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ABBE, E. C., and PHINNEY, B. O., University of Minnesota, Minneapolis, Minn.: *The action of the gene dwarf$_1$ in the ontogeny of the stem in maize.*——Maize plants which are d_1d_1 in constitution have a lower rate of increase in length of stem and mature more slowly than do normal plants. The number of stem units is the same, but the stem units are shorter at maturity in the d_1d_1 plants so that these plants are dwarf in stature. Stem unit eight, being reasonably representative, was used for further intensive study. Since the shoot apices of dwarf and normal plants are similar in size, form and cellular constitution, while the subsequently formed young stem unit of the dwarf has shorter cells than does the normal, it was concluded that the threshold of action of d_1d_1 is at just that stage in ontogeny when the stem unit becomes recognizable as a morphological entity. Coupled with the lower growth rate of the dwarf is the slower rate of cell division throughout the ontogeny of stem unit eight. During the earlier phases of stem growth the cells of the dwarf are slightly shorter than are those of the normal plants when stem units of the same length are compared, while in the later phases they are somewhat longer, indicating that the rate of cell enlargement in the dwarf differs from that in the normal. Thus the state of tension between two major morphological phenomena——rate of cell division and rate of cell enlargement——differs in the dwarf from that in the normal. At maturity, however, stem unit eight is longer in the normal because there have been more cytokineses and cell enlargement has proceeded more rapidly than in the dwarf. The action of d_1 in the ontogeny of the stem is thus a multiple action, influencing a series of morphological phenomena which in turn affect stature.

ATWOOD, SANFORD S., U. S. Regional Pasture Research Laboratory, State College, Pa.: *The multiple oppositional alleles causing cross-incompatibility in Trifolium repens.*——In order to determine the number of oppositional alleles (S_1, S_2, S_3, etc.) causing self- and cross-incompatability in two series of plants (17 and 10 individuals, respectively) which had been selected for breeding purposes, each individual was crossed with a homozygous plant (S_1S_1). In all but one of the 27 resultant F_1 progenies, two intra-sterile, inter-fertile groups were found. From this it can be concluded that 26 of the 27 parents each carried two different alleles and the other might have since only five F_1 plants were tested. Within each series all F_1 groups were mated diallely, and each F_1 group

or its heterozygous parent was crossed as a female with six plants, homozygous respectively for six other alleles (S_2-S_7). Since all F_1 plants bore the common factor S_1, an incompatible mating between any two indicated that the two alleles being tested were the same. Likewise, failures with the homozygous plants indicated identical alleles. In order to be certain that failure to set seed was due to identical alleles, all incompatible matings were repeated two or three times, and the reciprocal crosses were made. All possible matings were accomplished and about 47 percent of the diallel crosses were tested reciprocally. In this way 34 alleles from the 17 plants in the first series were tested among themselves, and each was tested with the seven in homozygous plants. Of these 41 alleles, 34 (83%) proved to be different. In the second series, 25 (96%) of the 26 alleles were different.

BAKER, MONTEE R., and IBSEN, HEMAN L., Kansas State College, Manhattan, Kan.: *Two modifiers of self (S) and white-spotting (s) in guinea pigs.*——The dominant modifiers *Pi-1* and *Pi-2* (pigment inhibitors) affect the expression of both *S* (self) and *s* (white-spotting). One of these modifiers alone has no visible effect on a self (*S*), but when both are present there is a varying number of small white spots on the head along the mid-dorsal line, even though the animal is *SS*. White-spotted animals (*ss*) not carrying the modifiers (and therefore *pi-1 pi-1 pi-2 pi-2*) usually have a large amount of pigment. So far as can be determined at present, the two modifiers are duplicates. The chief evidence for this consists in the fact that two animals may be quite similar in regard to the location and the amount of their white-spotting, and yet by breeding tests it can be shown that if one carries *Pi-1* the other carries *Pi-2*. When both *Pi-1* and *Pi-2* are present in a *ss* individual the pigment is greatly reduced, resulting in an animal that is all white except for some small pigmented spots located anteriorly and usually covering the ears and eyes. Only one animal supposedly of the composition *ss Pi-1 Pi-1 Pi-2 Pi-2* has been produced up to the present. The apparent cases of incomplete dominance of *S* over *s* can be explained in our animals by the presence of both *Pi-1* and *Pi-2* in the heterozygote (*Ss*).

BEADLE, G. W., and TATUM, E. L., Stanford University, Calif.: *Genetics of biochemical characters in Neurospora.*——From material X-rayed prior to meiosis, single ascospore cultures are grown on a medium to which is added, in the form of yeast extract, as many as is practicable of the substances normally synthesized by the organism. Such strains are subsequently tested for loss of synthetic abilities by transferring them to "minimal" media containing inorganic salts (ammonium nitrogen), a carbon source (sugars, starch or fat have been used in various tests), and biotin (the one required growth factor that cannot be synthesized by the normal strains). Induced loss of synthetic ability is indicated by failure to grow normally on such minimal media. Among the mutants obtained in this way are: 1) one unable to synthesize vitamin B_6 (pyridoxine), 2) one unable to make the thiazole half of vitamin B_1 (thiamine)

and 3) one unable to make *para*-aminobenzoic acid. Each of these differs from the normal by a single gene, and each is made indistinguishable from normal by supplying it with the particular substance that it cannot synthesize. These facts are consistent with the assumption that each of the genes involved is concerned with the control of one and only one specific chemical reaction. Other mutants, not yet investigated as regards inheritance, are characterized by loss of ability to synthesize a growth factor different from any vitamin known to the authors, loss of ability to utilize fat as a carbon source, and in a number of other ways. The general approach offers promise both as a method of learning more about how genes control specific processes and as a means of studying biochemical processes as such.

BEASLEY, J. O., and BROWN, META SUCHE, Texas Agriculture Experiment Station, College Station, Texas: *Asynaptic plants of Gossypium and their polyploids.*——In the F_2 of *Gossypium hirsutum* by *G. barbadense*, American upland by Sea Island cotton, fertile and sterile plants were found in a ratio approximating fifteen fertile to one sterile. At first metaphase the fertile plants had the normal 26 pairs of chromosomes while different sterile plants averaged six to nine pairs of chromosomes. Doubling the chromosome number in the sterile plants failed to restore normal chromosome pairing and fertility.

BEATTY, ALVIN V., University of Alabama, University, Ala.: *Mitotic periodicity in leaves.*——The examination of leaf tissue from fifteen families of plants, including 20 species of herbs, vines, shrubs and trees, has revealed a rhythmic cycle in mitotic division which is very similar in all species. In general each one exhibits two maxima periods of increased activity at twelve hour intervals occurring at about three in the morning and three in the afternoon, the morning one being the most active, and two minima periods, which are quite constant for all species and follow soon after the maxima, occurring at about seven in the morning and five in the afternoon. In most species the rise from a minimum to a maximum is characterized by minor fluctuations in mitotic activity.

BERNSTEIN, MARIANNE E., Carnegie Institution of Washington, Genetics Record Office, Cold Spring Harbor, N. Y.: *The incidence and Mendelian transmission of mid-digital hair in man.*——To determine the mode of inheritance of the distribution of mid-digital hair on the human hand, data were collected by BURKS and analyzed by BERNSTEIN and BURKS on parents and offspring and on sibling pairs of high school age. DANFORTH'S finding that with very few exceptions a child will have no more fingers affected than its more hairy parent was confirmed.——A hypothesis of monomeric inheritance was offered: that genes for the more affected phenotypes are dominant and allellic with respect to genes causing less affected phenotypes. The validity of this hypothesis was tested on the family and sibling data by statistical methods with good results. ——It was also observed that the proportional frequency of the more and of the less affected phenotypes differs for groups of diverse European origin.

For a group of Italian derivation less mid-digital hair was observed than for a group of Irish derivation, and still more mid-digital hair was encountered for a group of North European-Germanic derivation.

BISHOP, D. W., University of Pennsylvania, Philadelphia, Pa.: *Cytological demonstrations of chromosome breaks soon after X-radiation.*——First spermatocyte prophase stages of Orthoptera are used to demonstrate X-ray induced chromosome breaks. Three minutes after irradiation breaks in one of the four diakinetic chromatids can be demonstrated (*Chortophaga viridifasciata* treated with 540 *r*). In *Melanoplus bivittatus*, fixed six minutes after irradiation (270 *r*) many cases of breaks are found in one of the two visible threads of pachytene chromosomes and in one of the chromatids of diakinetic chromosomes. Within this time interval no cases of simultaneous breakage of two visible threads occurs. However, within thirty minutes (270 *r*) two-thread as well as one-thread breaks occur in diakinetic chromosomes. A few double breaks were found within eight minutes at 540 *r*. These results are evidence for an almost immediate effect of the irradiation in contrast to a delayed effect. However, the breakage reaction seems to be a gradual rather than an instantaneous event, judging from the longer time required for two-thread breaks at the same dosage. Chromosome fragments are found in spermatogonial and spermatocyte anaphases within 30 minutes after irradiation. The point of breakage in prophase chromosomes is at random. In normal and in treated cells neither the pachytene nor the diakinetic chromosomes are in contact with one another; if the breakage mechanism is the same as that leading to inversions and translocations, the evidence supports the breakage-first as opposed to the contact hypothesis.

BISHOP, D. W., University of Pennsylvania, Philadelphia, Pa.: *Sensitivity of spermatocyte chromosomes to aberrations induced in the embryos by X-radiation.*——Gonads were removed from adult and late nymphal grasshoppers (*Circotettix verruculatus*) which had been irradiated (150 to 750 *r*) as embryos still within the chorion. In the first meiotic anaphase there are chromosome alterations, not found in any other mitotic stage, and not included among the usual cytogenetic changes. These aberrations affect one or both of the diad components of the tetrad, and include constrictions, attenuations, and breaks. They are invariably located between the point of spindle attachment and the nearest region of association of the arms of the homologs ("chiasm"). The second spermatocytes thereby produced frequently contain large duplications and deficiencies and are inviable. All of the cells within an affected cyst have been derived from a single treated cell by at least seven divisions. Yet no abnormalities in the previous spermatogonial, diakinetic, or first spermatocyte metaphase chromosomes predict the aberrations that will occur at meiotic anaphase. Comparisons with chromosome rearrangements involving reciprocal translocations (multiples), inversion-crossovers (dicentrics and acentrics), and small deletions, demonstrate that some other mechanism of chromosome alter-

ation pertains. The distribution of aberrations is non-random, concerning the regions affected within particular chromosomes as well as different chromosomes within a cell. A large proportion of aberrant chromosomes show homologous breaks, symmetrically placed, in the two members of a tetrad. The conclusion is drawn that the X-ray effect is general and the chromosomes become fragmented at points of natural weakness.

BOGART, RALPH, MUHRER, M. E., and HOGAN, A. G., University of Missouri, Columbia, Mo.: *The physiology and inheritance of a hemophilia-like abnormality in swine.*——A hemophilia-like condition, characterized by prolonged bleeding, has been observed in swine. Hemorrhages from slight injuries, or no visible injury, are frequently fatal. The coagulation time of whole blood and of plasma from "bleeder" hogs is greatly extended but once formed the clot retracts in normal time. Blood from "bleeder" hogs is normal in quantity of prothrombin, fibrinogen, calcium and formed elements. Either tissue juices or platelets will cause blood from "bleeder" hogs to clot in a normal manner. This indicates that blood from "bleeders" is deficient in an available source of thromboplastin. The abnormality first expresses itself at about two months of age and becomes more severe with increasing age. The data, which include 84 matings and 585 offspring, indicate that the defect is due to a recessive gene. There is considerable variation in severity of the character which indicates that modifying genes influence the degree to which the "bleeder" gene expresses itself. No evidence for sex-linkage has been obtained.——(Contribution from the Departments of Agricultural Chemistry and Animal Husbandry, Mo. Agri. Exp. Sta. and the Bureau of Animal Industry, U.S.D.A. Mo. Agri. Exp. Sta. Journal Series No. 790. Aided by a grant from the John and Mary R. Markle Foundation.)

BREHME, KATHERINE S., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *A survey of the Malpighian tube color of the eye color mutants of Drosophila melanogaster.*——The color of the larval Malpighian tubes of certain eye color mutants was found by BEADLE to differ from the bright yellow characteristic of the wild type. The tube color of 25 mutants was reported by BEADLE, and of eight others by BRIDGES, CURRY and SCHULTZ. Because of the usefulness of this character in classifying larvae for experimental purposes, observations have been made of 66 additional mutants, virtually completing the list of factors affecting eye color. No direct relation has been found between the amount of pigment in the eye and in the tubes. Alleles which have a similar effect upon eye color appear to have a similar effect upon tube color, although the safranin and vermilion alleles may offer exceptions to this generalization. Alleles which have a different effect upon eye color (the white locus) affect tube color in varying degrees, and dark eye color is not necessarily accompanied by dark tube color. Two useful chromosomal aberrations are readily classifiable in the larva: T (2; 3) Pale (white tubes) and In (3L) persimmon (almost white).

BRINK, R. A., and COOPER, D. C., University of Wisconsin, Madison, Wis.: *Somatoplastic sterility as a function of the endosperm genotype.*——Following the mating, *Nicotiana rustica* ♀ by *N. tabacum* ♂, most of the seeds collapse although a few attain a germinable condition. This combination is intermediate between *N. rustica* selfed, which is fully fertile, and *N. rustica* ♀ by *N. glutinosa* ♂ in which all the seeds fail early. The two classes of hybrid seeds are similar in that (a) endosperm growth is retarded, (b) pronounced hyperplasia of the nucellus occurs and (c) the integumentary cells distal to the vascular bundle do not differentiate into conducting elements. With reference to (a) and (b) above, however, the hybrid seeds differ in degree. The endosperm-nucellus volume ratios at the two-celled proembryo stage, for example, are as follows: 1.47 for *rustica* selfed; .72 for the *tabacum* hybrid; and .51 for the *glutinosa* hybrid. Similarly, the percentage of seeds in which the endosperm is occluded by nucellar overgrowth at the 8- to 16-celled embryo stages is zero, 22 percent and 76 percent, respectively. All the *tabacum* hybrid seeds continuing growth beyond early stages show the endosperm in direct association with the integument through the nucellar gap at the chalazal end. Growth of these seeds is at the expense of the integument, the cells of which tend to become depleted of their contents.

BRITTINGHAM, WM. H., U. S. Regional Pasture Research Laboratory, State College, Pa., and The University of Maryland, College Park, Md.: *The nature and extent of variation in Kentucky bluegrass as criteria for apomictic seed formation.*——A nursery of 10,066 plants was established from 115 parental plants of *Poa pratensis* L. Seed set under bag varied from none to over 80 percent, with 65 percent of the plants giving over 60 percent seed set under parchment bag. Self-pollinated progenies were available from 87 parental plants. The following average figures were obtained: germination 80.3 percent, polyembryony 7.0 percent, survival in the field 86.3 percent, and among single seedlings 14.8 percent, and among twin seedlings 17.1 percent deviated from their respective maternal types. The highest value obtained for polyembryony was 31.6 percent, the highest for variability 65.5 percent. The lowest value for survival was 27.5 percent and was found in the progeny giving the highest value for variability. No significant correlations were found between variability and source of material, seed set under bag, and germination. A barely significant negative correlation existed between polyembryony and variability. A highly significant negative correlation was found between survival and variability. Morphological and cytological studies have indicated that plants from both single seedling and twin seedling sources arise from 1) apomictic development of reduced eggs ("haploids"), 2) fertilization of reduced eggs by reduced pollen ("diploids" by amphimixis), 3) fertilization of unreduced eggs by reduced pollen ("triploids"), and 4) apomictic development of an unreduced egg derived from a cell of the nucellus by apospory and resulting in matroclinous offspring ("diploids" by apomixis). The results of this work are not inconsistent with the conclusion that techniques of selection, strain building, and intra-

and interspecific hybridization are theoretically applicable to breeding problems in Kentucky bluegrass.

