(3) In(1)sc^{8L}, S, sc^{4R}, y w^{a} B/Y, sc^{19i}♂ x y v f/sc^{S1}·Y^{L} ♀ yielded an individual with f ♀ thorax and abdomen. The prefrontal and vertical regions were extreme sc, non-f (sc^{def}/sc^{S1}), and each eye had dorsal patches of light pigment, whereas the color of the rest of each eye was wild-type. In one eye the light patch was large, and the eye was misshapen, presumably owing to mosaicism for B. The color of the light patch was nearly w (presumably w^{a}); the color of the rest of the eye was due to diffusion of v^{+} substance from the sc w^{a} B tissue. This fly is thought to have arisen through fertilization of two egg nuclei: sc^{S1}·Y^{L}♀ x In(1)sc^{8L}, S, sc^{4R}, y w^{a} B♂ and y v f ♀ x Y, sc^{19i}♂ .

Consideration of two egg nuclei generally involves maturation and subsequent fertilization of the nuclei of a binucleate primary oöcyte, although fertilization of the egg nucleus and one of the polar-body nuclei seems a reasonable alternative.

Lindsley, D. L. Failure to demonstrate sister-strand crossing over. The recovery of what seemed unreasonably frequent w^{a} B^{+} offspring from M-5/+ females led to a consideration of the possibility that they might be B reversals caused by sister-strand crossing over rather than mere removal of B from M-5 by double crossing over. It might be that in a situation where homologous pairing and exchange are reduced to a minimum, sister-strand exchange is increased to a detectable level (unequal exchange, however, might be the least efficient criterion of sister exchange). To check this, y^{2} M-5/f B fu females were crossed to y^{2} w^{a} v f males. The F_1 were as follows: 3871 y^{2} w^{a} B males, 3879 f B fu males, 4343 y^{2} w^{a} B females, 4676 f B females, 17 patroclinous males, 2 matroclinous females, and 8 double crossovers. It

thus became obvious that the w^a B^+ individuals originally recorded were double crossovers and not B reversals.

Lindsley, D. L., and Novitski, E. Frequent linkage of $Y^SX{\cdot}Y^L$ and chromosome 4.

From females irradiated with 3600 r which were heterozygous for $Y^SX{\cdot}y^Lsc^8$, In(1)EN, $y{\cdot}y^+$ and In(1)dl-49, w lz^s crossed with M-5 males, y male offspring were commonly encountered (0.7% of all F_1 males). These flies were found to carry the $Y^SX{\cdot}Y^L$ chromosome which had lost y^+ from the tip of the Y^L arm; such y chromosomes were also found in exceptional females. Tests of 16 such chromosomes show that (a) they all have retained their inverted sequence and the fertility factors of Y^S, and are therefore not rings; (b) all but one have lost at least some Y^L fertility factors; and (c) five of them now have chromosome 4 (ci^+ and ey^+) linked to them. One of those carrying a chromosome 4 linked is the one which has retained its Y^L fertility factors and is therefore a $Y^SX{\cdot}Y^L$ 4 chromosome.

A second type of X-4 involvement, and one that was spontaneous, was discovered in a breakdown product from y w attached-X. This chromosome was a single y w X but seemed to disturb normal disjunction of chromosome 4. Upon testing, this chromosome was discovered to carry ci^+ and ey^+. These findings may indicate some degree of homology between X and 4 heterochromatin.

Lüning, K. G. Variation in breakability of chromosomes in mature spermatozoa of D. melanogaster.

In experiments in which sperm was irradiated, with the same dose, in males and in inseminated females, Dr. Bonnier and myself observed a higher rate of recessive lethals in the sperm irradiated in females. It was not important whether the male-irradiated sperm was tested in previously irradiated or in nonirradiated females. In several series of experiments I have studied the variation of aberrations due to chromosome breaks, viz., yellow mutations in Muller-5 chromosomes and hyperploid males, and males supposed to be XO. The material consisted of 393,585 F_1 offspring from X-carrying spermatozoa examined for y females and hyperploid males, and 14,701 F_1 females and males in which XO males were studied. The results showed 25%-60% more breaks in spermatozoa irradiated in females than in spermatozoa irradiated in males. The corresponding increase in recessive lethals was 10%-25%.

From the technical point of view also the results are of interest, as the rates of hyperploid males induced with the same dose varied with both the males and the females. This is shown in the table, which gives the rates per 10^4. Series M represents irradiation of males only, Series vF-M irradiation of virgin females and males, and Series iF-M irradiation of inseminated females.

Ser.	Hyperploid Males			
	Canton-S ♂♂		M-5 ♂♂	
	y w sn ♀♀	y ac sc pn sn ♀♀	y w sn ♀♀	y ac sc pn sn ♀♀
M	6	10	10	21
vF-M	6	-	9	21
if-M	13	21	20	29

From this table it is clear that comparisons between experiments of this type can be made only within the same type of mating.

Lüning, K. G. The effect of oxygen tension on chromosome breaks.

In the above note and in several previous papers I have shown that the breakability of chromosomes by X-rays depends on the stages in spermiogenesis treated, the age of the males at treatment, and whether the spermatozoa are irradiated in males or in females. In all cases a greater variation was observed in the rates of breakage than in the rates of induction of recessive lethal mutations. It was consequently concluded that a certain ratio of the recessive lethals is independent of breakage.

In experiments by Baker et al. with different oxygen tensions, the rates of occurrence of breaks and of recessive lethals seemed to be reduced to the same extent. In a series of experiments I have confirmed this result. For yellow mutations (minute rearrangements) the ratio N_2/air was 0.75, and for recessive lethals from the same series, 0.73. Both values are a little higher than Baker's results. The parallel reduction in breaks and recessive lethals can be explained if the low oxygen tension is effective in protecting against primary injuries, but not if it simulates protection by increasing the rate of reunion.

In order to analyze this problem further I made a crucial test by irradiating in air and in nitrogen two types of males: (1) with rod-X and marked Y (sc^8 Y with the y^+ gene), and (2) with closed-X and sc^8 Y. The males were mated to y w sn females, guaranteed to be free from extra Y chromosomes. The normal F_1 males were y w sn; sc^8 Y, phenotypically gray. If the X or the Y was lost the males would be y w sn (XO), phenotypically yellow. As Pontecorvo has shown, most apparent losses are real losses. So we would expect the same rate of rod-X and closed-X losses if the oxygen effect was a primary protection, but a lower rate of closed-X than of rod-X losses if the effect was on reunions. The results favor the former hypothesis, because the ratio N_2/air for closed-X, corrected for the spontaneous rate, was 0.70, and that for rod-X, with correction, was 0.82.

In order to test the oxygen effect on the known variations in breakability of chromosomes in various stages of spermiogenesis, two experiments were carried out, showing that when flies were irradiated in N_2 atmosphere about twice as many induced breaks were found in sperm from the period 7-10 days after treatment than in those from the first 6 days. I had previously shown that when flies were irradiated in air there was a quadrupled instead of a doubled effect in the 7-to-10-day period. This discrepancy will be studied further.

MacKendrick, M. Elaine. Further examples of crossing over between alleles of the w series.

Following the discovery of crossing over between alleles of the w series in D. melanogaster (w and w^{bl}, and w and w^{co}, MacKendrick and Pontecorvo, 1952), further alleles have been investigated. w^{bl}, w^{co}, w^e, w^i, and w^a (from Cal. Tech., designated w^{aCT}) occupy a position on the X chromosome about 0.025 units to the left of w. Another w^a (from Edinburgh, designated w^{aE}) does not cross over with w. In a total of 145,000 flies obtained in about equal proportions from w^e/w^{co}, w^{bl}/w^{co}, w^{bl}/w^e, w^{bl}/w^{aCT} no recombinant types arose. These results identify two regions, one containing w^{bl}, w^{co}, w^e, w^i, and w^{aCT} and the other containing w and w^{aE}.

However, heterozygotes w^{bl}/w^{aE}, which yield both wild-type and white crossovers, produce the latter through two different directions of crossing over. This suggests that three regions are involved, with epistasis playing a part.

Makino, S., and Kanehisa, T. Hereditary melanotic tumor occurring in D. virilis.

Morpholotical and genetical studies have been made on the tumorous growth occurring in a wild strain of D. virilis collected in the vicinity of Sapporo, Hokkaido. The tumors are benign, and vary in size and shape. They develop on the mesonotum, scutellum, pleura, and head. They are recognized as pirmented bodies in the imagos within ten to twenty days after emergence. The results of crossing between the tumorous strain and the wild nontumor strain suggest a maternal influence on the incidence of tumors in the offspring.

Mather, W. B. A survey of the Drosophila fauna of southeast Queensland.

Since July, 1952, a survey of the Drosophila fauna of southeast Queensland has been under way. The main collecting site has been the University Farm at Moggill just outside Brisbane, where regular weekly collections have been made from banana baits. To date, sixteen species have been detected and are in culture: D. busckii, D. enigma (victoria species group), D. melanogaster, D. repleta, D. serrata (melanogaster species group), D. simulans, species H (victoria species group), species L (victoria species group), species N (mulleri subgroup), species O (Sophophora subgenus), species P (victoria species group), species Q (Pholadoris subgenus), species R (melanogaster species group). By far the dominant species at Moggill Farm is simulans: circa 80% from July to October, falling to circa 30% from November to January, and rising to circa 80% from March to June. The second dominant species is serrata (also from the melanogaster species group): circa 40% from January to February, but falling to circa 10% from July to October and from April to June. Besides the collections made in southeast Queensland, isolated collections have been made along the eastern seaboard from the New South Wales border to Thursday Island, adding ananassae and spinofemora to our stocks. An interesting feature of the fauna is the presence of six species of the Pholadoris subgenus, viz., lativittata, enigma, and the new species H, L, P, and Q. Of these, all except Q fall into the victoria species group but Q appears to be assignable neither to the victoria nor to the mirim species group. An analysis of the Moggill Farm data, redescriptions of lativittata, serrata, and enigma, and descriptions of the seven new species, together with their chromosome morphology, are being prepared for publication.

Meyer, Helen U. Two new cases of crossing over in the germ line of male D. melanogaster.

In addition to one case reported in DIS-26, two more such examples of crossing over in the germ cells of Drosophila males could be detected in the course of our work on induction of mutations by the polar cap method. In all instances the pole cells of these males had been treated with ultraviolet. In some cases lethals were present in those cells in which crossing over had occurred during later cell multiplication.

