new findings of non-disjunction in autosomes of triploid females and of males carrying inversions in their autosomes seem to be desirable. It should be noted that cases of autosomal non-disjunction in males which carry inversions have already been found by Dobzhansky (1933) and by J. Schultz (unpublished). Dobzhansky and Darlington have observed cases of non-disjunction of autosomes cytologically in Drosophila pseudoobscura (unpublished).

Summary.—1. No translocations between chromosomes I, II and III of Drosophila melanogaster were found in more than 900 eggs from triploid females and the equal number of spermatozoa from diploid males.

2. Non-disjunction of the autosomes in males, resulting in spermatozoa with two or none of a special pair of autosomes was frequent.

3. Triploid females frequently produced eggs which did not receive any of the chromosomes II or III.

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1 Work done—as Fellow of the Rockefeller Foundation—at the Biological Laboratories of the California Institute of Technology, Pasadena, Cal.


UNISEXUAL MAIZE PLANTS AND THEIR RELATION TO DIOECISM IN OTHER ORGANISMS

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Dioecious plants occur naturally in at least 61 families scattered among some 48 orders of angiosperms in both monocotyledons and dicotyledons. With these unisexual plants there are often monoecious and hermaphroditic individuals in the same species. From the widespread distribution in the plant kingdom, it seems probable that various systems of partial and complete sex-separation have been developed. In 7 dioecious species of bryophytes and 51 dioecious species of angiosperms there are differences in the size, shape or number of chromosomes associated with the two sexes. In all but a few cases the female gametes are alike. In 33 dioecious species no allosomes have been found. Many hypothetical factors, both germinal and environmental have been postulated to account for the appearance of different sexes in the offspring from the same parents.

The occurrence of dioecious forms in a species that heretofore has not
shown them and their continued propagation through four generations gives an actual illustration of the working of specific germinal factors resulting in sex-separation.

Dioecious maize has been developed by combining two recessive genes, tassel-seed-2 and silkless, located on different chromosomes, now numbered I and II. Plants with these two recessive genes in the homozygous condition have the staminate flowers in the terminal inflorescences replaced with carpellate flowers. Functionally these plants are females. The male plants have the same factorial composition except that the tassel seed gene is heterozygous. The terminal flowers are staminate as in normal maize. The lateral inflorescences are entirely sterile. In this way the seed parents produce only seed and the pollen parents only pollen.

Fourteen dioecious families in all have been grown. Six of these have been continued through the fourth generation. In a total of 967 plants in all families, 390 are males and 515 females, with 61 normals. Twenty-one progenies produced only male and female plants; of these, 170 are males and 210 females, a ratio of 1 to 1.24.

Evidence from several sources proves that the female plants are homozygous, $t_{s2}t_{s2}s_{k}s_{k}$, in composition, and that the male plants are heterozygous, $T_{s2}t_{s2}s_{k}s_{k}$. The male plants are stable in their sex expression in all environments in which they have been grown. Abortive pistils have been noted on a few plants but no seeds have been produced. In the female, the terminal inflorescences are highly variable ranging from all carpellate flowers with no stamens to a large number of flowers with functioning stamens and only a few seeds. This variation is partly developmental and partly genetic. The latter is indicated by the fact that persistent differences in this respect are seen in the several families all grown under the same conditions.

The tassel-seed-2 gene not only suppresses the staminate flowers in the terminal inflorescences but also forces normally aborted ovules into full growth. This results in the crowded and irregular kernel arrangement in the lateral inflorescences that are characteristic of tassel seed plants. For these reasons tassel-seed-2 is considered to be a female-promoting gene. Other germinal factors of this general type are known in maize.

The silkless factor suppressing the carpellate flowers in all parts of the plant is considered as a male-promoting gene. Other genes having a similar action have been located in several different chromosomes of maize. When homozygous tassel-seed-2 and silkless are together in the same individual the silkless gene has no apparent effect.

This dioecious maize has originated from normal plants showing no irregularities in chromosome number or structure. The enforced heterozygosity in one sex may permit a viable deficiency to persist in one member of the heterozygous pair if it should occur. This would result in chromosome
inequality of the two sexes. Inversions in this chromosome pair would reduce or suppress crossing-over in one sex. An accumulation of recessive factors in the protected chromosome, interacting with complementary factors in other chromosomes, could bring about an intensification of the two sex types together with secondary sexual characters. At least the interaction of two specific loci holds the balance of control over the other germinal factors and over the environmental influences and supplies a working mechanism whereby separate-sexed individuals are produced and maintained from generation to generation.

The evidence supporting these brief statements will be published in *Genetics*.

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**CONCERNING COMPACT CONTINUA WHICH CONTAIN NO CONTINUUM THAT SEPARATES THE PLANE**

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It has been shown, by Mazurkiewicz,\(^1\) that every arc which lies in a compact acyclic continuous curve \(M\) is a subset of an arc which lies in \(M\) but which is itself not a proper subset of any other such arc. In the present paper it will be shown that if, in a plane \(\alpha\), \(S\) is a compact continuum containing no continuum that separates \(\alpha\) and \(K\) is a subcontinuum of \(S\) which is irreducible between some two points, then \(K\) is a subset of some subcontinuum of \(S\) which is irreducible between some two points but which is itself not a proper subset of any other such subcontinuum of \(S\).

With the aid of this result it will be proved that if, in the plane \(\alpha\), \(M\) is a non-degenerate, compact and atriodic continuum which does not separate \(\alpha\), then \(M\) is irreducible between some two points.

Let \(S\) denote a definite compact continuum lying in the plane \(\alpha\) and containing no continuum that separates \(\alpha\). If \(X\) and \(Y\) are any two points of \(S\) the notation \(XY\) will be employed to designate the\(^2\) irreducible sub-continuum of \(S\) from \(X\) to \(Y\).

**Theorem 1.** If, in \(S\), the indecomposable continuum \(M\) contains the point \(B\) of the irreducible continuum \(AB\) and \(M\) is irreducible from \(B\) to some point \(O\) not lying on \(AB\), then the continuum \(M + AB\) is irreducible from \(A\) to \(O\).

*Proof.*—Since no subcontinuum of \(S\) separates the plane \(\alpha\), \(M \cdot (AB)\), the common part of \(M\) and \(AB\), is\(^3\) a continuum, and so is \(M \cdot (AO)\). But \(AO\) is necessarily a subset of \(M + AB\) and therefore it contains a point of