probably determined by a recessive gene of major effect. All those examined were found to be homozygous for interchange A, from which we conclude that the gene is located on one of the chromosomes involved in this interchange. It is clear, however, that this major gene difference does not account for the excess of heterozygous A's, because the homozygous A plants which are 'yellow' survive as well as those which are green. The ratio of the two types was in fact 16 'yellow' to 11 green. Although we cannot entirely rule out the possibility of some major gene affecting the results, an alternative, and more likely, explanation is that the advantage of the A interchange heterozygotes is due to a superior balance of polygenes in heterozygous combinations. We can therefore make use of these interchanges for genetic investigations of rye populations in much the same way as inversions have been used by Dobzhansky in *Drosophila*.

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Chromosomal Polymorphism in a Bark Weevil

The North American bark weevil, *Pissodes approximatus* Hopk., has three different chromosome numbers, namely, 30, 31 and 32, due to what White[1] has called 'centric fusion' of non-homologous autosomes. The 'fusion' homozygote consequently has two large V-shaped chromosomes instead of four smaller rod-shaped chromosomes, and the 'fusion' heterozygote has one V and two rods that form a trivalent in primary spermatocytes (Fig. 1).

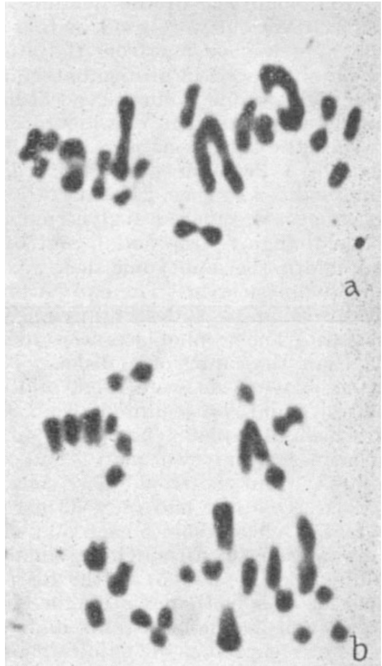

Fig. 1. Primary spermatocytes in *Pissodes approximatus*. (*a*) first metaphase: 13II + 1III + XY ; (*b*) first anaphase. (× about 2,300)

Although chromosomal polymorphism of this type is well known in the Orthoptera[2], mainly no doubt because the order has received considerable attention from insect cytologists, this constitutes the first recorded example of the phenomenon among the five hundred or so beetles that have been examined to date. It is nevertheless quite certain that almost 10 per cent of the species have evolved neo-XY sex chromosomes through 'centric fusion' of the X-chromosome with an autosome, their mode of origin being revealed in the heterogametic male by the morphology and differential staining of the sex-determining complex. However, that the process, as confined to autosomes, must have contributed in large measure to the multiplicity of chromosome numbers found in the Coleoptera[3] is attested by the number of cognate species and neighbouring genera in which the one with the lower chromosome number has a relatively large pair of autosomes. Nevertheless, until this direct demonstration, their true mode of origin has been a matter of inference.

So far, a total of sixty-seven adults, mostly males, have been examined from widely scattered areas in Ontario. At least two of the three types occur in each area, but none has been studied intensively enough to test for deviation from the Hardy–Weinberg equilibrium. However, since the species apparently breeds at random in well-defined populations, an investigation of their genetical dynamics may be expected to reveal much of the mode of operation of natural selection under different environmental conditions and elucidate the problem of the genetical evolution of populations and geographical races of insects.

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Nucleus and Spindle of *Bacillus megatherium* in Fission and Sporulation

The cells of *Bacillus megatherium* have been stained by DeLamater[1], Fitz-James[2], Robinow[3] and others with various dyes to show the chromatin-threads after pretreatment with perchloric acid, chloric acid or other reagents. Chromosomes have been observed occasionally in mitosis as well as a structure which I identify with the spindle described by Lindegren *et al.*[4] in the yeast cell. The large ellipsoidal nucleus containing the chromosomes in the centre of the bacterial cell can be observed in the living cell. This structure is identical with that which DeLamater[1] observed in stained material of *Bacillus megatherium* and which Whitefield and Murray[5] observed in stained cells of *Shigella dysentriae*. The chromosomes appear when dried (unheated) bacterial smears are stained with 1 per cent aqueous gentian violet. They are not clear when stained directly with Giemsa solution but stain clearly with Giemsa after pretreatment with 10 per cent perchloric acid for 20 min. (Fig. 1,*a*).