

GENETICS

Genes Traced to Individual Chromomeres in New Research

GENES, the tantalizingly elusive minute units that control our inheritance of such things as hair color and the shape of our noses, have been tracked down almost to their final lair by a scientific team consisting of an American, Prof. H. J. Muller of the University of Texas, and a Russian, Dr. A. A. Prokofyeva, of the Soviet Academy of Sciences' Institute of Genetics.

Prof. Muller, on leave from his university, has been during the past year a research guest of the Academy at Leningrad. The results which he and his colleague have attained to date were reported before the first meeting of the Academy just held at its new headquarters in Moscow. The study is similar to research recently reported by independent investigators in the United States and Russia. (See *SNL*, Sept. 29, p. 195, Oct. 13, p. 236).

Prof. Muller and Dr. Prokofyeva have dealt with chromosomes, the minute sausage-shaped bits of living substance within the cell nucleus or center. These chromosomes have been regarded for many years the abode of the genes although the exact distribution of the genes within them has never been accurately determined.

Now one of the outstanding results of the Muller-Prokofyeva research has been to trace known gene groups to definite locations within the chromosomes. They have made a much more exact map of their places of residence than has hitherto been possible. They have traced home to individual chromomeres the particular genes they singled out for study. Chromomeres are sub-

divisions of a chromosome only about one hundredth the size of the larger bodies.

The smallest bit of chromosome stuff with which Dr. Prokofyeva has worked had a diameter about equal to the shortest wavelength of visible light which is sixteen millionths of an inch. Yet in or on that tiny particle there was room for several genes.

The two investigators hope that before long, they may be able to break off chromosome particles so small that they can contain only one gene apiece, and thus obtain a definite measure of the size of the individual gene.

The new attack on the secret of the chromosomes was made possible by two previous developments.

First, by a method of inducing mutations or evolutionary changes in organisms through bombardment with X-rays, developed by Prof. Muller some years ago.

Second, by a new technique in staining chromosomes and mapping the gene locations on them, which was announced for the first time (*Science*, Dec. 22, 1933) by Prof. Muller's colleague at the University of Texas, Prof. T. S. Painter.

By bombarding the chromosomes with X-rays, and then studying the breaks and shifts in their minute structure thus caused, Dr. Prokofyeva was able to make a map showing where gene changes should be expected. At the same time, Prof. Muller prepared another map, on a purely genetic basis, showing the locations of the gene changes. When the two maps were compared, they were found to correspond exactly, constituting a very nice case of mutual scientific support.

Sometimes the X-ray bombardment resulted in the dislodgment of a bit of chromosome carrying a few genes, which found its way to an entirely new place on the line-up and worked its way in, like a bird chased off a telegraph wire by a small boy's stone wedging itself into another roosting place without dislodging any of the crowded birds already there. Such newly-located chromosome fragments carry their genes into places where the interaction between the transferred genes and those already in place produce marked

changes or mutations in the appearance of the resulting organism. The effect of a gene or gene-group thus appears to depend at least partly on its interaction with its neighbors, and not altogether on intrinsically possessed powers of its own. This "position effect" is a discovery that may be of great importance.

Science News Letter, November 10, 1934

From Page 299

it would be rash to assume that this fact gives any clue to the length of time such a process might take in Japan, it does give some indication of the order of magnitude of the time period during which spectacular changes in population can take place. Probably the prospects of a declining population would not have seemed any less remote to the Englishman of 1880 than they do to the Japanese of today.

"The Japanese themselves are naturally less concerned with the state of the population 50 or a 100 years hence than with the problems raised by the addition of many millions during the next few years."

Although the rapid spread of the practice of birth control is recognized by Dr. Charles as one of the factors contributing to the diminishing family, to blame the dissemination of birth control information for small families is, she considers, to put the cart before the horse. Rather a change of social ideas has produced the desire for birth control information and its spread.

Not New

Birth control methods are known to have been used in Bible times, she declares, and many of the artifices widely used today were already known before the end of the eighteenth century. But changing social conditions have recently brought about a different attitude toward parenthood. Children today are felt to be a burden.

The increasingly long period of dependent childhood and youth, together with a lack of economic advantage for the father of a family, combine to make the child a financial burden. New ideals in education and new social ambitions combine to make the child a social burden. The modern child psychologist comes in for his share of the blame for the new dread of parenthood.

"Psycho-analysis has assisted in transferring the burden of original sin from the child to the parent," Dr. Charles comments. "Fortified with beard and Bible, the Victorian father shouldered his responsibility for the misdeeds of

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