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.

RICHARD GOLDSCHMIDT
UNIVERSITY OF CALIFORNIA

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.

appears to be the method of evolution. This interpretation is difficult to harmonize with Blackwelder's assumption (p. 365, line 9) that "new species originate not by gradual imperceptible changes, but by sudden mutations." His assumption leads to the idea that some new creature of human lineage will crowd out man, whereas, predicting from the past, man will probably evolve gradually via new Mendelian combinations, chromosome aberrations and gene mutations. There seems to be little chance for off-shoots to diverge from man.

What are the chances that some other species not of human stock may outstrip man? For comparative analysis, consider the birds. When they took to the air, they obtained a practical monopoly among vertebrates despite the prior claims of the pterosaurs and winged insects. With this monopoly, they were able to spread and differentiate into very successful groups. In doing so, they undoubtedly eliminated by competition many of the intermediate stages of development, so there are few forms left to indicate the steps in their evolution.

Man is in a similar position with his monopoly on intelligence. He was the first to develop it to the stage where it could be successfully applied to modification of his environment on a large scale. This environmental control is so enormous by comparison with other animals that he is transforming large sections of the world so as to produce increased density of his own population and his satellites at the expense of other creatures. In so doing, man seems, like the birds, to have crowded out intermediate forms, so there is now a large gap between man and his nearest primate relatives. But there is still a difference between the past divergent evolution of birds and the prospects for man. In contrast with birds which developed divergence in ecological isolation, man is now reversing the process. With his rapidly developing transportation facilities, he is tending to prevent isolation, thus providing more and more mixing of divergent hereditary characteristics of previously differentiated races.

With man applying his intelligence to the control of his biological competitors and with his biological destiny in his own hands (Goodale), it would seem that man has good cause to be optimistic despite the alleged dangerous specializations to which Miller called attention. There may be, however, enough generalized characters of man to nullify the purported dangers from such specializations. There seems to be nothing on the horizon in any direction which shows possibilities of taking leadership away from man or his descendants—certainly not the insects.

ANGUS M. WOODBURY

UNIVERSITY OF UTAH

DEMONSTRATION OF LABYRINTHULA PARASITE IN EEL-GRASS FROM THE COAST OF CALIFORNIA[1]

IN a recent publication of the U. S. Fish and Wildlife Service, Moffit and Cottam describe some current abnormalities in the feeding behaviors of brant along the Pacific Coast.[2] These appear to be related to the depletion of marine eel-grass, *Zostera marina,* that forms the preferred food of brant. Marked loss of the Pacific varieties of *Zostera marina* is limited to a few localities, and the condition is not comparable to the sudden wasting of Atlantic eel-grass in 1931.

At various intervals during the past year I have examined specimens of plants taken from affected beds without obtaining satisfactory evidence of parasitic activity. Recently, however, I received exceptionally well-fixed material in which I was able to demonstrate readily the *Labyrinthula* common to the diseased Atlantic eel-grass. The parasite was clearly present in two specimens collected from North Humbolt Bay, California, and from San Quentin Bay, Lower California. The beds from which they were taken were in good condition with few wasted plants. The *Labyrinthula* shows the same morphological features and peculiar distribution in recently invaded leaf tissue as in diseased leaves of Atlantic eel-grass.[3]

CHARLES E. RENN

GRADUATE SCHOOL OF ENGINEERING,
HARVARD UNIVERSITY

A SYSTEM FOR THE FILING OF REPRINTS

ALTHOUGH we are in sympathy with the recent request of Professor McCay[1] regarding standardization of size of reprints it is not likely that all journals will respond to his suggestion. In any event the change could not be retroactive, and hence we are faced with the problem of filing reprints larger than the usual sizes. The author has adopted recently a system, which may not be original, though I have not seen it used elsewhere, which gives promise of being satisfactory. The present file contains more than two thousand reprints and reports.

Discarding the usual boxes the system makes use of small metal cabinets. The particular cabinet chosen[2] contains 27 drawers, each measuring $3'' \times 9'' \times 12''$. In addition to accommodating the larger reprint sizes of which Professor McCay complains it is possible also to file typed reports ($8\frac{1}{2}'' \times 11''$). Of advantage

[1] Contribution No. 311 of the Woods Hole Oceanographic Institution.

[2] J. Moffit and C. Cottam, Wildlife Leaflet 204, November, 1941, 26 p. (mim.), Fish and Wildlife Service, U. S. Department of the Interior, 1941.

[3] C. E. Renn, *Biol. Bull.*, 70 (1): 148–158, 1936.

[1] C. M. McCay, SCIENCE, n.s., 94: 415, 1941.

[2] Obtained from Hobart Cabinet Company, Troy, Ohio.