One case involved crossing over between two third chromosomes which were marked by the recessive genes jv and ri, alternatively. Fifty-seven F_1 males from one treated polar cap were tested for lethals in both their second and third chromosomes. Of 27 ri chromosomes tested, 25 had a lethal (l_{ri}) and also an additional visible mutation (mut_{ri}); of 30 jv chromosomes tested, 29 carried another lethal (l_{jv}). Two F_1 males had the crossover combination ri ljv, and one F_1 male contained the reciprocal arrangement jv l_{ri} mut_{ri}. The presence of these lethals in all germ cells tested either was due to preexisting lethals in all the third chromosomes of both maternal and paternal origin, or, if these lethals had been induced by the treatment, then all the offspring were derived

from only one single propagating germ cell. In that case the crossing over must have occurred in a later cell than that in which the lethal arose, and if it was caused by the mutagen it arose as an "after effect." For our present purpose these lethals served as additional markers to distinguish the crossover combinations. No information is available as to whether or not crossing over occurred in any of the other chromosomes. When the same males were tested for the second chromosomes, there was one single lethal found, but not in the same cell in which crossing over had occurred.

The other case involved two second chromosomes from offspring of a treated male of genotype cn crs/dp^{o} ta; ve/ru ri. Analysis of both the treated second and third chromosomes of 39 F_1 males showed the presence among them of 14 cases of induced lethals, derived from 8 occurrences of mutation in the primordial germ cells. Among them was one group of lethals in a third chromosome marked with ve which proved to be nonallelic to two other groups of lethals in ve chromosomes. This particular group was recovered in 2 F_1 males (out of a total of 16 males testing the ve chromosome); when bred for their second chromosomes, both these (and only these) males proved to carry the crossover combination dp^{o} ta cn crs. It is a temptation to assume that the action of the mutagen, besides inducing a lethal in the third chromosome, also caused crossing over between the second chromosomes in the same germ cell. If so, then several hours at least must have passed since the termination of the ultraviolet treatment, because, according to Rabinowitz and Sonnenblick, the pole cells remain in interphase and do not enter the prophase stage till they are permanently located in the gonads, some 14 hours later.

However, we are not in a position yet to decide whether or not ultraviolet, like some other mutagenic agents, can cause crossing over to occur in a male Drosophila. Its mutagenic action might simply have facilitated the detection of these cases by furnishing markers in the form of lethals. Experiments to clarify this point are under way.

Mickey, George H., and Yanders, Armon. Specific-loci mutants from X-rays and fast neutrons.

Mutation rates were determined for eight specific loci (res) in the third chromosome of D. melanogaster, after irradiation with 250 kvp X-rays and fast neutrons from the ORNL 86-inch cyclotron. The mutation rates in the group exposed to cyclotron neutrons were significantly higher per unit of dose (rep) than in groups exposed to X-rays. We interpret this to mean that the effect of neutrons is greater in producing chromosome aberrations, particularly small deletions.

Milani, R. Genetical researches on the housefly.

Populations of houseflies are polymorphic and carry an impressive number of recessive mutations, affecting mostly the wings. In some cases the genes involved have high density in a given population, where they have been found several times in a period of seven years, and appear to be present in geographically distinct populations. The mutations usually have poor penetrance and variable expressivity. Inbreeding in most cases is followed by extinction of the lines: sterility and larval and pupal mortality are involved. A line in its 22nd generation of brother-sister matings was still highly polymorphic for color patterns of the abdomen. Gynandromorphs have been found, both in nature and in the laboratory, with clear indications of familial incidence. Anteroposterior gynandromorphs with female abdomen have been seen in copulation.

Mittler, Sidney. Influence of vitamins upon incidence of tumors in tu^{50j} stock.

The incidence of tu^{50j} in D. melanogaster is related to nutrition. The flies were reared on a medium which consisted mainly of glucose, sodium ammonium phosphate, and trace elements, and the yeast Hansenula anomala. Thus practically all the nutritive factors, vitamins, amino acids, came from the yeast. S. cerevisiae (Baker's yeast) cannot grow on the above medium unless some of the B Complex vitamins are present; thus that yeast was rejected for this reason and not as Plaine (DIS-26) misinterpreted. Addition of large amounts of vitamins to the above vitamin-amino acid-free medium altered the incidence of tumors. Riboflavin, nicotinic acid, pyridoxine hydrochloride, calcium pantothenate, ergosterol, B-12, and p-aminobenzoic acid all increase the penetrance of the tumor. Vitamins A and K, thiamine hydrochloride, choline hydrochloride, biotin, calciferol have no influence on the tumor production.

Momma, E., Suzuki, K., and Makino, S. Drosophilidae feeding and breeding on fungi.

In order to learn which drosophilid species feed or breed on fungi, collections of flies by net-sweeping were made in the Botanical Garden, Hokkaido University, Sapporo, during the period June to September, 1953. In addition, fungi of various kinds from the same place were collected and cultured in the laboratory. The determination of the species was made with young flies emerged from larvae or eggs thus collected. The results are summarized in Tables 1 and 2.

Table 1. Drosophilid Species Feeding on Fungi

Species of fungi	Species of Drosophilidae	
Coprinus micaceus	Mycodrosophila sp.	Hirtodrosophila sp.
	D. nigromaculata	D. transversa
	D. immigrans	D. auraria
	D. funebris	D. coracina
	Sp. close to histrio	D. testacea
	D. sp. (melanica gr.)	D. nipponica
C. atramentarius	Scaptomyza sp.	Hirtodrosophila sp.
	D. transversa	Sp. close to histrio
	D. immigrans	D. lutea
	D. auraria	D. funebris
	D. testacea	D. nipponica
	D. nigromaculata	
Hypholoma appendiculatum	Mycodrosophila sp.	Hirtodrosophila sp.
	D. nigromaculata	D. transversa
	Sp. close to histrio	
Lactarius vellereus	Hirtodrosophila sp.	
Armillaria mellea	Mycodrosophila sp.	Hirtodrosophila sp.
	D. transversa	Sp. close to histrio
Pluteus cervinus	Hirtodrosophila sp.	D. nigromaculata
	D. transversa	
Lepiota sp.	Mycodrosophila sp.	Scaptomyza sp.
	Leucophenga sp.	Hirtodrosophila sp.
Mycena sp.	Hirtodrosophila sp.	
Pleurotus ostreatus	Mycodrosophila sp.	Hirtodrosophila sp.
	D. nigromaculata	Sp. close to histrio
P. cornucopioides	Mycodrosophila sp.	Leucophenga sp.
	Hirtodrosophila sp.	D. nigromaculata
	D. testacea	Sp. close to histrio

(table continued next page)

(Table 1 continued)

Species of fungi	Species of Drosophilidae	
Trametes confragosa	Hirtodrosophila sp.	
Polyporus squamosus	Mycodrosophila sp.	Scaptomyza sp.
	Hirtodrosophila sp.	D. nigromaculata
	D. transversa	D. coracina
	Sp. close to histrio	D. testacea
	D. nipponica	

Table 2. Drosophilid Species Breeding on Fungi

Species of fungi	Species of Drosophilidae	
Coprinus micaceus	Mycodrosophila sp.	D. testacea
	D. funebris	
C. atramentarius	D. transversa	
Pleurotus cornucopioides	Leucophenga sp.	Hirtodrosophila sp.
Polyporus squamosus	D. testacea	
P. varius	Mycodrosophila sp.	D. transversa
	D. testacea	

Moriwaki, D., Okada, T., Ohba, S., and Kurokawa, H. Further information on Drosophila species belonging to the "obscura" group found in Japan.

The species D. bifasciata seems to be the most common wild species, being widely distributed all over the mountain districts in Japan. Besides the mountains, some forest zones in level country also form its habitat, depending on the season. For example, it was collected in Hokkaido (Akkeshi, etc., less than 50 m above sea level) in summer, and in Asakawa (near Tokyo, about 200 m above sea level) in winter. In the latter locality monthly investigations were made for more than a year, during which time a fairly large number of flies was found in late February, as well as a few in December, March, and July.

Another species identified as D. alpina (see DIS-26, p. 112), was found this summer also in Yatsugatake and its vicinity, which is the only local area in which this species has been found, according to the results of our collections during the last three years. The karyotype was found to consist of two pairs of V-shaped and one pair of rod-shaped chromosomes.

Muller, H. J. Autosomal mutation studies by means of crisscrossed lethals and balanced male-steriles.

This technique, like that employing the "sifter" stock described in DIS-25 (pp. 117-118), has as its purpose the "automaticizing" of the inbreeding of F_2 females with the required type of F_2 males, that is, avoidance of the very time-consuming and uncertain operation of obtaining virgin females in each of the numerous F_1-F_2 cultures in a large-scale mutation experiment on an autosome. When the method is used in its entirety, it has the disadvantage, as compared with the sifter method, of requiring the investigation to be conducted on given chromosomes, containing one or another male-sterile gene, but it has the following advantages over the sifter method: the genetic scheme breaks down less often through crossing over, the flies used in the crosses have a higher productivity, and the final stocks of mutants and suspected mutants lend themselves more readily to extended measurements of relative viability, such as are needed for studies of invisible "detrimental" genes. The writer has constructed a series of special second-chromosome stocks for this purpose.

For the more efficient use of this method, it is advantageous to have three isogenic balanced stocks, each containing a different male-sterile gene in that chromosome which is to be used for mutation-frequency studies. Examples are furnished by our stocks g44, g39, and g116 as listed in the Indiana stock list of DIS-26. The three distinctive second chromosomes in these stocks have the respective compositions crs, cn ms rm sp, and ta cn bw, and all are balanced over a chromosome with both "Curly inversions," of gene composition al^2 Cy Bl cn^2 L^4 sp^2. The symbols crs and ms denote the invisible male-steriles known as "cream-underscored sterile" and "male-sterile 2.1," lying at about 108 and 66, respectively; whereas ta denotes "tapered," which causes both male sterility and tapered wings and lies at about 57. (The symbol rm denotes "ruffled microchaetes," which arose with ms.) In preparation for an experiment, the "P_0" cross is made of cn ms rm sp/al^2 Cy Bl cn^2 L^4 sp^2 by ta cn bw/al^2 Cy Bl cn^2 L^4 sp^2, in either direction; and the non-Curly sons, of composition ta cn bw/cn ms rm sp, are crossed by homozygous crs females. This "P_0" cross gives rise to sons, called "P_1," in which the frequency of mutation is to be investigated. Half of them are of composition ta cn bw/crs and half are cn ms rm sp/crs (all being phenotypically +).

