Substituting for D its value $\frac{1}{3}v\lambda$ from equation (2) we find again

$$Z = \frac{3}{2}\frac{a^2}{\lambda^2}.$$

Summary.—The average number of collisions which an electron makes when diffusing through a gas, a distance a, when no field is acting on the electron, is calculated to be $\frac{3}{2}\frac{a^2}{\lambda^2}$. λ is the mean free path of the electron. The number of impacts is seen to be independent of the velocity of the electron.

I wish to thank Professor Epstein for suggesting the second method of calculation, and also Professor Tolman for helpful criticisms.

* NATIONAL RESEARCH FELLOW IN CHEMISTRY.

[1] Riecke, *Ann. d. Phys.*, **66**, 353 (1898).
[2] Hertz, *Z. f. Phys.*, **32**, 298 (1925).
[3] Einstein, *Ann. d. Phys.*, **17**, 559 (1905).

CORRELATION BETWEEN SHAPE AND BEHAVIOR OF A CHROMOSOME

BY LILIAN V. MORGAN

DEPARTMENT OF ZOÖLOGY, COLUMBIA UNIVERSITY

Communicated February 5, 1926

Yellow females of a race of Drosophila melanogaster, in which the two X-chromosomes are attached to each other, occasionally produce daughters that are heterozygous for yellow and for the sex-linked characters of their fathers. In this event, the daughter has received from the mother one of her two X-chromosomes detached from its mate.

In the spring of 1922, a wild type female of this kind, whose father was scute broad apricot, was mated to a forked bar male and produced, besides yellow and scute broad apricot sons, a number of forked bar sons. The forked bar males were tested in order to discover whether the mother had been an XXY female, and they proved to be sterile; they were non-disjunctional XO males. F_1 females were mated to X-ple males and gave two unexpected results; a recurrence of a number of patroclinous males and a very low number of flies of cross-over classes; among those which occurred was an unusually large proportion of double cross-overs.

Counts were then made to ascertain the percentage of crossing-over and among the flies that were examined there was a high percentage of gynandromorphs of one type. The mothers of the gynandromorphs were heterozygous for the yellow-bearing chromosome. The gynandromorphs were

zygotes that had received that chromosome from the mother and an X from the father and by elimination of the yellow chromosome had become in part male.

The low percentage and the kind of crossing-over, without doubt, and perhaps also the high non-disjunction and high percentage of gynandromorphs due to elimination of one particular chromosome, are correlated with the shape of the chromosome.

In sections of the equatorial plate of females, heterozygous for the yellow-bearing chromosome, one of the X-chromosomes, instead of being rod-shaped, is like an almost or entirely closed and somewhat rounded letter U.* Recently, homozygous females have been sectioned and, as anticipated, both X's are of this shape.

If crossing-over takes place at a time when the chromosomes are twisted about each other, the same end results that are found with two rod-shaped chromosomes will not be expected when one of them is U-shaped, hence the new cross-over ratios. The other two irregularities, high non-disjunction and frequent production of gynandromorphs, might both be expected to follow if the chromosome is slow to reach the pole of the spindle at division of the cell.

* H. J. Muller has recently reported in a paper presented before the Society of Naturalists a similar instance. Before the appearance of the female described above, he had discovered a fly which gave unusual percentages of crossing-over, and he has recently found that the shape of one X-chromosome of its heterozygous descendants is very similar to the one described here.

---

*THE GENETIC BASIS OF SUSCEPTIBILITY TO TISSUE TRANSPLANTS**

BY LEONELL C. STRONG

BUSSEY INSTITUTION, HARVARD UNIVERSITY

Communicated February 4, 1926

An explanation for variation in susceptibility to transplantable neoplastic tissue has long been sought. The difficulty of throwing some light on such a complicated problem has been great. In the early years of tumor transplantation work, there was great rivalry between the upholders of the various alternative hypotheses. At the present time, we are able to reconsider the earlier work in view of recent developments and to point out some of the difficulties of the old approach.

The question whether susceptibility to a transplanted tissue is inherited or not early attracted investigators. Some said that heredity plays a part in susceptibility; others maintained the opposite view. Even with the establishment of the multiple factor hypothesis by Little and Tyzzer,