ATWOOD, SANFORD S., U. S. Regional Pasture Research Laboratory, State College, Pa.: *Cytogenetics of incompatibility in Trifolium repens.*—Thirteen self-sterile F₁ plants were crossed in all combinations and were backcrossed with their self-sterile parents. The F₁ plants consisted of four intra-sterile, inter-fertile groups of five, four, three, and one plant, respectively, and all were reciprocally fertile with both parents. Using ten flowers in each cross, compatible crosses averaged 44.9 seeds and incompatible 0.26. A second series of diallel crosses were made between 13 F₁ plants and their parents. One parent was self-sterile and the other highly “pseudo-self-fertile.” Both this latter parent and its progeny were practically self-sterile when individual flowers were self-pollinated in either full flower or the bud, but they set selfed seed when the entire heads were rubbed to effect pollination. The factors conditioning this pseudo-self-fertility are independent of those causing cross-incompatibilities, since four intra-sterile, inter-fertile groups of four, four, three, and two plants, respectively were found in this second set of progeny. Compatible crosses averaged 41.9 seeds and incompatible 0.18. The results in both series of crosses are explained best by the diploid (16 bivalents found regularly) personate type of oppositional factors where the parents differ in both alleles. The 12 groups from the two series were compatible in all combinations, indicating at least seven different allelomorphs in the four parents. Other evidence suggesting a large number of allelomorphs is that all matings (over 200) between unrelated plants were compatible. Few or no seeds were set in incompatible crosses because of poor pollen germination and pollen tube growth within a few hours after pollination.

BANTA, S. M., Brown University, Providence, R. I.: *Possible rôle of amixis in the evolution of organisms.*—Experimental findings from parthenogenetic reproduction in Cladocera and other well authenticated facts suggest that amixis, particularly when alternating with amphimixis, may be a potent factor in evolution. In Daphnia, mutation in diploid parthenogenesis is moderately frequent—all of our recognized Cladocera mutations having arisen during parthenogenesis. Most of these mutations are recessives and their effects, almost exclusively physiological, are recognized only in the results of sexual reproduction—inbreeding within the clone involved. The relative frequency of occurrence of these mutations during parthenogenesis together with, in nature, the periodical occurrence of amphimixis suggests that in the amictic-amphimictic cycle abundant genic recombinations occur.
The vast populations normally resulting from amixis should contain propor-
tional numbers carrying any recessive mutations, or any non-deleterious
dominant mutations, which might have arisen. If the mutation is domi-
nant and confers an advantage to its possessor the mutant population during
parthenogenesis should become disproportionately large. In any case, if the
mutation is of potential advantage the amictic-amphimictic cycle affords
opportunity for the one-in-a-million recombination which, perhaps alone,
may produce an individual superior to its forbears or fitted for occupancy
of a changed or new environment. For example, our thermal mutation in
*Daphnia longispina* was such a potentially advantageous mutation. The
amictic-amphimictic cycle occurs in many organisms, particularly among
parasites and animals occupying transitorily favorable environments. It is
conceivable that this mechanism has been a large factor in the development
of the almost incredibly specialized and elaborate adaptations in life histor-
ies of certain parasites.

**Barto, Elizabeth**, Laboratory of Vertebrate Genetics, University of
Michigan, Ann Arbor, Mich.: *Absence of linkage between certain characters in
the deer-mouse, Peromyscus maniculatus.*—The characters albino versus
dilute, albino versus nude, and ivory versus hairless, in the deer-mouse,
*Peromyscus maniculatus*, have been tested to determine their linkage relation-
ships. Independent assortment of the genes for each of these pairs of char-
acters was shown in the F₂ generations and in test-crosses, indicating absence
of linkage.

**Beatty, Alvin V.** University of Alabama, University, Ala.: *Mitosis in the
pollen tube of Eschscholzia.*—Within fifteen minutes after sowing the pollen
of the California poppy on a prepared medium, both the growth of pollen
tubes and the division of generative nuclei have begun. All normal mitotic
prophase stages, including the double nature of the chromosomes, can be
seen. At the end of two hours the pollen tubes range in length up to 2 mm.
Most tubes between 0.5 mm and 1.0 mm show a typical mitotic metaphase
with a well developed spindle and an equatorial alignment of the chromo-
somes. Since the chromosomes are small they are situated throughout their
lengths in the equatorial plane. The anaphase chromosomes are separate,
easily distinguishable, and migrate simultaneously, forming regular mitotic
configurations. Immediately following telophase the gametes are formed.
They migrate toward the end of the tube, but are rarely closer together than
the distance between the telophase nuclei.

**Blair, Albert P.**, Indiana University, Bloomington, Ind.: *Inter-relations
of the toads of eastern North America.*—Inter-relations of the toads of eastern
North America have been studied from three angles: (1) extensive field work
involving determination of ranges, areas of hybridization, etc., (2) critical
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examination of specimens collected in the field, and (3) experimental hybridization. The several so-called species are found in almost every case to be linked by intermediate populations. 3500 toads have been measured and local variation studies made where sufficient specimens are available. 987 species hybrids representing 29 crosses have been raised through metamorphosis.

Blakeslee, A. F., Avery, A. G., and Berger, A. D., Carnegie Institution of Washington, Cold Spring Harbor, New York: Genes associated with prime types in Datura and their possible relation to the hypothesis of position effect.—In our collection of over ninety prime types which consists chiefly of races homozygous for segmentally interchanged chromosomes, the large majority show no deviation from normal in appearance as would be expected if position effect were frequent. In a few cases, however, homozygous prime types are distinctly abnormal. It has not yet been possible to determine whether these exceptions are due to genes which do not cross over, to small deficiencies which accompanied the break, or to position effect.

Blanc, Richard, and Braun, Werner, Department Zoology, University of California, Berkeley, Calif.: Phenocopies and X-radiation in Drosophila melanogaster.—The authors have attempted to establish a relationship between number of phenocopies in Drosophila melanogaster and extent of X-radiation. Prepupae of an inbred Oregon-R stock were subjected to X-radiation for periods of 1/4 to 4 1/2 minutes (at approximately 940 r units per minute), and the images were examined for phenocopic effects. Characters most frequently noted were abnormal abdomen, various bristle defects (particularly absence), curled and curved wings, opaque wings, and trident. Occasional phenotypes included rough eyes, vortex, and a number of wing shape and wing venation effects. A direct proportionality between average number of phenocopies per fly and degree of radiation was observed from 1410 r units to the highest dosage for which significant data were available, i.e., 3290 r units. The decrease in number of normal flies is represented by an S curve. A typical mortality curve was found, with a sharp drop in viability from 2350 to 3290 r units. Certain relationships were established among the thoracic bristles. The anterior and posterior dorsocentrals reacted differently to increase in radiation, while the anterior and posterior scutellars reacted in a similar manner, though not to the same degree. It is suggested that the scutellars may be classified as a single bristle system, and the anterior and posterior dorsocentrals as separate bristle systems.

Braun, Werner, Department of Zoology, University of California, Berkeley: Increase in time of development after partial and complete starvation of larvae and its effect on the phenotype of several mutants of D. melanogaster—Partial (peptone-food) and complete starvation of larvae of D. melanogaster increases time of development. Developmental rate can be changed differently accord-
ing to the degree and length of starvation and the stage in development at which it is started. If the time of development is thus increased in vgno larvae an increasing destruction of wing area can be observed with increasing time of development (Proc. Nat. Acad. Sci. 25, 5). Precisely timed tests indicated that no definite sensitive period exists for the effect of partial starvation. The effect is larger the earlier the larvae are transferred to peptone food. After partial starvation the destruction always increases from the tip of the wing towards the base of the wing (scalloping).—No definite sensitive period for complete starvation has been found as yet. Patterns of destruction are typically different if starvation is started severally at different times of larval development. Larvae which are completely starved for a 3 day period, which starts before the larvae are 75 hours old, develop into flies 80% of which always exhibit a destruction starting from the posterior margin of the wing (Bd type). If larvae are completely starved beginning at a time after 75 hours of larval age, all hatching flies exhibit wing destruction starting from the anterior margin (Bx type). An antler-like pattern of destruction results (60% of hatching flies) if larvae were removed from all food at the age of 50 hours. Changes of developmental rates were produced by the same method in some other mutants of D. melanogaster. It was observed that after increase in time of development B/+ and Lobe eyes become normal, Curly wings straighten out (only in certain stocks) and the amount of extra venation is reduced in plexus stocks.

BREHME, KATHERINE S., Carnegie Institution, Cold Spring Harbor, N. Y.: The growth of transplanted Minute and wild type optic disks in Drosophila melanogaster.—As part of a study of the effect of the host upon growth of imaginal tissue, optic disks of female larvae 76 hours after hatching were transplanted into larvae of the same age and sex (at 25°C). At eclosion of the host, the transplants were dissected out and the facets counted. The stocks used were Florida wild type (puparium formation at 100 hours after hatching) and Minute-w isogenic with Florida (puparium formation at 144 hours). The mean facet number of Mw transplants in wild type hosts, pupating 24 hours after the operation, was 294.3 ± 31.8; Mw transplants Mw hosts, pupating 68 hours after the operation, had a mean of 487.3 ± 43.1 facets (difference = 193.0 ± 51.9). Wild type disks in wild type hosts, pupating 24 hours after transplantation, formed a mean of 489.1 ± 28.8 facets; in Mw hosts, pupating in 68 hours, they formed 599.5 ± 23.1 facets (difference = 110.4 ± 36.9). The following conclusions may be drawn: 1) The length of the interval between transplantation and puparium formation of the host, during which the transplant increases in cell number, is a major factor in determining the size attained by the transplanted disk. This is in agreement with data on Bar obtained under different conditions by Bodenstein. 2) Increase in cell number continues in the wild type optic disk after 76 hours (data from +in+ and +in Mw). 3) Under conditions of the experiment, the wild type disk forms fewer facets in transplant than in situ.
BRINK, R. A., and COOPER, D. C., University of Wisconsin, Madison, Wis.: *The significance of double fertilization in flowering plants.*—The early collapse of fertile ovules in *Medicago sativa* is about five times as frequent following selfing as after cross-pollination. This type of seed failure, which is termed somatoplastic sterility, is shown to be due primarily to excessive meristematic activity of the inner integument, causing starvation of the endosperm and embryo. Continued development of the young seed apparently requires that the endosperm maintain an ascendant physiological position relative to the growing maternal tissue, (nucellus or integument, as the case may be), adjacent to the embryo sac with which it must compete for a limited food supply. Otherwise the partition of nutrients becomes unbalanced in favor of the nucellus or integument, and somatoplastic sterility results. Marked heterosis is shown in the young hybrid endosperm, although it can not be detected in the much more slowly growing embryo. Conversely, inbreeding depresses the rate of nuclear division in the alfalfa endosperm, in many cases below the critical level for ovule survival. Double fertilization, therefore, may be interpreted as a mechanism which, through heterosis, enhances the competitive position of the endosperm in the delicately balanced internal environment of the ovule.