For the investigation of mutation rate in these "P_1" males, they may be crossed individually to "P_1" females of our balanced stock g102, having the composition Cy, In L dp^{Tx} cn bw/S Sp cn bw. Crossing over between the lethals Cy or dp^{Tx} and S or Sp is here prevented by the left-arm inversion associated with Cy (that of the right arm being absent). Among the F_1, all six possible combinations are distinguishable by means of their visible markers, and all four types of F_1 males that occur in the cross of any individual P_1 male can be used for the investigation of mutations that may be present in the second chromosome derived from that P_1 male. The composition of these F_1 males may be represented as ta cn bw or cn ms rm sp or crs/Cy, In L dp^{Tx} cn bw or S Sp cn bw. No matter to which of the six types an F_1 male belongs, he is to be crossed individually by females of our stock g64, having the composition dp^T Sp ta cn ms crs/S^2 Cy Bl cn^2 L^4 sp^2. On this scheme, the undesired second chromosome of the F_1 male, no matter whether it is of type Cy dp^{Tx} or type S Sp, gives only lethal offspring, by reason of their being homozygous for one or another of these four genes. This is because the P_1 female, which had furnished the "undesired" chromosome of the F_1 male, had had her lethals in an arrangement which was crisscross, as compared with that in the female to which the F_1 male was crossed: thus if the first female were represented as A B/C D the second would be A D/C B.

The desired second chromosome of the F_1 male, that having the male-sterile gene, forms viable combinations with both second chromosomes from the female, but only those F_2 males are fertile which have the desired balanced combination of the male-sterile chromosome with the Curly-containing chromosome, since the other F_2 males are homozygous for a male-sterile gene. Hence all the F_2 females, including those of the desired kind, have necessarily been crossed with the required type of males, and virgins need not be obtained. However, the F_2 flies must be ehterized so that the Curly females (and males) may be picked out for breeding, inasmuch as the undesired non-Curly F_2 females (unlike the corresponding males) would be able to breed. Etherization also permits the rare crossovers involving the Curly-containing chromosome to be discarded. The F_2 females and males chosen for breeding have the composition ta cn bw or cn ms rm sp or crs/S^2 Cy Bl cn^2 L^4 sp^2.

It then remains to examine the F_3 for mutations. Lethals are made evident, without etherization, by the absence of F_3 flies normal with respect to the dominant combination S^2 Cy Bl L^4. The detection of most visibles requires inspection of the non-Curly flies under ether, and the detection of detrimentals

requires counts. Extended counts can readily be obtained for this purpose by continuing the given balanced stock from F_3, while always selecting for breeding only the Curly (or, alternatively, only the non-Curly) females. However, such selection is of course unnecessary for merely maintaining the stock.

Extensive experience with this method by Dr. H. U. Meyer and her associates has proved its practicability. Besides the stocks above mentioned, others employing the same male-sterile genes and lethals, but different combinations of markers, have been constructed and used. The choice of the best combinations to use varies somewhat with the purpose of the experiment.

If the male-sterile genes, or others accompanying them, had caused sterility of the homozygous females also, the operation of the scheme would be more fully automatic, both in its use for the detection of lethals and visibles in F_3 and also in its use for measuring viability in later generations. For in that case not only the males but also the females of undesired type (except for some rare crossovers) would be prevented from breeding, and the etherization and selection of F_2 might thereby be avoided. But although we have tried using rn and ap^2, which sterilize both sexes, they proved unsuitable for other reasons. Few other recessive genes of fair viability which sterilize both sexes are known. It would be a major task to introduce female-steriles into appropriate combinations with the male-steriles. Moreover, in that case the P_0 female would have to be heterozygous for a balancer chromosome, since the homozygous females would be sterile, and, in consequence, only half the P_1 males (those not receiving the balancer chromosome) could be used for the tests.

It is also possible to use a scheme like the above in which, however, the male-sterile genes have been entirely omitted. In that case it remains unnecessary to obtain virgins in F_2. However, unless suitable recessive markers are provided to distinguish homozygotes in F_3, it becomes necessary to etherize the F_3 in order that the heterozygous flies containing the dp^T Sp chromosome (recognizable by their Sp) may be distinguished from the homozygous non-Curlys. Theoretically, however, a more obvious dominant might be introduced into the dp^T Sp chromosome, to avoid the necessity for etherization of F_3. When it is desired to continue any line after F_3, as a nonselected stock, etherization and the obtaining of virgins becomes necessary in some one generation, in order to remove the unbalancing dp^T Sp chromosome.

Experience shows that these additional requirements do not make the method, when used without male steriles, impracticable. It is especially useful in this form when the chromosomes to be studied for the frequency of contained mutant genes are derived from wild populations, or from laboratory stocks into which it is not practicable to introduce male-sterile genes. The method without the male-steriles may be denoted simply as that of "crisscrossed lethals." Stocks with crisscrossed third-chromosome lethals have also been constructed for this purpose by the writer, and tests by Dr. Meyer have proved their practicability.

Müller, H. J. Autosomal nondisjunction associated with the rotund translocation.

It is sometimes useful to be able to obtain nondisjunction of major autosomes. It has been found that a very high frequency of such nondisjunction of the second chromosomes can be obtained by using flies heterozygous for a translocation associated with the gene rn (rotund). Many years ago the writer irradiated a stock of rotund for the purpose of obtaining an inversion in the right arm of chromosome 2 which would give less crossing over with normal than the right-arm inversion

associated with Curly, and which could be used for balancing. The chromosome finally selected because of its considerable reduction of crossing over was however found later to have, in addition, a large-scale translocation with chromosome 3, although the details of the breaks have never been worked out. It is referred to sometimes as "rn, In2RM" and sometimes as "rn, T23," the latter being (for short) more appropriate, since the translocation may be of the insertion-deletion ("transposition") type (into 3), without any actual inversion. It is likely that many present-day stocks now designated merely "rn" have this translocation.

Since nondisjunction of the second chromosome ordinarily gives a visible offspring only when one nondisjunctional gamete fertilizes a complementary nondisjunctional gamete of the opposite sex (one gamete having two second chromosomes and the other none, to give a "diplo-II" zygote), it is necessary, for demonstrating this nondisjunction, to make a cross in which both the male and the female parent are heterozygous for rn, T23. In addition, in order that the nondisjunctionally produced offspring may be recognized as such, it is necessary to provide markers whereby both the second chromosomes of one of the parents may, in the offspring, be distinguished from the second chromosomes of the other parent. This is accomplished when, for example, females of our stock g94, of composition S Sp ab^2 pr Bl rn, T23/al^2 Cy cn^2 (L^4) sp^2, are mated with males of composition rn, T23/Gla (produced by a prior crossing of stock g89, rn T23/Cy cn^2 sp^2 with g73, Gla/pi). Nondisjunctional offspring from this mating will exhibit the complete set of dominants of the female parent, namely, S Sp Bl Cy (L^4), if they received both second chromosomes from her, or only Gla, if they received both second chromosomes from the father.

Crosses of this kind have shown more than 10% of the offspring to be of the nondisjunctionally produced types. From this it can be reckoned (since only cases of complementary nondisjunction in both parents can show) that more than one-third of the segregations must be nondisjunctional for the second pair of chromosomes (when expressed as an average for both parents, which may however differ in their frequency). Quite possibly the third pair of chromosomes also may undergo frequent nondisjunction when this translocation is present, and even both second and third pairs at once, but this matter has not been studied. Moreover, there is no reason to believe the rn translocation to be unique in these respects.

Muller, H. J. Further evidence of abnormal types of copulation by the male D. melanogaster.

To supplement the report in DIS-25 (pp. 118-119) of copulation by a D. melanogaster male with another male in the latter's neck groove on its dorsal side, the present note records the observation of a male found in copulation with a dead male. The live male had effected intromission into the genital opening of the dead male and was so securely fixed into the latter that they remained firmly attached after etherization, and later, after immersion in alcohol and killing thereby, although they fell apart on being dried out. The dead male appeared to have been dead for about two days before the copulation occurred, being partly dessicated already. The live male was in a dorsad position relative to the dead male, like that which males take relative to females in the normal copulation of this species. Although the penetration appeared as deep as it normally is, it was not determined whether ejaculation had occurred, nor is it known for how long a period the copulation had been in progress at the time the flies were observed and (immediately afterwards) etherized. The culture containing these flies contained a considerable excess of males.

That response on the part of the partner is unnecessary for copulation by a Drosophila male was already known, from the frequent cases in which copulation has been observed between an active male and an etherized or partly etherized female. Males of copulatory age are also known to copulate with females which are newly hatched and presumably unresponsive sexually. All this, however, is not to deny the fact that the behavior of a responsive female Drosophila is conducive to the copulatory act, except in those cases in which the female is too active for the male (as when wild-type females are used with yellow males).

Nakamura, K., Imaizumi, T., Kitazume, Y., Shiomi, T., and Takanami, M. Biochemical studies on embryonic lethal factors in two strains of D. melanogaster.

(1) Amino acid metabolism in lethal embryos of an attached-X strain: Quantitative analyses of amino acids were carried out by the method of microbiological assay. Four egg stages were studied in the viable embryo (see our previous report, DIS-26, p. 114), and the corresponding four stages in the lethal embryo. In the first two stages, viable and lethal embryos cannot be distinguished morphologically. Results: Valine, isoleucine, and histidine show no remarkable changes either in the normal developing stages or in the lethal embryo. On the contrary, the amounts of glutamic acid, aspartic acid, glycine, arginine, threonine, and serine decrease in the lethal as compared to the viable.

(2) Accumulation of urea in the embryo of a new X-ray-induced strain: A new X-ray-induced lethal strain was obtained in our laboratory. It was found that the effect of the lethal factor appears in the embryo just before hatching; and accumulation of urea was observed in the lethal embryo (xanthydrol method). The locus of the gene was calculated to be 5.8 on the X chromosome.

Details of the two studies will be recorded in another paper.

Novitski, E. An attempt to eliminate X chromosomes from oögonia.

For the purpose of determining the meiotic behavior of cells with only one X chromosome, females of D. melanogaster were irradiated with 1000 r and mated to B males. It was assumed that oögonial cells which had lost an X chromosome would give rise to 50% nullo-X eggs, which would be recovered as patroclinous males. In addition, the irradiated females were heterozygous, and the males homozygous, for rucuca, to check on crossover values in such single-X eggs. Classification for the autosomal mutants was abandoned, however, when it became obvious that the attempt to eliminate X's was unsuccessful.

