HOW CAVE BIRDS FIND THEIR WAY BY ECHOES

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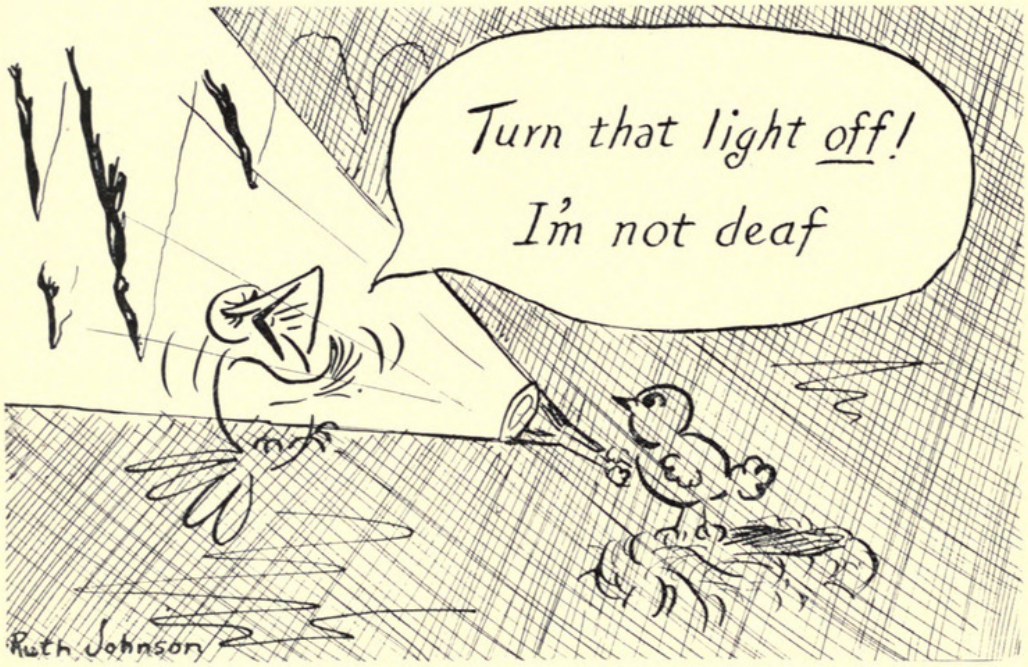
CURATOR OF BIRDS

WHEN IN THE MOUNTAINS of southeast New Guinea with Archbold Expeditions I found a cave in which swifts were nesting. Far back in the cave they had glued their cup-shaped nests against the walls, laid their eggs there, and were raising their young. Though I turned out my light and waited to adapt my eyes to the darkness there was no trace of a lightening of the gloom. In what seemed to be complete darkness the swifts were coming and going. At that time I had no inkling of how they found their way.

A clew came with the discovery of the manner in which bats find their way in darkness. "Blind as a bat" is an old saying, but actually bats have quite normal eyes. Though their eyes are smaller proportionately than those of many other mammals, such as mice, they are not nearly as small as the degenerate eyes of moles and shrews, and they appear to be useful. However, bats fly in the complete darkness of caves and fly by night.



Experimentally it has been shown that bats avoid obstacles even when they are blinded. This fact was recognized at least one hundred fifty years ago, and a special sense was postulated to explain it. However, recent experiments at Harvard University have demonstrated that bats, deprived of sight, are able in flight to locate objects by echo-location. Bats utter high frequency, supersonic, cries with their vocal apparatus and hear the echoes with their ears. Thus they are able to perceive the location of the objects and fly accordingly.

Dr. Donald Griffin, who worked on this bat-orientation problem at Harvard, was able to apply the results to a similar problem in birds. In Venezuela there is a peculiar bird known as the oil bird, which resembles a nighthawk or nightjar. It spends the day in caves and nests there, far in, beyond where the light of day penetrates.

Dr. Griffin visited some of the caves and exposed photographic film in their recesses where the birds were flying. The film shows no perceptible darkening after nine minutes of exposure. As the birds flew about in the darkness they were noisy. In particular, when flying about in the caves they gave loud sharp clicks that were repeated rapidly and almost continuously. Dr. Griffin, using the recording equipment he employed in studying bat echo-location, found that these clicks had a frequency of about 6,000 to 10,000 cycles. This is well within the range of human ears, which have a range of about 20 to 20,000 cycles. There were no ultra-high frequency sounds.

Tentatively it was concluded that the oil birds were using these sounds in echo-locating objects to guide their flight in the Stygian darkness. It remained to test this experimentally. Several birds were captured and taken to a house where a room was fitted up for experiments. With light the birds flew about easily avoiding the walls. In darkness they performed equally well, the observers following their movements by the sounds the birds made—the noise of their wings and the clicking sounds.

Then the following experiment was made. The birds had their ears plugged with cotton sealed in with duco cement and were then released in the dark room. A pronounced difference was seen. The birds now flew into the walls. They could no longer avoid collision. These birds were then flown in the lighted room. They easily avoided the walls. The cotton plugs were then removed and the birds again flown in the darkened room. They flew as well as they had previously in the light and in their earlier untreated condition in the dark.

There seems no doubt that these birds use acoustic orientation—echo-location—to guide them in their flights in the darkness of the caves and in the experimentally darkened room. This is similar to the acoustic orientation of bats but differs in that the sounds used are within the range of human hearing.

Probably the swifts I saw in New Guinea used the same principle in finding their way to their nests in the dark recesses of caves. Perhaps the swifts use their voices for this, or perhaps they use the fluttering noise of their wings.

It is interesting that only recently has this principle been adopted for use in sounding ocean-depth, in charting harbors, and in locating floating derelicts and other hazards to navigation. Some bats and some birds have been using it for a long time, but only after we discovered it independently did we find that they had used it before us.

BOTANIST TO EXPLORE 'LOST WORLD' AGAIN

When Dr. Julian A. Steyermark, Curator of the Phanerogamic Herbarium, sailed for Venezuela late in December he was continuing an expedition that, in reality, began in April, 1953. At that time he started out to explore the summit of Chimantá-tepuí, the largest table mountain in the remote reaches of Venezuela's "lost world." So arduous and treacherous was the task of breaking trail to the summit of this mountain that by the time the summit was gained few days were left in which to explore the area. But even quick exploration revealed unusual plants (some of which are new genera), four species of snails new to science, a rare frog (only two of which had been found previously), and bats (on which a paper has already been published by Colin C. Sanborn, Curator of Mammals). Curator Steyermark determined to return in 1954 to continue his explorations.

The present expedition is a joint enterprise of New York Botanical Garden and Chicago Natural History Museum. Dr. John Wurdack of the Botanical Garden, a veteran of several trips to the "lost world," is co-leader of the expedition with Dr. Steyermark. Transportation to Venezuela is being provided by Gulf Oil Company.

Wurdack and Steyermark plan to use the trail Steyermark cut last year. Consequently their ascent of the mountain will be accomplished much more quickly than was possible in 1953. Full time, from the day they reach the summit until April, will be spent in culling the hitherto unknown botanical and zoological riches of Chimantá-tepuí.