BRUMFIELD, R. T., Yale University, New Haven, Conn.: *Cell-lineage studies in root meristems by means of X-ray induced chromosome rearrangements.*——Certain types of chromosome rearrangements induced by X-rays are passed on through subsequent cell division to all the descendants of the affected cell. Thus chromosome changes induced by X-rays offer a means of "tagging" a single cell and determining the kind and extent of tissues derived from it. This paper reports results obtained by the use of this method in studying cell lineage in root meristems.——Germinating seed of *Vicia faba* and *Crepis capillaris* were X-rayed, allowed to grow for three weeks after radiation, then primary root tips were fixed and sectioned transversely. Cytological observations revealed that many of the root meristems thus treated were chromosomal chimeras, both normal and rearranged complements (usually unequal translocations) being found in the same root. All chimeras so far observed have been sectorial ones. In most of the chimeras of both Vicia and Crepis the sector having the rearranged complement represents about one-third of the root and includes root cap, epidermis, cortex, endodermis, and central cylinder. This indicates that in these roots a single cell may give rise to all the above tissues and that the whole root develops from but few cells at the extreme tip. Sectorial chimeras would not be expected if the meristem consisted of "histogens" as described by HANSTEIN.

BUSHNELL, RALPH J., University of Connecticut, Storrs, Conn.: *Incompatible matings in inbred families of the bean weevil.*——The common bean weevil, *Acanthoscelides obtectus*, provides excellent material for the study of fertility of inbred families as the infertile eggs collapse soon after being deposited. In a series of 151 matings, the individuals comprising the matings being derived from field infested beans, 7.28 percent of the males were involved in infertile matings. Offspring from 66 of the original matings were brother × sister mated and from a total of 449 such matings, 21.2 percent of the males and 20.7 percent of the females were involved in incompatible matings. Actually, only 368 males were used as some males were tested with two or more of their sisters. Tests of the latter type showed that some males were compatible with all sisters with which they were tested, other males being compatible with some but not all of their sisters, while a few males were compatible with none of their sisters. In many instances, the members of an incompatible pair had been observed in coition. Incompatible matings occurred in 33 of the 66 families selected for the first generation of inbreeding. However, 11 of the 33 families not showing incompatibilities in the first generation of inbreeding did show them in the second. Of the families in which incompatible matings occurred in the first generation of inbreeding, 28.6 percent (89 out of 311) of the matings were infertile, while the second generation of brother × sister matings produced 23.9 percent (82 out of 343) incompatibilities. Of the families in

which incompatibilities became evident for the first time in the second generation of inbreeding, there were 23.85 percent incompatible matings (26 out of 109) in that generation.

CASPARI, ERNST, Lafayette College, Easton, Pa.: *Genetic and environmental factors influencing testis color in Ephestia kühniella.*——Two loci are known to influence testis sheath pigmentation in Ephestia. The series a^+-a^k-a diminishes the quantity of pigment in testes, as well as in eyes and other organs, by controlling the release of a diffusible substance necessary for pigment formation. A gene pair *Rt-rt* controls the quality of the pigment formed in the testes, but not in the eyes. *Rt* testes are brownish violet, containing evenly distributed sepia colored granules of equal size. *rt rt* testes are red or pink, containing red pigment granules of unequal size and sometimes pigment diffuse in the cells. The strength of pigmentation of the testes is furthermore influenced by the hatching order, the first hatching animals having more heavily colored testes than the later hatching ones. This applies to *RtRt*, *rtrt* and *aa* animals. The eyes of *aa* animals do not show any influence of hatching order. It is concluded that this factor influences testis pigmentation through some process other than the formation of a^+ substance.

CHASE, ELIZABETH BROWN, and CHASE, HERMAN B., Department of Zoology, University of Illinois, Urbana Ill.: *Inheritance of shape of vaginal orifice in the mouse.*——The vaginal orifice was examined at the time of introitus in two inbred strains of mice and in the offspring of crosses between them. In one strain a large oval vagina was found in 100 percent of the cases (102); in the other, a small round vagina was found in 179 and oval in 5 females. In the F_1, oval vagina shape was found in 41, round in one female. In the F_2 there were 91 oval and 29 round. In the back-cross to the round type, there were 30 oval and 27 round produced. These results would seem to indicate a single factor affecting vagina shape, showing dominance of the oval type.

CHASE, HERMAN B., Department of Zoology, University of Illinois, Urbana, Ill.: *A mutation toward normal eyes in the anophthalmic strain of mice.*——In the sixth generation of inbreeding a female appeared with a normal left eye and a nearly normal-sized right eye, a condition much nearer normality than was ever recorded in this strain. This female mated with her completely eyeless brother produced offspring indicating that she was heterozygous for a factor for normal eyes. From this mating two sublines have been selected, one with 98 percent anophthalmics and the other with 94 percent normals. Crosses with other strains have shown that *Ey* (normal) is dominant over *ey* (eyeless). Crosses between these two sublines have shown no dominance but a complete range of expression from normal through completely eyeless. A matroclinous tendency is shown, however, in the shifting of the median of this range toward normality with a normal-eyed mother.

CLANCY, C. W., University of Oregon, Eugene, Ore.: *Development of eye colors in Drosophila melanogaster: Further studies on the mutant claret.*——Evidence for the existence of ca^+ substance has been re-examined. Unpublished data supplied by Professor G. W. BEADLE of Stanford University along with results of experiments carried out by the writer show, 1) that the type of non-autonomous development undergone by a wild-type optic disc when grown in a claret host is non-specific and occurs in other hosts known either to lack v^+ hormone or to contain it in reduced amount as compared to wild type, 2) that wild-type optic discs grown in claret hosts contain less brown pigment than wild-type control implants, 3) that wild-type optic discs grown in hosts of claret constitution can approach full wild-type pigmentation very closely when additional v^+ hormone is supplied, and 4) that by a variety of tests the mutant claret exhibits less v^+ hormone activity than wild type. In view of these results the original basis for the postulation of ca^+ substance is no longer tenable. A method for the extraction and measurement of the eye color pigments of Drosophila has been devised and preliminary values obtained in a series of measurements on wild type, claret, and double-recessives of claret with vermilion, cinnabar, and brown. These show that the mutant gene claret acts in such a way as to reduce the quantity of the red pigment to about 17 percent, and the brown pigment to about 28 percent of that present in wild type.

CLARK, FRANCES J., Connecticut Agricultural Experiment Station, New Haven, Conn.: *Preliminary investigations in Zea mays of the germination capacity of pollen with aberrant nuclei.*——Maize plants which are homozygous for the recessive mutant *dv* (divergent spindle) produce microspores whose normal chromosome complement is distributed among several to many micronuclei. Usually a return to the normal nuclear condition follows the first division of the microspore. Occasionally, however, the distribution of the chromosome complement among several nuclei may persist resulting in multinucleated vegetative or generative cells or uni- or multinucleated cells with no division of the cytoplasm. Such male gametophytes may develop normal appearing pollen grains. To determine whether these grains are capable of germination, pollen of *dv/dv* plants was placed on small pieces of silks. After 30 minutes the silks were fixed, stained in aceto-carmine and cleared with chloral hydrate. Of the 287 pollen grains examined, one had two nuclei and two had three nuclei in the vegetative cell. Two sperm cells were also present in each of these three grains. The pollen grain with two nuclei in the vegetative cell had commenced germination. Of 17 pollen grains containing *only* one or two nuclei (no sperm nuclei present), eight had produced normal appearing germ tubes which had penetrated the silk hairs. It is concluded that pollen germination does not require a normal morphological organization of the pollen grain (one vegetative cell and nucleus and two sperm cells with one nucleus each) nor the inclusion within a single nucleus of all the chromosomes of the vegetative cell.

CLELAND, RALPH E., Indiana University, Bloomington, Ind.: *Report on the*

analysis of segmental arrangements of Onagra complexes.——The segmental arrangements of a considerable number of Onagra genoms are being analyzed, and the present status of this work is summarized. Considerable progress has been made since the last report. The smear method is now being used almost exclusively in the determination of chromosome configurations. A few examples of such preparations are exhibited.

COLE, LEON J., and FINLEY, HAROLD E., University of Wisconsin, Madison, Wis.: *The production of somatic mutations in the pigeon with X-rays.*—— The exhibit shows flight feathers from ash-red pigeons of genotype $B^A B$. Feathers on the right panel are from the right wing; on the left are the corresponding feathers from the left wing. In the top row are feathers plucked before any treatment; they show relatively little flecking. Immediately after plucking the empty follicles in the right wing were exposed to 750 r and 1000 r of X-rays; those in the left wing received no treatment. In the second row are the feathers regenerated from these follicles. It is evident that the amount of flecking has been greatly increased in the treated feathers. That a permanent change has been produced is indicated by the tendency to reproduce the flecking pattern in three subsequent feather-generations from these same follicles (rows 3, 4 and 5) without further treatment. This increase in flecking may be attributed to mutations produced in the feather germ by the X-rays, either by change of the B^A gene to B or b, or by the production of a deficiency in that region; the present experiment is not decisive as to which.

CROUSE, HELEN V., University of Missouri, Columbia, Mo.: *Translocations in Sciara: Their effect on chromosome behavior and sex determination.*——In *Sciara coprophila* maps have been made of the four salivary chromosomes and the points of breakage in ten translocations localized. Salivary chromosomes B and X of *S. reynoldsi* have been mapped. Studies on four translocations place the Puff locus on chromosome B, the sex-linked recessive, yellow, on X. B and X are the two rod-shaped chromosomes in metaphase. In *S. coprophila* the translocation studies identify salivary chromosomes X, II, and III as the three rods in metaphase and associate the Wavy, Fused, and Curly linkage groups with these three chromosomes; map sections 12, 22, and 34 mark their respective centromere ends. Chromosome IV is the V-shaped chromosome; Dash is located on IV.——The translocation studies support the identification of the precocious chromosome as the sex chromosome of Sciara. When the X is translocated reciprocally with autosomes in *S. reynoldsi* and *S. coprophila*, only one of the translocation chromosomes exhibits precocious behavior in the secondary spermatocyte. This chromosome has been demonstrated to be the one with the X centromere in three separate instances. In *S. coprophila* there are no factors distal to map section 10 B which control the precocious behavior. In all cases the chromosome which exhibits precocious behavior during spermatogenesis is the one eliminated from the soma and germ line during embryogeny. Males which transmit an X-translocation ordinarily produce

only daughters. The male embryos do not hatch, presumably because of the unbalanced chromosome complement in their soma subsequent to chromosome elimination. The female embryos develop in spite of the unbalanced complement in their nuclei prior to the elimination process.——The translocations were produced in strictly monogenic *S. coprophila*. Females heterozygous for translocations involving any one of the autosomes are monogenic. Females heterozygous for each of the five X-translocations regularly produce offspring of both sexes. The "exceptional" males in all cases have rudimentary sterile testes; males with a small ovary and a sterile testis have been observed. The "exceptional" females produce sons and daughters. The intact X chromosome appears to be essential to the monogenic condition.

CUMLEY, R. W., IRWIN, M. R., and COLE, L. J., University of Wisconsin, Madison, Wis.: *Genic effects on serum proteins.*——Although no differentiation of the serum proteins of Pearlneck (*Streptopelia chinensis*) and Senegal (*S. senegalensis*) was possible by direct precipitin tests with Pearlneck antisera, it was found that Pearlneck serum could be definitely distinguished from Senegal serum in tests with the "reagent" produced by absorbing certain anti-Pearlneck sera with Senegal serum. Three such reagents were tested with the sera of 14 backcross birds, obtained from mating, to Senegal, species hybrids and two backcross hybrids from the cross of Pearlneck and Senegal. A definite segregation of serum antigens specific to Pearlneck was observed, showing that the antigens specific to Pearlneck are gene-determined.——Furthermore, a comparison of the presence or absence of antigens, specific to Pearlneck, of the blood cells (also gene-controlled) and serum, respectively, of these backcross hybrids showed that such antigens of the serum might be present either in the presence or absence of demonstrable cellular antigens. This segregation shows that the antigens specific to Pearlneck in the serum and cells, respectively, are not produced by the same genes, and only a loose linkage, if any, obtains between them.——The results of this and previous investigations show beyond reasonable doubt that the species-specific qualities of the serum proteins are determined by gene action and suggest that the total protein complex is likewise determined by genes.

DEMEREC, M., HOLLAENDER, ALEXANDER, HOULAHAN, M. B., and BISHOP, M., Carnegie Institution of Washington, Cold Spring Harbor, N. Y., and National Institute of Health, Bethesda, Md.: *Effect of monochromatic ultraviolet radiation on Drosophila melanogaster.*——Abdomens of male flies of yellow-white and wild type stocks were pressed between quartz plates and irradiated with measured quantities of monochromatic ultraviolet radiation of the following wave lengths: 2280, 2650, 2937, 3050, 3130 and 3300 Å. The flies were analyzed for sex linked lethals by *ClB* method. Some sterility was induced by all wave lengths tested, shorter wave lengths proving to be more effective than the longer ones. A sharp break in the effectiveness took place between 3050 and 3130 Å. Sterility is apparently due to injury produced in

the tissues by radiation which penetrates the abdominal wall. Energy required to produce sterility at 2280 Å is about 2.1×10^6 ergs per cm^2 and the sterility limit is so low that only 1 percent of lethals can be obtained. At 3130 Å energy of 83.5×10^6 ergs per cm^2 can be easily applied since it sterilizes only about 50 percent of the treated males. Such dosage induces about 5.5 percent lethals. Yellow-white flies showed higher sensitivity to injury than wild type flies.—— For 3130 Å data are available indicating that the genetic effect increases with the dosage applied, but that the interference of secondary factors induces a great deal of variability in successive experiments. This is probably caused by the absorption of radiation by tissues which happen to cover the testes during irradiation. In occasional experiments the percentage of lethals obtained was as high as 50 percent indicating the possibility that ultraviolet may produce mutations at a very high rate.——In one experiment with 2650 Å one translocation among 116 treated sperm was observed. Additional 762 tests of sperm from males which had been given similar treatment did not disclose any translocation. None was observed among 1073 sperm obtained from males treated at 3130 Å with energy which produces 5.5 percent lethals.

DEMEREC, M., KAUFMANN, B. P., and SUTTON, E., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *Genetic effects produced by neutrons in Drosophila melanogaster.*——Oregon-R, wild-type males were treated with neutrons using the Institution's electrostatic generator, with a lithium target. During the treatment, which lasted several hours, flies were kept at constant temperature and humidity, and shielded from beta rays by one-fourth inch of lead. Dosage measurements were made with a 25 r Victoreen chamber and are expressed in arbitrary n-units.——Two groups of males were treated with about 1500 n-units, and two with about 2000 n-units. Part of the males from each group were mated with *ClB* females in order to determine the frequency of induced X-chromosome lethals. The remaining males were mated with wild-type females, and the salivary gland chromosomes of the F_1 female larvae were analyzed for breaks.——The lower dosage produced $23/1221 = 1.88$ percent lethals, and the higher dosage gave $30/1068 = 2.81$ percent. From X-ray studies of the Ore-R line by Demerec, and from Timoféeff-Ressovsky's and Zimmer's studies on the production of lethals by neutrons it is inferred that in this experiment n-units can be transferred into r-unit equivalents by multiplying values by a factor of about two. Cytological analysis showed for the lower dosage 18.43 ± 2.43 percent altered sperms and 46.66 percent breaks per total sperms, and for the higher dose 20.2 ± 2.33 percent altered sperms, and 53.5 percent breaks. Comparable values for equivalent treatment with X-rays are: 18.82 ± 1.60, 49.23; 29.8 ± 3.12, and 85.58 percent respectively. These results indicate that the frequency of breaks induced by neutrons does not differ appreciably from the frequency induced by an equivalent dose of X-rays. Breaks are also distributed at random throughout the chromosomes.