When females were irradiated immediately after emergence, kept in a bottle for three days, and transferred at two-day intervals thereafter, the ratios of patroclinous males/total males were as follows: 0-3 days, 25/3380; 3-5 days, 37/6729; 5-7 days, 5/1606; 7-9 days, 0/3662; 9-11 days, 0/4649; 11-13 days, 1/6540. An unirradiated control gave, in the 0.5 day interval, 0/5810. Furthermore, females treated prior to emergence, during the pupal, larval or egg stage, gave the following frequencies of patroclinous males: pupae treated 8-9 days after deposition of the egg (= 1-2 days before hatching) 2/237; 7-8 days, 10/2178; larvae 6-7 days old, 3/1725; 5-6 days, 0/418; 3-4 days, 0/310; 2-3 days, 0/1509; eggs 4-20 hours old, 0/414; and 0-3 hours, 0/1205.

Since the period after irradiation during which patroclinous males appeared agrees well with the duration of the period after other treatments during which effects on other meiotic phenomena, like crossing over (Plough), are found, it appears as if this effect of the irradiation is confined to the

meiotic period. Either the X chromosomes are refractory to irradiation during oögonial stages, or those cells lacking one X chromosome are unable to proceed as far as the meiotic divisions, either because 2 X's are necessary or because the process of loss of an X is in itself lethal. In any case, it has not been possible, by this method, to produce clusters of one-X cells in the gonads.

Okada, T. Comparative morphology of the rectal papillae of drosophilid flies.

The number (1), arrangement (2), and shape (3) of the rectal papillae were examined in 84 species of drosophilid flies, belonging to 14 genera. (1) The number of papillae in Cryptochaetum grandicorne Rondani was found to be 6. This number is probably unique, in that it differs from the 4 characteristic of both Drosophilidae and Athericera. (2) Among the drosophilids examined, the arrangement of the papillae in the rectal pouch is in two rows, opposite one another, except in Cryptochaetum, in which the papillae are arranged in a rosette. (3) The shorter or more globular papillae tend to be found in the so-called more primitive species or groups. Most fungus-visitors, including Mycodrosophila, Hirtodrosophila, and members of the quinaria group, show comparatively elongated papillae.

Okada T. Convolution of the mid-intestines of adult drosophilid flies.

The manner of coiling of the proximal intestine was comparatively studied in 77 species of drosophilid flies belonging to 12 genera. As a rule, the coils of the anterior and posterior halves are opposite in direction but unequal in number. As has been known, so-called primitive species usually have smaller numbers of coils than advanced ones. It was also found that sap- or fungus-feeders tend to have larger numbers of coils than fruit-feeders.

Oshima, C. Genetic studies on DDT resistance in wild and mutant strains of D. virilis.

DDT resistance was investigated in 18 Japanese and American wild strains and 13 mutant strains. About thirty adult flies, aged 4-5 days, were put into a small glass tube, in which a filter paper (2.5 x 6 cm^2), impregnated with 0.25 mg of DDT and 0.3 ml of water, was stuck around the glass tube near the bottom. After 24 hours, the mortality of flies was determined. Under these conditions, every wild and mutant strain showed about 80%-95% mortality, except v es pe and st B pe, which gave about 15% mortality--a high resistance to DDT. At first this resistance seemed to be controlled by polygenes. But data obtained on the progeny of resistant and sensitive strains suggest that a major gene is linked with the eosinoid (es) and peach (pe) genes, located on the fifth chromosome of D. virilis. It is an interesting fact that this fifth chromosome seems to be homologous to the right arm of the second chromosome of D. melanogaster, in which the existence of a DDT-resistance gene has been confirmed by M. Ogaki and M. Tsukamoto.

Oshima, C., and Taira, T. Further studies on the population genetics of dimorphism of color pattern in D. rufa.

Since last year (see DIS-26, p. 116) we have continued the study of populations of D. rufa, a species which has a dimorphic color pattern of the last abdominal segment in female flies. In both the Asakawa (near Tokyo city) and the Kochi (Shikoku island) districts, D. rufa appeared in May and seemed to reach its maximum number in September. The frequency of light-type flies (genotype d/d) was about 13%-14% of the total population number in September. Although no remarkable seasonal change was observed, the frequency of light-type flies seemed to decrease gradually from May to September. In these natural populations, other species

like D. lutea, D. auraria, D. montium, D. ficusphila, and D. imigrans were mingled with D. rufa.

Homozygous light-type flies (d/d) were mixed in large quantities with homozygous dark-type flies (D/D) in a population cage. About 100 days from the start, the frequency of d/d began to decrease gradually; equilbrium was reached about 500 days later. Within this time, the frequency of light flies became about 30% and that of dark flies about 70% of the total population.

Although the following relation of genotypes, D/d > D/D > d/d, was found in natural populations, the relation in artificial populations was D/d > d/d > D/D. Both kinds of population showed balanced polymorphism, because the heterozygous flies (D/d) always had the highest adaptive value. Such a phenomenon of heterosis could be explained by differences in the mating abilities of males of the different genotypes. The mating ratio of ♂ D/d : ♂ D/D : ♂ d/d was 1.00 : 0.82 : 0.38, and there was a similar tendency in females. No morphological differences were found in the sexual organs of males of the different genotypes, but a significant difference was found in the number of peg-like bristles on the egg-guide in females. The mean values for bristle number in ♀ d/d, ♀ D/D, and ♀ D/d were 17.228 ± 0.094, 14.767 ± 0.090, and 15.767 ± 0.093.

The fact that light-type flies (d/d) had higher adaptive value than homozygous dark flies (D/D) in an artificial population was demonstrated by the observation that larvae of the former type were superior to those of the latter in a crowded population of larvae.

When D. rufa was cultured with D. ficusphila in a population cage, the former was superior to the latter in adaptability to these artificial conditions, but the rate of increase of dark-type flies seemed to be suppressed as compared with the rate of increase in a population containing only D. rufa.

Prevosti, A. Two newly introduced species of Drosophila found in Europe.

In domestic habitats of Barcelona, D. ananassae Dles. and D. mercatorum Patt. and Wheeler have been found. The cosmopolitan D. ananassae had already been found in the eastern part of the Palaearctic region, but in the literature no records have been found for Europe. D. mercatorum seems to be a species that is becoming cosmopolitan, recorded in Nearctic, Neotropical, and Australian regions; in Barcelona it is rather common in domestic habitats. The karyotype corresponds to D. mercatorum mercatorum and crossability is unlimited with both D. m. mercatorum and D. m. pararepleta.

Redfield, Helen. The effect in D. melanogaster of the presence of an extra Y on crossing over in the mid region of chromosome 3.

Earlier data of Schultz and Redfield suggest that differences shown between experiments designed to study the effect of the Y chromosome on crossing over in the centromere region of chromosome 3 might be due to the presence of undetected third-chromosome inversions in some of the crosses. Accordingly, the following new crosses were undertaken, making use of known inversions in 3, and of the genes ri and pP, just to the left and right, respectively, of the spindle fiber attachment, and Sb, some 10 map units to the right of pP. Females of the composition ri pP Sb/Payne were first tested; they involved no Y and no second-chromosome inversion. These gave standard crossover values for females heterozygous for the Payne inversions: mothers of age 2 to 6 days (N - 2580)

gave ri-p^P = 0.62 and p^P-Sb = 0.89. The same mothers of age 7 to 11 days (N = 1945) in subcultures gave ri-p^P = 1.03 and p^P-Sb = 1.03. A second set of mothers contained in addition the second-chromosome inversion $Plum^2$; some of them had an extra Y chromosome, whereas their sisters did not. These females furnished the following values for the first cultures. No Y; Pm^2/+; ri p^P Sb/Payne ♀♀ (N = 3333) gave ri-p^P = 1.4, p^P-Sb = 3.2. Y; Pm^2/+; ri p^P Sb/Payne ♀♀ (N = 1710) gave ri-p^P = 2.3, p^P-Sb = 6.2. The subcultures showed similar results. No Y; Pm^2/+; ri p^P Sb/Payne ♀♀ (N = 2687) gave ri-p^P = 1.6, p^P-Sb = 4.5. Y; Pm^2/+; ri p^P Sb/Payne ♀♀ (N = 1472) gave ri-p^P = 3.3, p^P-Sb = 7.8. Thus the proportion of crossovers for the sensitive region of the third chromosome from females containing one set of Payne inversions is approximately doubled by the presence of $Plum^2$ and quadrupled by the presence of both $Plum^2$ and a Y.

Sandler, L. The high rate of nondisjunction and low rate of exchange in the euchromatic distal X segment of the $T(1,4)B^S$.

A mating of females heterozygous for $In(1)sc^8$, f v cv, and $T(1,4)B^S$ to y w.Y^s/Y^{lc} males gave the following results: +♀♀ = 1711; sc^8 f v cv♂♂ = 1085; $T(1,4)B^S$♂♂ = 1433; y w B^S (hyperploid) ♂♂ = 333; sc^8 f v cv B^S (hyperploid) ♂♂ = 3; B^S♀♀ = 1968; y w ♂♂ = 21; and 7 crossover males.

The y w B^S hyperploid male class represents instances of nondisjunction of the euchromatic X segment of the translocation from the sc^8 X chromosome. Since these males are possibly somewhat inviable, the number of recovered cases (333) is probably an underestimate. This high frequency of nondisjunction in addition to the low frequency of recovered double exchanges (7) suggests that euchromatic pairing attraction may be weak, since most of the X-chromosome euchromatin (from y to the region of B) is available for pairing.

A similar cross in which the sc^8 X chromosome had been replaced by one carrying the dl-49 inversion (y Hw m^2 g^4, dl-49/$T(1,4)B^S$ x y w.Y^s/Y^{lc}) gave 576 y♀♀, representing cases in which the euchromatic X segment of the translocation had disjoined from the dl-49 X chromosome, and 275 y w B^S (hyperploid)♂♂, representing those cases in which the euchromatic segment and the dl-49 X chromosome had not disjoined. This would indicate that the high rate of nondisjunction in the case involving the sc^8 X chromosome was not a consequence of disjunctional difficulties due to the presence of the long inversion.

Scheltgen, Elmer, and Cole, Kathleen M. The effect of pressure on rate of mutation in D. melanogaster.