BRYSON, VERNON, Columbia University, New York.: *The modifying effect of Minutes.*—A wide variety of mutant genes have been combined with *M(3)* and its allele *M(3)*Fla, with the purpose of determining the effect of extreme Minutes on dominance, penetrance and expressivity. Particular interest is attached to experiments involving *B*B*, B*, co, fa, ap*, Jag, Ser, Lyra and Xa, combined individually with these Minutes. Here the modifying action of Minutes was well marked, whereas in numerous other cases no appreciable modifying influence could be detected. It is shown that Minutes often enhance the phenotypic expression of genes with which they are combined and that such modification is consistent with the generally accepted viewpoint that dominance, penetrance and expressivity are aspects of the same problem. In the heterozygote detection of modification involving any of these phenomena is correlated with the expression of one, as contrasted with two doses of the gene, in the non-Minute genotype. Enhancement must obviously be in the direction of the homozygote; e.g., *Jag/MFla* is phenotypically similar to *Jag/Jag*, not to *Jag/+*. Entirely consistent is the manifestation of phenotypic effect by confluens, which in the non-Minute heterozygote is undetectable, but in the Minute appears as though homozygous. Similarly penetrance may be increased. Modification of the homozygote is also in the direction of enhanced expression which may now be recognized as beyond the limits imposed by the normal residual genotype. If the homozygote is lethal but has a phenotypic effect in the heterozygote, then its heterozygous combination with Minute may fail to survive, as in *MFla/Dfd* (Payne). These experiments indicate that Minutes may be regarded as among the most effective of non-specific modifiers in *Drosophila*.
COOPER, D. C., and BRINK, R. A., University of Wisconsin, Madison, Wis.

Somatoplastic sterility as a cause of seed failure following interspecific hybridization.—Fertilization occurs between 50 and 60 hours after pollination in the following matings: Nicotiana rustica × N. glutinosa, and reciprocal, N. rustica × Petunia violacea and N. glutinosa × P. violacea. Seed is not formed, however, due to early collapse of the fertile ovules. Histological changes leading to failure are essentially like those frequently observable in normally cross-pollinated Medicago sativa after selfing, as earlier described by the authors under the term somatoplastic sterility. Normal seed formation follows self-pollination in N. rustica and N. glutinosa. Fertilization occurs 20–24 hours after pollination, and endosperm and embryo develop rapidly. Nucellar cells become flattened, forming a thin and gradually shrinking layer between endosperm and integument. The course of development following interspecific and intergeneric hybridization, on the other hand, is conspicuously different. The endosperm particularly, and possibly the embryo also, grow more slowly. The nucellus quickly becomes meristematic, instead of regressing, and forms two or more layers of cells. As the nucellar cells proliferate, starch appears in them, the endosperm breaks down and development of the ovule eventually ceases. The immediate cause of ovule collapse is attributed to endosperm starvation due to hyperplasia of the nucellus. The latter condition is believed to arise when the genetic constitution of the endosperm is such that it fails to attain and maintain an ascendant physiological position relative to the adjacent maternal tissue which is also stimulated to development following fertilization.

CUMLEY, R. W., and IRWIN, M. R., University of Wisconsin, Madison, Wis.: Immunological and geographic relationships among pigeon species.—Using immunological procedures, notably the agglutinin-absorption technic, it was found that the species of pigeons from the Old World and those from the New World, when compared, represented two more or less distinct groups. Briefly, there appear to be antigens which are common to species of both the Old and the New World. Further, within the species of the Old World there are other antigens which set these species apart as a group from any of those in the New World. These components are shared by many, if not by all, of the Old World species. And then there are other antigens which set each species apart from every other species of the Old World. Likewise, the species of the New World have a group of cellular characters which are not found in those of the Old World, and which are present in most, if not in all, of the species of the New World. Also, each species has its own distinctive antigens.

CURTIS, M. R., and DUNNING, W. F.; Institute of Cancer Research, Columbia University, New York, N. Y.: An independent recurrence of the blue mutation in Rattus norvegicus and observations on a mosaic of blue and its normal allelomorph.—A recurrence of the blue mutation described by ROBERTS in 1929 is reported in a strain of pedigreed agouti black hooded rats. The foundation
stock of this strain was three rats obtained from Copenhagen in 1920. The known genetic constitution of the strain is \( CC\ PP\ AA\ hh \). The first observed blue mutants appeared in the 15th brother \( \times \) sister generation of Line 2331. Prior to this time Feb. 23, 1934 intense hooded coat color had been recorded for each of the observed 6059 rats of this strain of which 187 were direct ancestors and their full sibs and 504 were half-sibs of the direct ancestors of the mutants. Since the appearance of the mutation the collateral families have produced 3565 pure line intense colored progeny and thousands of hybrids none of which have shown the mutant character. The identity of this blue character with the one observed by ROBERTS has been established by CASTLE in crosses of the two stocks. A hooded female mosaic for blue and intense color has recently been observed in an \( F_2 \) population of 286 rats from a cross of intense hooded (\( Dh \)) by blue selfed (\( dH \)). Her pattern is 26 percent colored with a black area on the right side of the face and left side of the cape equal to about 10 percent while the remainder of the colored area is blue. She has had to date 16 blue progeny by a blue selfed male indicating that the mosaicism is somatic.

Dawson, W. M., and Katz, Reuben, U.S.D.A., Bureau of Animal Industry, Washington, D. C.: Preliminary report on variation in ability of dogs to master a multiple-choice situation.—As a basis for later genetic studies an attempt is being made to find types of behavior that will provide a clear-cut discrimination in the intelligence of dogs. A modification of the “Hamilton Multiple-Choice Apparatus” is used in one of the tests. The dog is faced with the problem of finding which one of four doors is unlocked. In these tests many dogs developed a good system of seeking the right door which eliminated the repetitions that would otherwise have been expected. Pulis, Chows, Border Collies and \( F_1 \)'s of Puli \( \times \) German Shepherd, Puli \( \times \) Chow, and Puli \( \times \) Border Collie, totaling 44 dogs, were tested. When dogs were scored on avoidance of repetition, a wide distribution of scores was obtained. On the basis of total doors tried in approximately 140 trials by each dog the percent of doors not repeated varied from 39 to 80. The mean for the 44 dogs was 56.8 \( \pm \) 0.9. Average scores for the three largest groups were: Pulis, 54.3 \( \pm \) 2.3; \( F_1 \) (Puli \( \times \) German Shepherd) 62.5 \( \pm \) 1.3, and \( F_1 \) (Puli \( \times \) Chow) 55.2 \( \pm \) 1.5. While the means of the first two groups appear to differ significantly the magnitude of the reliability coefficient of the test (\( r = .82 \)) and the small number of dogs in each group make it necessary to do further work before drawing final conclusions. One litter (Puli \( \times F_1 \) (Puli \( \times \) German Shepherd)) in which the \( F_1 \) dam was selected for her very high score on this test (80), has an average score of 63.9 \( \pm \) 2.0 indicating that the selection may have had some effect.

Demerec, M., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: A comparison between the X-ray induced and the spontaneous Notches. ——Salivary gland chromosome study of an unselected series of 27 X-ray induced Notches shows that 3 had the full complement of bands, in 7 cases one
band was missing, in 4 cases 2 to 5 bands were missing and in 13 cases more than 6 bands were missing. Similar study of a series of 10 spontaneous Notches shows 1 case in the first group, and 3 cases in each of the other three groups. The spontaneous series consisted of Notches kept in stock at various laboratories and obtained from them for this study. Since long Notch deficiencies have poor viability it is probable that in this series natural selection may have eliminated some of the long deficiencies. Such a possibility finds support in the genetic analysis by Li and Bridges of spontaneous Notches collected at random; it was found that 4 out of 25 involved the white locus as well and were thus long deficiencies extending to the left of Notch. In my X-ray series 7 out of 27 involve white, while in the spontaneous series only one out of ten is white, suggesting the working of natural selection in the case of the spontaneous series. When this is taken into consideration the two series show a striking similarity in the frequency distribution between the four groups differing in the length of the deficient segment.

Dunn, L. C., Columbia University, New York City: Changes of dominance in the house mouse.—The Brachyury (short-tail) mutation behaved as a dominant in the stock in which it was found by Dobrovolskaia-Zawadskiaia. When outcrossed and backcrossed to several inbred stocks of Mus musculus and to Mus bactrianus, the expression of the mutation in the heterozygote was decreased, the degree of dominance modification depending upon the particular stock to which crossed. These results resemble those obtained with two stocks by Green. Additional observations do not indicate any marked effect either of modifiers or of heterosis upon the homozygote which regularly dies as embryo at about 11 days.—One normal stock (Bagg albino) which had been shown to have plus modifiers for Brachyury was tested with another short-tail mutation, Sd, of similar phenotype. In continued backcrosses to Bagg albino, the effects of Sd increased progressively, so that most heterozygotes are now tailless. No effect on homozygotes was noted. The same inbred stock thus modified two similar phenotypes in opposite directions. It is thus evident that dominance modifiers may have some specificity.

Eigsti, O. J., University of Oklahoma, Norman, Okla.: Effects of colchicine upon the nuclear and cytoplasmic phases of cell division in the pollen tube.—The cytogenetical variations resulting from effects of colchicine upon nuclear and cytoplasmic phases of the division of the generative cell were studied by the microscopic slide method in Tradescantia occidentalis (n=6) and Polygonatum commutatum (n=20). A treated series consisted of the addition of colchicine to the cultural medium (sucrose-agar). In control cultures the double metaphasic chromosomes were arranged upon an equatorial plate from which the daughter chromosomes separate into their respective nuclei. The presence of colchicine inhibited the formation of an equatorial plate stage and prevented the complete separation of daughter chromosomes but did not preclude the
formation of nuclei or impede the development of pollen tubes. A variable number of nuclei was found in the pollen tube of the treated series. Cytological studies of the morphology and number of chromosomes present in nuclei formed thus revealed that both daughter chromosomes were present in the same nucleus. A detailed study of two nuclei in one pollen tube of *Polygonatum* disclosed that one nucleus contained 11 double chromosomes (22 daughter chromosomes) and the other had 9 double chromosomes (18 daughter chromosomes). Each nucleus formed in the presence of colchicine therefore is a cytogenetic entity unlike any other nucleus in the same pollen tube or unlike the nucleus formed after the usual division of the generative cell. The frequency of chromosomal breakage is higher in treated material which indicates that colchicine induces variations other than polyploid changes. The production of chromosomal breakage and the formation of nuclei containing both daughter chromosomes when pollen tubes are treated with colchicine provides the basis for multitudinous variations of a cytogenetic nature.

