

ENTOMOLOGY—PHOTOGRAPHY

# Ultra-Fast Wing Beats Of Insects Discovered

Using Exposures of One Twenty-Five-Thousandth of Second; Almost Incredible Speeds Are Recorded

See Front Cover

**S**TUDIES of the almost incredibly fast beatings of insect wings, in some cases as high as 350 strokes per second, are in progress at Harvard's Biological Laboratories as the first step in a comprehensive research program aimed at understanding the physiological processes which sustain this exceptionally vigorous activity.

The investigation, directed by Dr. Leigh E. Chadwick, is aided by the high speed stroboscopic and photographic technique perfected by Prof. Harold E. Edgerton of the Massachusetts Institute of Technology. With exposures as fast as a 25,000th of a second, sharp, stop-action photographs can be obtained of the whirling wings or the insects can be observed visually, either stopped altogether, at slow motion or even in reverse.

Outstanding among Dr. Chadwick's preliminary findings is the first conclusive answer to an old scientific argument, whether the speed of the wing beat varies among species, among individuals of the same species or even in the same individual under different external conditions. Dr. Chadwick finds there is considerable variation in all of these cases.

Different individuals of his most useful subject, drosophila the fruit fly, which has already made such tremendous contributions to the science of genetics, for example, vary in wing speed from about 9000 beats per minute to possibly 13,000 under normal conditions. Increasing temperatures skyrocket the rate from 6000 at 50° Fahrenheit (10° Centigrade) to double that at 84° F. (29° C.).

## Fatigue Slows

Fatigue naturally lowers the rate, even at high temperatures, but the fruit fly can usually manage two or three hundred thousand strokes before exhaustion.

Wing speeds of moths and butterflies also vary widely among different species. The common big yellow swallowtails, for example, average about six beats a second while hawk moth speeds run as high as 90 per second. The honey bee averages between 160 and 220 per second, the

bumblebee, 240, and the common house fly about 160. Dragon flies, at 30 per second, have the peculiarity that the rear set of wings precedes the front set in the beating, in contrast to the case for other types of insects.

To appreciate these tremendous speeds, compare them with high-speed physical exercises of other animals: man can do a fast one-finger piano trill at about 10 beats per second; the leg of a scratching mouse does about 20 per second; the wings of a hummingbird, much too rapid to be seen, go about 50 beats per second.

Dr. Chadwick is also studying the effects of atmospheric pressure on wing-

speeds and correlating his findings with oxygen consumption as a clue to internal physiological activity. Associated with him in the study are three research students, Carroll M. Williams, Darcy Gilmour, and O. P. Pearson.

Science News Letter, August 5, 1939

MEDICINE

## Report Rabbit Fever Cure By Sulfanilamide

**T**ULAREMIA (rabbit fever) has been successfully treated with sulfanilamide, Dr. Walker L. Curtis of College Park, Ga., reports. (*Journal, American Medical Association*, July 22)

This apparently is the first reported case of the use of this outstanding new drug in fighting the infection that comes from handling infected rabbits.

Mice infected with tularemia germs were not helped by sulfanilamide in studies made at the U. S. National Institute of Health, Dr. Edward Francis, replied to an inquiry by Science Service.

Science News Letter, August 5, 1939



## TAKING OFF

Scientific high speed photography at Harvard University by Dr. Leigh E. Chadwick now makes possible the study of the almost incredibly fast beating of insect wings. Above, a bumble bee takes off for flight, giving a last upward kick with its hind leg. Its wing beats occur at the rate of 240 a second. A wasp sits at the bottom right. Exposure time 1/25,000 of a second. On the cover of this week's SCIENCE NEWS LETTER is shown a cicada with wings beating 45 times a second "stopped" near the bottom of the down stroke.