D. melanogaster eggs of different ages were subjected to pressures from 5200 to 9000 pounds per square inch for various lengths of time in a hydrostatic pressure apparatus. A pressure of 5200 to 5500 pounds per square inch at a temperature of 33° C for 20 minutes on eggs 13 to 17 hours old was most effective, since it caused a delay in the hatching of the eggs, a varying sex ratio in the offspring of the treated parents, and a number of abdomen abnormalities. Eggs treated at a very early stage, 0-4 hours, were severely affected, only 5% hatching. Abnormalities of the antennal segments and abdomen were caused by a pressure of 5500 pounds per square inch for 20 minutes on eggs of 17-21 hours; only 60% of these eggs hatched after the treatment. Pressures of 5200 to 5800 pounds per square inch on eggs of 0.5 to 3.5 hours and 13.5 to 17.5 hours prolonged the egg stage two and four times that of the controls, respectively.

Scossiroli, Renzo E. Advancing a plateau by selection in irradiated populations of D. melanogaster.

The work on selection under X-ray irradiation, of which a short report was given in DIS-26, has been carried further. Previous selection for high number of sternopleural hairs had brought a population to a plateau of selective response at a level of 27 hairs. From this population, two untreated (controls) and two treated (3000 r-units each cycle of two generations) lines were derived and selected for the same character. The irradiated lines exhibited an immediate response to selection, reaching a new plateau at the twenty-first cycle (about 42 sternopleural hairs). The control lines remained at the level of the original plateau (28 hairs at the twenty-first cycle). The irradiated lines exhibited a larger standard deviation and coefficient of variation of number of sternopleural hairs than the control lines. The efficiency of selection in the irradiated lines can therefore be attributed to increased variability. The irradiated lines also exhibited a marked increase in sterility (number of sterile matings) and a strong decrease in fertility (number of offspring per mating) as compared with the control lines.

Special tests showed a direct relationship between the selected character, sterility, and reduced fertility. The best-fitted flies were those with a hair number close to the mean of the line, and the least-fitted were those with extreme numbers of hairs. It therefore appears that the reduced fitness of the irradiated lines cannot be attributed exclusively to the effect of deleterious mutations produced by X-ray treatment. From the experimental data it may be concluded that X-ray treatments were efficient in producing new variability in the polygenic system related to the selected trait, and that artificial selection was able to utilize this increased variability. The experiments are being carried further.

Scossiroli, Renzo E. Selection under irradiation for low number of sternopleural hairs in a population of D. melanogaster plateaued for the selected trait.

Four lines were derived from a population previously selected for low number of sternopleural hairs in which a plateau had been reached at a level of 14.7 sternopleural hairs. Two of these new lines were treated with doses of 3000 r-units each cycle of two generations, and selected for low number of sternopleural hairs. The other two were selected for the same trait but without X-irradiation. Neither of the untreated lines showed any response. Only one of the treated lines showed a reaction to the selection pressure, reaching a new plateau at a level of 13.7 hairs. The other treated line remained at the level maintained by the untreated lines. No remarkable increase of variability in terms of standard deviations was noted. Increase of sterility and decrease of fertility were observed.

Owing to the lack of progress shown by the untreated lines and by one of the treated lines, experiments were performed to test for the presence of heritable variability. It was found that in spite of the lack of progress a good part of the observed variability was genetic in source, and that the heritability in the treated lines was much higher than that in the untreated lines. The lack of progress was thus not due to absence of genetic variability of the selected trait. Furthermore, the X-ray treatments were efficient in building up new genetic variability, which was accumulated by artificial selection without response at the phenotypic level.

Sobels, F. H., and Basden, E. B. D. polychaeta Patt. and Wheeler in Europe.

The first European specimen of D. polychaeta known to us is a female caught by Miss E. L. M. J. Boessels, 7/27/51, at the

Geul stream, South Limburg, Netherlands, 160 km from the sea, during the first author's survey of Dutch Drosophila species. Most strikingly, this specimen was trapped in scattered woodland remote from houses. Patterson and Wheeler (1943), on the other hand, recorded the species only on banana wharfs near Galveston, Texas, but assumed it to have immigrated from South or Central America. Another record is from the Hawaiian Islands and Guam (Patterson, pers. comm.). The second author has seen the following specimens from ships at Liverpool, England. Ship A: 1 female (dead), 5/7/52; 7 males, 5 females (alive), 1/15/53, the first with a cargo of cocoa and copra loaded on the Gold Coast, the ship being on a regular West Africa run. A culture from these is now maintained. Ship B: 1 female (alive), 10/28/52, on a regular Malaya-Liverpool run, on this occasion with Malayan logs. Ship C: 2 males, 1 female (dead), 3/18/53, on a West Africa-U.S.A. run for the last three years, but this West African cargo was carried to Liverpool. The last record suggests an introduction route for this species into the United States.

Spiess, E. B. Drosophila from Yosemite National Park, California.

During the latter half of July and the first half of August, at four localities from 5000' to 8000' on the Tioga Pass road, flies were collected for the purpose of replenishing stocks of persimilis. The various species encountered were as follows. D. pinicola and D. occidentalis were especially common in tall timber areas, and when extremely common occupied traps to the exclusion of members of the obscura group. D. nigrohydei occurred rarely at 6000' and 7000'. D. azteca was common up to 6000', more rare at 7000', and not found at all at 8000'. D. persimilis and D. pseudoobscura occurred with equal frequencies at 5000', but at 8000' the frequency of persimilis was about six times that of pseudoobscura. Salivary analysis has been completed only for the highest locality, where frequencies of gene arrangements of the third chromosome are as follows: Whitney, 87.2%; Klamath, 7.3%; Mendocino, 2.9%; Standard, 1.6%; and Sequoia, 1.0%.

Suzuki, K., Momma, E., and Makino, S. Species of Drosophilidae living on plants.

In order to find out which species of the Drosophilidae live or feed on plants, flies were collected on the following three species of plants: the trefoil (Cryptotaenia japonica), the clover (Trifolium repens), and a kind of knotgrass (Polygonum Hydropiper). The collections were made with the use of a net at the Botanical Garden and the Farm of Hokkaido University, Sapporo, for a period ranging from June to September, 1953. The determination of the species was made in adult flies. The results are shown in Tables 1 to 3.

Table 1. Flies obtained on Cryptotaenia japonica

	June	July	Aug.	Sept.	Total
D. nipponica	44.0%	30.5%	53.0%	64.9%	59.6%
D. nigromaculata	14.6	17.3	11.7	4.0	6.8
D. auraria	0.0	4.3	5.9	14.1	11.0
D. transversa	0.0	0.0	0.0	2.0	1.4
D. megalopectinata	9.7	0.0	0.0	0.0	1.1
Scaptomyza sp.	14.6	39.2	20.6	6.7	11.0
Scaptomyza sp.	17.1	8.7	8.8	8.0	9.1

(Table 2--see next page)

Table 2. Flies obtained on Trifolium repens

	June	July	Aug.	Sept.	Total
D. nipponica	32.4%	41.7%	40.2%	45.8%	39.2%
D. nigromaculata	1.8	8.3	1.3	5.1	3.1
D. transversa	0.0	1.7	0.7	0.0	0.5
D. histrio	0.9	0.0	0.0	0.0	0.3
D. auraria	0.0	0.0	2.7	0.0	1.0
Scaptomyza sp.	64.9	48.3	52.4	49.1	55.0
Scaptomyza sp.	0.0	0.0	2.7	0.0	1.0

Table 3. Flies obtained on Polygonum Hydropiper

	June	July	Aug.	Sept.	Total
D. nipponica	11.8%	10.4%	38.5%	73.3%	40.0%
D. nigromaculata	11.8	50.7	30.8	11.1	25.7
D. auraria	2.9	1.5	5.1	1.1	2.2
D. transversa	0.0	1.5	7.7	6.7	4.3
D. megalopectinata	0.0	1.5	0.0	0.0	0.4
Scaptomyza sp.	73.5	34.3	7.7	3.3	23.5
Scaptomyza sp.	0.0	0.0	10.3	4.4	3.5

Takada, H., and Makino, S. Distribution in Hokkaido of an unrecorded species close to D. busckii.

An unrecorded species close to D. busckii found in Mt. Taisetsu was described in DIS-26. Further observations revealed that this species inhabited in various localities in Hokkaido, as shown in the table. According to the advice of Dr. M. R. Wheeler, of the university of Texas, we wish to name this species D. alboraris. Several stocks of this species have been kept in our laboratory. In addition, another kind of Drosophila, close to this species but different in the structure of the genital organ, has been found in the forest of Mt. Maruyama and Mt. Asahidake. The morphological study of this species is in progress.

Locality	♀	♂
Imagane	-	7
Marauyama (Sapporo)	3	1
Asahidake	-	2
Nopporo	9	8

Takada, T., Makino, S., Momma, E., and Suzuki, K. Two rare species of Drosophila from Hokkaido.

(1) D. megalopectinata was obtained in large numbers in Sapporo during the period from June to August. The flies were collected by net-sweeping on the following plants, Cryptotaenia japonica, Polygonum Hydropiper, Trifolium repens, Smilacina japonica, and Torilis Anthriscus. (2) The species to be identified as D. helvetica of the obscura group was collected in the forest of Mt. Asahidake at an altitude of 1060 m, by the use of banana traps. The flies collected were 4 males. The determination of the name is uncertain now. Their characteristics are as follows. Arista with seven branches, two below in addition to terminal fork. Antennae brownish, third joint brown. Middle orbital one-third anterior, one-quarter posterior. Second oral bristle about one-half first. Only one prominent bristle on each palpus. Cheeks light brownish, their greatest width about one-fifth the greatest diameter of the eyes. Acrostichal hairs in six rows, no prescutellars. Sterno-index 0.4. Abdominal segments brownish, each segment with slightly dark brownish black band. Sex comb of two black stout bristles on the inner distal surface of first tarsal joint

of prothoracic leg, a black stout bristle on the same surface of second tarsal joint of prothoracic leg. Wings clear, veins brown. Costal index about 2.8; fourth vein index about 2.2; 5c index about 1.5; 4c index about 1.3 Phallosomal index about 0.9. Testes in a spiral of about three gyres.

Tantawy, A. O. Selection for long and short wing length with different systems of mating.

This experiment was designed to study the response to selection with different systems of mating. Three different systems of mating were used; brother-sister, double first cousins, and outbreeding. In each system, parallel selection lines for long and short wing length have now been continued for fourteen generations. All the selected lines are treated similarly to ensure the same environmental conditions. The response to selection under each of the three different systems is presented in the table in terms of deviations from a control stock maintained by mass mating under the same environmental conditions. As both sexes of each system show almost the same general trend, their deviations from controls have been averaged. The unit of measurement is 0.01 mm.

