DISCUSSION AND CORRESPONDENCE

THE PRODUCTION OF MUTATIONS BY X-RAYS IN HABROBRACON

MULLER[1] has shown that mutations, both lethal and visible, may be produced in *Drosophila melanogaster* by means of X-rays. Weinstein[2] has repeated and confirmed Muller's findings. Other investigators have by the same means subsequently induced germinal modifications in plants, of which some at least appear to be genic.

Early in 1927 similar tests were made at Muller's suggestion with the parasitic wasp, *Habrobracon juglandis* (Ashmead). No results were at first obtained, and it appeared that dosages adequate to sterilize the flies had little or no effect on the wasps. Further work with greatly increased dosages resulted in reduced fertility and at least one visible mutation (small head). There was also evidence of lethal mutations, but these were not checked by linkage, as was done in Drosophila.

After an interruption of some months, the work has been resumed with advantage of knowledge in regard to adequate dosage gained from the previous experiments. There have already resulted three visible mutations; one affecting the eyes, one the wings and one the body as a whole. The last is semilethal and linked with the locus for orange eye. Many lethals have apparently been produced as evidenced by decrease in (haploid) males, but no attempt has been made to follow out their method of inheritance. The heredity of the visibles is being traced.

It is significant that among the offspring of the relatively few treated wasps these mutations (including four visibles) have been found, while in previous work involving several hundreds of thousands of individuals not more than seven visibles have been detected.

Induction of sterility in Habrobracon shows some remarkable differences from what occurs in Drosophila. Experiments to test the meaning of these differences are now in progress.

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PLIOCENE URODELES IN WESTERN KANSAS

FOR the past four years, Mr. H. T. Martin, of the paleontological department of the University of Kansas, has been excavating and investigating a deposit of Lower Pliocene sand in Sherman County, Kansas. The work has been carried on in a cut where the drainage into the Smoky Hill River has made a gully about seventy-five feet deep in the surrounding prairie. The particular stratum worked is about twenty feet below the level of the prairie, and consists of a deposit of fine, silty sand in which a rich series of mammal remains are found, together with some skeletal fragments of birds, reptiles and amphibia, the latter occurring in large numbers.

When, in the course of the excavating, small bones were found in the sand, sieves were procured and used and about five tons of sand were carefully sifted to make more certain the collecting of this material. By this means the remains of over a hundred individuals of urodele amphibia were recovered. The skeletal material, although completely disarticulated, is perfectly preserved and completely fossilized and in such excellent condition that the bones can be studied and articulated as though they were fresh skeletal elements.

The condition of the bones shows that there has been no washing and little movement of any kind in the sands since they were deposited, for thin, paper-like bones such as parasphenoids are perfectly preserved.

A few natural articulations remain intact. Three stapes were recovered from the sand-filled cavity of the otic capsules, while in four specimens the stapes were ankylosed in position on the lips of the foramen ovale. Of one hundred and eighty angulars, the calcified articulars were in place in twenty-one specimens.

All parts of the axial and appendicular skeleton have been found and identified with the exception of small carpal and tarsal elements and some of the bones of the digits. All the elements of the skull were also obtained with the exception of the palatines and nasals, but since these are exceeding thin and delicate, only the merest chance would make their recovery possible and sieving would only serve to break them to pieces.

The deposits in which this amphibian material was found are typical of the early Pliocene. The age of these specimens must be judged from the animals associated with them in the sands; since, as pointed out above, it is apparently impossible that there could have been any washing or transposing of material, one is forced to the conclusion that the skeletons of the amphibia and the other animals were laid down in the sands at about the same time.

The following early Pliocene animals were found associated with these amphibia:—Aphelops, Pliohippus, Prosthenops, Procamelus, Pliauchenia, Dromo-

[1] Muller, H. J., "Artificial Transmutation of the Gene," SCIENCE, Vol. 66, pp. 84–87, 1927.

[2] Weinstein, Alexander, "The Production of Mutations and Rearrangements of Genes by X-rays," SCIENCE, Vol. 67, pp. 376–377, 1928.

meryx, Blastomeryx, Mylogaulus, Sciurus, Paomys, Aelurodon, Pseudaelurus, Machaerodus, together with a few bird, reptile and anuran bones.