DODGE, B. O., The New York Botanical Garden, New York, N. Y.: *A herit-*

able factor complex for heterocaryotic vigor in Neurospora.——A new bright cadmium-yellow dwarf race of Neurospora which has a very low growth rate is non-conidial. Races C_4 and C_8 of *Neurospora tetrasperma* both produce conidia and they are of opposite sex. They are stable races so far as growth rates and production of conidia under standard cultural conditions are concerned. When nuclei of the dwarf race and those of C_4 are brought together in the same cytoplasm to give a heterocaryotic mycelium, this mycelium grows very much more vigorously, two or three times as fast as does that of race C_4 alone and the amount of conidia produced is increased manyfold. The dwarf race reacts with race C_8 which is of the same sex, in the same way, increasing the growth rate and the production of conidia very strikingly. When the dwarf race is crossed with race C_4 and new races are obtained by germinating the f_1 ascospores, some of these new races show the same bright yellow non-conidial dwarf characteristics. When nuclei from these are allowed to mingle with nuclei of either C_4 or C_8 in a common cytoplasm the same heterocaryotic vigor is manifested. Furthermore, some of the new races which are unisexual show very vigorous growth with production of large amounts of conidia. Since the nuclei of their mycelia must be haploid and homocaryotic, the vigor shown is simply due to favorable new combinations of genes now included within the same nuclear membrane. Heterocaryotic vigor, true hybrid vigor and individual haploid inherited vigor are to be distinguished.

EIGSTI, O. J., University of Oklahoma, Norman, Okla.: *A comparative study of the effects of sulfanilamide and colchicine upon mitosis of the generative cell in the pollen tube of Tradescantia occidentalis (Britton) Smyth.*——Concentrations of each drug within the range of 1:1000 and 1:10,000 induced mitotic abnormalities. Greater concentrations of each drug inhibited pollen tube formation. Consequently the generative cell remained apparently inactive mitotically. There are several noticeable effects of colchicine upon mitosis of the generative cell; *viz.*, unseparated daughter chromosomes scattered in the pollen tube, daughter chromosomes relegated to the same nucleus, and disturbed metaphasic stages which preclude regular sperm formation. Sulfanilamide also induces mitotic irregularities such as: interrupted metaphasic stages; irregularly formed nuclei; and disintegrated chromosomal material. The maximum number of nuclei attainable in pollen tubes growing in a medium containing colchicine is six (one nucleus for each pair of chromosomes); whereas, more than six nuclei frequently appear in the pollen tubes of sulfanilamide preparations. Eight hours after the pollen was planted onto the medium containing sulfanilamide small globular bodies appeared in the plasm of certain pollen tubes. A duplication of chromosomes is not the usual result of treatment with sulfanilamide; however, colchicine usually causes duplication of chromosomes in the nucleus. This feature of duplication in the presence of colchicine and lack of duplication in the presence of sulfanilamide is the notable difference between the effects of these drugs upon mitotic phenomena of the generative cell of the pollen tube of *Tradescantia occidentalis*. These studies indicate that

the genetic consequences of treatments of meristem with sulfanilamide might possibly differ from those of colchicine in which case polyploidy is the usual result from meristem treatment.

FANKHAUSER, GERHARD, and CROTTA, RITA, Princeton University, Princeton, N. J.: *The frequency of spontaneous aberrations of chromosome number among larvae of the newt, Triturus viridescens.*——During the past four years, a systematic investigation has been made of the chromosome numbers of larvae of the common newt, *Triturus viridescens*. The counts were made in whole-mounts of tailtips amputated at an early larval stage. The larvae all developed from eggs laid in the laboratory from November to May, by pituitary-stimulated females. Several triploid larvae (FANKHAUSER, 1938; GRIFFITHS, 1941) and a pentaploid larva (FANKHAUSER, 1940) were discovered during the first three years. The past year has added other cases of triploidy and pentaploidy, as well as several other types of numerical aberrations. Sufficient material has thus accumulated for a preliminary estimate of the frequencies of the various aberrations in this species.——A total of 1074 larvae have been classified as to chromosome number so far. 1056 were diploid (22 chromosomes), 10 triploid, 1 tetraploid, 3 pentaploid, and 1 haploid. One of the three remaining larvae possessed a complement of 24 chromosomes, one was a haploid-diploid chimaera, while the tailtip of the third contained both diploid and hypertriploid cells. Of particular interest are the three pentaploid larvae and the single haploid which is probably the first case of spontaneous haploidy to be described among vertebrates. Less extensive studies of larvae of other salamanders (*Triturus pyrrhogaster*, *Eurycea bislineata*) have shown that similar spontaneous chromosome aberrations occur in these two species also.

GILES, N. H., and NEBEL, B. R., Yale University, New Haven, Conn., and New York Agricultural Experiment Station, Geneva, N. Y.: *An analysis of the intensity factor in X-ray induced chromosomal aberrations in Tradescantia.* ——In a series of experiments developing microspores of Tradescantia were given equal total doses (308 roentgens) of X-rays at widely different intensities, from 1.3 to 1200 r/min. At the 4–5 day period following irradiation smears were made for an analysis of the percentages of translocations (dicentric and ring types) and of interstitial deletions——small acentric rings according to RICK and SAX (isodiametric fragments in the terminology of NEBEL, WILSON and MARINELLI) induced during the resting stage at the various intensities. At 50 r/min. and above (150, 600, and 1200 r/min.) the percentage of aberrations in both classes remains approximately constant——there is little or no intensity effect. At lower intensities (20, 10.3, 5.2, 2.5, and 1.3 r/min.) the percentage of aberrations in both classes decreases progressively, but not linearly with decreasing intensity, until at 1.3 r/min. the number of aberrations per cell is somewhat less than half that found at intensities of 50 r/min. and higher. These results are in accord with the hypothesis that the chromosomal aberrations types studied result from two independent potential breaks,

and that the reunion of broken ends occurs during the resting stage within a certain time following the initial breakage. When this time is exceeded restitution occurs. Other interpretations involving second order processes may also require consideration.

GOOD, CHARLES M., JR., and NABOURS, ROBERT K., Kansas Agricultural Experiment Station, Manhattan, Kan.: *Genetic problems of the grouse locust Tettigidea parvipennis Harris.*——There are 19 genes for color pattern, and two for wing and pronota lengths, now known in *T. parvipennis*, most of them being dominant. These are located on at least four of the seven pairs of chromosomes of the species. Though there are 11 dominant genes on one of the pairs of chromosomes no crossing over has been observed. With fewer numbers of genes on any other pair of chromosomes to work with still no crossing over is known. Apparent cases of linked genes are known but crossing over has not occurred. Most of the patterns can be distinguished in any combination of genes so there is apparently a large number of allelic genes on each of the pairs of chromosomes. One of the patterns (not sex-linked) does not show in the female. There are three different genes producing analogous cuffings or bandings of the hind femora. These differ from each other in primary and secondary characters. *T. parvipennis* are also now being studied cytologically.

GOPAL-AYENGAR, A. R., Department of Botany, University of Toronto, Toronto, Canada: *Structure and behaviour of meiotic chromosomes in Gymnosperms.*——By a technique which involves pretreatment of the material before fixation, with NaCN 2^{-5} Mol. for 45 seconds to one minute and subsequent staining by the use of the Feulgen nucleal reaction or with acetocarmine, it has been possible to unravel the coiling systems of the meiotic chromosomes in species of Pinus, Taxus and Ginkgo. The number of gyres of the major spirals of particular chromosomes can be determined with certainty and its frequency is variable among and between bivalents. Generally speaking, there is a direct relation between chromosome length and the number of gyres. Reversals of coiling occur on either side of the centromere. There is undoubted evidence of a minor coil in the I metaphase and anaphase chromosomes of all the species investigated. The chiasma frequency of Ginkgo is between 1.8–2.5. Meiotic aberrations include inversions, which give rise to bridge configurations at I anaphase. In *Pinus nigra* v. *austriaca* up to 5 percent bridges were found. There is very little sterility in the pollen grains.

GOPAL-AYENGAR, A. R., Department of Botany, University of Toronto, Toronto, Canada: *Structural hybridity in Scilla species.*——Cytological examination of several species of Scilla and related genera has shown a high degree of chromosomal abnormality. These include asynapsis, univalence at meiosis, inversions, deletions and translocations, microcyte formation and ameiosis. The frequencies of bridges and fragments are very high in *Scilla siberica* (n=6). Approximately 39 percent of the cells show bridges ranging from one

to six at I anaphase. Nearly 8 percent of the cells possess two bridges in a cell (including those formed as a result of complementary crossovers in single and successive or overlapping inversions). There is also definite evidence of reciprocal and disparate crossing over in successive inversions. About 1.2 percent of the cells have three bridges and .1 percent show 4, 5 and 6 bridges respectively. Of the remaining, 15 percent of the cells have only fragments at I anaphase. There is a decrease in the number of bridges at II anaphase, though not considerably. In Bellevalia species there is a slight increase in the frequency of bridges at II division thus indicating the previous existence of loops at I anaphase. The difficulties that arise in the quantitative estimation of the coefficient of hybridity and hybridity equilibrium are discussed in the light of the chromosome behaviour of these species.

GORDON, MYRON, New York Aquarium, New York Zoological Society, N. Y.: *Dominant and recessive responses of the Sd factor in natural and domesticated fish populations.*——The gene *Sd* for a black-spotted dorsal fin has been known to be present in natural populations of *Platypoecilus maculatus* since 1867. *Sd* appears to be sex-linked dominant when tested with *sd* fish taken from its own natural habitat in the Rio Papaloapan, Mexico. When wild *Sd* fish are tested with *sd* fish of domesticated, aquarium-reared stocks, the spotted dorsal character does not appear in F_1. An extremely small number of *Sd* fish have been recovered in F_2, but the ratios indicate no simple Mendelian basis for the results. When *Sd P. maculatus* from natural populations are hybridized with three different *Xiphophorus hellerii* stocks: albino, red, wild, all the F_1 hybrids display the spotted dorsal character in an exaggerated manner. In some hybrids the condition leads to the first, and in others to the second, state of melanosis of the dorsal fin, similar in some respects to that produced by the *Sp* factor on the body proper.

GORDON, MYRON, New York Aquarium, New York Zoological Society, N. Y.: *A third primary factor, Sd, for melanomas in hybrid fishes.*——It has previously been shown that when the macromelanophore factor, *Sp*, for black spotting, or *N* for black band of *Platypoecilus maculatus*, is combined with *Sp* and *N* modifiers, *A* and *B*, of *Xiphophorus hellerii* the hybrids develop melanomas. When these hybrids are backcrossed to *X. hellerii*, the severity of the melanomas among the offspring of the next generation is intensified, often evoking the development of melanomas in day old fishes. A third factor for macromelanophores, the cells that evoke melanomas, has been discovered among the wild population of *P. maculatus* in Mexico. Owing to the fact that the macromelanophores are confined mainly to the dorsal fin of this new variety it has been called "the spotted dorsal" factor, *Sd*. When an *Sd P. maculatus* is mated with *X. hellerii*, the dorsal fin of the hybrid is almost entirely infiltrated with macromelanophores; this results in a partial breakdown of the fin and denotes the second state of melanosis. When fertile hybrids are backcrossed to *X. hellerii* the condition of melanosis is intensified and appears

much earlier. The pathological behavior of the macromelanophores, evoked by *Sd*, appears to be similar to that of *Sp* and *N* under hybridization.

GOWEN, JOHN W., Iowa State College, Ames, Iowa: *On the physiological basis of inherited disease resistance.*—Our investigations have established six inbred strains of mice differing markedly in typhoid resistance. Two strains are highly susceptible, two fairly susceptible and two have great resistance; the differences between the extremes being of the order of a thousandfold. Search for physiological factors which might account for these differences in inherited resistance has shown the level of the blood cells to be of real significance. The strains differ in the numbers of both red and white cells, as well as in the proportions of the different leucocytes. The differences in numbers of red and white cells are correlated with the resistance and susceptibility. The resistant strains show more of each type of cell than those of intermediate resistance; strains of intermediate resistance have a greater number than strains which are susceptible. Changes in the proportions of the leucocytes have less significance than greater total numbers of cells.

HERTEL, ELMER W., Wartburg College, Waverly, Iowa: *Studies on vigor in the rotifer, Hydatina senta.*——Bisexual inbreeding of the rotifer, *Hydatina senta*, resulted in a variety of strains having different degrees of vigor. There, however, was found to be a uniformity in the vigor within a given strain as was demonstrated by the rate of parthenogenetic reproduction. By selection and bisexual inbreeding for three generations nearly pure homozygous weak strains were obtained. The original vigor was restored to a marked degree by selection and crossbreeding of the weak strains. Multiple factors are probably responsible for the variation in vigor. About 4000 female rotifers, which produced more than 94,000 young, were raised and recorded during these investigations. Four unrelated strains of the rotifer were used. The vigor of the parental stocks, the inbred generations, and the cross-bred generations was determined by recording the number of young females produced by a mother. Culture conditions were kept uniform throughout all of the experimental work. Buffer solutions were used to maintain a pH of 7.2 in the culture solutions at a temperature of 16° to 18°C. A flagellate, Polytoma, was added daily as food for the rotifers. Chlamydomonas was fed instead of Polytoma for the production of males in cross-breeding.

HINTON, TAYLOR, and ATWOOD, K. C., Columbia University, New York, N. Y.: *A comparison of the specificities of terminal adhesions of salivary gland chromosomes in two strains of Drosophila.*——The two-by-two adherence of chromosome ends is non-random in salivary chromosome preparations of two wild type strains (Oregon-R and Swedish-b) of *D. melanogaster*. The frequency with which the various combinations of adhesions occur differs significantly between the two strains. The Oregon-R data was presented in an earlier report by HINTON and SPARROW (1941). In 107 cases recorded for Swedish-b, the

combinations occur as follows: 2L-3L—36; X-3L—18; X-2L—15; 2L-3R —11; 2L-2R—10; 2R-3L—9; 3L-3R—8; X-3R—6; 2R-3R—3; X-2R—1. The F_1 of the cross between the two wild type strains has a pattern of specific adhesions which is a close fit with the Oregon-R pattern, indicating a kind of dominance of the Oregon-R pattern over that of the Swedish-b. These data indicate that at least three groups of factors are contributing to the nonrandomness of the adhesions. The groups of factors are tentatively defined as: chromosome length, a non-specific stickiness, and four or more different specificity factors. When unsmeared nuclei were studied from total mount preparations of glands, 42 out of 50 showed free ends. This indicates that the nonrandomness is not due to a differential pulling apart of chromosome ends from a common mass during the process of smearing. The arrangement of chromosomes in the nucleus is found to have no correlation with the adhesion pattern.

HOLLANDER, W. F., Palmetto Pigeon Plant, Sumter, S. C.: *A sexually dimorphic factor in the pigeon.*——In previously published studies it has been shown that the mutant "Faded" is dominant to wild-type coloration, and sex-linked. The phenotypes of the "Faded" female (hemizygous) and the heterozygous male are indistinguishable. Recently the homozygous male has been produced and tested; the phenotype is markedly different from that of the female or heterozygote, even in late embryonic stages. Pigmentation is reduced to a trace, and the nestling down is considerably shortened. The homozygous males show normal vigor and fertility. The "Faded" factor therefore is an excellent basis for auto-sexing strains; preliminary matings indicate that perfect accuracy in distinguishing sex can easily be obtained, at least by the time the squabs are two weeks old.