**Giles, Norman**, Harvard University, Cambridge, Mass.: *Spontaneous chromosome aberrations in Tradescantia.*—The types, frequency, and loci of spontaneous structural chromosome aberrations in a number of pure species and in the progeny of a natural species hybrid of Tradescantia have been studied at first post-meiotic mitosis. These aberrations are similar in most respects to chromosome alterations induced by low dosage X-rays in the developing microspore. This similarity suggested that the spontaneous breaks might be due to natural radiation. Considerable evidence is presented, however, to show that this is not the case. Localization of the breaks in the centromere region suggests that tortional strains occurring during the coiling cycle may be a major factor in causing spontaneous breaks. The frequency of spontaneous aberrations varied widely among individuals of the F2 generation, indicating the possible genotypic control of the aberrations. The average percent of breaks in the hybrids was about three times that of the pure species, and it is suggested that this increase may result from the recombination of genetic factors following hybridization.

**Glass, H. B.**, Goucher College, Baltimore, Md.: *Differential susceptibility of the sexes of Drosophila to the effect of X-rays in producing chromosome aberrations.*—Treatment of mated females of *D. melanogaster* by X-rays provides simultaneous exposure of sperms and pre-meiotic eggs to identical doses. Offspring from eggs laid in the first five days following treatment yield approximately equal frequencies of lethal mutations in ♂ and ♀ germ-cells. 55 translocations were all produced in ♂ germ-cells. This disproportion is significantly greater than would be expected from the elimination of translocations in eggs undergoing meiosis. Inversions have been obtained from both ♂ and ♀ germ-cells. They are more frequent in the former, but the significance of the difference is not yet established.
GLASS, H. B., Goucher College, Baltimore, Md.: Genetic identity of translocations of independent origin.—The genetic identity of translocations associated with the dominant mosaic eye-colors bw$^V_3$, bw$^V_4$ and bw$^V_6$ in D. melanogaster has been proved by obtaining reciprocal homozygotes for chromosome 2L·3L from one origin and chromosome 3R·2R from another. The genetic test here is probably more critical than the parallel cytological studies of salivary gland chromosomes. These three translocations were derived independently from X-ray treatments. Their identity indicates the presence in the chromosomes of definite weak spots especially subject to breakage and rearrangement.

GORDON, MYRON, New York Aquarium, N.Y.C.: Gene frequencies and parallel variations in natural populations of seven geographical species of Mexican fresh-water fishes.—The members of the genera Platypoecilus and Xiphophorus are divisible into a number of geographical species; each species of a genus occupies a distinctive river system. Most of them display, in nature, a parallelism of heritable patterns. Most variable is P. maculatus with its 127 phenotypic expressions, mostly recombinations of 15 genotypes. Some genes are rare (Sh, C6, C6, Cs, Mc, Ct, T), fairly common (Sd, N, M, C, Co) or quite common (Sp, O, Cc), in P. variatus, one subspecies has four genes (Sp, M, C, Cl), another has an extremely high percentage of one (Sp), and the third species has but one (Sp). P. xiphidium has four genes (Sp, M, C, Cl). Isolated populations within each species show a distinctive proportion of the genes. P. couchianus, furtherest north, has but the spotted gene. X. montezumae has a distinctive gene (Sc) in addition to Sp and M. X. helleri has the spotted gene rarely. M, C and Ct have been reported in the literature but are not represented in our wild caught specimens. A newly discovered pigmy Xiphophorus species has no patterns mentioned above. Collections made of P. maculatus in 1867, 1902, 1932 and 1939 indicate there is, in general, genic stability for a number of patterns. Comparative genetic studies of these patterns in all species is in progress.

GOWEN, JOHN W., Iowa State College, Ames, Iowa: The structural significance of reproduction capacity in self-reproducing entities.—In the evolution of complexity in living things the most striking phenomenon is the introduction of self-reproduction at some stage of the organization of high molecular weight proteins, between things called organic molecules and things called living. The characteristic reproductive capacity of a gene or a virus as well as size and mutative ability are common bonds of likeness between them. Inactivation of genes or of viruses, marked by loss of reproductive capacity, occurs in X-ray treatment. Tobacco mosaic virus of several strains may be inactivated exponentially by X-rays of 4 different wave lengths. By utilizing the quantum concept for the absorption of photoelectrons of known path lengths we may calculate the size of the vital volume of the molecule having to do with reproduction. This calculated volume is of 15,000,000 molecular
weight. Besides this volume, another portion of lesser but not as yet strictly defined size is occupied by elements capable of mutation without loss of reproductive capacity to the whole. The total of these two volumes presumably makes up the whole structure. An estimate of the molecular weight of this whole structure, $17,000,000$ is furnished by the supercentrifuge experiment of Svedberg and Erickson-Quensel. A comparison of the two measurements shows that the portion of the molecule having to do with reproduction occupies the major part.

Green, E. L., and McNutt, C. W., Brown University, Providence, R. I.: *Bifurcated xiphoid, another effect of the short-ear gene in the mouse.*—A multiple recessive stock of short eared mice, $aabb(c^e c^e)dd pps t^s$, was found to have a formation of the xiphoid process of the sternum which differed from the normal rectangular type in that the posterior margin is deeply bifurcated. In $F_1$ from this stock by wild type ($C_3H$ strain), the xiphoid processes were all rectangular. In the $F_2$ and the backcross generation, the bifurcated xiphoid reappeared in ratios characteristic of determination by a single mendelian recessive, though there was a slight but uniform deficiency of the recessive group. In every case, however, the progeny with bifurcated xiphoid were also short-eared. Since no crossing over between these two characters has yet occurred, it seems that bifurcated xiphoid process in this stock is caused by the same genetic mechanism which determines short-ears, and the morpho-genetic processes which arrest the development of ears and bones of the cranium also arrest complete fusion of the bilateral sternal cartilages prior to their ossification in the medial plane to form normally the single rectangular xiphoid process. The deficiency of short-eared animals in segregating populations is probably caused by the often reported lowered viability of this genotype.

Green, M., and Oliver, C. P., University of Minnesota, Minneapolis, Minn.: *The action of temperature and of non-allelic mutants upon heterozygous vestigial in Drosophila melanogaster.*—The frequency of wing notching in flies heterozygous for $vg$ was not affected by $19, 23, 28$, or $30^\circ C$, the frequency fluctuating between $0$ and $1\%$. An increased frequency occurred with heterozygous $vg$ in compound with dominant minutes. With $M(2)l^2$ the frequencies were $20$, $65$, $56$, and $5$ percent at the respective temperatures; and with $M(3)w$, $58$, $80$, $83$, and $6$ percent, with notching more extreme on the average. With each minute the highest frequency occurred at $23$ or $28^\circ$. Several heterozygous mutant types were tested at $23^\circ$ in compound with heterozygous $vg$. Each compound gave a notching frequency greater than that in the control, although in some cases only slightly higher. The frequencies varied from $1$ to $82\%$, ranging in the order of increase: Controls; $In (3R)C$; $al S$; $Me$; $Pm dx$; $L^2 M(2)l^2$; and $M(3)w$; but the degree of manifestation was not consistent with each increase in frequency. Some association between length of life cycle and frequency of notching is indicated, although that association seems not absolute. Temperature increase alone cannot account for the frequency
increase. Variations may be due to interaction of the mutant genes, possibly closely associated modifiers, with heterozygous vg, the temperature affecting the action of the modifying mutant. In general, males show a higher frequency of and also a more extreme notching. The notching varies from a slight to a beaded-like type.

HARNLY, MORRIS H.; Washington Square College, New York University, New York, N. Y.: Experiments demonstrating no pupal critical period for wing size and form in four genotypes of D. melanogaster.—Previous experiments with various genotypes for the vestigial locus have all shown a temperature effective period for wing size and form in the larva. It was thought that there might be another critical period for a different process of wing formation during the pupal stage, and that the second period might have a different critical temperature. Transferring dimorphos vestigial from 32°C at either 120 hours or puparium formation to 25° or 16° resulted only in a marked increase in mortality at the lower temperature. Our inbred vestigial stock was treated similarly and likewise gave negative results. Total development at 25° or transfers at puparium formation from 25° to 16° of the backcrossed vestigial-pennant stocks produced only flies with “nicked” wings. However, transfers at 96 hours to 16° gave the previously obtained frequency of normal and “nickcd” wings. Tests of the original black vestigial-pennant stock produced at 16° only flies with normal wings, at 25° many with both wings normal, and at 30° some with normal wing margins. Furthermore, a “delta” was frequently present at 16° and extra cross-veins at the two higher temperatures. Preliminary reciprocal crosses between the two pennant stocks show that a sex-linked modifier affects the presence or absence of marginal nicks, and at least one or possibly two modifiers are associated with the appearance of extra cross-veins. A second critical period during the pupal stage was not found.

HEFNER, ROBERT A., Miami University, Oxford, Ohio: Multiple alleles (?) in the inheritance of crooked little fingers.—Earlier reports have designated hereditary crooked little fingers as Streblomicrodactyly. Subsequent investigations have revealed two additional types of hereditary factors resulting in crooked little fingers. These are given the descriptive titles of Minor streblomicrodactyly and Lateral streblomicrodactyly respectively. The former is shown from one family where it appears in 11 individuals. The latter is here shown from two families where many individuals are affected. The exhibit shows the three types of crooked little fingers by photographs, X-ray prints, and family charts. No family shown by these charts has any known relation to any other family in the group. The separate inheritance of each of these types of crooked little fingers shows Mendelian dominance over the normal condition. In some records the inheritance is that of an irregular dominant condition. How any of the streblomicrodactylyous conditions behaves toward others in the series is not known since families where more than one of the deviations has been introduced have not been discovered. The location of such combinations would be
of decided genetic interest. The assumption of multiple alleles is at this time purely hypothetical.

Huestis, R. R., University of Oregon, Eugene, Ore.: Tests for linkage in Peromyscus.—Tests of four coat colors with one another and with flexed tail in Peromyscus maniculatus show no proof of linkage in any case. A double recessive recombination class was not obtained in over 400 F2 individuals produced from a silver agouti-flexed tail cross but the ratio of individuals in obtained classes does not fit a theory of close linkage. The non-appearance this recombination class is not explained.