A preliminary study of this urodele material shows that the specimens, numbering over a hundred individuals, belong to one species and must be placed in the family Ambystomidae and probably in the genus Ambystoma. The size of the skeleton would be about that of some of the larger members of the genus Ambystoma living to-day, averaging about 225 mm in length. A study of the material is now being carried on and a complete description and diagnosis will be available in the near future. In so far as the writers are aware, these are the first urodeles to be described from the Lower Pliocene.

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THE ALBINO RAT

THE use of the term *Rattus norvegicus albinus* to designate the domesticated strain of albino rat, used so extensively in experimental laboratories, has been condemned by systematists on the grounds that albinos occur in practically all species and are only variants. That is a point for systematists to settle, but it seems evident that so far as the Wistar strain of white rats is concerned there is something more to be said. Recent work on the gametic composition of a colony of rats resulting from interbreeding the Wistar strain with the wild gray rat, *R. norvegicus* Erxl., a partial report of which appeared in the December 16, 1927, issue of SCIENCE, indicates the possibility of a greater difference between the parents than is ordinarily found in strains of one species.

The chromosomes of ninety rats have been examined, some of them being the ordinary albinos. No differences could be detected between the gametic composition of these and the other members of the group. A comparison of the albinos of the colony, however, and the Wistar strain of albinos, shows marked differences in gametic composition both in chromosome counts and in the chromosome number in the offspring resulting from matings made between them and other members of the colony. So far as our knowledge of the specificity of chromosome number and behavior goes at the present time, this would not be an expected result if the ordinary albinos of the colony and the Wistar strain were merely variants of one species. Examination of four wild gray rats, *Rattus norvegicus*, shows that these rats had a diploid count of forty-two chromosomes and both twenty-one and thirty-one chromosomes in the secondary spermatocytes, the dimorphism in the haploid number being the common characteristic of the members of our colony. According to Donaldson[1] the pure strain of albinos came from *R. norvegicus* and "is far removed from its wild ancestor and moderately inbred." How far this removal must be carried before species-differences arise is a matter of speculation, but the fundamental differences in gametic composition are suggestive in this connection. Since the ordinary albinos of the colony show the gametic composition of other members of the colony, it is probable that this change has occurred since the original strain of pure albinos was segregated from its wild ancestor.

This change is not confined to members of our own colony of mixed rats. The testes of two rats received from the laboratory of Professor R. A. Dutcher, Pennsylvania State College, gave chromosome counts of forty-two and sixty-two respectively, each showing both twenty-one and thirty-one chromosomes in the secondary spermatocytes. Members of a third colony came from Professor H. Steenbock, University of Wisconsin, in which the same conditions are found.

It seems possible that the primitive or basic number of chromosomes in *R. norvegicus* is forty-two, and that the dimorphism in the haploid number is a late acquisition, and that we have here a new species in the making which will ultimately come to have only 62–31 chromosomes.

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THE HIDING PLACES OF TREE-FROGS

A NOTE in SCIENCE (Mar. 9, 1928) on "Tree-Frogs in Pitcher-Plants," by Dr. E. A. Andrews, of Johns Hopkins University, in which he calls attention to an association between pitcher-plants (*Sarracenia flava*) and the tree-frog (*Hyla cinerea*) observed near Beaufort, N. C., in June and July of 1888, brings to mind a similar observation made by us on June 21, 1924, in a region of the same type. While collecting near Washington, N. C., at the head of Pamlico Sound some sixty miles north of Beaufort, we came upon an extensive sphagnum swamp, at the time very dry and firm enough to walk about on, and found it filled with orchids and pitcher-plants, *Sarracenia flava* most abundant. The swamp is surrounded by thin pine-woods interspersed with scrub-oaks, these occurring also on the dry knolls in the sphagnum. While opening the pitcher-plants in order to collect the insects hidden in the deep greenish yellow funnels we were surprised to find a long, thin, green tree-frog.

[1] Donaldson, H. H., 1924, Wistar Institute, Philadelphia.