HOVANITZ, WILLIAM, California Institute of Technology, Pasadena, Calif.: *Variable frequencies of a dominant color gene in a wild population.*—The sex-limited, dominant, homozygous lethal, white female polymorphic form of *Colias eurytheme* (Lepidoptera) appears to occur in various frequencies in wild populations; the normal color is orange. Counts made of adults at various intervals throughout the season of an apparently continuous breeding population (at Mono Lake, California) from early spring until winter have disclosed a wide range in saturation of the gene at that locality. Extreme frequencies in 1941 range from 60 percent in May to 13 percent in late July to 52 percent in early October in a series of eight approximately $2\frac{1}{2}$ week interval samples. The fluctuations form a reasonably smooth curve of variation and nearly all samples are either statistically significant from adjacent samples or samples one farther removed. The adaptational mechanism allowing a gene to exist in such high concentrations (with a lethal disadvantage) in competition with an apparently satisfactory "wild-type" is not yet apparent; likewise, the reasons for the fluctuations remain obscure.

HUESTIS, R. R., University of Oregon, Eugene, Ore.: *Gene interaction in*

Peromyscus.——Among random tests for linkage in Peromyscus a cross between flexed tail and silver agouti produced only one double recessive mouse in one thousand F_2 young but no commensurate paucity of the F_2 wild-type class. The single individual has sired more than one hundred test cross young. The data make it probable that the flexed tail-silver agouti combination is usually lethal, somewhat probable that the genes are linked.

HUNT, H. R., HOPPERT, C. A., and ERWIN, W. G., Michigan State College, East Lansing, Mich.: *Heredity in rat caries.*——This experiment (started early in 1937) is designed to discover whether heredity is partially responsible for susceptibility to dental caries in rats. The caries-producing diet consists of 66 percent of coarsely ground rice, 30 percent of whole milk powder, 3 percent of alfalfa leaf meal, and 1 percent of sodium chloride. The rats are placed on this diet at 35 days of age and are observed fortnightly for cavities in the lower molars. The time required to produce the first cavity is the criterion of susceptibility. A susceptible and a resistant strain are being developed. Very close inbreeding is being used in each line. Breeders are selected in accordance with three criteria: 1) the time they require to develop caries, 2) the time required by their siblings, and 3) ancestry. The phenotype alone is unreliable as a guide in selection. For example, a 25 day male mated with 25–31 day females gave offspring with a mean of 60 days. The same male mated with 72–86 day females produced offspring averaging 61 days. Nearly 2000 rats have been studied. The current averages of sibship means are as follows. Susceptible line: 2nd generation, 57 days; 3rd, 43 days; 4th, 37 days; 5th, 32 days; 6th, 29 days; 7th, 38 days; 8th (incomplete), 28 days. Resistant line: 2nd generation, 116 days; 3rd, 142 days; 4th, 168 days. Thus hereditary differences are evident. The ranges of the incomplete 6th generation resistants and 8th generation susceptibles show little if any overlapping.

HUTT, F. B., and MUELLER, C. D., Cornell University, Ithaca, N. Y.: *On the linkage relations and manifestation of polydactyly in the fowl.*——Tests of several mutations for linkage with the recently-discovered linkage group containing duplex comb (*D*) and multiple spurs (*M*) revealed that a dominant gene for polydactyly, *Po*, belongs in that chromosome. The relationship of the three genes is *D*—28—*M*—33—*Po*. The expression of polydactyly is quite variable and it is completely suppressed in many heterozygotes. Diallel crosses of the same *Popo Mm* females with two different *popo mm* males showed that modifying genes preventing the appearance of polydactyly in heterozygotes also inhibit the manifestation of multiple spurs. Thus, in progeny of one of these males, 49 percent showed *Po* and 48 percent *M*, while in chicks from the other male only 16 percent were polydactylous and 29 percent showed multiple spurs. The expectation in each case was 50 percent. Similar suppression of both characters was observed in other matings. Linkage of *Po* with *M* as measured in over 500 gametes in the first of these matings was 33.5 percent. In the second mating, in which both characters were suppressed, the amount of ap-

parent crossing over between the two genes was 56 percent. *Po* causes duplication of one or more phalanges of the first digit, while *M* induces centers of ossification in scales not normally ossified. Although these two processes are not identical, they have some common features and it is perhaps to be expected that both would be suppressed by the same modifiers, since the areas affected are in close proximity.

IRWIN, M. R., and CUMLEY, R. W., University of Wisconsin, Madison, Wis.: *Suggestive evidence for duplicate action of genes.*——The antigens of blood cells are more or less primary products of their causative genes, although a few examples of presumed interaction in the production of cellular characters are known. Thus hybrids between Pearlneck (*Streptopelia chinensis*) and Ring dove (*S. risoria*) possess "hybrid substances" not present in their respective parents.——Several different characters (d-1, d-2 · · · d-11) particular to Pearlneck, have been obtained in progeny of backcross to Ring dove.—— A part of the hybrid substance has always been present with the Pearlneck character d-11; another, but different part, with d-4. Other parts of the hybrid substance have been associated with the Pearlneck characters d-1, d-2, d-3, d-7, d-9, and d-10. However, the hybrid substances correlated with each of these six different characters of Pearlneck are indistinguishable by immunological tests, but they are definitely different from the other two hybrid components. Thus the "hybrid substance" of these species hybrids is divisible into at least three structurally different antigens.——In contrast to the complete association observed of two different parts of the hybrid substance with Pearlneck characters d-4 and d-11, respectively, only a loose linkage, if any, exists between the gene or genes responsible for each of the six different Pearlneck characters (d-1, d-2, d-3, d-7, d-9 and d-10) and those for the hybrid substance associated with each of these characters.——Two alternative explanations may be offered for these findings. 1) A single chromosome of Pearlneck, carrying one or more genes which by interaction with a gene or genes of Ring dove produce a third part of the hybrid substance, has usually been present in each of the various backcross individuals possessing the respective chromosomes carrying genes for the six different characters peculiar to Pearlneck. This explanation, however, appears highly improbable. 2) There are one or more genes on each of several chromosomes of Pearlneck which, by interaction with a gene or genes of Ring dove, produce indistinguishable and probably identical effects. The genetic data suggest this as the more probable interpretation.

IVES, P. T., Amherst College, Amherst, Mass.: *Allelism and elimination of lethals in American populations of Drosophila melanogaster.*——Lethal second chromosomes extracted from wild populations of *D. melanogaster* were tested against each other for allelism and against lethals occurring in the laboratory. In 1176 crosstests of 49 wild So. Amherst, Mass., lethals, the rate of allelism was 0.43 ± 0.20 percent. In 1200 crosstests of 50 wild Winter Park, Fla., lethals, the rate was 0.33 ± 0.17 percent. In neither case does the rate of elimination of

lethals per generation approach the apparent lethal mutation rate per generation. In 2261 crosstests of 27 lethals occurring in the laboratory, both to each other and to 54 wild lethals, and of 10 Belfast, Me., wild lethals to 45 So. Amherst ones, the rate of allelism was 0.31 ± 0.12 percent. The lack of significant differences between these rates suggests that the alleles found in the wild samples represent separate mutations of the same locus, in each case, rather than common parentage of the lethal chromosomes.

JAAP, R. GEORGE, Oklahoma Agricultural Experiment Station, Stillwater: *Modifiers of the sex-linked gene for barred feathers and sex identification in newly hatched chickens.*——Stages in reversal of dominance produced by modifiers of the Z^B gene are demonstrated by means of skins from day-old chickens. At this time one Z^B gene produces no visible effect on "wild-type" down coloration, either in the heterogametic female or in the heterozygous male. This phenomenon is responsible for positive sex identification of chicks within a true breeding color pattern. Modifiers which intensify pigmentation in the down cause reversal of dominance, the extent of reversal being largely dependent on the degree of melanism. The form with a maximum amount of melanic pigment is the only condition of modifiers recognized in The American Standard of Perfection. Color differences between the heterogametic female and the homogametic male are indistinct in this form. When the basic down color is made less intense than that of the "wild type" lack of sufficient pigmentation causes the effects of the Z^B genes to become indistinct and sex identification inaccurate. Positive sex differences, possible only with the combination of modifiers which has been designated as "wild type" are useful for research in sex physiology as well as providing a useful convenience to the industry. The skins included in the exhibit represent all degrees of melanism in the "gold" and "silver" phenotypic patterns.

JEFFREY, EDWARD C., and HAERTL, EDWIN J., The Biological Laboratories, Harvard University, Cambridge, Mass.: *Chromosomal phenomena in fertilization.*—This important field has remained practically unworked so far as the internal organization of gametic chromosomes is concerned on account of the inadequate technique for the fixation of chromosomal structures imbedded in tissue. As the result of a number of years of experiment a medium has finally been developed which apparently brings about reliable fixation of the internal structures of all chromosomes. Due to this situation it is now possible to outline the details of chromosomal organization in fertilization. Investigations have been carried on on Lilium, Tradescantia, and Erythronium. The latter has proved particularly favorable. Two reversely coiled chromatids are present in both the fusing sperm and egg nuclei (which are in a prophase condition). The too commonly held view that only one chromatid is present in reproductive chromosomes is consequently inaccurate. The spiremes of both nuclei are continuous and they become united end to end to form the prophase of the first division in the fertilized egg. The divisions of the egg and subsequent mitoses

in the embryo show the same chromosomal organization as in the reproductive nuclei. The same situation is also found in the divisions of the endosperm and of the gametophyte. In meiosis precisely similar conditions are found, namely a continuous spireme, breaking up into chromosomes which contain two reversely spiralled chromatids. These facts appear to make necessary a fundamental revision of the accepted views in regard to fertilization and meiosis. It is now apparently clear that the meiotic chromosomes differ in no respect from any others except in number.

KAMENOFF, RALPH J., City College, New York, N. Y.: *A cytological study of the embryonic livers (16–18 days) of normal and flexed-tailed (anemic) mice.*——An embryonic anemia of the flexed-tailed mice as early as 14 days' gestation has been recorded. Since the liver is the seat of erythrogenesis in late embryonic life, reaching its maximum activity about the 17th day, an examination of the liver including counts of various types of cells was undertaken. A greater total density of cells was found in the 16th and 17th day normal livers than in the flexes, while the 18th day normal is less dense, due to the greater number of larger vacuolated liver cells. Less erythrogenesis is taking place in the 18-day normal livers. There are also some differences in the types of cells present. In the 16th and 17th days the flexed-tailed mice show a higher percentage of the earlier erythrogenic cells than do the normals. This may be due to a delay in erythrogenesis in the flexes. Further study of the earlier stages is being made.

KAUFMANN, B. P., and DEMEREC, M., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *Sperm utilization in Drosophila melanogaster following single and multiple inseminations.*——It has been found by actual count that the number of sperms transferred in a single copulation by the four to five day old, wild-type male approaches 4000. In succeeding copulations the number is gradually reduced until after a few consecutive matings no sperm is transferred. The amount of sperm delivered in a single copulation is only sufficient to ensure fertilization of all eggs laid during the first few days by the average female. Subsequently the percentage of sterile eggs increases, until toward the end of the egg laying period practically all eggs deposited are unfertilized.——A measure was made of the ability of sperms of wild-type, Curly/Glazed and plexus brown speck males, when used in all possible mating sequences, to take precedence in fertilizing the eggs of *px bw sp* females. Curly and Glazed offspring from these crosses were slightly more frequent than wild-type; the *px bw sp* represented only about one-sixth of the total. Similar proportions were found among the offspring of *px bw sp* females, which were permitted to lay their eggs in the same bottle, after each mated with only one of the types of males available. Such similarity suggests that differences in frequency of various classes of offspring following polyandry are referable to differential viability of the different types of embryos and larvae, and not to selective fertilization.

KEELER, C. E., and KING, H. D., The Wistar Institute, University of Pennsylvania, Philadelphia, Pa.: *The taming effect of coat color genes in the Norway rat.*——Modification profiles are exhibited for various coat color genes in the Norway rat displayed on a fairly uniform residual hereditary background, detailing their specific effects on anatomy and behavior. An analysis of popular laboratory strains of rats is presented to show that most of these strains are tame by virtue of the effects of their coat color genes on behavior rather than due to the modifying effects of captivity.

KIMBALL, R. F., Johns Hopkins University, Baltimore, Md.: *A gene affecting the manner of swimming in the ciliate protozoan, Euplotes patella.*——A gene affecting the manner of swimming in the ciliate protozoan, *Euplotes patella*, has been found. The dominant allele of the gene determines that the animals swim in a wide spiral with very little forward motion so that they practically move round and round in a circle. The recessive allele determines that the animals swim in a narrow spiral with considerable forward motion. The expression of the character is considerably influenced by nutritive and other conditions so that animals of the homozygous recessive genotype, if in very poor condition, tend to the circular type of movement. If animals with a dominant allele are subjected to a short temperature shock of over 38°C, they swim for a short time in a narrow spiral. Individual variability also occurs so that occasional animals of one genotype may swim in the manner characteristic of the other. However, large cultures under good conditions can almost invariably be classified with certainty.

KING, ROBERT L., State University of Iowa, Iowa City, Iowa: *Inheritance of melanism in Melanoplus differentialis.*——A small percentage of *Melanoplus differentialis* collected in the Great Plains and adjacent regions are black with a few yellow markings. A mating between a single black female, found in 1930, and wild type males gave an approximate ratio in F_2 of 3 type: 1 black. The sex ratio among the black individuals was 1:1. In the summer of 1938 a relatively large number of black individuals were collected as nymphs in eastern Nebraska and eastern South Dakota. Black individuals mated to black give all black; black individuals mated to wild type give all wild type. Various matings of such F_1 hybrids gave the following results: inbreeding of F_1 gave 449 type to 133 black in F_2; back crossing F_1 males to black females gave 222 type to 236 black; backcrossing F_1 females to black males gave 241 type to 285 black. There were approximately equal numbers of males and females in all classes of offspring. These data are consistent with the assumption that the gene for the black color phase is recessive to wild type, not sex-linked.

LAANES, T., and MACDOWELL, E. C., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *Screw-tail, a new mouse mutation.*—This mutation is most conspicuously indicated at birth by the tail, which is usually tightly coiled. Later this corkscrew is opened out and leaves the tail bent into various

angular patterns with thickenings at the angles; similar kinks are found in the spine. Growth and development are markedly retarded. At birth screw-tail mice are smaller than their normal litter mates and about 24 percent are found dead, compared with 8 percent; many more die before weaning. Their small size and general ill-favored condition persist. Breeding is very rare; the only productive matings of screw-tail mice have been with screw-tail-producing normals (14 normals to 15 screw-tails) and most of the young were found dead.——Screw-tail first appeared from two sib mothers of the 50th brother by sister generation of the CSH-Bagg albino strain; these two families included 46n:13 s.t. and 57n:19 s.t. Two other females (sibs of the above two) by the same sib male gave 67 and 76 normals and no screw-tails. Subsequent inbreeding of the normal descendants of these four females gave families with 100 percent normals and other families with ratios approximating 3:1 (23.0% s.t. in a total of 1357). The deficiency of screw-tails in the total is due to males (21.1% s.t.) as the females alone gave 24.7 percent s.t. At birth there is a relative deficiency of males among screw-tail young; the totals show 44 percent males as compared with 49.1 percent males among normal litter mates.

LAMOREUX, W. F., HUTT, F. B., and HALL, G. O., Cornell University, Ithaca, N. Y.: *Genetic selection for low fecundity in the fowl.*——Selection of a strain of White Leghorns genetically capable of only low egg production was started at Cornell in 1914 and has been continued to the present time. With mass selecton, as practised until 1934, average annual production (365 days after first egg) in 1914, 1915, and 1917 was 97, 99, and 83 eggs respectively, but only once from then until 1935 was average production less than 102 eggs. Beginning in 1935, the breeders were selected on the basis of the performance of progeny or siblings, and the production of pullets hatched that year was 79 eggs, the lowest in the records of the experiment. Since that time the records have been tabulated only to 500 days of age. However, most hens of the low-fecundity strain cease laying before that age and the change therefore results in only a slight reduction in the egg record—in 1935 less than three eggs. That this sudden decline in production was a direct result of the change in methods of selection is shown by the fact that average production during the succeeding five years (1936–40) was 68, 58, 59, 67, and 40 eggs. In contrast, fowls bred for economic characters, including high fecundity, lay from 170 to 180 eggs in the 500-day period and most of them lay many more before ovulation ceases. The difference in these strains under similar environmental conditions demonstrates the extent to which modern records of high productivity are dependent upon the genetic constitution.

