preparation was obtained by treatment with acid and acetone and fractionation with alcohol, which gave only a weak biuret reaction and on hydrolysis yielded 48.5 per cent. reducing sugar (calculated as glucose). Another preparation made in a different way from saliva adsorbed with kaolin and charcoal, reacting strongly with anti A immune sera, had the composition C, 44.65 per cent.; H, 6.76 per cent.; N, 7.43 per cent. (calc. for ashfree substance; ash 3.37 per cent). It is intended to describe the results later in detail.

Although it can not be claimed that any group specific substance isolated so far is a chemical individual, and in spite of differences in their immunological behavior from that of bacterial polysaccharides, it would seem probable from the foregoing data that the group substance A owes its peculiarity to carbohydrate groupings. Taking into account its relationship to other non-protein substances specific for species or organs, one is led to think that carbohydrates may play a rôle in the specificity of materials of animal origin comparable to their significance for the specificity of bacilli, as demonstrated by Heidelberger and Avery.

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THE PRESENCE OF COMPOUND CHROMOSOMES IN THE PRIMARY SPERMATOCYTES OF CIRCOTETTIX VERRUCULATUS (ORTHOPTERA)

THE hypothesis of segmental interchange[1] is based upon the assumption that homologous elements attract each other at synapsis. If an interchange of parts between two non-homologous chromosomes should occur in the spermatogonia the resulting attraction at synapsis should bring about the union of chromosomes which are not wholly homologous. The chromosomes involved in such an interchange should appear as multiples or rings in the first maturation division. Multiples of this nature are commonly found in the primary spermatocytes of *Circotettix verruculatus* after irradiation with x-rays.

In all irradiated individuals there are some cysts containing first spermatocytes in which the chromosome structure seems to be unmodified as well as other cysts whose cells contain multiples or rings formed as a result of a translocation occurring in the spermatogonia. Since it is known that all the cells within a single cyst are the descendants of one spermatogonium, the presence of the same multiple in all the cells would be expected. All individuals, however, whose spermatocytes show multiple chromosomes

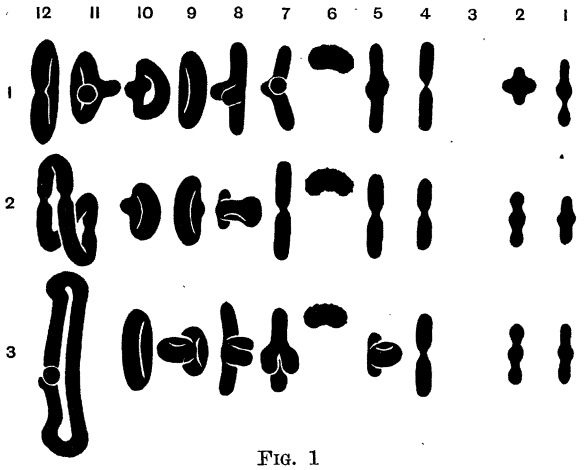

FIG. 1

have the normal spermatogonial number of twenty-one.

The drawings were made from the primary spermatocytes of a single individual which had been irradiated before hatching. The chromosomes figured in the first row are from a cell which seemed to have been unaffected by the irradiation and, therefore, represents the normal condition for this animal.[2] The multiples or rings formed as a result of a reciprocal translocation are shown in the second and third rows. This interchange of parts between one of the homologues of chromosome eleven and that of chromosome twelve has resulted in the formation of a closed ring similar to those found in Oenothera. The configuration of the ring in the second row is such that the segregation of the homologous elements would be complete; whereas, in the ring figured in the third row the structure is such that segregation would be only partial.

Many different multiple chromosome forms are found, but the translocations involved in their formation are so complex that a description of them will be reserved for a more complete paper on the effects of x-rays upon the germ cells of *Circotettix verruculatus*.

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[1] J. Belling, *Jour. Genetics,* 18: 177–205, 1927; J. Belling and A. F. Blakeslee, Proc. Nat. Acad. Sci., 12: 7–11. 1924.

[2] For a more complete description of the chromosomal conditions in *Circotettix verruculatus* see a previous paper by the same author in *Jour. Morph. and Physiol.,* 47: 1–36.