Huettnner, Alfred F.; Queens College, Flushing, N. Y.: Differentiation of the gonads in the embryo of Drosophila melanogaster.—After the primordial germ cells have been shifted dorso-posteriorly, they enter the amnio-proctodaeal invagination, where they remain loosely clustered at the posterior end of the diverticulum. They stay there impassive for approximately two hours without undergoing mitosis. During the sixth hour of incubation at 25°C, they make their way into the body cavity through the columnar cells of the gut diverticulum. This movement cannot be seen in the living material. From the study of fixed preparations, the impression is gathered that the movement through the gutwall is essentially amoeboid. As the hindgut diverticulum grows backward, the mesentodermal cluster of cells associated with the gut is carried dorso-laterally, where these cells will later contribute to the formation of the dorsal wall of the midgut. It is during this movement that the primordial germ cells are carried to their permanent position and become surrounded by mesentodermal cells. In ten to eleven hour embryos the gonads are formed. Not all the primordial germ cells which are carried passively into the amnio-proctodaeal invagination in the early embryo, are incorporated into the gonads. Some of them never pass through the gutwall into the body cavity, in others the migration is never completed, and in other instances they become entangled and lost in the yolk mass. Counts of the number of primordial germ cells in the primitive gonad show that approximately five to seven are grouped in some, whereas ten to thirteen are observed in others. In the light of Kerkis' report of the size differences in the gonads of newly hatched male and female larvae, these observations indicate that the sex of the gonads may, in all likelihood, be determined in the ten to eleven hour old embryo.

Humphrey, L. M.; University of Arkansas, Fayetteville, Ark.: A preliminary report of the effects of inbreeding in cotton with special reference to staple length and lint percentage.—In 1936 the inbreeding and hybridization method was introduced into the cotton improvement program at the Arkansas Experiment Station, and inbred lines were started in three varieties of cotton. Inbred lines for experimental purposes have been carried since 1930. In 1937 inbreeding was started in five more varieties and in 1938 in two more. All cotton varieties studied were found to be very non-uniform, particularly in fiber characteris-
tics. A highly significant negative correlation between staple length and lint percentage was found in five varieties, and no significant correlation was found in the remaining five. Cotton is largely self-pollinated, but there is enough cross pollination to introduce a certain amount of heterozygosity. Inbreeding rapidly segregates numerous types which become relatively very uniform after three to four generations, the inbred lines being much more uniform in all cases than the varieties from which they arose. Statistical studies of the lint percentages and staple length would indicate that the inbred lines become highly uniform after three to four generations of inbreeding, and no further significant increase in uniformity is evident up to eight generations. This would indicate the possibility of using three- or four-year inbred lines as inbred strains or varieties.

HUTT, F. B., and LAMOREUX, W. F., Cornell University, Ithaca, N. Y.: A map for six linkage groups in the fowl.—A map is presented illustrating the 23 mutations listed below, together with their wild-type alleles, and showing the approximate loci of 21 of these mutations in the six linkage groups now established for the fowl. These groups are numbered below in the order of their discovery and the numbers used have no relation to specific chromosomes. The approximate cross-over distances are given. (1) Sex chromosome: head streak—13.5—barring and slaty shanks (as yet unseparated in linkage tests)—27—brown eye—20—light down—16—silver—11—slow feathering. Locus of sex-linked gene for naked is not yet determined. (2) Rose comb—0.4—creep—30—uro-pygial. (3) Crest—12.5—dominant white—17—frizzling, with fray tentatively assigned to this group. (4) Blue egg—5—pea comb—33—marbling—46—naked neck. (5) Silkie—10—flightless. (6) Duplex comb—28—multiple spurs. In the sex chromosome arrangement and distances given, present what seems the best fit of all available data. In the second and fourth groups the distances actually determined are as given but the arrangement requires confirmation.

HUTT, F. B., Cornell University, Ithaca, N. Y.: A new linkage group in the fowl.—Genetic studies of the multiple spurs found in Black Sumatra fowls have shown this character to be an autosomal unifactorial mutation, incompletely dominant in heterozygotes but always easily distinguishable from the normal condition. The symbol $M$ is proposed for the causative gene. Males have usually three spurs on each shank, but may have up to five. In adult females the mutation is clearly shown by three enlarged scales and an absence of the spur papilla usually found in females. It is classifiable in newly-hatched chicks regardless of sex with an accuracy of more than 98 percent. For these reasons the mutation is especially useful for studies of linkage. Tests for linkage with dominant white, rose comb, flightless and pea comb (each a marker for a separate linkage group) have all shown independent segregation of multiple spurs, thus apparently eliminating the gene $M$ from the four autosomal linkage groups previously established. Further tests have shown it to
be linked with the gene $D$, for duplex comb, there being about 28 per cent of crossing over between the two genes. This establishes a fifth autosomal linkage group.

**Irwin, M. R., and Cole, L. J., University of Wisconsin, Madison, Wis.: Interrelationships of the cellular characters of three species of Columbidae.**—That part of the antigenic pattern of the red blood cells of Pearlneck (*Streptopelia chinensis*), not shared by Ring dove (*St. risoria*), has segregated into at least ten different characters, following backcrosses to Ring dove of the species hybrid and selected backcross birds. These characters have been designated as $d-1$, $d-2$, $d-3$...$d-11$. Each of these individual components is produced by the action of one or more genes. The results of various tests show that a part of the specific antigenic complex of Pearlneck, as contrasted with Ring dove, is shared with still a third species, the Senegal (*St. senegalensis*). Of the ten specific components of Pearlneck, only two ($d-6$ and $d-11$) appear not to be shared in toto with Senegal. It would be expected, then, in a cross of Pearlneck and Senegal, the offspring of backcrosses of the species hybrid to Senegal would be of four kinds in approximately equal numbers: viz., those whose cells contain (1) both $d-6$ and $d-11$, (2) $d-6$ alone, (3) $d-11$ alone and (4) neither of these constituents. Each of these four types of cells has appeared in the backcross offspring. The actual results obtained following a genetic test of the relationship between these particular species gives added confidence as to the accuracy of similar comparisons between Pearlneck, for example, and other species with which no hybrids have been obtained.

**Irwin, M. R., and Cumley, R. W., University of Wisconsin, Madison, Wis.: Interrelationships of the cellular characters of species of Columba.**—Earlier studies have revealed that in contrasting cellular characters of two related species, some characters are shared by both species, and, in addition, each species contains cellular components which are peculiar to itself. At least a part of the characters which distinguish one species from another may in turn be shared by a third. In both doves and pigeons, these species specific substances have been found to be genetic characters which segregate in accordance with Mendelian laws, and which are transmitted as unit substances through species-hybrid and back-cross generations. In the present comparison of eleven species of *Columba*, some pairs of species were found to possess the major part of their antigenic components in common; and their specific characters were but infrequently shared with other species. In other contrasts, two species were seemingly more distantly related, having less antigens in common and sharing at least a part of their respective specific antigens with a majority, if not all, other species. All intermediate degrees of relationship were found. Apparently, no one species is composed of a combination of the antigens (genes) of two other species, and it is doubtful whether a combination of antigens in any number of species could account for all the antigens present in any one. However, the data regarding this question are as yet incomplete.
JEFFREY, EDWARD C., and HAERTL, EDWIN J., Harvard University, Cambridge, Mass.: Nuclear fusions in relation to chromosomal structure and inheritance.—The demonstration is illustrated by photomicrographs, microscopic preparations and drawings. These show the great advantages in connection with the study of chromosomal organization resulting from the study of the numerous examples of nuclear fusions, namely reproductive (diploid) and endospermal (triploid and quadruploid) presented by the Angiosperms. In all cases regardless of the number of chromosomes involved the organization of the post-fusional chromosomes is the same as in somatic cells, namely each chromosome contains two oppositely spiraled chromatids. It is thus clear that there is no microscopically visible result arising as a sequel to nuclear fusions, reproductive or otherwise. The facts emerging in the present investigation depend on the utilization of a greatly improved technical manipulation in connection with the fixation and staining of the chromosomes, which results for the first time in a clear revelation of their internal organization. It is now obvious that the structure of chromosomes of the categories somatic (sporo-phytic), meiotic, gametophytic and trophophytic (endospermal) is identical. In other words chromosomes may differ in number in the various categories of nuclei but not in organization.—This situation appears to necessitate a profound revision of cyto-genetical theories related to chromosomes, particularly the long held hypothesis of synapsis (syndesis) or chromosomal pairing in meiosis. The terms leptotene, zygotene, pachytene and diplotene also apparently can no longer be logically or accurately used. Chiasmatypy, so called, is as characteristically present in somatic, gametophytic and endospermal divisions as in those designated meiotic and consequently can apparently have no significance in connection with reproductive inheritance.

KAUFMANN, B. P., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: Induced changes in chromosomes carrying inverted sections.—The distribution of 278 X-ray induced breaks was plotted by use of salivary gland chromosomes of Drosophila melanogaster containing the dl-49 inversion in order to detect any possible reinversion and to measure break frequency in regions adjacent to the limits of the inverted section. No significant differences were detected between break distribution in these regions and in similar regions of chromosomes having the wild-type sequence of banding. However, data for the entire X chromosome showed that there exist certain intercalary regions of high break frequency, which probably contain heterochromatic material. If the original breaks leading to the inversion should occur in such intercalary regions, the possibility of reinversion would be increased.—As a corollary of this study, analysis was made of a series of induced changes to wild-type from roughest3, which is associated with a long inversion extending from 3C to near the spindle attachment region in the X chromosome. Reversion of roughest3 is not infrequent, and five changes to wild-type have been analyzed. Two are reciprocal translocations between 2L and X heterochromatin; two are reciprocal translocations between 3R and X heterochromatin;
one involves transfer of the nucleolus-organizing region from the X to 3L. Obviously phenotypic reversion of roughest may be associated with various types of chromosomal rearrangements, independent of reinversion, probably involving in each case a break or breaks in the proximal heterochromatic region of the X chromosome.

Lawson, Chester A., Wittenberg College, Springfield, Ohio: Sexual balance and the differentiation of aphid types.—It is proposed that differentiation of aphid types is controlled by the opposing action of two forces (male and female) operative during development. If the male force dominates completely, a male develops. If the female force dominates completely, a gamic female develops. Incomplete dominance by the female force causes the development of the following types in order of decreasing female dominance: gamic-parthenogenetic female intermediate, wingless parthenogenetic female, wingless-winged parthenogenetic female intermediate, winged parthenogenetic female. Parthenogenetic females are sex intergrades or mosaics. Supporting evidence is found in the classification of differential structures into male and female characters and the correlation of these characters with aphid types. Male characters are wings, wing muscles, ocelli, many secondary sensoria on antennae, thin hind tibiae lacking sensoria, male reproductive system. Female characters are no wings, no wing muscles, no ocelli, few secondary sensoria on antennae, swollen hind tibiae with many sensoria, female reproductive system.