LANDAUER, WALTER, Storrs Agricultural Experiment Station, University of Connecticut, Storrs, Conn.: *A new mutation of fowl affecting the axial skeleton, especially in the tail region.*——Description of a mutation which appeared in a stock of White Leghorn fowl. The most common expression resembles that of the well-known rumpless mutation and its modifications: the caudal vertebrae,

the external tail and the uropygial gland are partly or entirely absent. Completely rumpless animals are relatively rare. In incompletely rumpless animals the morphological expression is somewhat different from that of the intermediate rumpless fowl which have been described earlier. In addition, lordoses, kyphoses, extra ribs and other abnormalities of the axial skeleton occur rather commonly in this stock. Breeding data will be discussed.

LAWSON, C. A., Wittenberg College, Springfield, Ohio: *The mechanism controlling production of aphid types.*——The germaria of female aphids can be differentiated on the basis of appearance and size into four types. 1) Gamic female, which produce gamic eggs and are found in gamic females. 2) Male producing, which produce male eggs and are found in some wingless parthenogenetic females during the gamic phase of the cycle. 3) Wingless parthenogenetic female, which produce parthenogenetic female eggs and are found in female-producing wingless parthenogenetic females. 4) Winged parthenogenetic female, which produce female eggs and are found in winged parthenogenetic females. When gamic-parthenogenetic female intermediates have both gamic and parthenogenetic female germaria the parthenogenetic female germaria are always the male producing type. The embryos contained in these intermediates are usually male. If any are female they are usually gamic female. Winged-wingless parthenogenetic female intermediates may have germaria of any type except all gamic female. It is assumed that a single sex substance is produced during the gamic phase of the cycle which causes wingless female type germaria to become the male producing type, which then produce male eggs. The same sex substance in winged parthenogenetic females has no effect on the winged female type germaria which continue to produce female eggs, but the sex substance does effect these eggs causing them to develop into gamic females. The production of winged and wingless types is explained by assuming that embryonic wingless parthenogenetic female type, male producing type and gamic female type germaria produce a wing inhibitor, while winged parthenogenetic female type germaria and males, which have no germaria, do not.

LEWIS, E. B., California Institute of Technology, Pasadena, Calif.: *The Star and asteroid loci in Drosophila melanogaster.*——Further studies of the two rough-eyed mutants, dominant Star (*S*, 2-1.3) and recessive asteroid (*ast*), formerly called Star-recessive (S^r), in *D. melanogaster* show that asteroid is located 0.02 map unit to the right of Star. Sixteen wild-type cross over products between the two loci have been recovered as well as three cases in another experiment of the complementary type having Star and asteroid on the same chromosome. From each of the latter cases, asteroid, identical with the original asteroid as far as can be detected, has been derived by crossing over with a normal chromosome. A comparison of *S ast*/++ and *S*+/+*ast* reveals a striking position effect: whereas, *S ast*/++ has normal wings and roughened eyes like *S*+/++, *S*+/+*ast* has extensively interrupted wing

venation and extremely small rough eyes. When these two closely linked mutants are on opposite chromosomes they act phenotypically as allelomorphs. The finding that Star and asteroid are located in the 21 E1–2 doublet of the salivary gland chromosomes suggests a possible basis for this phenomenon in as much as such doublets have been interpreted as natural repeats in the chromosomes. A salivary gland chromosome analysis shows no departure from normal in the case of *S*, *ast*, *S ast* and the wild-type cross over complement to *S ast*.

LINDEGREN, CARL C., and LINDEGREN, GERTRUDE, University of Southern California, Los Angeles, Calif.: *X-ray and ultraviolet induced mutations in Neurospora.*——The uninucleate thin-walled spores (spermatia) of *Neurospora crassa* were treated by ultraviolet and X-rays cultured individually in separate test tubes and compared with an adequate number of controls. The variants induced were true gene mutations, for when mated with mycelia of opposite sex, factors differentiating the variations segregated at meiosis. A considerable number of the mutations, from both sources, reverted. Reverse mutations are much more easily brought into expression and have an opportunity to obtain supremacy in the fungi because the nuclei are haploid and the thallus is structureless and coencytial. A reverse mutation in any one of the nuclei in the thallus may change the phenotype. It is possible that the so-called "temporary changes" found by EMMONS and HOLLAENDER are likewise mutations which reverted. Fifty percent of the spermatia treated with X-rays were killed and over 99 percent of those treated with ultraviolet were killed at the dosages used. A considerable number of the X-ray variants gave evidence of the presence of chromosomal aberrations, while this was not true of any of the ultraviolet variants.

LINDSTROM, E. W., Iowa State College, Ames, Iowa: *Inheritance of seed longevity in maize inbreds and hybrids.*——Embryo longevity of maize varies to a marked degree and is definitely heritable. Germination tests with hundreds of inbred lines and F_1 crosses of 5–12 year-old seed, stored at room temperature in Ames, showed germination percentages ranging from 0 to 90 percent. Some inbred lines failed to live in storage more than 3–5 years. Experiments under controlled conditions of temperature (40°–50°–60°C.) and of humidity (0–30–60–90 percent by H_2SO_4 solutions in desiccators) were devised to hasten respiration or reduce longevity. Hybrid seed of long-lived by short-lived parental inbreds exhibited the long-lived condition, often with significant differences in reciprocal crosses. The number of genes involved is not always large because one-generation selfs in varieties (Krug and a Reid's Yellow Dent strain) gave significant differences in longevity of seeds. Curves of temperature and humidity effects on the respiration or aging of dormant inbred and hybrid maize seeds are presented.

LUCE, WILBUR M., University of Illinois, Urbana, Ill.: *Effects of formalin*

upon facet number in the bar alleles of Drosophila melanogaster.——HINSHAW, in press, studied the effects of formalin upon bar eye. Her preliminary observations indicate a reduction in facet number is brought about by the treatment. In the series of experiments reported upon here, bar-infrabar(BB^i), bar(B), infrabar(B^i), and double bar(BB) all derived recently from one original strain(BB^i), were raised on food to which there had been added from 0.3 cc to 1.2 cc of formalin to every 100 cc of water used in making the banana-agar-yeast food. Thirty to 35 eggs were placed in each of the vials used. All flies were raised at 27°C except during the egg collecting period the latter being done at 24°C. Critical facet counts of flies raised in the low concentrations are not yet complete but preliminary observations give no evidence of any effect on facet number here. The percentage of eggs hatching and the general conditions of development were better than in the control vials. In the highest concentrations of formalin the percentage of hatch, the number of pupae produced, and the number of adults emerging were all somewhat less than in the case of the controls indicating that the formalin was having a lethal effect. Here too, the length of time necessary to complete development was also increased. The mean facet number was reduced in all cases by the treatment with the highest concentrations of formalin, the percentage of reduction as compared with the controls varying from 24.47 percent in bar males to 13.84 percent in bar-infrabar males.

MAINLAND, GORDON B., University of Texas, Austin, Texas: *The Drosophila macrospina group.*——The *macrospina* group falls into three subdivisions: *Drosophila macrospina macrospina* extending from central Texas eastward into Florida and northward into Ohio; *D. macrospina limpiensis* being found in west Texas, New Mexico, Arizona, Utah, and Sonora; and *D. subfunebris* known only from the vicinity of Pasadena, California. In all tests attempted *macrospina* and *limpiensis* strains cross readily and produce normal numbers of progeny. F_1 progeny from *macrospina* ♀ × *limpiensis* ♂ are fully fertile while the reciprocal cross yields fertile females and sterile or semi-sterile males depending upon the strains employed. In general this sterility decreases as the distance between the strains of the two subspecies decreases. No *macrospina-subfunebris* crosses have produced progeny with the exception of central Texas strains; a small percentage of central Texas *macrospina* ♀ × *subfunebris* ♂ crosses produce progeny while the reciprocal cross fails. All *limpiensis-subfunebris* crosses attempted have yielded progeny in at least one direction. As the geographical distance between the *limpiensis* strains and *subfunebris* decreases, the matings go more readily. All F_1 males from *subfunebris* × *limpiensis* or *macrospina* are sterile while their sisters are fully fertile. In the F_2 progeny from interspecific backcrosses, not all of the females are fertile and less than 1 percent of the males are fertile. The *macrospina* group is a chain of strains extending from one coast to the other. On the basis of genetics, cytology, and systematics, the two end members are distinct species; but gene interchange from one end of the chain to the other is possible through intermediates.

McNUTT, C. W., and SAWIN, P. B., Brown University, Providence, R. I., and Ohio State University, Columbus, Ohio: *A genetic study of the pattern of the vena cava inferior in the rabbit.*——Variations in the pattern of the vena cava and its tributaries occurring in 2300 rabbits from seven unrelated, and in some cases inbred, families and from crosses between them are separable into 29 distinct categories. The conclusion that these variations are primarily genetic is drawn from the following evidence: 1) The distribution of normal and atypical venae cavae in the several families is significantly different both quantitatively and qualitatively. 2) In the F_1 of crosses between predominantly normal families with those possessing a high incidence of abnormality, the normal type is the more frequent. 3) In the F_2 and in successive backcrosses segregation is apparent, but tendencies for the distribution to be continuous and intermediate between those of the parental generations involved are obvious throughout. These observations coupled with the facts that the "recessive" segregates do not breed true, but through selection can be used to establish a strain almost 100 percent atypical, seems to indicate a multifactorial interpretation. Ontogenetically the variations represent the persistence of portions of the bilaterally symmetrical postcardinal, supracardinal and cardinal collateral embryonic venous systems, which in normal development successively undergo atrophy between the fetal fourteenth and sixteenth days. It is tentatively suggested that these variations are the result of functional adaptation of the vascular system to meet altered conditions produced by hereditarily controlled changes in differential growth.

MICKEY, GEORGE H., Louisiana State University, Baton Rouge, La.: *Polysomaty and polyploid gametes in Romalea microptera.*—Polyploidy occurs in the male germ cells of Romalea as well as in the sheath around the follicles. Varying numbers of chromosomes up to octoploid are found in spermatogonial plates, but they are nearly always multiples of the haploid. Although most of the spermatozoa are normal haploid, a surprising number of polyploid sperms are found in otherwise apparently normal testes. Diploid, triploid, tetraploid and even pentaploid sperms occur. The abnormal spermatozoa are most easily recognized at an early stage of spermiogenesis, when the chromatin has lost its staining capacity except the heterochromatic X-chromosome. In spermatids containing the sex chromosome, the number of heterochromatic masses is indicative of the degree of ploidy: haploids have one; diploids, two; etc. Another criterion of ploidy is size; but only cells within the same cyst, and consequently in the same stage of development, may be compared in size. Contrast in size is most striking in mid-spermiogenesis when other criteria likewise are more easily evaluated. Another obvious evidence of ploidy is the number of "basal bodies" or ring centrioles present. A normal haploid spermatid has only a single basal body and a single axial filament, whereas diploid cells have two each; triploids, three; etc. Acrosome size and number of nebenkerns are also increased in polyploid spermatids. Evidence concerning formation of polyploid gametes is found in the fact that diploid spermatids occur in pairs, triploids and tetraploids usually occur singly.

MULLER, H. J., and PONTECORVO, G., Amherst College, Amherst, Mass., and University of Edinburgh, Edinburgh, Scotland: *Recessive genes causing interspecific sterility and other disharmonies between Drosophila melanogaster and simulans.*——The effects were studied of the minor chromosomes of *D. simulans* after their transfer (by a method previously reported) into an otherwise *melanogaster* genotype. Males with *simulans* Y were sterile, like XO males. Y-*sim* suppresses variegation somewhat, but less than Y-*mel*. It undergoes some nondisjunction with attached *melanogaster* X's.——Homozygous IV-*sim*, in *melanogaster*, allows fair viability. But it results in a complex of slight, variable, recessive peculiarities, *e.g.*, flattened form, heavier trident, eye reduction, semi-*simulans* male genitalia. Homozygous IV-*sim* males, unlike females, are sterile; their testes are fairly developed but, as EPHRUSSI observed, their vasa contain few or no spermatozoa. This recessive sterility depends upon a narrowly localized chromatin region, almost certainly one gene, since it appears in compounds of IV-*sim* with IV-*mel* containing a "Minute-IV" deficiency. This result is not due to non-allelic interaction between the "Minute" and the sterility processes, for normal-appearing triplo-IV's having two IV-*sim*'s and one Minute-deficient IV-*mel* are likewise sterile.——Evidence for peculiarities of other genes in IV-*sim* is found in IV-*sim*/IV-*mel* heterozygotes in which the IV-*mel* carries a known mutant gene. Thus, the recessive "cubitus" becomes partially dominant under these conditions, while the dominant "Cataract" becomes nearly recessive. Nevertheless, segregation of IV-*sim* from IV-*mel* seems fairly regular.——The fact that even these minor chromosomes exhibit so many gene differences indicates that the reaction systems producing the similar phenotypes of apparently closely related species may be highly divergent. Hybrid sterility is but one expression of this cryptic divergence, which need not in itself have had a selective value.

MULLER, H. J., and PONTECORVO, G., Amherst College, Amherst, Mass., and University of Edinburgh, Edinburgh, Scotland: *The surprisingly high frequency of spontaneous and induced chromosome breakage in Drosophila, and its expression through dominant lethals.*——The unusually low ratio of daughters to sons of irradiated males having ring X-chromosomes is shown to be mainly due to death of zygotes with affected X's. For, at 4000 *r*, only about 3 percent of females are found to be converted into males by induced loss of an X, whereas the relative number of females is reduced by about 35 percent. Allowing for deaths from X-translocations (some 10 percent), most of this dominant lethal effect on the females must be due to "simple breakage," which in rings must often be followed, in cases which would otherwise be restitutional, by formation of dicentrics, occasioned by twisting of the chromonema or chromonema-pair before re-union. The results show over 75 percent of these sister-dicentrics to be lethal (translocational dicentrics being still oftener lethal). Breaks in non-rings are presumably induced by irradiation as often as in rings, but here the great majority are followed by perfect restitution. Thus at 4000 *r* nearly all offspring contain one or more restituted chromosomes. Nevertheless the lethal losses of non-ring X's are frequent enough (*ca* 5% at 4000 *r*) to show

that a considerable part of the dominant lethal effect of sperm irradiation results from "simple breakage" with sister-dicentric formation. The frequency of spontaneous lethal and viable losses of rings (*ca* 13% and 2.5%) is likewise surprisingly high, and may be due to spontaneous breakage. This probably occurs similarly in non-rings but is followed by perfect restitution. Since so few spontaneous structural changes arise, this breakage would usually occur in pre-spermatozoon stages, allowing prompt restitution.

