part of the United States having a semitropical marine fauna or flora. Applications giving an outline of the proposed investigation, the place of proposed study and the time of stay should be sent to the Committee on Award, care of Dr. Columbus Iselin II, Woods Hole Oceanographic Institution; Professor Ross G. Harrison, Yale University, or Professor E. Newton Harvey, chairman, Princeton University.

APPOINTMENT for the year 1942–43 to the Charles W. Hargitt Research Fellowship in Zoology, at Duke University, will be made on March 15. The fellowship for post-doctoral work, carrying a stipend of $1,000, is restricted to research work in cytology; appointment is for a single year with the possibility of reappointment. Applications must be filed by March 1. Inquiries should be made to, and application blanks obtained from Dr. Geo. T. Hargitt, Biology Building, Duke University, Durham, N. C.

AFTER over thirty years of operation with a mechanically recording Wiechert seismograph, the Spring Hill College Seismological Observatory (Mobile, Ala.) began the New Year of 1942 with the installation of two sensitive photographic instruments. Two drum synchronous motor-driven recorders and two rebuilt McComb-Romberg tilt-compensating seismometers have been sent on indefinite loan to the observatory by the Franklin Institute of Philadelphia. The seismographs were used in Little America during the last Antarctic expedition of Rear Admiral Richard E. Byrd. The U. S. Coast and Geodetic Survey undertook to rebuild and increase the sensitivity of the instruments and assisted in placing them in operation. The seismologist in charge of the Spring Hill Observatory is Fr. A. J. Westland, S.J., who recently completed four years special study in seismology under the direction of Rev. Dr. J. B. Macelwane, S.J., director of the Institute for Geophysics at St. Louis University.

DISCUSSION

SEX-DETERMINATION IN MELANDRIUM AND LYMANTRIA

IN a series of reports Warmke and Blakeslee[1] announced the important discovery that in Melandrium the Y-chromosome contains the male-determining factors balanced against the female ones in the X-chromosomes, the autosomes playing hardly any role in the mechanism. This constitutes a mechanism identical with what I had considered for many years to be the situation in Lymantria (of course with M and F exchanged on account of female heterogamety, ♀ = XY or WZ). In Lymantria it is unequivocally proven that the male determiners (M) are located in the X-chromosomes and that the female determiners (F) are inherited maternally, the autosomes containing only secondary modifiers for femaleness. This maternal inheritance of F, confirmed in innumerable and decisive checks, may mean either cytoplasmic or Y-chromosome localization. I decided for the Y-chromosome when cases were found in which a weak female crossed to a strong male produced, in addition to sex-reversal males, a few exceptional females which turned out to be strong and inherited this character maternally. This excludes the cytoplasm and can be explained by non-disjunction and fertilization by an XXY male from the strong race. Thus I considered the location of F in the Y-chromosome as most probable and repeatedly discussed the consequences. Having for about 15 years accepted this solution, which was borne out by all available facts, I finally made up an experiment which I considered crucial.[2] The idea was the following: If F is located in the Y-chromosome, a sex reversal male produced by crossing a weak mother to a strong father is XY and therefore has a weak F in the Y-chromosome, a strong M in the X. Some of the daughters of such males derive their Y from the XY-father, which is then a Y with a weak F. This can be tested by crossing all daughters to strong males. If F is located in the Y-chromosome a part of the crosses will produce only males (half by sex-reversal). This experiment carried out with over 100,000 individuals never gave an all male brood. I considered this final proof in favor of the cytoplasm, though the above-mentioned data, explained by non-disjunction and location of F in the Y-chromosome, now became unexplainable, though the facts were found over again.

Blakeslee's new work suggests a need for reconsidering the situation: perhaps, after all, the old explanation was correct, and the sex-determining mechanism is the same as in Melandrium. To answer this question it is necessary to re-examine the experiment, considered to be crucial, for a possible loophole. The test presupposes, first, that half of the F_1 individuals from all-male broods are XY, as had been found in previous work; second, that in the offspring of these males females are present which have been sired by

[1] See H. E. Warmke and A. F. Blakeslee, SCIENCE, 89: 1939, *et al.*

[2] R. Goldschmidt, *Ztschr. ind. Abstl.*, 67: 1934; *Bibl. genet.*, 11: 1934.

sex-reversal males. As 168 F_1 males were crossed and 365 daughters tested by recrossing with strong males, we assumed that XY-males could not have escaped detection. Actually 10 per cent. of the crosses with F_1 males were sterile. Now that Blakeslee's work focuses attention again on the Y-chromosome, the question has to be asked (not overlooked in the original paper) whether these sterile crosses were not the only ones sired by a sex-reversal male. If this were the case, the experiment would no longer be crucial. After Blakeslee's work I am inclined to this conclusion and to assume that my original conclusion as to the location of F in the Y-chromosome, backed by weighty experimental evidence, was the correct one. A decisive experiment could be planned, but its execution would require definite Japanese races of the gypsy moth, a condition which precludes a check for the time being.

