STUDIES ON THE GENETICALLY INERT REGION OF THE X-CHROMOSOME OF DROSOPHILA.

I. BEHAVIOUR OF AN X-CHROMOSOME DEFICIENT FOR A PART OF ITS INERT REGION.

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(With One Text-figure.)

I. INTRODUCTION.

The recent works of Muller and Painter (see Painter, 1931; Painter and Muller, 1932; Muller and Painter, 1932) have shown that a considerable part (probably about a half) of the X-chromosome of D. melanogaster is genetically inert. Further, it has been made clear by the same works that this inert part of the X-chromosome is homologous with the Y-chromosome. These discoveries, which have been confirmed by Dobzhansky (1932), raise a number of important problems concerning the structure and evolution of the sex-chromosomes of Drosophila. An experimental study of some of these problems was undertaken by the writer. The present work forms the first part of this investigation.

II. MATERIAL.

As material for the present work an X-chromosome of D. melanogaster was used, obtained through crossing-over of two differently inverted X-chromosomes, the chromosome y–sc$^4$ (found by I. I. Agol (1929)) and the chromosome sc$^3$–wa$^t$ (found by B. N. Sidorov (1931)).

In the chromosome y–sc$^4$ the left break of the inversion passes between the genes sc and pn and the right one lies to the right of bb. The y–sc$^4$ chromosome used in the present work besides y and sc carried the genes v and f introduced there by double crossing-over.

1 For the convenience of the reader the names of the characters referred to in this paper are given below. The figures in brackets after each character indicate the position of its locus on Chr. 1.

ach = acheta (0.0); B = bar (57.0); b = bobbed (70.0); Cl = suppressor of cr. and lethal; f = forked (56.0); pm = prune (0.8); se = scute (0.0); v = vermilion (33.0); wa$^t$ = apricot (1.5); wa$^c$ = cosine (1.5); y = yellow (0.0).
In the chromosome $se^8-w^8$ the left break of the inversion passes likewise just to the right of $sc$. The right break, as has been shown by M. M. Kamshilov (unpublished), lies to the right of $bb$, between this locus and the point of attachment of the spindle fibre.

In a cross of a $y^{se^4}f^{v}w^{so^{8}}$ female with $y-w^8$ males besides the non-cross-over classes of males there were obtained some males showing the characters $y$, $sc$, $w^4$, $v$ and $f$. These males evidently were the result of a single crossing-over between the loci of $v$ and $w^8$ of the $y-sc^4$ and $se^8-w^8$ chromosomes. A chromosome arisen through a single crossing-over of two differently inverted chromosomes must carry a duplication and a deficiency. In the given case the duplication should have included a small piece of the chromosome immediately to the right of $so$ (if only the left breaks of both inversions do not coincide exactly). The deficiency should have included the region between the right breaks of both the inversions and consequently the locus of $bb$.

The fact that males carrying this cross-over $X$-chromosome proved to be viable is best explained on the assumption that the deficiency in it includes only such parts as are homologous with the $Y$-chromosome, and that therefore the presence of the $Y$-chromosome inhibits the lethal action of the deficiency. To test this supposition males carrying the $X$-chromosome in question were crossed with females homozygous for bobbed and with females homozygous for carnation. The $F_1$ females from crosses with $bb$ showed a sharp exaggeration of this character, thus supporting the above supposition. Crosses with carnation females showed that the deficiency does not include this locus. Further studies have shown that the $X$-chromosome with the deficiency is lethal in homozygous females and in females heterozygous for the lethal allelomorph of $bb$ ($bb^i$), but exerts no lethal effect in case such females carry a $Y$-chromosome. All this leads to the conclusion that the $X$-chromosome studied has a deficiency including $bb$ and no other known loci. Henceforth this chromosome, carrying, as has been already stated, the genes $y$, $sc^4$, $w^4$, $v$ and $f$, will be referred to briefly as the "$bb\text{-def}$" chromosome.

### III. The Genetic Behaviour of the Chromosome "$bb\text{-def}$" in $XY$ Males.

Assuming that the $X$-chromosome investigated has a deficiency for the $bb$ locus, the question arose whether this deficiency is limited to this locus or includes a certain part of the inert region of the $X$-chromosome.