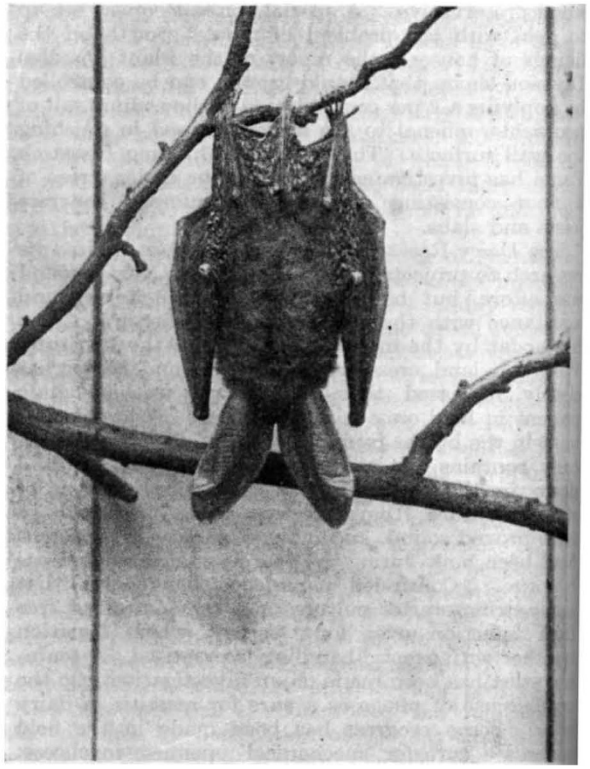
progress. Root development work, which has now been suspended, is reviewed in the report.

In addition to testing work the Dominion Laboratory has been concerned with research work, the Chemical Engineering Section being largely occupied with work connected with the dehydration of vegetables and apples, while the Physical Chemistry Section has been concerned mainly with spectrographic analysis. The Coal Survey Laboratory has continued its physical and chemical survey of the coal resources of the Dominion. Many investigations on paints and protective coatings have been carried out during the year both for defence and civilian purposes. Rubber problems investigated during the year included particle-size and other determinations of rubber fillers, preparation of rubber solutions, investigation of rubber tyre preservatives, rubber-ware for milking machines, and an examination of the possibility of manufacturing synthetic rubber in New Zealand. At the Dominion Physical Laboratory, the physical testing and electrical laboratory was concerned with the yield and quality of linen flax fibre, dimensional changes of trace line paper for map reproduction, mould on inner wall surfaces in New Zealand houses and the application of radioactive luminous paint for equipment.

At the Magnetic Observatory, Christchurch, the programme of work in terrestrial magnetism, seismology, cosmic radiation, atmospheric electricity and meteorology was generally maintained during the year.



THE LONG-EARED BAT.

BATS

By OLIVER G. PIKE

THERE are very few naturalists who can with certainty distinguish British bats in flight. It even comes as a surprise to many to learn that there are twelve species in Great Britain. The chief reason British bats have been so neglected is that they appear, except at rare intervals, at dusk and before dawn, and are therefore very difficult to observe. Apart from this, they live, as a rule, in rather inaccessible places, and most of their daylight haunts are dark.

When watching a bat on the wing, we are looking upon the most perfect example of flight. I do not know any bird that can equal their powers of manœuvring; a bat going full speed (and it can travel fast) will suddenly stop, do a quick right or left turn, rise and dive, turn completely over, and perform other stunts that are bewildering to watch.

To many, bats are mammals without a voice. This is because the high-pitched cry, which is very frequently uttered while flying, is beyond the powers of hearing of about three out of every four people, while the low, loud noises, such as the beating of a large gong, make no impression on them.

Bats are flying mammals; through the millions of years of evolution their arms have changed into wings. If we examine the wing of a bat, we see how the bones are really exaggerated fingers, with a thin flexible skin stretched over them, while on the bone that corresponds with our thumb there is a hook, which the animal uses to attach itself to some support while resting.

All bats have one young only during the year, which is born in mid-summer; they are helpless at birth, and for several days are carried around by the mothers while they search for their own food. When too heavy to carry, they remain in their haunt until about seven weeks old; then they are able to fly and search for food on their own account.

It is doubtful if the bat ever uses its eyes while searching for insect food; experiments have shown that bats which have been blindfolded and liberated in a room in which several strings were hung from the ceiling were able to avoid them with the greatest ease. To make up for the lack of sight, they seem to be provided with a sense of which we know little, and to which it is difficult to give a name, but which appears to be connected with the 'earlet' of the ten species in the family Vespertilionidæ, and the very remarkable facial development known as the 'horse-shoe' on the two species in the family Rhinolophidæ. These organs, combined with their keen sense of hearing, assist them to dodge all obstructions, and to find insect food while flying in the dark.

Bats are the only surviving back-boned animals, with the exception of the great class of birds, that are able to fly, but unlike the birds, they are rather helpless except while in the air.

There is a vast field open for the enthusiastic naturalist who cares to undertake the serious, but difficult, study of these nocturnal mammals.

Some excellent work has been done in this respect by Mr. Brian Vesey-Fitzgerald, editor of the *Field*. In the *Proceedings of the Hampshire Field Club*, **16**, Part 1, pp. 64–71, he gives a detailed and valuable description of each of the twelve species found in the county, together with their distribution, founded upon his personal observations.

If naturalists in other counties would follow in his steps, we should gather a deal of valuable information about these much-neglected mammals.