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MAN'S BIOLOGICAL FUTURE

THE discussion of man's biological future started by Blackwelder[1] and continued by Goodale[2] and Miller[3] still leaves much unconsidered. Blackwelder states the case thus (p. 365):

> Just as it would have been difficult for even a most intelligent trilobite to imagine the fish, which was destined to drive him from the scene, so it is not easy for us to forecast the nature and potentialities of that new species of *Homo* which may appear in the distant future—unless indeed our genus itself has by that time run its course and is not destined to offer the world anything further. . . . The only way in which he is likely to outstrip *Homo sapiens* effectively is in the quality of his brain.

To these pessimistic implications that man may not be able to hold his own against some hypothetical new species of *Homo,* Miller adds three further pessimistic implications, namely (1) man's giantism, (2) his racial old age and (3) his specialized type of social behavior; pessimistic because of the implication that specialization has proved dangerous in paleontological history.

To this, should be added the speculations of Howard,[4] who in comparing man with insects concludes (p. 5) that

> insects have had 12,500 times the chance that man has had to evolve a persistent type. . . . Man, then, is a newcomer. He may be a fugitive inhabitant of the world, speaking in geological terms, but . . . the possession of characteristics (insects) . . . would seem to assure their persistence even if such an experiment of Nature's as the human species should be found eventually to be an unfortunate and unsuccessful one. . . .
>
> It seems as though the insects were quite the most permanent and persistent type that life has evolved. . . . (p. 8) for the consideration of our present existence and of our relation to the forms of life that coexist with us it is not too much to assume that insects will be here when we are gone. I am inclined to think . . . that the last living thing on the globe will be some active insect sitting on a dead lichen which will represent the last of the life of the plants.
>
> But there may come a cataclysm, in which case the human species may be wiped out, . . . (p. 9) Tillyard has found in New Zealand a primitive caterpillar feeding on a liverwort . . . and this insect type appears to have remained unchanged for millions of years. What is a cataclysm or two to the insect class? . . . the insects have passed through cataclysm after cataclysm; and when they are subdued it will be safe for some possible historian in Mars to say "That is the end of that world."

To any possible objection about pessimism, Blackwelder has replied that a "scientist is under no obligation to be an optimist. His only concern must be to approach nearer to the truth." If truth offers hope, so much the better. Goodale offered hope that "man holds his biological destiny in his own hands." This, of course, assumes that man will direct his own evolution on the basis of his understanding of genetic principles.

But quite apart from man's control of his own evolution, there is evidence to indicate that man or his improved descendants will be able to cope with his competitive foes or forces of nature. The fact that man or his ancestors have been able to cope with and survive in face of all competition from longer persistent forms gives a ray of hope. His emergence from such competition to a dominating place among organisms where he has almost a monopoly on intelligence is positively encouraging.

The characterization of the present as an age of insects based largely on the enormous numbers both of kinds and individuals is scarcely tenable as an alternative to the age of man. It overlooks the fact that man's ancestors persisted in face of the opposition of the long established forms and gradually spread over most of the world, occupying nearly every terrestrial habitat suitable to his size despite the presence of insects or other animals already established there.

Primitive man having spread into nearly every part of the world, where he was confronted with varying environments, developed adaptations which met the differing conditions and produced differing races. Successful and prolific races sometimes over-ran less successful races and crowded them into oblivion. This

[1] Eliot Blackwelder, SCIENCE, 93: 359–366, April 18, 1941.
[2] H. D. Goodale, SCIENCE, 93: 618, June 27, 1941.
[3] Gerrit S. Miller, Jr., SCIENCE, 94: 163–164, August 15, 1941.
[4] L. O. Howard, "The Insect Menace." Century Company, 347 p.