NEBEL, B. R., WILSON, G. B., and MARINELLI, L., New York Agricultural Experiment Station, Geneva, N. Y., McGill University, Montreal, Canada, and Memorial Hospital, New York, N. Y.: *X-ray dosage curves in Tradescantia.*——Three independent dosage curves have been plotted for the action of X-rays on Tradescantia microsporocytes observed 4–5 days after raying. The first set of exposures was made by G. B. WILSON in Geneva, N. Y. early in 1940 and scored in Montreal in 1941. The second set of data was collected by B. R. NEBEL also in Geneva from plants grown in constant environment. The third set of data was collected from radiation applied to cut heads of Tradescantia at the Memorial Hospital by L. MARINELLI. Within the limits of the three experiments environmental differences were found to be unimportant. The method of radiation is held responsible for the results obtained. At Geneva the radiation was intermittent the *off* period being from 30″ to 90″ with the *on* period of equal or shorter duration. The intensity of the *on* period varied between 50 and 200 *r*/m, 100 *r*/m being the most common intensity used.——The Wilson-Geneva and the Nebel-Geneva data are identical. They were scored independently. For rings and dikinetic translocations above 100 *r* the Geneva data show a straight line (K^1) for the relationship between dose and effect. For isodiametric fragments the independent data of WILSON and NEBEL show a more than linear rise for dose and effect——$K^{app\cdot 1.5}$–. A more than linear rise ($K^{1.5}$) for rings and dikinetic translocations plotted against dosage was obtained from the Nebel-Memorial Hospital experiment. The same experiment showed a value of K^2 for isodiametric fragments. These results were obtained by applying 110, 200, 300 and 400 *r* with varying intensity and continuous exposure over a total time of two minutes for every application.

NEEL, J. V., Dartmouth College, Hanover, N. H.: *A case of high mutation frequency in Drosophila melanogaster.*——In February, 1941, a long inbred wild type strain of *D. melanogaster*, which until then had been quite uniform, was observed to be throwing a high proportion of phenotypically aberrant individuals. Thus far 50 different fertile mutants, 17 different sterile off-types which were probably genetic in origin, and numerous variants (mostly mosaics) whose aberrant characteristics did not reappear in subsequent generations, have been found among a total of 72,851 flies examined. The mutation rate is thus up approximately 5–10 times over the more commonly observed values. Of the 41 mutations that have been localized as to chromosome, 27 are

sex-linked. These latter include 12 yellows, 2 Notches, 2 singeds, 2 bobbeds, a cut, a carmine, and a lozenge. 1706 X chromosomes, derives from two substrains of the mutable stock, were simultaneously analyzed for the occurrence of lethals and visibles; 2 visibles and 15 lethals were found. The rate of occurrence of lethal mutations ($0.88 \pm 0.23\%$) is thus also high in these substrains. However, 985 X's from a third substrain yielded only one lethal and no visibles. The nature of the factor(s) responsible for the increased mutation rate is being investigated.

NEWBY, W. W., University of Texas, Austin, Texas: *An intersex in Drosophila virilis.*——A dominant mutation, found in a wild strain of *Drosophila virilis* from Texas, causes heterozygous female flies to become intersex. Such intersexes are male-like in that the anal plates are vertical in position and claspers are present. They are female-like in that the vaginal plates are present, but these are always reduced in size or are abnormal in shape. The tergites and sternites are larval in character. There are nine tergites; the posterior three being reduced in size, and there are six sternites, the sixth being represented by a pair of small plates.——Internally, the reproductive organs are primarily female but in all specimens the various parts are reduced, absent, or abnormal. The gonads have the yellow color of the testes but the cells are ova-like.

OLIVER, C. P., and GRAY, ROYAL C., University of Minnesota, Minneapolis, Minn.: *The use of genetic information in the control of hereditary ataxia in a human kinship.*——In a kinship, dominant cerebellar ataxia is traced for five generations. Families of ataxic persons have been large; the sibships in living generations are at least as large as average families of today. From one ataxic person of generation I, four of eight children became ataxic. From one ataxic person of generation II, seven of nine children, ten of fifty-six grandchildren, and one of seventy-one great-grandchildren had developed ataxia at the time our records were completed, and others can be expected in the grandchildren and great-grandchildren as they reach the age of onset. The average age at death for ataxic individuals was thirty-seven in generation II, thirty-eight in III, and thirty-two in IV; the five living ataxic persons in IV had an average age of thirty-four. Ataxic women die earlier than ataxic men. With the cases known for certain in generation IV, the average age of onset of the disease was twenty-four, the range from twenty-one to thirty. In this kinship with the early age of onset, the defect can be eliminated. An ataxic person should have no children; and a person with an ataxic parent should postpone having children until he has passed the age of onset, for all practical purposes thirty in this family, and has remained free of ataxia. Medical and genetic data are published in Minnesota Medicine, May, 1941.

PIPKIN, ALAN, and PIPKIN, SARAH BIDICHEK, Tulane University, New Orleans, La., and North Texas Agricultural College, Arlington, Texas: *Albinism*

in negroes.——A study of pedigrees of albinism in four negro families has been made. Three generations are covered in three of the families and five generations in the fourth family. Eye colors appeared as blue, bluish-yellow, greenish-yellow, and cinnamon-brown in the ten albinos observed. Nystagmus was invariably present, photophobia also. Pupils appeared dark. Strabismus was present in two albinos. Hair color varied from a light reddish color to straw yellow. Head hair was of a fine texture, and in most cases the face and arms were covered with a fine downy hair. Hair samples were taken for microscopic study. Freckles were observed in five adult albinos, absent in four albino children, and absent in one adult. In one adult a skin cancer on the face and arms had developed. In three families, there were five albinos and sixteen dark pigmented children born of normal dark pigmented parents, showing albinism to be dependent upon a simple autosomal recessive gene. No consanguinity was recorded in any of these cases. In the fourth family, albinism appeared in three successive generations. From two marriages of a normal dark negro and an albino negro, three dark and five albino offspring resulted. No consanguinity was admitted, and the spouses were reared in different localities. Therefore unless the spouses were heterozygous for recessive albinism in two successive generations, this family must possess a type of albinism dependent on a dominant gene.

POLLISTER, A. W., and MIRSKY, A. E., Columbia University, and the Hospital of The Rockefeller Institute for Medical Research, New York, N. Y.: *Preparation of a nucleohistone from mammalian organs, and direct demonstration of its nuclear origin.*—From liver and other organs (kidney and spleen) there has been extracted a nucleoprotein of high phosphorus content (3.8%), all phosphorus being present in the form of desoxyribose nucleic acid (shown by positive Feulgen and Dische reactions). The protein is a histone. Preparations are highly viscous, and show birefringence of flow, indicating rod-shaped molecules. The protein is soluble in 1.0 M NaCl, and insoluble in 0.14 M NaCl (isotonic). It is also soluble in 0.02 molar NaCl, in which it is no longer very viscous and no longer shows birefringence of flow. When precipitated (by isotonic NaCl) it does so in strikingly fibrous form. It has the characteristic nucleic acid absorption band, 2540 Å. One-third to one-fourth of the desoxyribose nucleic acid in liver cells has been isolated in this form. In the above properties the liver nucleoprotein is comparable with the nucleohistone from the thymus, which has long been generally accepted as of nuclear origin. The nuclear source of the nucleohistone has been demonstrated cytologically by study of extracted frozen sections of liver, kidney, and pancreas. Upon brief (5–10 minutes) treatment with 1.0 M NaCl the nuclei swell, and lose nearly all their capacity for a positive Feulgen reaction. Isotonic NaCl (5 minutes) shrinks the nuclei, and restores the stainability, though not the original nuclear pattern. Longer treatment with 1.0 M NaCl causes the nuclear contents to flow out of the cell. Isotonic NaCl precipitates this extracellular nucleohistone as long fibres that are Feulgen positive. The chemical and cytological

evidence therefore agree in showing that a desoxyribose nucleoprotein has been extracted from the nucleus.

POWER, MAXWELL E., Yale University, New Haven, Conn.: *Neurological effects of mutants reducing facet number in the eyes of Drosophila melanogaster.*——A number of mutants of *Drosophila melanogaster* which affect facet number have been studied to discover whether the reduction in peripheral sense organs is accompanied by corresponding changes in the central nervous system. The brains of the following stocks have been studied in Bodian impregnated sections: wild type (Oregon R, 780 facets), heterozygous Bar females (358 facets), Bar males (91 facets), Bar females (68 facets), double Bar males (29 facets), and individuals of "eyeless-2" which have no facets. The matrix of the external optic glomerulus is reduced in proportion to the decrease in facet number, because it is composed of centripetal fibers from the ommatidia. A definite volumetric hypoplasia of the middle optic glomerulus has been found which follows the decrease in eye size. This body, however, does not entirely disappear even in completely eyeless individuals. RICHARDS and FURROW (1925) reported similar observations in an anatomical study of the eye and brain of "eyeless." It appears that the centripetal fibers from the eye are necessary for producing the orderly arrangement of the fibrillar components within the middle glomerulus because in the flies from the lower end of the series the characteristic striate appearance of this body is lost. Of the three optic glomeruli the two parts of the inner one are least changed. The several bundles of fibers which connect the middle and inner glomeruli with those glomeruli of the opposite side and with other parts of the brain are constant throughout the series of stocks. The other discrete parts of the brain, *e.g.*, corpora pedunculata, corpus centralis, and protocerebral bridge, remain unchanged.

POWERS, E. L., JR., Johns Hopkins University, Baltimore, Md.: *The determination of mating type of double animals in the ciliate protozoan Euplotes patella.*——With the use of the double animal in *Euplotes patella* which contains two nuclear complexes in a common cytoplasm the following observations have been made. 1) The mating type of a double animal containing but one kind of gene for mating type in one of its nuclear complexes and only one other kind in the second complex is the same as that possessed by a single animal which contains these two genes in its single nuclear complex; that is, no change in mating type is observed when the two different alleles determining the type in question are separated into different nuclei in the same cytoplasm. 2) There is no preferential mating, having its basis in the genes for mating type, of singles with particular halves of these doubles. Each half of the double, therefore, is seen to be equally affected by the genes for mating type in each of the two nuclear complexes present. 3) Because the mating types of these double animals are not affected by the loss of one of their micronuclei, it is concluded that the macronucleus is capable of determining mating type in the absence

of its corresponding micronucleus. 4) Single pronuclei are capable of giving rise to physiologically functional nuclear complexes. 5) Double animals which contain but one kind of allele induce, usually, very little mating in singles heterozygous for that allele. 6) KIMBALL'S hypothesis of genic determination of mating type in this species is supported by the observations made on the inheritance of mating type in these experiments.

POWERS, LEROY, U. S. Department of Agriculture, Horticultural Field Station, Cheyenne, Wyo.: *The nature of the series of environmental variances and the estimation of the genetic variances and the geometric means in crosses involving species of Lycopersicon.*——Weights of individual fruits were obtained from a cross of the Danmark (*Lycopersicon esculentum* Mill.) and the Red Currant (*L. pimpinellifolium* (Jusl.) Mill.). A graph is given that shows the percent of genetic variance included in the variance for between means of blocks when the number of individuals grown per block varies. The experimental design was that of a randomized block. From the graph the number of individuals necessary per block to attain a certain degree of accuracy can be determined. The environmental variances were found to be functions of the means and were found to form a geometric progression. Information as to the nature of the series of environmental variances is essential to the development of methods of separating the genetic from the environmental variation. A method of separating that portion of the variance due to segregation of the genes from that portion of the variance due to environmental influences is presented. The method as it is extended to apply to other data should prove of considerable value in attacking the difficult problem of quantitative inheritance. A method of using the genetic variance to obtain a correction factor to be subtracted from the theoretical geometric mean used in studying the nature of the interactions of the genes affecting weight of fruit was developed and is illustrated. After the correction factors had been applied to the data for the Danmark×Red Currant cross it was found that the data are in agreement with the hypothesis that the effects of the genes differentiating weight of fruit are geometrically cumulative.

QUISSENBERRY, J. H., and BROWN, S. O., Agricultural and Mechanical College of Texas; College Station, Texas: *Inheritance of an eye anomaly in the albino rat.*——Expression of this character is extremely variable. Degrees of anomaly extend from a slight reduction in the size of one eye to the complete absence of both eyes. F_1 and reciprocal backcross progenies including 830 rats were studied. At least one major and one or more minor modifying factors determine the expression of this character. Significantly more females than males are affected. The left eye was more often affected, or affected to a greater degree, than the right eye. It was suspected that certain environmental factors like ration were causing part of the variability in the expression of this character. Responses to rations free of vitamin A and B_1 have been checked. The affected strain was equal to or better than a non-affected strain with

which it was compared in terms of storage and utilization of these vitamins. Embryological development of this anomaly is being studied histologically.

RANDOLPH, L. F., U. S. Department of Agriculture and Cornell University, Ithaca, N. Y.: *The influence of heterozygosis on fertility and vigor in autotetraploid maize.*——Pronounced decreases in vigor and fertility accompany chromosome doubling in inbred strains of maize, while tetraploids derived from stocks that have not been inbred are as vigorous or more vigorous than the diploid parent, and are highly fertile. Tetraploid plants produced directly from inbred lines derived from various commercial varieties, including Luces Favorite, Webbers Dent, Onondaga White Dent, Bloody Butcher, Spanish Flint, the corn belt lines 4-8d, Hy, 187-2, 38-11 and inbred genetic stocks were consistently much shorter and less robust than their diploid sibs. They ordinarily produced few viable seeds, although abundant pollen and well-developed ear shoots were formed. With the single exception of the line 4-8d, repeated attempts to establish tetraploid lines directly from diploid inbreds have been unsuccessful. In contrast to the pronounced deleterious effects of doubling homozygous inbred lines the doubling of heterozygous open-pollinated varieties, or hybrids derived from inbred lines, produced vigorous robust and highly fertile tetraploids. During the inbreeding process in both the diploid and the tetraploid reduction in vigor progresses at essentially the same rate as reduction in heterozygosity, and renewed vigor accompanies the recovery of heterozygosity through the hybrid recombination of genetically dissimilar inbreds. The deleterious effect of doubling the number of homozygous genes at each locus in the tetraploid derived directly from the inbreds and the absence of this effect in the heterozygous tetraploids suggests that homozygosity *per se* is a significant cause of the reduction in vigor which accompanies inbreeding and, conversely, heterozygosity in itself may be responsible for much of the vigor or heterosis exhibited by hybrids.

REED, S. C., CHADWICK, L. E., and WILLIAMS, C. M., Harvard University, Cambridge, Mass.: *Frequency of wing-beat as a character for separating species, races and geographic varieties of Drosophila.*——The Edgerton stroboscope provides a precise method for determining the number of wing-beats per minute of strains of Drosophila. Under standard conditions each species has a characteristic range of wing-beat frequencies. Though the average difference between various strains of Race A and Race B of *D. pseudoobscura* is only 470 double wing-beats per minute, this difference is 7.34 times its standard deviation. Of the several geographic varieties of *D. pseudoobscura* tested, the fastest of Race A flew at 11,470 beats per minute and the slowest of Race B at 10,140; this wide range of frequencies allows one to distinguish physiologically different geographic strains with ease. Reciprocal hybrids and backcrosses to both fast and slow parental strains were secured and showed definitely that the wing-beat frequency is under exact genetic control and that the number of factor pairs concerned is probably not large. The differences in wing-beat frequency

between species, races and geographic varieties were found to rest in large part upon a striking morphological relationship. This relationship is between the muscle-mass of the thorax which is responsible for wing motion and the area of the wings. If the muscle-mass be held constant, the frequency of wing-beats increases uniformly as the wing area, and hence the air resistance, decreases. The genetic changes which have separated strains of Drosophila in regard to the "physiological" wing-beat character are therefore gene changes affecting primarily the proportional relations between wing muscle and wing area.