Generation number	Brother-sister		Double-cousins		Outbreeding	
	Long	Short	Long	Short	Long	Short
1	0.46	-2.48	0.72	-0.71	2.12	-1.25
2	1.24	-4.36	0.85	-2.21	1.76	-2.51
3	1.58	-7.61	0.44	-2.02	1.99	-7.38
4	2.94	-6.02	3.00	-0.77	4.30	-7.63
5	2.04	-11.50	0.11	-5.95	1.52	-10.42
6	4.68	-10.29	1.31	-7.37	1.42	-9.85
7	3.47	-14.90	1.61	-8.34	1.61	-14.06
8	1.91	-11.11	1.51	-6.48	2.62	-12.15
9	3.24	-4.17	2.31	-4.69	3.83	-10.47
10	1.93	-11.48	1.54	-6.90	4.82	-11.78
11	1.83	-11.66	2.55	-6.09	4.72	-15.17
12	1.83	-12.38	0.29	-9.40	3.57	-17.80
13	2.24	-15.11	0.82	-11.53	3.31	-19.23
14	0.53	-16.26	0.21	-9.22	3.91	-20.64

These results clearly demonstrate that selection has been effective in all the systems of mating in high and low lines. Progress of selection in all the lines is more rapid in lines selected for short wing than lines selected for long wing. Lines maintained by the brother-sister and outbreeding systems show almost the same response to selection in plus and minus directions to the seventh generation, after which the latter system show a higher response than the former. Selected lines carried out by matings between double first cousins show an intermediate response to selection between the brother-sister and outbreeding systems.

The divergence between high and low lines maintained by brother-sister matings increases gradually from the first generation of selection to the fifth, after which it tends to stabilize. In this mating, the selected line for long wing shows two units above the controls and the line selected for short wing shows eleven units below the controls and then stabilizes at almost this response to selection. In the case of outbreeding, the divergence between the two selected lines increases gradually from the first selection generation to the fourteenth generation. At 25% and 50% coefficient of inbreeding, lines carried out by brother-sister matings display greater

response to selection, in both directions, than lines carried out by double-first-cousins mating.

Response to selection for wing length in all the different selected lines is accompanied by a change in thorax length in the same direction. This is to be expected from the high genetic correlation between them in the initial unselected stock. Effects of different systems of mating on various characters, such as heritability of wing and thorax length in the selected lines, egg production, hatchability, and so forth will be studied.

Thoday, J. M. A Notch-translocation cross demonstrating nondisjunction of chromosome 3 in D. melanogaster?

The following observations were made with the assistance of Mr. T. B. Boam. A Notch mutant was obtained as two granddaughters of an irradiated w^a male mated to ClB/w m f. The two flies were white-eyed and Notch-winged. They were crossed to w stock flies, and from these crosses several lines were established which were used in selection experiments. Notch was of variable expression and limited, though high, penetrance. The eye color was the result of a V position effect, not a w deficiency. Both eye color and Notch expression could be enhanced or decreased by selection. The eye color position effect occurred with w^a N/w but not with w^a N/w^+. w^a N/w^a flies had paler eyes than w^a/w flies. Crosses of w^a N/w by w^+ gave about 23% w^+ sons; those tested were fertile, showing that the Notch flies carried Y. The cross w^a N/w^a, In(1)r^{49j} x w gave 50% w sons. (See r^{49j} in New Mutants section.)

Salivary preparations indicated an X-3 translocation, exchanging X tip for 3L. Dr. H. Slizynska has kindly re-examined these preparations and reports that the break in X is between 3C1 and 3C6; 3C6 and 7 (Notch bands) are present in the proximal part of X. 3C2,3 (white band) is absent from the proximal part of X, but may be present in the translocated tip. The break in 3 is in 80E, F--probably at the beginning of 80F (hence in 3L).

Shortly after these preparations had been made the Notch stocks were lost as the result of an unfortunate accident. Before this, a cross had been made to test the first salivary observations. The cross was w^a N f/w f x ss bx. The F_1 results were as follows:

	+	white-forked	spineless-bithorax	Notch	white-Notch
♀	57	-	-	16	2
♂	1	40	8	-	-

No explanation seems plausible for the non-forked white-notch females, but it seems difficult to avoid the conclusion that the spineless-bithorax males (at least some of which were fertile) were the result of fusion of eggs having Y, no X, and no chromosome 3, and sperm having two third chromosomes. If so, then the ss bx stock shows high nondisjunction for chromosome 3. The loss of the Notch stocks precluded further tests. The cross D/LVM x ss bx gives negative results. Should anyone obtain a similar translocation, the author would be grateful for stocks so that the ss bx stock may be tested further.

Ulrich, Hans. Induction of "abnormal abdomen" by partial X-raying of Drosophila eggs.

By X-raying single portions of eggs, 0.1 mm in length--that is, single fifths of the eggs--abnormalities of the abdominal segmentation were induced, the percentage of abnormal flies depending on the age of the eggs when treated and on the position of the irradiated portion (see DIS-25, p. 131). Two sensitive periods, only

partially separable, were found, at ages 1-2 and 4-5 hours (oviposition and development at 25°). In both cases, the resulting abnormalities are manifested already in the larva. In most of the individuals in question, they are manifested again in the adult, whereas the remaining ones control larval abnormalities during metamorphosis.

At the age of 1-2 hours the egg still seems to react to irradiation as a whole; the position of the abnormality on the adult abdomen is not clearly correlated with the position of the irradiated portion of the egg. The type of abnormality induced at this early stage corresponds, as a rule, in larvae as well as in flies, to that occurring after treatment of eggs with high temperature during three sensitive periods (oöcyte, 2-3 hours, and 9-10 hours; see DIS-26, p. 128) and to that characteristic of several mutants described by Zimmermann (DIS-26, p. 69), especially atypical course, or partial or complete absence, of one or several segmental borders.

At the age of 4-5 hours the reaction of the egg to irradiation is a local one. Only treatment of one of the last two fifths of the egg results in a relatively high percentage of abnormal individuals; and the position of the irregularities corresponds to the position of the irradiated portion. Owing to the blastokinesis, irradiation of the last fifth of egg causes an irregularity in the anterior part of abdomen, whereas irradiation of the next-to-the-last fifth induces an irregularity in the posterior part. The irregularities are of another type than that which occurs after irradiation of 1-2-hour eggs. They concern the structure of segmental borders rather than their course.

Partial X-raying of eggs at later stages, up to hatching, does not affect the segmentation of larvae, but causes a third type of abnormality of the adult abdomen. Occasional tergites or sternites of the flies are abnormal in shape, and tergites cover their segments only incompletely. The position of this abnormality correlates exactly with the position of the irradiated portion of the egg. No sensitive period for the production of this type of abnormal abdomen can be designated. Apparently the X-rays affect the "hypodermal histoblasts" in the embryo, which later during metamorphosis form anew the hypoderm of the imago.

Ulrich, Hans. Single event in killing of Drosophila eggs by X-rays?

Drosophila eggs were X-rayed with different doses at the age of 1-2 hours, 2-3 hours, 3-4 hours, and so forth (oviposition and development at 25°). In every case the percentages of nonhatching (i.e., killed) eggs increased with dose in an S-shaped curve, the curves growing steeper with increasing age of eggs at time of treatment. According to the target theory in radiobiology, the dose-frequency curves obtained may be formally interpreted as due to killing of the eggs, at every stage tested, by several hits--the required number of hits increasing with age. The dose necessary to kill 50% of eggs--that is, their resistance to radiation--increases simultaneously with the number of hits. Langendorff and Sommermeyer had concluded previously that so-called 4-hour eggs (real age, 2.75 ± 1.25 hours) are killed by a single hit. This statement, which is referred to repeatedly in biophysical papers interpreting the results of treatment of Drosophila eggs with different doses of various kinds of rays, is refuted by our findings and meanwhile has been corrected by Langendorff and Sommermeyer themselves.

Since the number of nuclei grows larger during embryological development, the increase of hit number with increase in age suggested that the eggs are killed by an effect of the X-rays on nuclei. Consequently it was to be expected that newly laid eggs, before cleavage, might be killed by a minimal

number of hits, perhaps by a single hit. Actually, X-raying of eggs 0-15 or 0-10 minutes old yielded a dose-frequency curve that differed only insignificantly from the theoretical single-event curve. The 50% dose for this stage is somewhat higher than that for the 1-2-hour eggs, which thus represent the most sensitive stage.

The decisive importance of the nucleus to the event of killing by irradiation was proved by partial X-raying of eggs at the age of 15-30 minutes, the youngest stage that could be irradiated partially. After separate treatment of the 1st, 2nd, 3rd, 4th, and 5th fifths (counted from the anterior pole)--each fifth being 0.1 mm in length--with a constant dose of 1000 r, the percentages of killing of the irradiated eggs were 3%, 65%, 16%, 3%, and 2%, respectively. Without irradiation about 3% died. Accordingly, only that part of the egg that contains the two pronuclei (or at most 2 to 4 cleavage nuclei) is radiosensitive. It may be concluded that the single event which apparently can kill the egg before cleavage, and probably only at this stage, affects the nucleus, perhaps by inducing a dominant lethal factor of some kind, for example a chromosomal aberration.

Weeks, Leo. Studies on the two subspecies, D. melanica melanica and D. melanica paramelanica.

The nature of certain morphological differences in the two subspecies, D. melanica melanica and D. melanica paramelanica has been studied. The difference in the shape of the penis apparatus as reported by Miller (1944) was used as a criterion to differentiate between the males of the two subspecies. A difference in the shape of the spermatheca in the two subspecies has also been observed. The spermatheca of the subspecies melanica is more rounded and pointed at the distal end; that of the subspecies paramelanica is more rectangular at the distal end. This difference in the shape of the spermatheca was studied in melanica and paramelanica collected in Nebraska; in strains of melanica from Arizona, Texas, Florida, and Georgia; and in strains of paramelanica from Minnesota and Maine (kindly supplied by Drs. J. T. Patterson and D. F. Poulson). The criteria of the difference in the shape of the penis apparatus and the difference in the shape of the spermatheca have been used to determine the frequencies of the subspecies in the vicinity of Lincoln, Nebraska. The males from the collections were identified as to subspecies on the basis of the shape of the penis apparatus. Each female from the collections was put in a vial with food and allowed to produce offspring. The female was then examined and identified as to subspecies on the basis of the shape of the spermatheca. Several males and females of each female's offspring were identified as to subspecies, using the previously mentioned criteria. In all but a few questionable cases, the female offspring had the characteristic spermatheca shape of the female parent and the male offspring had the characteristic penis-apparatus shape of the males of the subspecies to which the female parent belonged.