Lawson, Chester A., Wittenberg College, Springfield, Ohio: The probable mechanism controlling wing development in aphids.—The germaria in embryonic winged and wingless aphids differ prior to time of determination of wings. Nurse cells in germaria of embryos destined to be wingless begin secretion of "nutrient" substance before wings begin development. This secretion presumably inhibits wing development. Nurse cells in germaria of embryos destined to be winged do not begin secretion before wings begin development. Lack of such secretion permits wing development.

Lincoln, Ralph E., Iowa State College, Ames, and Cornell University, Ithaca, N. Y.: Production and rate of mutation in Phytomonas stewartii by X-radiation.—Broth cultures of Phytomonas stewartii were treated with X-radiation of 0.7A and 1.5A at intensities which reduced a culture of 100,000,000 viable cells to less than 1,000 viable cells within a period of 25 minutes. Inactivation curves for this organism are of the single absorption type—that is semilogarithmically linear. Variation was observed in colony type, colony color, virulence and mucoid characters. Mutation increases in proportion to exposure time. Under conditions where only one out of every 100,000 cells treated remains viable, the mutation rate is about 200 times higher than the natural mutation rate after growth in broth, or about 10,000 mutations per million treated cells as compared to 55 per million cells after
growth in broth. In general the same pattern and type of variation was found after X-radiation as after growth in broth. Most mutations observed are stable, hereditable and transmissible from parent to daughter cell, although certain stocks have been isolated in which it is impossible to stabilize the variant type.

**Love, R. Merton, Cereal Division, Central Experimental Farm, Ottawa Canada:** A cytologically deficient speltoid of hybrid origin.—Three bearded speltoids were found in F₁ Huron X R.L. 1005. Both varieties are bearded spring wheats. Progeny of the three speltoids totalled 36, of which 20 were normal and 16 speltoid. The 15 plants examined cytologically had 21 bivalents. Nine were normal cytologically and six were characterized by a heteromorphic bivalent, one member of which was deficient for the longer arm. Phenotypically, the nine plants were normal (in respect of the speltoid characters) and the six plants heterozygous for the deficiency were speltoids. No individuals homozygous for the deletion were obtained. Although the number of plants was small, the ratio seems to be characteristic of the C series type. The occurrence of the aberrant plants emphasizes the importance of hybridization in the origin of off-types. Breaks at the attachment region in unpaired chromosomes are a fruitful source of deletions which result in certain specific off-types in *vulgare* wheats. Hybridization, accompanied as it is by a comparatively high proportion of univalents in F₁ and some plants of later generations, plays an important role in the origin of speltoids and other off-types characterized by visible deficiencies. At the same time most, if not all, hybrids between *vulgare* wheats are heterozygous for one or more inversions (unpublished data). Fragmentation, caused by crossing over in the inverted regions, results in deletions. This too will lead to off-types, but small deficiencies may not be detected in wheats, where prophases are difficult to study. It is quite possible that A-series speltoids fall in this category.

**Myers, W. M., U. S. Regional Pasture Research Laboratory, State College, Pa.:** Tetrasomic inheritance in *Dactylis glomerata*.—The regular occurrence of quadrivalents at meiosis in *Dactylis glomerata* indicates that tetrasomic inheritance should obtain. When self-pollinated, one plant produced normal green and chlorophyll deficient (lethal) seedlings in a ratio approximating 35:1. In progeny tests of 63 first generation inbred plants 16 produced only normal seedlings and 47 produced both normal and chlorophyll deficient seedlings. By means of X² the segregating families were separated into 32 approximating 35:1 and 15 approximating 3:1 ratios. Assuming that the parent plant was duplex (AAaa) with the gene located near the spindle fiber attachment, the expected ratio is 16.2 not segregating, 32.4 segregating 35:1, and 14.4 segregating 3:1. X² for fit of observed to calculated gave a value of P above .99.

**Luce, Wilbur M., University of Illinois, Urbana, Ill.:** Effects of oxygen on development and facet number in a bar infrabar strain of *Drosophila melan-
Preliminary observations by Margolis and by myself have indicated that oxygen has considerable effect on mean facet number and on the length of the period of development in bar strains of Drosophila. In the experiments here reported, an inbred strain of bar infrabar was subjected to treatment with oxygen for periods varying from 6 to 96 hours at different times throughout the egg, larval, and pupal stages. Continuous treatment throughout the entire egg stage or the entire pupal stage had little effect either upon the speed of development or upon mean facet number. Due to its lethal effect prolonged treatment could not be used during larval stages. Here treatment varied from 6 to 24 hours. Speed of development during larval stages was retarded by the treatment, the greatest retardation resulting from treatments during the first, second, and the first half of the third instars. Treatment during late third instar and prepupal stages had a slight retarding effect. The period of greatest effect on facet number was found to be from the 60th to the 80th hours of development, which corresponds closely to the temperature effective period for facet number in this stock. Oxygen has less effect on facet number in bar infrabar than it has in bar or infrabar. Thus the treated females showing the greatest effect had a mean of $31.18 \pm 0.49$ compared with controls at $24.88 \pm 0.32$.


---In most mammals, including the rabbit, the posterior vena cava typically lies to the right of the dorsal aorta and passes dorsal to it at its bifurcation into the two common iliacs. This position in man, cat and pig is due to the persistence of the embryonic right supracardinal vein as the major part of the adult posterior vena cava, whereas deviations from it represent a substitution of one or another of the posterior cardinals, supra cardinals or cardinal collateral canals. A preliminary survey of these variations in five inbred families of rabbits and in crosses between them discloses approximately ten percent of so-called anomalies, among them being the marsupial type in which the vena cava, throughout its length and at its bifurcation, lies ventral to the aorta, representing a persistence of the embryonic cardinal collateral canals. Although the incidence of these variates in the total population is small and occurs in all families in which any numbers have been examined, it is found that ninety percent of them are either in inbred family V or in cross-bred matings to which family V contributes, and that within this family the most common variate is the marsupial type which in every case traces back two generations to the same male ancestor. The apparent genetic relationship between internal morphological characters peculiar to two separate but closely related orders of mammals suggests the possibility that further study of this variation may bear upon processes of phylogenetic as well as ontogenetic significance.

Metz, C. W., Department of Embryology, Carnegie Institution, Baltimore, Md.: The nature of the chromatic granules in salivary gland chromosomes.

---The range in pattern variation in selected regions is illustrated. For example,
in *Sciara ocellaris* one short region may appear in any of the following configurations: (1) Four conspicuous, similar transverse bands. (2) Three bands, the middle one much denser than the others. (3) Two transverse rows of conspicuous, block-like granules with concave sides, the granules of one row being much heavier than those of the other, and alternating with them in checker board fashion. (4) One row of block-like granules, with only faint traces of any additional structure. The block-like granules seem clearly to owe their concave sides and checker board arrangement to the presence of large achromatic droplets lying between them. The evidence here agrees with other evidence in indicating that the granules are chromatin masses which arise through distortion of the disks by the achromatic droplets, and that they have *per se* no genetic significance.

**Metz, C. W., Department of Embryology, Carnegie Institution, Baltimore, Md.:** *Spontaneous chromosome breakage during embryonic development in Sciara.*—In *S. reynoldsi* one chromosome pair regularly breaks into two segments during development in the salivary glands but not in ordinary embryonic cells. This provides additional evidence that the salivary gland chromosomes are highly modified structures. Here, as in the somewhat similar case described previously in *S. ocellaris*, the break probably occurs at the centromere region. It is postulated that two centromeres are present and that they separate spontaneously to effect the break. The phenomenon may have a bearing on the mechanism of evolutionary change in chromosome number.

**Murray, M. J., Cornell University, Ithaca, N. Y.:** *An F2 study of interspecific characters.*—*Acnida tamariscina* (Nutt.) Wood native to the western prairie states hybridizes readily with *Acnida cuspidata* Bert. native to the coastal plain from Florida to Louisiana. F2 and backcross progenies indicate that the major genetic differences between these two species are of three types: 1) On the basis of pollen abortion chromosomal dissimilarities are postulated; 2) Color and certain characters of the female flowers are inherited as simple Mendelian differences, while 3) such differences as leaf shape and size, stem size and character are inherited as quantitative characters. The chief differences involved in speciation in this particular example are of a quantitative nature presumably due to multiple genes. Hybridization is prevented only in so far as geographical and ecological barriers are effective.

**Murray, M. J., Cornell University, Ithaca, N. Y.:** *An attempt to obtain sex-linked mutations in a dioecious plant.*—A normal female plant of *Acnida tamariscina* (Nutt.) Wood was pollinated with X-rayed pollen. Seed from 474 different F1 open-pollinated females were grown. No visible sex-linked mutations were found in over 250,000 F2 seedlings and approximately 10,000 mature F2 plants. This suggests that the Y chromosome has a full complement of allelomorphs. However, ten chimeras were obtained. These were chlorophyll changes associated with fifty percent bad pollen in the affected areas.
ABSTRACTS

MYERS, W. M., and HILL, HELEN, D., U. S. Regional Pasture Research Laboratory, State College, Pa.: The association and behavior of chromosomes in autotetraploid grasses.—Three plants of Dactylis glomerata had a range in mean quadrivalent frequency in microsporocytes of 3.3 to 4.2, an average of 3.9; five plants of Agropyron cristatum, 3.4 to 4.2, an average of 3.7; and nine plants of Arrhenatherum elatius 3.4 to 4.6, an average of 3.8. The maximum number possible in each species is 7. The frequency of sporocytes with lagging univalents at anaphase I varied from 3.0 percent to 66.0 percent and generally corresponded in different plants with the frequency of their metaphase I nuclei showing univalents. In most plants there was an excess of laggards, indicating that some of them originated from other sources than metaphase I univalents. The lagging univalents divided equational at anaphase I, and a majority of the half chromosomes were included in the daughter nuclei; the remainder formed micronuclei. The percentage of quartets showing micronuclei was correlated in the different plants with the frequency of lagging univalents at anaphase I. Observed numbers of micronuclei in eight plants varied from 13 to 52 percent of the numbers expected if all of the daughter half chromosomes from the anaphase I laggards formed micronuclei. One plant had more than was expected. The number and position of micronuclei in the quartets confirmed the assumption that most, if not all, of them originated from lagging and dividing univalents at anaphase I. Chromatin bridges and acentric fragments at anaphase I and telophase I of eleven plants studied indicated that each was heterozygous for one or more inversions.