RICK, CHARLES M., University of California, Davis, Calif.: *Cytological irregularities induced in Petunia by X-ray treatment of pollen.*——Pollen of diploid Petunia was subjected to X-ray doses varying from 10,000 *r* to 100,000 *r* and was subsequently applied to stigmas of untreated plants. All seed produced by pollen surviving the higher doses was germinated on nutrient agar under aseptic conditions. Pollen which had been exposed to doses as high as 50,000 *r* functioned to produce viable seed. No haploid plants were obtained from any of the treatments. Thirty-three plants were found to have gross chromosomal deviations including inversion, translocation, duplication and deficiency. One-third were chimeras in which the chromosome condition of pollen mother cells differed, usually in the presence or absence of a fragment chromosome, from that of the roots. Loss of the fragment in the earliest divisions of the zygote presumably accounts for these differences. Two monosomics were of special interest. In one the odd chromosome nearly always appeared as a univalent, which usually failed to be included in either telophase nucleus in the first meiotic division and appeared as a micronucleus in later stages. In the other monosomic the odd chromosome was associated in a trivalent in the majority of figures and never lagged at anaphase of the first or second divisions. This unusual pairing is attributed either to a duplication present in the normal chromosome complement of Petunia or possibly to a translocation induced by the X-ray treatment.

RIFE, DAVID C., Ohio State University, Columbus, Ohio: *Handedness and dermatoglyphics in twins.*——Comparisons of the occurrence of finger and palm patterns in 740 left-handers with their occurrence in 600 right-handers reveal that bimanual variations in the incidence of single patterns are greater in right-handers than in left-handers. The tendency is much more marked in females than in males. Comparison of the occurrence of finger and palm patterns in 365 sets of twins shows the same type of variation to exist between pairs composed of two right-handers and those consisting of one right and one left-hander, or of two left-handers. The differences are quite marked in female identicals, and in both male and female fraternals. In the identical pairs consisting of one right-hander and one left-hander, the right-handers show as marked left-handed tendencies as do the left-handers. Mirror-imaging of the patterns occurs with approximately the same frequencies in both types of

twins, and shows no correlation with handedness. Other investigations have revealed that twins showing intra-pair differences in handedness are about twice as likely to have left-handed relatives as are those pairs consisting of two right-handers. These observations indicate that whether members of twin pairs have the same or different handedness depends upon the genotype of the twins. (This investigation was made possible by a grant from the National Research Council).

RIDDLE, OSCAR, DUNHAM, H. H., and SCHOOLEY, J. P., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *Genetic hermaphroditism in a strain of pigeons.*——In a strain of common pigeons a true hermaphrodite capable of very limited breeding (as a male) was obtained. A normal sister of this hermaphrodite, when outcrossed to a male of another race produced (1st generation) one true hermaphrodite which, when bred as a male to a sister, threw seven true hermaphrodites (2nd generation). Further breeding is already known to have yielded three true hermaphrodites in the third and three in the fourth generations. Offspring in all generations are of the following types: normal females, normal males, males with left oviducts, and males (true hermaphrodites) with ovo-testis and oviduct on the left side and a testis on the right side. The ovo-testes have been found in birds whose ages vary between hatching and 75 months. Biopsy proved the persistence of an ovo-testis for more than 40 months. Of special interest is a fairly large group of males having a left oviduct and two testes without tissue histologically identifiable as ovarian. Such oviducts have been observed to attain a weight of 1.9 grams, which is twice that of the oviduct of a normal female not actively laying eggs. This development of oviducts in birds otherwise apparently male indicates that these birds are producing large amounts of estrogenic hormone and thus, on the basis of their internal secretions, their gonads also are partly female and bisexual.

RILEY, H. P., University of Washington, Seattle, Wash.: *Chromosomal behavior in two natural Tradescantia triploid hybrids with centric fragments.*——Two triploids from a woods near Michaud, Louisiana, showed characters of both *T. paludosa* and *T. canaliculata.* Each had 18 chromosomes plus fragments. At first metaphase the 18 chromosomes showed a high percent of trivalents, bivalents, and univalents and an occasional quadrivalent or hexavalent. Consequently the plants were over 90 percent sterile. In microspores with more than six chromosomes some somatic association of bivalents was observed at metaphase. One plant showed three small, centric fragments in root tip mitosis. These were double at metaphase and lay on the equatorial plate with the large chromosomes which they resembled except for size. At metaphase of the first meiotic division two fragments were paired while the third behaved as a univalent. The second plant had six centric fragments in the root tip. These all lay on the equatorial plate and the daughter fragments passed regularly to opposite poles at anaphase. At first meiotic metaphase

there were three fragment-bivalents normally and two or all three frequently lay alongside one another in a very strong secondary association. The members of the bivalents separated to opposite poles at anaphase. These fragments probably entered the hybrids from the *paludosa* parent as fragments are frequently found in that species. This second plant is triploid in number of large chromosomes and tetraploid in number of centromeres.

RISMAN, G. C., Brown University, Providence, R. I.: *Cell size in Habrobracon.*——Ever since HERTWIG's "Kernplasma" theory was enunciated, studies on the relationship of cell size to chromosome number have been made. In most cases, including both plant and animal material, this size-relation has been shown to hold. In Habrobracon, however, this correlation does not seem to be completely valid. Using haploid males (parthenogenetic, n = 10) diploid males (n = 20) and diploid females (n = 20), the size of the facets of the compound eye was determined. Since each facet is the secretory product of the two underlying cells, statistical differences in size must have some genetic control. The mean measurement across five consecutive facets was found to be: 1n males, 40.43 ± 6.86 mm; 2n males 44.46 ± 7.09 mm; 2n females 40.26 ± 5.72 mm as measured after camera lucida projection. These data corroborate a previous examination of the wing cell size by Speicher, in which the relationship was the same: 1n males = 2n females < 2n males. It would seem, therefore, that some other agent besides mere chromosome number is active in controlling the size of the cell.

ROBERTS, LEWIS M., Connecticut Agricultural Experiment Station and Yale University, New Haven, Conn.: *The effects of translocations on growth in Zea mays.*——This experiment was designed to determine if position effects of rearranged chromosomes can be detected in inbred material especially favorable for the measurement of small phenotypic changes. The obscuring effect of genetic segregation was removed by eight generations of self fertilization. Pollen of the inbred line was irradiated with 1000 *r* units, and from this treatment, 13 reciprocal translocations were cytologically identified. All 10 chromosomes were involved except 7 and 9. Homozygous and heterozygous progenies of the 13 translocations along with the untreated normal inbred from which they came were grown in a replicated field test. No striking differences appeared. Significant small differences, although relatively infrequent, were found by a statistical study of such characters as time of flowering, height, diameter of stalk, width and length of leaf. Changes of a progressive nature were few, but evidence was obtained that they did occur. One homozygous translocation involving three chromosomes averaged two days earlier in shedding its pollen and had a significantly larger stalk diameter than the untreated normal. Significant differences of an adverse effect outnumbered those of a progressive nature in the ratio of approximately five to one.

ROBERTSON, G. G., Yale University, New Haven, Conn.: *Increased viability*

of homozygous yellow mouse embryos in new uterine environments.——Homozygous yellow mouse embryos develop normally through cleavage and blastodermic vesicle formation (contrary to the observations of KIRKHAM, 1919). Just after normal embryos have begun to implant, the homozygous yellow embryo appears as a small mass of vacuolated cells in a decidual crypt in which the uterine epithelium has not disappeared, although the uterus is in the progestational phase. Death of the homozygous yellow embryos occurs after the blastocyst has come in contact with the uterine epithelium, and disintegration and resorption are completed within thirty hours. These abnormal embryos appear in the Mendelian ratio of one abnormal to three normal. The successful transplantation of ovaries from heterozygous yellow mice to homozygous agouti mice has made possible the study of the effects of a new uterine environment upon the development of homozygous yellow mouse embryos. In the agouti uterus these embryos develop further than in the heterozygous yellow uterus. This is indicated by the occurrence of twice the number of cells, by the development of a small ectoplacental cone and Reichert's membrane, and by the disintegration of the decidual epithelium associated with a more advanced development of the implantation site. From this it is evident that the viability of the homozygous yellow embryo is influenced by uterine as well as chromosomal factors.

ROMAN, HERSCHEL, University of Missouri, Columbia, Mo.: *Translocations involving "B" chromosomes in maize.*——"B" chromosomes are supernumerary chromosomes which consist largely of pycnotic material and are nearly or quite devoid of genetic effect. Translocations between these and the regular ("A") chromosomes are of value in connection with various problems concerning the role of heterochromatin in maize, and in providing material for the extraction of specific duplications and for various cytogenetic problems.——Seven translocations between "A" and "B" chromosomes and one between "B" chromosomes are described. All were produced by X-ray treatment of pollen of "B"-bearing plants.——The points of breakage in the "B" chromosome were in both the pycnotic and chromatic regions. The breakage points in "A" chromosomes were in various chromosomes and regions.——The translocations in which the point of breakage in the "A" chromosome has been determined are T1-B, T2-B, T4-B, and T7-B. In the first three the break occurred in the short arm and near the centromere of chromosomes 1, 2, and 4, respectively. In T7-B the break was within a few chromomeres of the end of the long arm of chromosome 7. T2-B, T4-B, and T7-B have been made homozygous.——Duplications of the new chromosome which includes the acentric segment of "A" have been obtained in T2-B and T7-B, in the latter case in homozygous condition.

ROSENBLAD, L. E., University of Houston, Houston, Texas: *A study of relationship between ventral receptacle and testes coiling in Drosophila.*——An analysis of the reproductive tract structures of numerous species of Drosophila

and closely related genera shows a high correlation between the number of ventral receptacle coils in the female and the number of testes coils in the male of the respective species. The ventral receptacle serves as a storage space for the spermatozoa which are produced in the testes. This seems to indicate that there is a need for more coils in the female to take care of the additional spermatozoa produced in the males having a greater amount of gonad tissue. A study of the size relationship between the testes and the spermathecae (also spermatozoa storage organs) in the female shows a positive correlation, but not as high as that between testes and ventral receptacle size. Species which are closely related, particularly those which hybridize, have almost the same number of testes coils and the same number of ventral receptacle coils. The relationship between the number of ventral receptacle coils and the time which the female retains the spermatozoa after fertilization seems to indicate that those species having longer coils retain the sperm longer; this evidence cannot be considered conclusive as other factors such as the retention of the spermatozoa in the spermathecae and uterus may affect the results. The dissection methods employed in this study were the same as described by the author in previous studies.

SANSOME, EVA R., SATINA, SOPHIA, and BLAKESLEE, A. F., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *Crossability between species and between tetraploids and diploids in Datura.*——Pollinations of *D. stramonium* by *D. metel* result in abundant fertilizations but in no viable seeds. Abortion of proembryo and endosperm occurs when they have formed 4 to 8 cells and about 100 cells respectively. Abortion has been assumed to be due to incompatibility between genes brought into the hybrid from the two parental species. A similar abortion occurs in most ovules from tetraploid by diploid pollinations within a highly inbred line, hence differences in genes cannot be the sole cause of embryo abortion. Since pollen tubes from a tetraploid usually burst in 2n styles, pollinations of 2n×4n generally fail to set capsules. By availing ourselves of the fact that the inside of the style through which pollen tubes grow is of epidermal origin, it is possible to make the cross 2n×4n by means of a 4n, 2n, 2n periclinal chimera. This cross results in a similar abortion after slight growth of embryo and endosperm. Since the ratios of chromosome numbers between embryo, endosperm and female somatic tissue in the 4n×2n cross deviate in opposite directions from those in the 2n×4n cross in comparison with the compatible crosses 2n×2n and 4n×4n, it is difficult to explain the abortion on the basis of a simple relation between the balanced chromosome numbers. In the three crosses mentioned, the abortion is associated with pseudoembryo formation which can also be stimulated by auxin injection. Some relation to chemical regulation is therefore suggested.

SHULL, GEORGE H., Princeton University, Princeton, N. J.: *Oenothera seg. acuminata, Oe. seg. contracta, and other mutational segregations from Oe. Lamarckiana and Oe. mut. erythrina.*——Repeatable mutational segregations have

been found in cultures of *Oe. Lamarckiana* and its derivative, *Oe.* mut. *erythrina*. These differ from the usual mutations from these forms, in being produced repeatedly on selfing some or all plants of the phenotypically normal parental type. Most of these mutational segregates have not bloomed, and many of them are so weak or of such slow growth that they probably will never bloom. The demonstration consists of photographs of the mutational segregates in contrast with their parents, with special emphasis on *Oe.* seg. *acuminata* from *Oe. Lamarckiana*, and *Oe.* seg. *contracta* from *Oe.* mut. *erythrina* which have been brought to bloom by means of special handling. The mutational segregations from *Oe.* mut. *erythrina* are of two kinds: (a) those which replace *Oe.* seg. *decipiens*, or (b) those which are additional to *Oe.* seg. *decipiens*, or to the segregate which has been substituted for seg. *decipiens*.

SONNEBORN, T. M., Indiana University, Bloomington, Ind.: *Inheritance of an environmental effect in Paramecium aurelia, variety 1, and its significance.*——In stocks homozygous for the gene $+^{II}$, crosses of mating type I × mating type II yield some clones of each type, with the percentage of type II clones $= 18.4 + t/0.51$, where t is the temperature during conjugation and nuclear reorganization. This relation holds through the range 10° to 35°C., and is based on a study of 1760 clones obtained at 9 different temperatures. After nuclear reorganization is completed, the mating type is not altered by temperature or other environmental conditions; it is inherited indefinitely through reproduction by fissions. These relations, although similar to some that have been interpreted as Dauermodifikationen, are not in conformity with this concept. Their interpretation is suggested by the two following facts. 1) Differences in mating type are determined by differences in the macronuclei. 2) Identical homozygous micronuclei give rise to diverse macronuclei. These macronuclear diversities, determining hereditary characters, are therefore mutations of some kind. The simplest interpretation seems to be that the $+^{II}$ gene is for type I and mutates with high frequency to an allele for type II, though only at the time the macronuclei develop from micronuclei. The high mutation rate, 38 percent to 87 percent as temperature rises from 10° to 35°, is enormously greater than any hitherto recorded. The randomness of occurrence of the changes is typical of mutations, for the two macronuclei that develop in the same reorganizing cell show independence and randomness in their determination.

SPARROW, A. H., McGill University, Montreal, Canada: *Spiralization in microspore chromosomes of Trillium.*——At metaphase and anaphase of microspore mitoses the chromonemata form a large-gyred hollow spiral. Along its gyres an irregular waviness or "minor" somatic spiral is visible. The spiral develops during prophase by an increase in gyre size and a decrease in gyre number and in chromatid length. Chromosome volume and chromonema (not chromatid) length both increase significantly between early metaphase and anaphase. Where the spiral can be seen to be double-stranded it is plectonemic.

The process of reducing this plectonemic spiral into parallel, freely-separable chromatids begins in one prophase as a reduction in gyre number and continues as relational uncoiling in the next. Paradoxically, therefore, a spiralization cycle such as that described above can be interpreted as an uncoiling process in which successive cycles overlap in prophase.

SPARROW, A. H., RUTTLE, MABEL L., and NEBEL, B. R., N. Y. State Agricultural Experiment Station, Geneva, N. Y.: *Sterility differences between auto- and allotetraploid Antirrhinum.*——Autotetraploids of 15 varieties have been produced by treatment of young seedlings with 0.16 percent colchicine. These plants set very few seeds and have, with the exception of one variety, continued highly sterile in the second and third generations. Allotetraploids were obtained by crossing the different varieties of autotetraploids. They set an abundance of seed. The marked difference in fertility of the two types of tetraploids cannot be correlated with differences in the number of quadrivalents at first metaphase nor to the relative proportions of good and bad pollen in acetocarmine smears. Thus in both the auto- and allotetraploids so far examined four to six quadrivalents were most frequently observed, but cells with higher and lower numbers of quadrivalents also occur. In an allotriploid examined the number of trivalents ranged from two to eight. Lagging and loss of chromosomes at first and second anaphase result in a variable amount of pollen abortion and numerous microcytes. In autotetraploids the amount of good pollen grains in different populations ranges from two to three percent up to about 95 percent, but is in no case correlated with very high fertility. In first generation allotetraploids the number of good pollen grains ranges from 35 to 95 percent and in all cases the plants set an abundance of good seed. Thus it appears that the sterility differences in the two types of tetraploids cannot be attributed merely to meiotic irregularities nor to pollen deficiencies.

