BIOLOGY

Operate on Tiny Insect in World's Most Minute Surgery

Creature Only Sixth of an Inch Long Is Worked on Under Microscope With Glass Needles for Knives

SURGICAL operations of incredible delicacy are used for the transplantation of eyes, sex glands, legs, wings, and other organs of tiny insects the size of ordinary gnats, by two young scientists, Drs. Boris Ephrussi and G. W. Beadle. Dr. Ephrussi is a Frenchman, Dr. Beadle an American. The work was begun in Paris, at the Institute of Physico-Chemical Biology, and has been continued at the William G. Kerckhoff Laboratories of the Biological Sciences at the California Institute of Technology. The insects operated on are the favorite experimental animals of geneticists, the handy little fruit-flies known more learnedly as *Drosophila.* They are subjected to the transplanting technique while still infants, in the larval or grub stage.

Although even the largest of these larvae are only a sixth of an inch long and a twenty-fifth of an inch in diameter, both scientists work at the same specimen at the same time.

The operating table is a small glass laboratory dish, and the two biologists work with hollow glass needles, drawn out to hair-line fineness. Each man watches through a double-barreled microscope. With the needles they pluck up the rudimentary "buds" of organs which have been dissected out of one larva, and inject them into the body of another.

The "host" larvae, with their added transplanted organs, are then placed in an incubator and kept at a temperature of 77 degrees Fahrenheit for four or five days, during which time they transform themselves first into pupae and then emerge as full-grown fruit-flies.

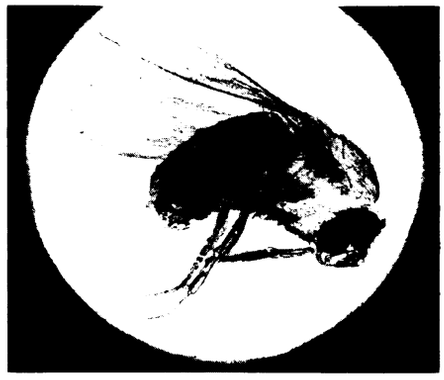
Not Useful

Some of the transplanted organs, of course, are never of any use to the insect that has acquired them. An eye grafted into the abdomen of a fruit-fly becomes a perfect eye, but because it lacks the proper nerve connections does not help its unconscious possessor to see.

On the other hand, transplanted ovaries often successfully make connection with a female insect's egg-laying apparatus, and these then function quite as well as the owner's original pair. Drs. Ephrussi and Beadle have even transplanted the ovaries of one fruit-fly species into a female of another species, mated the female with a male of her own species, and thus produced hybrid offspring, the actual, biological mother of which was dead several days before her eggs were fertilized and laid.

Important Purpose

These experiments have a purpose decidedly more serious than just showing that so difficult a biological stunt can be carried through successfully. *Drosophila* has been the most important organism for demonstration of the basic principles of heredity ever since Dr. Thomas Hunt Morgan, now director of the biological laboratories at the California Institute of Technology, carried out the pioneer researches in this particular field many years ago. But certain tissue transplantation work, of value in studying these principles, has hitherto been possible only with larger but less understood animals, like large insects, fishes, and frogs. It is for this reason that geneticists and biologists generally have taken a particularly keen interest in the work of Drs. Ephrussi and Beadle.



A PATIENT

This is how one of the tiny patients looks under the microscope. It is a matured insect having an extra eye transplanted onto the back of the body.

Science News Letter, October 31, 1936

BACTERIOLOGY

Germ Killer Makes Some Germs More Dangerous

BACTERIOPHAGE, an ultramicroscopic bacteria killer, can change the germs of typhoid fever so that they will do some of the things that make those of scarlet fever and erysipelas so dangerous, Dr. Jeanette D. Taranik of Stanford University has discovered. (*Proc. Soc. Experimental Biology and Medicine,* June.)

One of the most dreaded and dan-

DELICATE

Using hair-fine glass needles for instruments, and observing their patient through microscopes, Drs. Boris Ephrussi (left) and G. W. Beadle are operating together on the larva of a gnat-sized fruit-fly.

gerous of all disease germs is the variety which attacks blood corpuscles and destroys them. It is this kind which is responsible for a whole host of diseases, including scarlet fever, a kind of blood-poisoning that is particularly dangerous, a kind of meningitis, and a particularly virulent variety of peritonitis. Its chief characteristic is this breaking down of red blood corpuscles.

Most other germs do not have this ability, but it is possessed by a particularly resistant form of typhoid bacterium which Miss Taranik produces. She reports that she fed bacteriophage on typhoid bacteria, until most of the germs had been killed and "eaten." Then she grew the few germs which remained, to find that they now had not only all their old virulence, but also this new ability of destroying red corpuscles.