NABOURS, ROBERT K., and STEBBINS, FLORENCE M., Kansas Agric. Exp. Station, Manhattan, Kan.: Chromosome aberrations and viability in Apotettix eurycephalus Hancock.—The X-ray induced translocations of chromatin have been reported, one with the exchange between first and fourth autosomes, with depletion in amount of chromatin for the former and augmentation for the latter (1933); the other between a first autosome and a sex-chromosome, with increase in chromatin and probably an extra traction fiber attachment for the latter. The autosome of this translocation was lost (1935 and unpublished). The three surviving aberrators are designated tentatively as 1. donor(a1), 2. receptor(a4), and 3. receptor(X). The genetic and cytological data correlate (Robertson, 1935, and unpublished). Zygotes carrying donor(a1), and otherwise normal, hatch but rarely survive to 3-4 instar when they are recorded (14 donor(a1): 2443 normals). Receptor(a4) are 13 percent, and receptor(X) 14 percent, less viable than controls. Donor(a1) + receptor(X) are 38.5 percent below normal. Donor(a1) + receptor(a4) + receptor(X) fall 17 percent below controls. The data comprise approximately 50 other items of comparison of 15,088 aberrators with 49,000 normal, and with each other. In practically all cases augmentation of chromatin is accompanied by less mortality among males than females, and vice versa when there is a depletion of chromatin. There is indication, but not yet definite proof, that the XO(absence of Y) chromosome condition in grouse locusts is responsible for the significantly
lower viability, and perhaps for the much smaller size, of the males among the controls in grouse locust breeding.

Oppermann, Carlos A., University of Chicago, Chicago, Ill.: Interference and the mechanism of crossing over.—The present study discloses the general character of interference which, in view of the evidence offered, should be regarded as the expression of some intimate chromosomal feature uniformly manifest in normal and rearranged chromosomes. Numerous tests concerning the X-chromosome of Drosophila melanogaster led to the conclusion that in the euchromatic region of a chromosome, total obstruction of crossing-over at any point changes linkage relations according to a definite law: crossing-over will be restored with increasing distance from the point of interference at a rate approximated by \( y = 1 - e^{-kx^4} \), where \( y \) represents the coincidence value at a distance of \( x \) map units from the point of interference. \( k \) has a fixed value for a given set of conditions depending upon age, temperature, irradiation etc. Thus for normal temperature (25°C) \( k = 715 \), and for high temperature (31°C) \( k = 2500 \), taking the age average for the first six days. The new formulation of coincidence in terms of distance opens up the possibility for universal comparison of different types of interference given hitherto only separate and incomplete consideration. Closely resembling pictures based on extensive tests for a given temperature are revealed for interferences resulting from transposed spindle attachments in homozygous and heterozygous condition, heterozygous rearrangements, combined rearrangements, and multiple crossovers in the normal chromosome. A substantiating check is offered by the parallelism displayed in each case by both the normal and the heat series. The unit concept thus established entails a series of conclusions concerning the mechanism of crossing over; linkage relations in new rearrangements will be predictable.

Parker, Milton M., Ohio State University, Columbus, Ohio: The role of constitution in the emotionality of the adult albino rat.—The principle objective of the present experiments was to determine the extent to which emotionality might be the characteristic product of a constitutional basis, and the extent to which it might be influenced by non-constitutional or environmental factors. The reasoning was that if a valid measure of emotionality were available, and were applied to a genetically heterogeneous stock of animals raised under uniform conditions, then intercorrelations obtained between emotionality measured in several different situations should afford an estimate of the variance attributable to constitutional as well as environmental factors. The measure of emotionality involved the ability of the rat to inhibit defecation in repeated presentations of an emotion-provoking situation. The emotionality score was equal to the number of trials which provoked emotional defecation until three successive trials failed to provoke defecation. Six emotion-provoking situations were constructed. Each situation administered a different type of intense stimulation and required a different mode of adjustment. The measure of adjustment, however, always consisted of the cessation of defeca-
tion. Standardization, on the basis of odd versus even trials, showed the reliability for each situation to be not less than 0.85. The fifteen intercorrelations (for each sex) obtained between various combinations of the six situations were all beyond the "one percent point" of significance, the coefficients varying from 0.65 to 0.85. The consistency and significance of the results suggest that emotionality is quite characteristic of the individual organism, although it may obviously be affected by environmental influences.

PATTERSON, J. T., STONE, WILSON, and GRIFFEN, A. B., University of Texas, Austin, Tex.: The virilis complex in Drosophila.—This complex can be broken down into two groups. One of these groups is more closely related to D. virilis virilis (Spencer) and includes, at the present time, the standard virilis from Pasadena, strains from New Orleans, China and Japan, and several Texas strains. The other group includes D. virilis americana (Spencer), D. virilis texana (Patterson) and at least one other Texas strain. The salivary gland chromosome analysis shows that all members of the virilis group are very similar; the members of the americana-texana group differ from the virilis group and among themselves. The metaphase chromosomes vary within the complex from five pairs of rods and one pair of dots to one pair of rods, a pair of dots and two pairs of V-shaped elements. Tests show that cross-fertility is very high in the virilis group, rather high in the americana-texana group, but low between the two groups. Genetic tests show that different cross-sterility factors exist in the several strains, and that at least some of these factors are recessive. There are several morphological and physiological differences between the several strains. However, sex ratios in the crosses are normal; both males and females are fertile, although there are some peculiarities in the fertility of F2 and F3 generation males bearing an americana or a texana Y-chromosome. The hybrids are usually normal. From these facts we infer that the genic balance and the sex-determination mechanism are much alike in the two groups.

PHILLIPS, H. M., Emory University, Emory University, Ga.: Karyotaxonomy of Erythronium.—1. Preliminary survey of chromosomal number, morphology, and structure of developing microgametophyte of americanum.—In addition to morphological characters so often used, recent advances in systematics have introduced methods of observing additional natural phyletic indices. Chromosomal numbers, chromosomal morphology and structure, and genic changes have been used as a basis for verification or disagreement with systematists. Phyletic divergencies, families, genera, and species, have been shown to be correlated definitely with chromosomal changes. A preliminary investigation of Erythronium americanum has indicated the possibilities of this group for a detailed comparative study of hybridization, speciation, and phylogeny. An attempt will be made to determine the correlation existing between these phenomena and the karyology of the genus since the chromosomes
are large enough for a detailed analysis of structure and structural changes. Material is abundant, and the plants exhibit a number of interesting morphological variations. Material was collected from plants growing on Mt. Pinola near Atlanta, Ga. For permanent smears CRAF fixative was employed. Temporary mounts were made with Belling's iron-aceto-carmine method and with several modifications of this method. The n-number of *E. americanum* is 12. Counts were determined at late prophase, metaphase, and anaphase. A survey of polar view metaphase plates gave following results: 3 with 11 chromosomes; 187 with 12 chromosomes; 3 with 13 chromosomes; 1 with 24 chromosomes; 1 with 36 chromosomes. These counts from the microspore divisions indicate the possibility of a polyploid series within the species. Of 25 plants selected at random, however, no heteroploidy was encountered. The chromosomes of the dividing nuclei fall into two general morphology types; five chromosomes with submedian centromeres and seven with subterminal centromeres.

**Rick, Charles, M., Harvard University, Cambridge, Mass.: X-ray induced chromosome deletions in relation to mutation rate in Tradescantia.**—Small spherical fragments, independent of other chromosome aberrations, result from X-radiation of Tradescantia microspores. Evidence from size and shape indicates most of these to be interstitial deletions of ring structure. Their frequency within the dosage range of 100 r to 600 r indicates that they are conditioned mostly by 2 hits and that they are produced at random. X-ray treatment at 3°C induces significantly more deletions than the same dose at 39°C. The effect of X-radiation during the interkinesis preceding and the one following meiosis on the size of subsequently developed pollen grains was studied. Variability following both treatments is significantly greater than in controls. Variability at low temperature exceeds that at high temperature. Pollen size is interpreted as, at least in part, genetically self-determined. Since minute deficiencies are inseparable in genetic behavior from point mutations, the close parallel between fragment frequency and variability in pollen size suggests that the latter is a measure of mutation rate.

**Rife, D. C., and Boye, C. D., Ohio State University, Columbus, Ohio: The genetics of certain leaf variations in Coleus blumei.**—The following genetic variations occur in *Coleus blumei*. Factor *P* extends purple throughout the entire leaf, and an allele *p* results in solid green leaves. A third allele *p*, results in leaves with a purple pattern on the upper epidermis, surrounded by a green margin, and a green lower epidermis. Both *P* and *p* are completely dominant to *p*, while plants of genotype *Pp* are a brown gray color. A dominant factor *I* results in a dark green chlorophyll, and its recessive allele in light green chlorophyll. *P* and *I* segregate independently. Another dominant factor *A* results in chlorophyll throughout the entire leaf, and its recessive allele in leaves with albino midrib. Dominant factor *C* results in crinkly leaves, and its recessive allele in smooth leaves. *C* and *P* segregate independently. Another
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dominant factor \( S \) results in deeply lobed leaves and its allele in shallow lobed leaves. All observed plants of genotype \( Ss \) are male sterile. A second factor \( L \) also results in deeply lobed leaves and apparently is lethal in the homozygous state. Colchicine produces marked effects when seeds are immersed for twenty-four hours in a one percent solution. Seeds obtained by selfing purple plants of genotype \( Pp \), when treated with colchicine, produce solid black, solid red and patterned progeny. Presumably black plants are of genotype \( PPPP \), red plants \( PPpp \), and pattern plants \( pppp \). Black plants are self-sterile.

RILEY, HERBERT P., University of Washington, Seattle, Wash.: Interaction of genes for flower color in Nemesia strumosa.——Gene \( C \) determines anthocyanin pigment on the inside of the corolla lips; \( cc \) plants are yellow if gene \( W \) is present, otherwise white. The anthocyanin gene is linked with the self-sterility alleles with a crossover value of 37%. \( C \) plants vary from purple to red according to whether \( W \) and unidentified modifying genes are present. The deep purple "eyebrow" above the stamens and the numerous deep purple dots on the lower part of the throat are due to gene \( E \); \( ee \) plants have just a few pale lines above the stamens and almost no dots in the throat. Homozygous \( f \) plants have a variable number of small purple dashes of flecks on the lower lips; this is apparently a mutable gene. Plants homozygous for \( bl \) have a light blue color on the upper lips which is absent in \( Bf \) plants. The \( ee \) condition is expressed only if no other anthocyanin pigment is present; \( ee \) plants that have gene \( C \) or genes \( ff \) appear phenotypically like \( E \) plants. In \( cc \: ww \: blbl \) plants there is a blue margin about three millimeters wide on the upper lips if \( E \) is present; in \( cc \: wv \: blbl \: ee \) plants, the blue covers the entire upper lips. In plants with \( C, \: wv \) and \( blbl \), the margin on the upper lips is bluish-purple and the blue sap pigment appears to be precipitated by the purple and collected as granules in the center of the cells.