From these collections, made from May through July, 1953, the frequency of melanica was determined to be 86.1 per cent and that of paramelanica 13.9 per cent. The number of melanica collected was 210 and the number of paramelanica 34. An effort has been made to establish the replacement zone of the two subspecies in the United States. Collections of wild populations were made during August and September, 1953, in Missouri, Illinois, Indiana, Kentucky, Tennessee, and Georgia. Both the subspecies were collected in Nebraska and Missouri; only paramelanica in Illinois, Indiana, and Kentucky; only melanica in Tennessee and Georgia. Both melanica and paramelanica were also observed in collections from Virginia (furnished by Dr. Max Levitan).

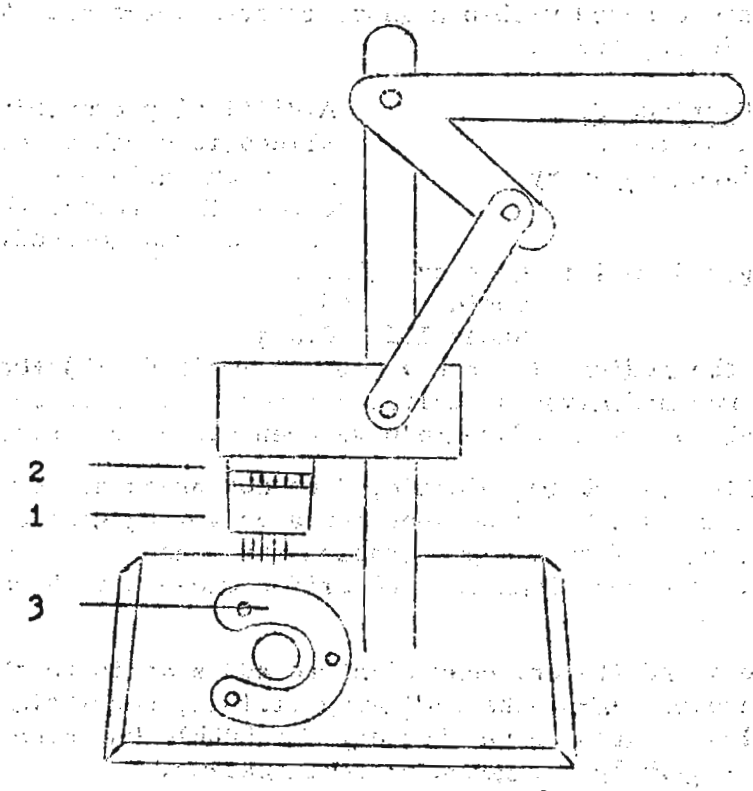
The following table presents data on frequencies of the two subspecies and the number of Drosophila collected in the different states.

States*	D. melanica		Other Drosophila	Total
	melanica	paramelanica		
Nebraska	210	34	5808	6052
Missouri	10	2	1124	1136
Illinois	0	43	3154	3197
Indiana	0	47	3220	3267
Kentucky	8	0	1928	1936
Tennessee	57	0	3468	3525
Georgia	126	0	6654	6780

*Collections were made in Nebraska from May through July, 1953. Collections were made in the other states during August and September, 1953.

Herskowitz, Irwin H., and Telfer, J. D. A device for punching holes in milk-bottle caps.

Excess moisture in culture bottles causes the sides to become wet and the food medium to become fluid, causing the death of many adults and difficulty both in clearing bottles of parents and in collecting newly emerged flies. In order that some of the excess water may evaporate, a device was constructed which punches a dozen and a half small holes in a cardboard bottle cap at a single stroke. Steel sewing-machine needles were pushed through a cork stopper that was about one-half inch shorter than the needles. The side of the cork (1) with the blunt ends of the needles was pushed onto a flower holder (2), which was lowered and also raised by moving a handle either up or down. The bottle cap was slipped beneath a horseshoe-shaped plate (3) which held the cap while the needles were punching the holes and were being withdrawn. Although the machine has been in use for several months no needles have had to be replaced, but if this is necessary the cork is easily removed from the flower holder and a new needle inserted. A diagram of this apparatus is shown below.



Laurence, Richard. A technique of collecting Drosophila eggs.

The following method has been used in collecting, counting, and determining the hatchability of Drosophila eggs, and is especially useful as a technique for studying lethals in the early stages of development.

First a hole is cut near the outer edge of the upper plate of a Petri dish. The hole is made large enough to accommodate a tube 2.5 cm in diameter.

This tube serves as the collecting chamber. In the lower plate of the Petri dish is placed a very thin layer of banana-agar food, which has been strained through eighteen-mesh screen to insure transparency. The flies are then placed in the tube. One end of the tube is plugged with cotton and the other end is inserted through the hole of the upper plate of the Petri dish and pushed into the clear medium. At the end of the egg-laying period, the cover of the Petri dish is removed, care being taken not to disturb the tube or flies. Next, the tube and the lower plate are together inverted, and when the tube is tapped with a finger the flies fall onto the cotton plug. Then the tube is quickly removed from the medium and pushed into a fresh position. The tube and the plate are turned right side up again. Before the upper plate of the Petri dish is replaced, the disk of food containing the eggs is transferred to a specially prepared black-background slide. This slide is made by placing a drop of black enamel on a glass slide and covering it with a large cover slip; this makes a perfect background for counting the eggs. After the eggs have been counted and charted, the disk of food is removed to a fresh vial of food. All moving of the disks is accomplished with the use of a short-bladed spatula. By this technique more than 100 eggs have been collected and counted within a short interval of time. The use of Moldex in the medium is suggested.

Oliveira, Henrique S. Sealing aceto-orcein salivary-gland temporary smears.

A difficulty commonly found in sealing smear slides is breakage of the seal and drying of the preparations when kept at low temperatures. To prevent these inconveniences, a new seal was devised. The composition of the sealing medium is:

beeswax	150 g
rosin	40 g
Sudan III	0.5 g

To prepare the medium, (a) the beeswax is melted; (b) the rosin is added to the melted wax and mixed at melting temperature, with care not to burn it; (c) after the beeswax and rosin have been mixed, the stain is added.

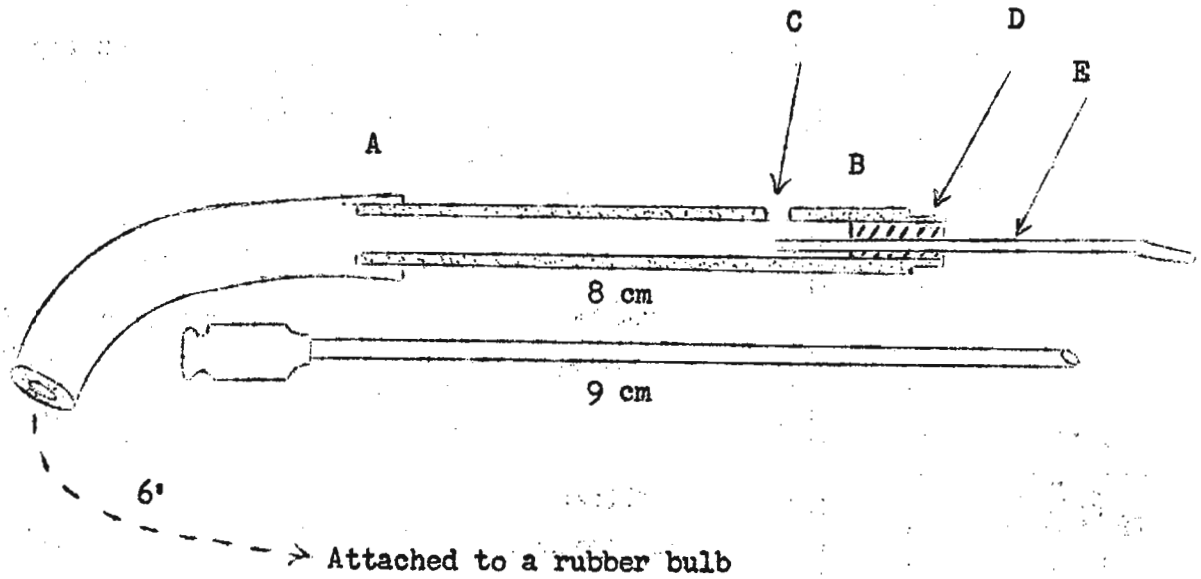
This seal, being plastic, does not break at low temperatures. Slides sealed by this method can be kept for a very long time at a low temperature without drying. After the preparations have been used the seal can easily be removed with a razor blade and the slides cleaned with sulphuric-bicromate solution.

We found it very convenient to add a stain to the seal. The stain has the advantage of making the seal very visible, permitting a delicate sealing. It also helps one to see whether any air bubble has been left in the seal, and in this way helps to get a perfect sealing.

Rizki, M. T. M. A micro-injection assembly for Drosophila.