SPENCER, W. P., College of Wooster, Wooster, Ohio: *Inherited variations in wild populations of Claytonia virginica.*——In extensive populations of *Claytonia virginica* in Wayne County, Ohio, two widely spread alternate types of sepal color, green and brown, have been observed. Only the green sepal type is found in the upper part of Little Apple Creek drainage system and in the entire Christmas Run drainage. In other regions small local colonies of several hundred plants exclusively brown occur. The Killbuck and Clear Creek valleys show mixed populations of green and brown with small local areas of one or the other. The hybrid between these two color types is gray. Green sepals streaked with purple is a relatively rare variant observed in several localities. In a low, swamp forest a colony was found with plants having green sepals with purple tips, changing to deep reddish-purple sepals as the flower aged. A small colony with petal number reduced has been located in Little Apple Creek valley. Fused inflorescence, in which the individual flower pedicels are united, has been found in several places. There are also variant types of petal size, shape, and color, and of sepal size and shape. These variants are actually mutant types

and not environmental effects as shown by the following facts: (a) the position and extent of colonies of certain variants have been observed in two successive years, 1940 and 1941; (b) tubers have been transplanted and have given the same variant type in the new environment; (c) all of the stems and flowers from a single tuber show the distinct variant in question. Owing to large numbers of individuals, extent of populations, and variety of habitats occupied this plants offers unusual opportunities for studies in micro-evolution.

SPENCER, W. P., College of Wooster, Wooster, Ohio: *Are natural mutations in wild Drosophila distributed in a Poisson series?*——In extensive inbreeding tests of wild *Drosophila hydei* populations it has been established that approximately one visible mutant is present in heterozygous form per four flies tested (exclusive of the special case of bobbed). Similar, but less extensive tests on *D. melanogaster* and *D. robusta* show the former to carry more mutants and the latter less in diverse populations. The findings of several cases of closely linked mutants present in the same wild chromosome raised the question of whether mutants in nature are distributed in a Poisson series among chromatin blocks of 10 units length or less. Basing calculations on the short *melanogaster* map of 280 units per chromosome set (*hydei* maps are longer), there are roughly 56 chromatin blocks of 10 units length per fly, and 224 such blocks per four flies. 264 mutants have been found distributed as follows: 251 chromatin blocks, 1 mutant each; 5 blocks, 2 mutants each; 1 block, 3 mutants. Each of the 257 blocks in which mutants were found represents the testing of about 224 blocks, or in all, the mutants were distributed in a chromatin block population of 57,568 in the manner recorded. Applying the Poisson formula, with grouping together of doubles and triples in the Chi-square calculation, the data clearly indicate that the mutants are not distributed at random to short chromatin blocks. Owing to the operation of decay, we are probably observing only the terminal traces of what was initially a much more marked non-random distribution.

STEINBERG, ARTHUR G., McGill University, Montreal, Canada: *Further studies on the histological development of the wild type and Bar eyes of Drosophila melanogaster.*——It has been reported previously that "cell clusters" consisting of four cells each are present in the eye discs of wild type larvae but not in Bar larvae at 72 and 96 hours of larval development at 25°C (STEINBERG, Genetics **26**: 325–346). These "cell clusters" have now been found to be cross sections through "goblet-like" structures. The latter structures, first observed in prepupae, were subsequently found in both 96 and 72 hour larvae. None were found in 48 hour larvae, thus confirming the earlier observations that cellular organization occurs after 48 hours and prior to 72 hours. The development of the "goblet-like" structures has been followed through the pupal period. *They are the precursors of the ommatidia and develop directly into them.* The "goblet like" structures are present also in both 96 and 72 hour old Bar larvae although in much smaller numbers than in wild type. (For example, no more than 4

goblets were observed in any section of a Bar eye disc while more than 20 have been observed in wild type.) Hence, there is probably no difference between Bar and wild type in the time of onset of the differentiation of the precursors of the ommatidia. These observations lend further support to the hypothesis advanced by STEINBERG (loc. cit. and Genetics **26**: 440–451) in which the difference in facet number between Bar and wild types is ascribed to a difference in the number of cells entering into the formation of the cephalic complex.

STONE, WILSON S., GRIFFEN, A. B., and PATTERSON, J. T. University of Texas, Austin, Texas: *Drosophila montana, a new species of the virilis group.* ——This species belongs to the wild-type forms of the virilis group. Somatic metaphase plates show twelve chromosomes: four pairs of rods, one pair of small V's and one pair of dots. The V-shaped element is the result of a complex rearrangement in chromosome 2, with an insertion of the centromere near the middle of the long euchromatic arm. No fusion of chromosomes is present. Thus far we have been able to hybridize it with *D. texana* and *D. novamexicana.* A study of the salivary chromosomes of the *montana-texana* hybrid larvae shows the following points: The X chromosome is identical with that of *texana;* chromosome 2 has the *texana* inversion and, in addition, the complex transposition of the centromere; chromosome 3 shows two included inversions, neither of which has been found in any of the other forms; chromosomes 4 and 5 show gene orders not yet observed in any other member of the group; finally, both X and 4 may show inversions in hybrids between strains of *montana.*

STURKIE, PAUL D., Alabama Agricultural Experiment Station, Auburn, Ala.: *Suppression of a dominant character, polydactylism, in the domestic fowl.* ——This report concerns the effects of low temperatures on the suppression of polydactylism in embryos, heterozygous and homozygous for the character, at two, three, four and five days of development. The eggs were incubated at the control temperature of 37.5°C for the above periods of time. Each of these age groups of embryos was then subjected to a temperature of 2.5–4°C for a period of 16 hours, then incubated for 2–3 days at about 34°C, after which time they were placed on control temperatures. From a mating of a homozygous polydactylous Houdan male to ten normal White Leghorn females, the eggs from which were incubated at control temperature, 207 polydactylous and two normal chicks were hatched. Embryos from this same mating were subjected to low temperatures at the above mentioned stages. The number of chicks hatched, which had received the cold treatments at two, three, four and five days were respectively 132, 160, 55, and 55. The percentages of non-polydactylous chicks produced from these respective treatments were: 78.8, 56.0, 56.0 and 18.0. The results indicate suppression of the character. The least effective treatment in suppression was that employed at five days of development. In most cases at this stage, the extra hind toe is differentiated, whereas at four days and earlier it is not. When embryos homozygous for polydactylism were subjected to the cold treatments at two, three, and four days, 19 percent of the hatched chicks were non-polydactylous.

VILLEE, CLAUDE A., University of California, Berkeley, Calif.: *The effect of cold treatments upon the development of the mutant aristapedia-Bridges in Drosophila melanogaster.*——Normally in aristapedia-Bridges only the base of the arista is changed to a fleshy lobe, the rest being plumose. Exposing developing larvae to a temperature of 14.4°C produces an increased expression of the character; in extreme instances the phenotype becomes identical with that of aristapedia, *i.e.*, the entire arista becomes tarsus-like and claw-tipped. The leg tarsi are abnormal, reduced in size and in number of segments. Cold treatments were begun 0 to 6 days after the parents were removed and continued one to eight days. A treatment of any given length produces its greatest effect if begun on the fourth day of development. In treatments begun immediately after the parents were removed or on the fifth or sixth day, the duration of the treatment made little difference in the effect. This was also true in treatments begun on the first or second day and ended before the fifth; however, if treatment was continued past the fifth day, the effect increased proportionally with the length of the treatment. Treatments begun on the third or fourth day produced an effect proportional to the duration of the treatment. This indicates that a decrease in the velocity of development produced by cold treatment enables the aristapedia-Bridges gene, working at a lower rate for a longer time, to produce a phenotype similar to aristapedia. Although the effect produced is greatest during the fourth day, some effect results from treatment during any day of development from the first to the sixth, indicating that there is no sharp T. E. P. for the reaction involved.

WALETZKY, E., and OWEN, R., University of North Carolina, Chapel Hill, N. C., and University of Wisconsin, Madison, Wis.: *A case of inherited partial sterility and embryonic mortality in the rat.*——A partially sterile condition, PS, appeared spontaneously in a single male and is inherited by half of his offspring. Although average litter size in the colony is over seven young, PS rats consistently produced about three young per litter when mated to normal rats. Eight out of 16 tested F_1 and F_2 males and females from the original male were PS and eight were normal. Both PS and normal females mated to normal and PS males respectively contain a normal number of implantation sites, but approximately 60 percent of these sites undergo resorption. The implantation sites are all equal in size at 8–9 days after mating, but gradually become markedly unequal. At 14–15 days resorbing sites contain only solid placentomata without any trace of an embryo. From 11 to 14 days, 19 out of 71 resorbing sites contained very small, relatively undifferentiated embryos, and the rest contained solid placentomata. Many of the abnormal embryos were partially or completely necrotic, and a few had open neural tubes anteriorly. At the earliest stage examined, 8–9 days, approximately half the sites contained normal embryos, and the other half solid placentomata with or without disintegrating fragments of an embryo.——The simplest hypothesis which seems to explain this partially sterile condition and the presence of several types of abnormal embryos is a heterozygous reciprocal translocation.

WALTERS, JAMES, L., and STEBBINS, G. LEDYARD, JR., University of California, Berkeley, Calif.: *Distribution of structural hybrids in Paeonia californica.* ——*Paeonia californica*, native to central and southern California, contains structurally homozygous forms, with five pairs at I metaphase, as well as structural heterozygotes showing all possible degrees of heterozygosity, namely ⊙ 4+3 pairs, ⊙ 6+2 pairs, 2⊙'s 4+1 pair, ⊙ 8+1 pair, ⊙ 6+⊙ 4, ⊙ 10. The structurally homozygous forms occupy a large area in the center of the range of the species, but are absent from its southern and northern ends. Within the area occupied by the homozygotes, colonies containing both homozygotes and various types of heterozygotes have been found. No difference could be found between homozygotes and heterozygotes in external morphology. The morphological variability among individuals of a colony appears the same in regions where only heterozygotes occur as it is in regions where both structural homozygotes and heterozygotes are found.

WARMKE, H. E., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *A new method for determining the sex heterozygote in species with morphologically undifferentiated sex chromosomes, and its application to Silene otites.* ——*Silene otites* is dioecious, but whether the male or female is heterogametic (XY) cannot be determined by cytological methods because of similarity in size of the sex chromosomes. By doubling the chromosome number and by utilizing the peculiar breeding behavior of the 4n sex heterozygote, it has been possible to present evidence that the male is heterogametic. The method is as follows: Using colchicine, XX and XY plants are transformed into XXXX and XXYY plants, respectively. The XXXX individuals will produce only XX gametes, but the XXYY individual will produce at least 1 XX:4 XY:1 YY gametes. A higher proportion of XY gametes will result if differentiation of the sex chromosomes is sufficient to disturb random pairing. When XXXX and XXYY individuals are crossed, therefore, three types of offspring are expected: 1 XXXX:4 XXXY: 1XXYY. In Silene approximately 5 males to 1 female are obtained when treated 4n males and females are crossed, which indicates two classes of males: 1 XXYY and 4 XXXY, or 1 XXXX and 4 XXXY, depending upon whether the female is XXXX or XXYY. To determine the constitution of the female, several of the treated 4n females are crossed to diploid males (and reciprocal if possible). If the female is XXXX, a 3n population of 1 male to 1 female should result; if it is XXYY, one should expect 5 males to 1 female. In Silene this cross has produced triploid males and females in a ratio that does not deviate significantly from 1:1. This indicates that females are homogametic and males are heterogametic, and makes possible the interpretation of breeding results on the same basis as in Melandrium.

WHITING, ANNA R., University of Pennsylvania, Philadelphia, Pa.: *X-ray sensitivity of first meiotic prophase and metaphase in Habrobracon eggs.*—— Hatchability percentages of unfertilized eggs X-rayed in late prophase I with

dosages up to 400 *r* are significantly higher than of controls. Above 400 *r* dosage-hatchability curve indicates that death depends upon the concurrence of two or more events the chance of which increases disproportionately with increased radiation. The lethal dose is about 35,000 *r*. In contrast, dosage-hatchability curve of eggs X-rayed in late metaphase I indicates that death results from one event. It is unchanged by time-intensity differences or by fractionated dosages. These eggs are sensitive to 50 *r* and the lethal dosage is about 1250 *r*. After 1864 *r* all suitable stages show fragments (terminal deletions ?) within the telophase I spindle or between equatorial plates at metaphase II. With 500 *r*, 750 *r* and 1000 r, percentages without visible fragments form a curve parallel to and somewhat higher than dosage-hatchability curve. Mean fragment number per egg increases with dosage. No eggs treated in prophase I with 1864 *r* show fragments. Eggs treated in metaphase I with 2500 *r* pass at once into telophase I when laid (like controls). 97.5 ± 1.35 percent complete meiosis and begin cleavage at approximately normal rates. When egg-laying is temporarily restrained to keep chromosomes relatively inactive after treatment hatchability is not significantly changed. If stresses peculiar to metaphase I chromosomes sensitize this stage to irradiation, treated prophase I chromosomes, which later undergo these stresses, must receive but slight injury at dosages lethal to former or recover almost completely before entering metaphase I. Data indicate that metaphase injury, like prophase, is due to chromosome breaks correlated with ionizations and not to "physiological" causes, stickiness and clumping of chromosomes.

WILSON, G. B., and BOOTHROYD, E. R., McGill University, Montreal, Canada: *Differential reactivity in the chromosomes of Trillium species.*—— Rhizomes of *Trillium erectum*, *T. grandiflorum* and *T. undulatum* exposed to a temperature of 3°C show a characteristic differentiation at metaphase and anaphase of root tip chromosomes into deeply and lightly stained regions. The differential pattern is a species characteristic and the three species studied show marked differences in their patterns. The rate with which the chromosomes become affected in *T. erectum* has been considered in some detail. A few regions appear after one hour and an apparent maximum is reached after 96 hours exposure. The same treatment has produced a similar differentiation in the somatic chromosomes of two varieties of rye.

WILSON, G. B., and SPARROW, A. H., McGill University, Montreal, Canada: *Partial fusion of untreated root tip chromosomes of Trillium erectum L.*——In a single root tip of *Trillium erectum* a number of metaphase plates showed one or more pairs of chromosomes which were fused for a short distance. In at least two cases the associated pairs are apparently homologous. In other cases, however, the associated chromosomes are non-homologous. In some cases this fusion involves breakage and rejoining of chromatids resulting in at least one instance in a bridge and fragment at anaphase. Other rhizomes collected at the same time and similarly handled before being examined showed no such irregularities.

ZAMENHOF, S., New York, N. Y.: *Selective irradiation.*——The possibility of ultraviolet irradiation of arbitrarily selected minute areas of chromatin is a step towards realization of selective irradiation of particular genes. Another advantage of experimentation with localized action of U.V. rays is the possibility of using higher dosages without lethal effects. It may be also of interest to irradiate cytoplasm alone instead of nucleus in order to find out whether or not the mutation-causing energy can pass from the cytoplasm to the nucleus. To produce minute spots of U.V. light two methods are feasible. 1) In H. J. MULLER'S method the condenser of a microscope is replaced by a short-focal quartz or fluorite lens which produces on the stage of the microscope (or on the living cell to be irradiated) a minute picture of a small and remote opening illuminated by the source of U.V. rays. 2) The author's method uses a screen opaque to U.V. rays but provided with an opening less than 0.5μ in diameter; the screen is placed directly beneath the cell to be irradiated. The author checked experimentally the size of luminous spots obtainable by these two methods. While the diffraction phenomena restrict the lower limit of the size of the irradiated spot, yet a spot as minute as 0.2μ in diameter with the lens method, and 0.9μ in diameter with the screen method, is obtainable.