SATINA, SOPHIA, and BLAKESLEE, A. F., Carnegie Institution, Cold Spring Harbor, N. Y.: Morphological differentiation in chromosomes of Datura stramonium.——Length and structural differentiation of chromosomes were studied at metaphase stage of division in young pollen grains of \( 2n \) and \( 2n + 1 \) plants. Pollen was chosen because only the haploid number of chromosomes is present. Half of the pollen grains from a \( 2n + 1 \) primary type contain \( n + 1 \) chromosomes, there being two of one kind, so that the extra chromosome could be identified. Half of pollen grains from \( 2n + 1 \) secondary types also contain \( n + 1 \) chromosomes but the extra chromosome is a doubled half-chromosome. Thus the ends of this chromosome could be identified. Use also was made of prime types when secondary types were unknown. Each chromosome in haploid complement is V-shaped, the insertion region dividing it into two arms of unequal size, the amount of difference depending upon the chromosome involved. The longest primary chromosome (1·2) averages 4µ; the shortest (23·24) averages 1.5µ. The longest secondary chromosome (1·1) averages
4.5\(\mu\), the shortest (19.19) averages 1.8\(\mu\). Seven of the twelve chromosomes have satellites on one of the arms. Five of the satellites are small. Both the 4 end of the 3.4 chromosome and the 10 end of the 9.10 chromosome have large satellites. Only one of the secondaries (10.10) has as its extra chromosome a satellited arm doubled. Differences in width of chromosomes also were observed. Comparison was made between chromosomes of pollen and root-tip cells of haploids. The small satellites were more conspicuous in root-tip cells.

**Sax, Karl,** Arnold Arboretum, Harvard University, Cambridge, Mass.: *X-Ray induced chromosome aberrations and their subsequent behavior.*—Both chromosome and chromatid aberrations are produced by X-rays. The frequency of aberrations produced by single breaks shows a linear relation to dosage, while those dependent upon two breaks increase as the square of the dosage. Many of these aberrations produce single or double chromatid bridges at anaphase. When these bridges break new fusions of broken ends occur, although some of the broken ends appear to behave as normal ends.

**Sears, E. R.,** U.S.D.A., University of Missouri, Columbia, Mo.: *Monofactorially conditioned inviability of an intergeneric hybrid in the Triticeae.*—Hybrids of *Aegilops umbellulata* with *Triticum monococcum* die at an early stage of growth, but when the same *Aegilops* species is crossed with *T. aegilopoides* (which on genetical and cytological grounds might be classified as a subspecies or variety of *T. monococcum*), the hybrids are viable. Results from both hybrid combinations are the same whichever direction the cross is made. Certain F4 and F6 derivatives of *T. monococcum*\(\times T. aegilopoides* have also produced viable hybrids with *Ae. umbellulata*. The same derivatives have been crossed to *T. monococcum*, and individuals from the resulting F1 and F2 hybridized with *Ae. umbellulata*. The results indicate that *T. monococcum* carries a single, mendelian factor which has a dominant lethal effect whenever it is combined with a genom from *Ae. umbellulata*.

**Shank, D. B.,** Iowa State College, Ames, Iowa: *Top-root ratios of inbred and hybrid maize.*—Inbreds and single crosses of maize were grown for six weeks on the three treatments (1) compost soil (2) washed river sand low in nutrients and (3) water cultures containing full nutrient solution. Completely randomized blocks were used. Top-root ratios based on dry weights were obtained and the data were subjected to an analysis of variance. The ten inbred lines tested showed differences that were highly significant. Their means ranged from 2.0 to 3.1. Top-roots ratios of four F1 generations were either significantly lower or did not differ from their low-ratio parent while in all cases they were lower than their high-ratio parent. No differences between reciprocal crosses could be demonstrated. Treatment differences were highly significant, with water cultures showing the highest, and sand the lowest mean top-root ratio.

**Shull, A. Franklin,** University of Michigan, Ann Arbor, Mich.: *Adult intermediate-winged aphids not physiologically intermediate.*—If intermediates
are due to development starting as of one type, but finishing as of another, the combination of characters shown would depend on which type of development preceded and on the order of determination. The observed combination of characters do not agree as to the order of determination, nor as to the direction of change; there are exceptions to any assumed order for either direction. Since the structures from which intermediacy has so far been judged are fixed and unchanging in the adult, the combination of them reflects only the processes occurring in the embryo. The adult might well be of one type or the other, not intermediate, in its physiology; and if so, it should be of the type toward which development was changing in the embryo. A number of adult intermediates in two strains of aphids have been tested as to wing production in their offspring, and as to the occurrence of males and gamic females among those offspring. Winged and wingless adults differ in these respects in both strains tested. The experiments indicated that adult intermediates were essentially like the wingless adults, indicating that the direction of change must be from winged to wingless. This agrees with histological observations which show that all aphid embryos, including the ultimately wingless ones, have wing rudiments before birth. It probably must be assumed that the change in development is not steady, but fluctuating.

SHULL, GEORGE H., Princeton University, Princeton, N. J.: The gene mutations of Oenothera Lamarckiana and its mutational derivatives.—Photographic presentation of gene mutations found in cultures derived from Oenothera Lamarckiana during the past 21 years. The first demonstrated gene mutation in the Lamarckiana series of forms was mut. funifolia, discovered in 1918. Older probable gene mutations were mut. brevistylis found by De Vries in nature, and mut. rubricalyx found by R. R. Gates in a mixed culture. In the 21 years since 1918 the following fully authenticated gene mutations have been discovered in the cultures of the exhibitor: In the first linkage group, associated with the zygote lethals characteristic of Oe. Lamarckiana; in order of their discovery, have been (a) mut. funifolia (1918); (b) mut. pervirens (1920); (c) mut. rubrifolia (1930); (d) mut. pollicata (1932); (e) mut. clusa (1934); (f) mut. petiolaris (1935); (g) mut. contracta (1938). In the third linkage group, and thus generally free from any indication of linkage with lethal factors: (h) mut. vetaurea (1921); (i) mut. supplena (1923); (j) mut. bullata (1925); (k) mut. acutifolia (1929). Not in the first linkage group, but with other linkage relations still unknown: (l) mut. acuminata (1936); (m) mut. recurva (1939); (n) mut. rotundifolia (1939). The last three are strikingly manifested in young rosette stages and appear in typical Mendelian recessive proportions in progenies grown from self-fertilized Oe. Lamarckiana, but they have not yet been brought to bloom. With exception of mut. recurva they are vigorous types and their rosettes persist throughout the first season of growth. Among the new gene mutations of the first linkage group, mut. contracta also has not bloomed and probably will never bloom. Its linkage relations are obvious because it completely takes the place of seg. decipiens in progenies of certain mut. erythrina parents.
SINGLETON, W. RALPH, and CLARK, FRANCES J., Connecticut Agricultural Experiment Station, New Haven, Conn.: Cytological effects of treating maize pollen with ultra-violet light.—A preliminary report of the cytologically observable effects of ultra-violet light has been published SINGLETON (1939). This is a continuation of the same study begun with DR. L. J. STADLER at the University of Missouri in 1937. Seed of five ears from treated pollen was grown (treatments and pollinations made by DR. STADLER). Three treatments with 2967 Å (56,000 ergs/mm²) and one with 2967 Å (64,000 ergs/mm²) produced 77 plants (from 84 seed planted). Of these there was one haploid, 19 plants with segregating pollen, 55 plants with normal pollen and two plants from which there were no collections. Seven of the segregating plants had no deficiency observable at pachytene; seven had observable deficiencies; one plant was very small and weak (no collection made) and was probably deficient; and four were not examined at pachytene. Three of the last four plants were normal at diakinesis but the fourth plant was not examined. Twenty-one plants (from 21 seed) were obtained from treatment with 2652 Å (28,000 ergs/mm²). Two had segregating pollen, one with a deficiency while the other, even though segregating empty pollen, had no observable change at pachytene. Deficiencies observed were on chromosomes 2, 4, 6, 7 and 10. Two plants had a deficiency on chromosome 4. In addition there was one translocation, 3-armed, the plant being deficient for parts of chromosomes 1 and 10. There was also an anomalous case of an apparent deficiency for the long arm of chromosome 6 with the short arm present in triplicate. This may have been a sectorial as pollen from this plant was not segregating.

SINNOTT, EDMUND W., and WHALEY, W. GORDON, Columbia University, New York City: The developmental basis of inherited size differences in plant organs.—Measurements of diameter of stem, petiole, leaf blade, ovary and mature fruit in various pure lines of Cucurbita and Lagenaria show that these organs are correlated in size, a large-fruited type having all its vegetative structures also proportionally larger than a small-fruited one. These differences between races are all related to differences in the volume of the apical meristem of the shoot, which is markedly larger in large-fruited types than in small ones. In F₂ of crosses between large-fruited and small-fruited races, this same correlation between size of fruit and size of vegetative organs is evident, indicating that size differences of the various organs are not independently inherited, but that in a given individual they all have the same genetic basis. This evidently operates by controlling the size of the apical meristematic region, from which all these organs develop.

SKIRM, GEORGE, Arnold Arboretum, Cambridge, Mass.: Frequency of quadrivalent formation in Tradescantia tetraploids.—In Tradescantia tetraploids derived from diploid gametes most of the chromosomes pair as quadrivalents, but in tetraploids produced by somatic doubling most of the chromosomes pair as bivalents. This behavior is attributed to structural heterozygosity of inter-
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Interstitial regions of otherwise homologous chromosomes. In a tetraploid produced by gametic doubling homology is not complete and there is no preferential pairing between the four "homologous" chromosomes. In tetraploids derived from somatic doubling there is complete homology between the duplicated chromosomes so that preferential pairing favors bivalent formation rather than quadrivalents. In cross pollinated plants with some structural heterozygosity of the chromosomes an autotetraploid produced by somatic doubling should be able to survive in nature, because it would have bivalent pairing and relatively high fertility from the beginning.