Meanwhile, Dr. Sophie Spicer of the New York Board of Health, who specializes on the red-blood corpuscle destroyers, has done the exact opposite of Miss Taranik's experiments (*Journal of Bacteriology,* July). She exposed some of her erysipelas and scarlet fever organisms to high heat, high acidity, or small amounts of chemicals, and was able to make them less able to destroy red blood corpuscles.

Science News Letter, October 31, 1936

ASTRONOMY-GENERAL SCIENCE

Earth May Meet Rusty End, Princeton Astronomer Thinks

DEATH by rusting, rather than by freezing when the sun goes out, or in the apocalyptic fires of a Judgment Day, may possibly be the eventual fate of the earth. This suggestion is made by Prof. Henry Norris Russell, Princeton University astronomer, writing in the new annual report of the Smithsonian Institution.

Oxygen, as everybody now knows, is the real essence of the breath of life. If it were to be wholly removed from the atmosphere of this planet, we should all perish—mouse and man, toadstool and tree. Some rocks contain oxygen, locked up in chemical combination. Sometimes this combination can be cracked, as by volcanic action. Then the oxygen is turned loose, largely as carbon dioxide.

Carbon dioxide is still unbreatheable, but it is eagerly seized upon by plants, which extract the carbon for food manufacture, and return half of the oxygen free. Thus the atmosphere is replenished.

But there are other rocks, very abundant, too, containing iron in the partly oxidized "ferrous" form. This ferrous oxide is thirsty for more oxygen, to complete its transformation into the "ferric" form. Ferric oxide is most familiar to us as common iron rust, but it is also responsible for most of the common red rocks and soils. Iron locked in this compound is permanently out of circulation.

Prof. Russell suggests that eventually the ferrous minerals will absorb all the oxygen in the air, or yet to be released into the air, locking it all up in ferric minerals. The earth will then be without the oxygen-breathing life as we know it. This stage may perhaps already exist on Mars, the rust-red planet.

But it is not due to arrive here tomorrow or the next day. Perhaps in a billion years, says Prof. Russell.

Many Have Watched Skies

Reports from many watchers of the skies, whether of remote nebulae and stars, or of the nearer planets and satellites, or of the doings of the earth's own intimate envelope of gases which we call the atmosphere, are found in the new Smithsonian report.

Possibilities of long-range weather forecasting are discussed by the Smithsonian Institution's secretary, Dr. Charles G. Abbot, and by a British "guest writer," Sir Gilbert T. Walker. Dr. Abbot's approach to earth's weather is through the sun's radiation, a subject he has studied for many years. Sir Gilbert sticks to earth, finding correlations between weather today in one part of the earth and the weather some months hence in another place.

The sun's place among the stars is described by Dr. Walter S. Adams, and the surface of the moon by Dr. Frederick E. Wright, both of the Carnegie Institution of Washington. Cosmic rays are the subject of Dr. Thomas H. Johnson of the Bartol Research Foundation of the Franklin Institute, and Dr. G. M. B. Dobson of the University of Oxford has a chapter on the upper atmosphere.

At Our Own Level

More strictly mundane matters, pertaining to the earth beneath and the waters that are under the earth, also receive their due meed of attention. A woman scientist on the Smithsonian staff, Dr. Florence E. Meier, gives a survey of those important but lowly and little noticed plants, the algae. Her colleague, Austin H. Clark, tells in some detail of swallow-tail butterflies. Another Smithsonian staff member, Dr. Ales Hrdlicka, relates his archaeological adventures in Alaska, which have opened up new vistas on the much-vexed question of man's antiquity in America.

That veterans are not necessarily too stiff-minded to be interested in new projects is well demonstrated by one of the most widely known of the "guest writers," the late Louis Blériot, one of the world's earliest flying men who died only about a month ago. Under the title of "Wings Over the Sea," he described approvingly the Armstrong scheme for establishing floating landing fields in the middle of the Atlantic.

Science News Letter, October 31, 1936

OBITUARY

Marlen E. Pew

FOR many years Marlen E. Pew was an editor among editors—the pilot of the newspaperman's own journal, *Editor and Publisher.* For this reason his death on Oct. 15 will be felt in every newspaper office in the land. He was a champion of weak and strong alike in their rights to say what they thought without hindrance. Press freedom was a practical passion with him.

Another phase of Pew's journalistic career was not so well known. He was one of that band of scientists and newspaper men who serve as trustees of Science Service. For nine years he served as one of the three representatives of the journalistic profession on Science Service's board, and for most of that period he was a member of the executive committee of the board. He was a pioneer in urging expert, accurate and yet interesting reporting of science in the daily press. And by his counsel he contributed largely to Science Service's success.

Both scientific and newspaper worlds owed him thanks and will miss his constructive endeavor.

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