A simple method of mounting a micropipette has been adapted for various purposes such as microinjection of dyes or ink, transplantation of organs, and attempts to artificially inseminate Drosophila. A glass tube 8 cm in length with a hole on one side (C) is fitted with a rubber plug (D). The correct size rubber plug can be made from a rubber stopper with the use of a cork borer. For assembly a B-D 17 hypodermic needle is inserted at A and forced through the rubber plug at B. A glass micropipette is then inserted into the bore of the hypodermic needle, and the hypodermic needle is carefully withdrawn, leaving the glass needle (E) in place as shown in the diagram. The end of the glass holder A is attached to rubber tubing, which is fitted with a rubber bulb at the other

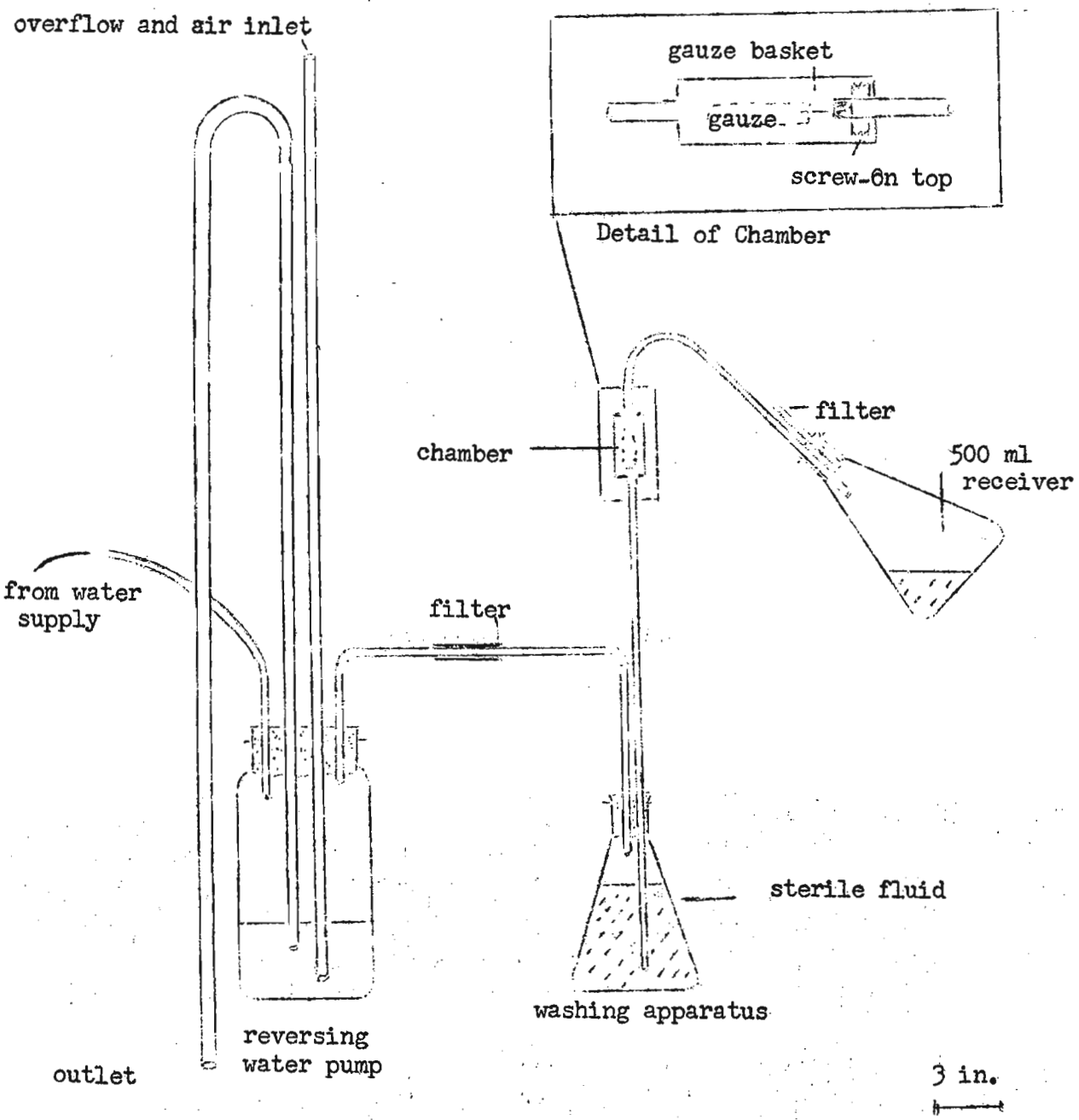
end. The rubber bulb can be pressed by foot and the pressure in the injection syringe can be controlled by opening and closing the hole in the glass holder with a finger.



Sang, J. H. A method for sterilizing Drosophila eggs. Current methods of sterilizing Drosophila eggs are usually unsatisfactory when large numbers of larvae are set up in each culture, and especially so when the proportion of yeast spores is high in the bottles containing the parents. A method depending on the dechorionation of eggs and removal of the freed chorions by repeated washing has been devised to overcome this. The first 100 cultures set up, each containing 40 larvae, showed an infection rate of 4.7%.

The routine now adopted is: (1) Free eggs from oviposition medium and expose to 0.5% HgCl for 15 minutes in beaker. (2) Dechorionate in beaker with fresh 1% chloride of lime solution, decant, and wash with water. (3) Transfer eggs to wire basket of washing apparatus, all of which has been previously sterilized by autoclaving (see diagram). (4) Wash with sterile water, 1% Cetavlon (cetrimide) and sterile water, using about 400 ml of each and regulating flow so that about 20 ml of each fluid is passed into the receiver at a time. (5) Transfer eggs to sterile agar plates, using the paper spoons described by Begg and Sang (Science, 1950), under sterile conditions. (6) Set up cultures with larvae within 2 hours of hatching. The entire sterilization takes about two hours, and many thousands of eggs can be handled at one time. Step (1) is necessary only when the bottles containing the parents are heavily contaminated with bacteria. Full details of the method will be published elsewhere.

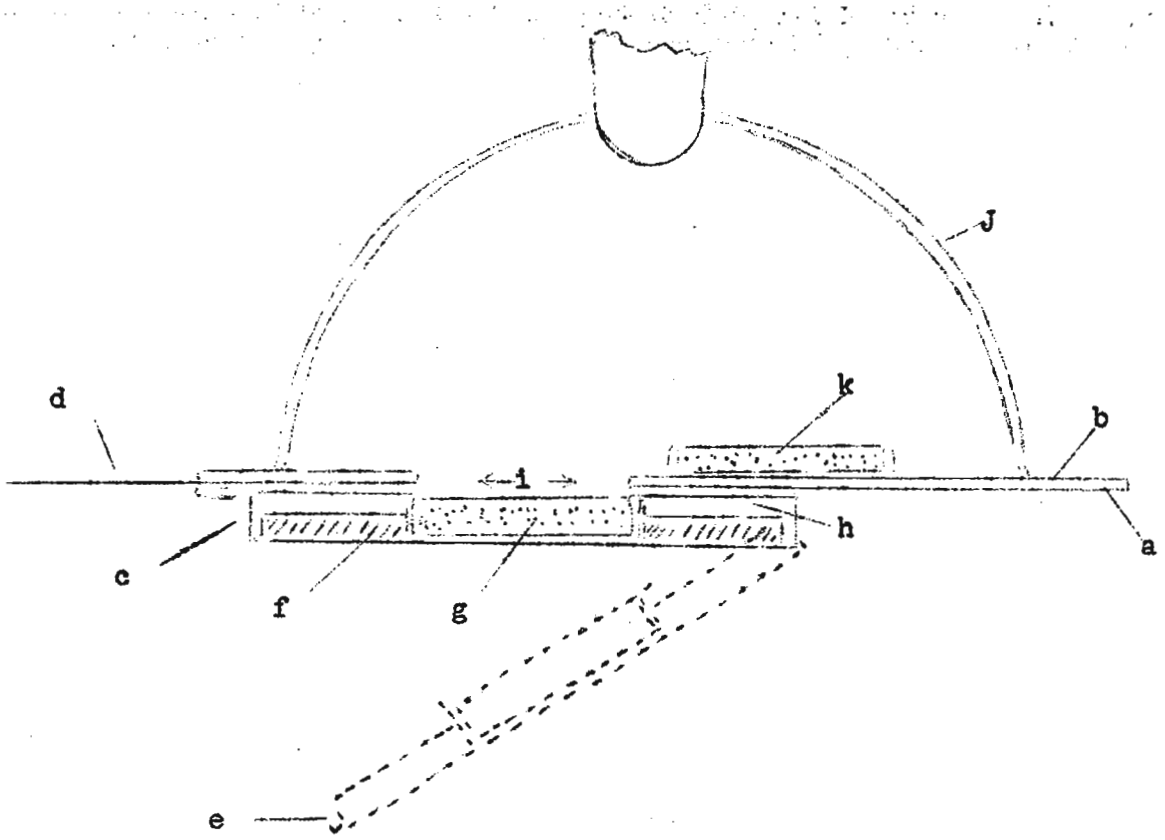
(see diagram next page)



Thomson, J. A. Population-cage windows. A continuous strip of cellophane 6 inches wide is a simple way of preventing spots of excreta from so covering the glass window that it becomes difficult to observe the contents of the cage. The roll of cellophane is fed through from one end of the cage to the other and is pulled taut against the under side of the window. It may be kept in place by means of cellulose tape. As soon as the cellophane strip has become mired with excreta (after about 6 to 10 weeks in our cages), it is loosened at both ends and a fresh strip fed through. If two people work together, it is possible to keep the strip taut against the glass so that few, if any, flies get trapped between the two surfaces. The soiled strip of cellophane can then be torn off and discarded.

Ulrich, Hans. A convenient method of collecting large numbers of Drosophila eggs homogeneous in age.

Newly hatched male and female flies are placed in bottles containing fresh food medium with yeast, and kept at 25°. Three to four days later the flies are collected and placed without being etherized under the glass bell of an apparatus whose structure is shown in the figure below (ca. 1/2X).



a = metal plate. b = filter paper. C = filmpack container. d = slide, partially removed. e = cover of the container, opened. f = wooden plate with a circular hole for the vial (g). g = egg-laying vial; its height equals the inner height of the container minus h. h = thin metal plate with a circular hole, the diameter of which is a little smaller than that of g. i = circular hole in a and b, diameter equaling that of the hole in h. k = vial containing filter paper moistened with syrup-water as additional food for the flies. l = glass bell with an opening closed by a cotton stopper.

The vial (g) is filled with well-fermented food, the leveled surface of which is partially covered by a strip (preferably, duplicate strips) of black blotting paper, moistened with diluted vinegar. Upon this paper are lying several small pieces of moistened black paper, or a ladder-shaped piece cut from a film. When the slide of the filmpack container is removed, the flies may oviposit. If the food and the paper are sufficiently moist, the eggs are deposited nearly exclusively on the surface of the paper along the borders of the small pieces of paper or of the ladder-shaped piece of film. Thus, if these pieces are removed, the eggs are lying in rows and therefore can be counted easily without being touched. They may be subjected to agents

such as X-rays directly while lying on the paper. If this paper is double, the upper strip with the eggs may easily be removed from the lower one, and will not be smeared with food. By cutting the paper in pieces, or by shielding single rows in succession with lead, one may apply different doses to separate parts of an egg collection. Changing of vials can be done very quickly without troubling the flies. If the apparatus is well constructed and handled, the flies do not escape. The eggs can be removed easily from the paper without being injured; and they are not smeared with food or yeast, a fact especially important in the partial X-raying of eggs carried out by the author.