SONNENBLICK, B. P., Queens College, Flushing, N. Y.: *The salivary glands in the embryo of Drosophila melanogaster.*——The salivary glands in *Drosophila melanogaster* are ectodermal in origin. Transverse sections of embryos incubated for eight hours at 25±.3°C show them as a pair of latero-ventral ectodermal plates situated immediately adjacent to the ventral nerve cord in the anterior portion of the embryo. The ectodermal plates invaginate, and as they increase in depth an external orifice remains. In these early glands differentiation into duct and gland proper has not as yet occurred. Ducts have appeared in twelve hour old embryos. The lengthening ducts approach one another and in sixteen hour embryos have united medially to form a common duct which enters the floor of the pharynx. Examination of preparations of several hundred embryos indicates that no mitoses ever occur in salivary gland cells. From the time of the appearance of the gland as paired ectodermal plates through the period of differentiation in the later embryo no cytoplasmic or nuclear division has been observed. Increase in the size of the glands is due, therefore, to the growth of the component cells in the plates which initially invaginate to form the glands.

SONNENBLICK, B. P., Queens College, Flushing, N. Y.: Dominant lethals and Drosophila embryonic development.——The cytology of dominant lethal genetic alterations induced by X-radiation and their effects on Drosophila embryonic development have not, hitherto, been reported. Zygotes whose development is initiated by gametes bearing such alterations die at various levels of development prior to eclosion, but particularly striking is the high death-rate among the embryos. Study of the embryos has indicated that (a) dominant lethals, which can kill when present in single dose, are primarily large chromosomal aberrations; (b) effects of the lethals are evidenced at different stages of development, even as early as the initial cleavages; (c) normal and abnormal figures may be noted side by side in a single egg; (d) dominant lethals may be induced in both sperms and ova; (e) nuclei with irradiated chromosomes can multiply but, occasionally, undifferentiated cellular masses may be observed within some embryos; (f) death occurs in the diploid phase of development.

STILES, KARL A., and DOUGAN, PAUL K., Coe College, Cedar Rapids, Iowa: A pedigree of malformed upper extremities.——This study traces skeletal anom-
lies through three generations. The defect varies greatly throughout the family. There are two individuals which have only a malformation of the fingers, namely, a webbing between the thumb and index fingers and an inward curvature of the little fingers. Seven individuals exhibit malformations similar to the above two cases plus a partial fusion of the radius and ulna bones of the forearm. Three extreme cases show not only deformities including the first two types, but also defects in the shoulders and upper arms. In two of these three cases the humerus is only about one inch long. The investigation includes four generations of twenty-six individuals, twelve of them showing some variation of the malformation. This skeletal morbidity is not inherited as simple Mendelian dominant, but rather irregular dominance is indicated.

Swanson, Carl P., Harvard University, Cambridge, Mass.: *Heterozygous inversions in Tradescantia.*—The frequency of meiotic inversion bridges was studied in a hybrid population of Tradescantia. Inversion bridges were correlated with chiasma frequency. No correlation was found between bridge frequency and number of terminal chiasmata, but a very high correlation was found between bridge formation and frequency of interstitial chiasmata. Heterozygous inversions appear to be frequent in interstitial regions, but they are not involved in crossing over when chiasmata are limited to the terminal regions of the chromosomes. Chiasma localization at terminal loci permits both structural and genetic heterozygosity of the chromosomes in Tradescantia species with few meiotic irregularities. Genetic control of the loci of chiasma formation in hybrid segregates results in crossovers and inversion bridges in interstitial regions heterozygous for inversions. Thus chiasma distribution and chromosome inversions serve as isolating mechanisms.

Waletzky, Emanuel, University of Wisconsin, Madison, Wis.: *The disproportionate interaction of bifid with other wing mutants in Drosophila melanogaster.*—The mutant bifid changes wing venation markedly, but not wing size. When bifid is combined with some mutants of the scalloped wing type, disproportionately small wings are formed. The reduction in wing size exceeds that expected as a result of simple additive effects. Disproportionately small wings have been found in the combinations of bifid with various Beadex alleles, scalloped, clipped, or vg

Waletzky, Emanuel, University of Wisconsin, Madison, Wis.: *Correlations between the manifold effects of Wrinkled in Drosophila melanogaster.*—Reduced wings and abnormal black cephalic pigment are manifold effects of Wrinkled. The manifestation and the penetration of these two characters are correlated in flies heterozygous for Wrinkled. The smaller and more abnormal the wing, the greater the frequency and intensity with which the pigment appears. When the wings are practically normal, abnormal pigment is invariably absent. These relations also hold in $D^+ / +W$ and $D^+ / +W$ flies, which
frequently have practically normal wings. However, the penetration of the pigment character is not increased in $D^{+}/+W$ flies whose wings are reduced by the presence of dumpy or miniature. $W/W$ flies whose wings are very greatly reduced by $v_{g}^{vestigial}$ show no abnormal pigment. Similarly, only a few Wrinkled $v_{g}^{sipped}$ and Wrinkled Beadex$^{i}$ flies, with greatly reduced wings, show abnormal pigment.

WARMKE, H. E., and BLAKESLEE, A. F., Carnegie Institution of Washington, Cold Spring Harbor, N. Y.: *Polyploidy and the sex mechanism in Melandrium.*—Experimental polyploidy provides a new method for the investigation of the sex mechanisms in dioecious plants. The specific tools are: 1, the addition of entire chromosome complements; 2, the addition or subtraction of specific chromosomes by means of non-disjunction; 3, the synthesis of new types with intermediate sex chromosome constitution by segregation. In *Melandrium* (*Lychnis* dioicum) the diploid male may be represented as 2A+XY, and the diploid female as 2A+XX. The polyploid types 4A+XXXXYY (male), 3A+XXY (predominantly male), 4A+XXXXY (predominantly male), 4A+XXXXXY (hermaphrodite) are therefore intermediate in sex chromosome constitution and give information regarding sex balance in this species. In the 4A+XXXXY type it is possible to measure the chromosomes within a single cell and demonstrate that the Y chromosome is larger than the X. By utilizing a combination of the aids provided by polyploidy it is possible to locate the sex determining factors. Thus, the Y chromosome is shown to be male determining; it appears that the X chromosome is female determining, and that the autosomes play little if any role in sex determination.

A 4n dioecious race, consisting of approximately equal numbers of 4A+XXXXY males and 4A+XXXXX females, has been established.

WATERS, N. F., and BRANDLY, C. A., U. S. Regional Poultry Research Laboratory, East Lansing, Mich.: *Studies in viability of poultry I. Inherent resistance to fowl paralysis.*—One of the objectives of the U. S. Regional Poultry Research Laboratory is to establish strains of definite genetic constitution with respect to resistance to so-called fowl paralysis. Experimental birds of ten different strains of White Leghorns were hatched from eggs purchased from breeders in widely scattered regions of the United States. Duplicate buildings and equipment on either side of a main Laboratory building are provided for the pathology and genetic studies. At the time of hatching, chicks of each strain from eight hatches were divided equally on a family basis. Approximately one-half of the chicks were placed on the genetic side and the other half on the pathology side, under a strict quarantine. Approximately two-thirds of the chicks on the pathology side were inoculated with blood from birds showing typical fowl paralysis, the others being held as contact controls. Examinations of birds from the genetic side affected with fowl paralysis as determined by gross and preliminary microscopic observations show an incidence of 1.8 percent for the highest viable strain, while the least viable strain
had an incidence of 11.7 percent to November 1, 1939. Diagnoses of birds from the inoculated group showing fowl paralysis according to the criteria employed revealed an incidence of 11.8 percent for the most viable strain, and 30.4 percent for the least viable strain. Some families within each strain have shown definite resistance to fowl paralysis while other families have shown high susceptibility. There are a number of families in different strains that have had no mortality from any cause, while in some families from these same strains, mortality has been 100 percent. The data show results only through October 31, 1939. No definite conclusions of genetic significance can as yet be obtained from this material. There is the possibility that the resistance of a few of the families to fowl paralysis may be of genetic nature. There is, however, the possibility that such resistance may be acquired or that the birds may be latent or carrier cases of the disease.

Wilson, G. B., and Nebel, B. R., New York State Agricultural Experiment Station, Geneva, N. Y.: Changes in chromosome sensitivity to X-rays.—Microspores of Tradescantia reflexa Raf. were rayed at various stages preceding first pollen-grain metaphase. Sensitivity was measured by the degree of chromosome alteration at first pollen-grain metaphase. Results indicate a positive correlation between the speed of mitotic development and the degree of response called "sensitivity." Several agents which either stop or retard division are being tested; first, for their own effect on chromosome and cell morphology and second, for their effects on sensitivity to X-rays as judged by comparisons with normal sensitivity curves.

Wright, Gertrude, University of Toronto, Toronto, Canada: Inheritance of form of flower in Linaria vulgaris Hill.—Abnormal flowers found growing wild have afforded a starting point for this study. These are of two main types,—peloric and spurless-tubular. The extremes of both types show radial symmetry but flowers intergrading to the two-lipped normals are common. Pelorics and tubulars are recessive to the wild normals and the backcross gives in each case a 1:1 ratio. The F2 of the cross normal X peloric is composed of 3 normal to 1 peloric. The cross peloric X tubular and its reciprocal produce normal flowers. That these synthetic normals differ genetically from the wild ones is shown by the crosses synthetic normal X peloric and synthetic normal X tubular. These result in the reappearance of both parental types in approximately a 1:1 ratio. Flower form seems therefore to depend upon at least two interacting factors. The wild normals may be designated PPTT; the pelorics PPtt; the tubulars ppTT; and the synthetic normals PpTt. If this is the case a new form is to be expected of the composition ptt. So far crosses of synthetic normals inter se have not revealed it. A few crosses of this type have yielded normals, pelorics and tubulars in the ratio 9:3:3 which suggests that the double recessive may be lethal. Further experiments are in progress.

of events occurs which enables a particular pathogen to sweep through a species. To particularize these events constitutes a most significant problem of disease resistance. If host and pathogen are closely integrated, one must change in susceptibility or the other in invasive power if epidemic disease proportions are reached. Following Schott's experiments, our own have shown that susceptibility or resistance in different host populations may be markedly increased by 25 generations of controlled breeding. But these changes are too slow to explain the shift from a stable population to the unbalance of epidemics. The immediate origin seems rather in mutation of the pathogen's virulence. The selective force isolating and purifying the population to the invasive type would lie in the hosts.—Four experiments with mouse typhoid, S. aetrycke, support this analytical view. In experiments 1, 2 and 4 the host type did not materially influence virulence. The third experiment was markedly different. Bacteria, passed through resistant mice, suddenly became the most virulent experienced; those through the susceptible mice showed no such change. Reversal of hosts caused the very slightly virulent strain, previously inhabiting the susceptible mice, to gain virulence explosively in the third passage through resistant mice. The virulent strain from resistant mice, passed through the susceptibles, remained stable. The results thus far indicate infrequent pathogenic mutation with host selection as a cause of epidemic virulence, agreeing with work of Wellhausen (1937) and Lincoln (1939) on the corn bacterial wilt relationship.