A curious deformity of a pigeon's bill.—While walking through the National Zoological Park, in Washington, D. C., I observed a common pigeon that appeared to possess a deformed head. The bird was walking on the lawn, and as I approached it made a feeble attempt to fly. Since I was unable to determine the nature of the deformity, I decided to trap the bird, which would enable me to examine the specimen in the hand. By securing a length of twine I fashioned a slip knot and baited it with corn. In this manner the bird was snared.

Upon examination I found that the pigeon was not malformed, but the upper mandible had been bent backward and forced downward into the hollow of the lower mandible. The tip of the beak bulged out a bit on the lower side of the jaw; thus the mandibles of the pigeon were locked, and the bird was unable to feed. This resulted in a deplorable condition.

The bills of the Columbidae are soft and pliable and readily lend themselves to bending. The pigeon may have collided with an obstacle, causing the locked condition described.—MALCOLM DAVIS, *The National Zoological Park, Washington, D. C.*

A late nest of the Ruby-throated Hummingbird.—The late Frank Chapman, in his book on birds, speaks of an occasional humming bird's nest in Florida but not until the month of May. Early in April, Mr. John T. Semple told me of his watching a Ruby-throated Hummingbird building a nest in a live oak on his place, here in Coconut Grove. The nest is approximately thirty feet from the ground. I took some moving pictures of this nest, the first picture being about April 19, when I noticed that the mother bird, which had been sitting on the nest, flew off and came back and started feeding a young one whose bill extended above the rim of the nest. I kept returning to take moving pictures until we had a heavy rain; something over two inches fell on Friday night of May 17. I had been going there every day in the hope of seeing the young birds fly from the nest as they were quite large and seemed to spend most of their time along the rim of the nest as if too crowded down below. When I arrived at Mr. Semple's on Saturday, the 18th, I found that the nest had been washed away by the heavy downpour and there was no trace on the ground of either the nest or the young. While I was sitting there talking over the matter with Mr. and Mrs. Twomey (of the Carnegie Museum at Pittsburgh) the mother bird returned to the tree, and it was a pitiful sight to see the little bird fly up to the branch and feel with her bill the marks of where the nest had been. I was at Mr. Semple's today (March 27) and his superintendent says that the bird has not been seen since that day.—A. S. HOUGHTON, *Coconut Grove, Florida.*

The structural basis of the voice of the Flammulated Owl.—The principal call or hoot of the Flammulated Owl (*Otus flammeolus*) is strikingly low in pitch in view of the small size of the bird. Marshall (Condor, 41: 71, 1939) has determined the pitch as A to B above middle C in males. This is five or six half tones lower than the trills of the much larger western Screech Owls (*Otus asio*), which center around E^1 and F^1.

In an earlier study of the vocal apparatus of owls (Miller, Condor, 36: 204–213, 1934) it was shown that the cross-section of the air passages corresponds in general with body size. The larger the species the larger is the syringeal segment of the air passages and the longer the vibratile membranes in the walls of the syrinx which produce the tone. The longer membranes of the larger species of course vibrate more slowly and yield lower-pitched notes. These general correlations are subject to several modifying influences: (1) The enlarged syrinx, and its membranes, varies from 203 to 238 per cent of the diameter of the unmodified bronchus in males of the ten species of the Strigidae examined. (2) In females the enlargement is less, namely 190 to 209 per cent, and this results in shorter membranes and higher-pitched notes even though body size of females is larger than that of corresponding males. (3) Tension of vibratile membranes can be controlled somewhat by muscle fibers and the pitch of the simple hoot may accordingly be altered several half tones by any one individual. (4) With general increase in size from species to species, the cross-sectional area of the bronchus increases roughly in proportion, although it lags behind; but diameter, to which the vibratile membranes correspond, increases only as twice the square root of the cross-sectional area divided by pi. Hence pitch of the hoot in the larger species is relatively high when one considers their size.

What enables the Flammulated Owl to produce so low a tone and thereby transgress these general principles governing owl notes and vocal apparatus? The syrinx of a recently taken male of this species (A. H. M. 6067) shows the following features. The bronchial diameter is 2.1 mm. and thus is but slightly less than in *Otus asio* (2.2–2.3) but greater than in the Pygmy Owl, *Glaucidium gnoma* (1.8–1.9); it is the same as in *Otus trichopsis* (Miller, Condor, 37: 288, 1935). Tracheal diameters for the same species are 3.7, 3.8–3.9, 2.5–3.0, and 3.6, respectively. Males of *O. flammeolus* weigh from 50 to 60 grams; *G. gnoma* usually weighs 60 to 65 grams; and the smaller races of *Otus asio* weigh 100 to 120 grams. Clearly *O. flammeolus* is a slender, lightly muscled owl that is not as dwarfed in basic structure and linear dimension as its weight would suggest. Its air passages certainly are little, if any, smaller than those of its near relatives in the genus *Otus*.

The length of the inner vibratile membrane in the syrinx of *O. flammeolus* is 4.5 mm. compared with 4.7 and 5.0 in males of *O. asio*, 4.4 in a male of *O. trichopsis*, and 4.2 in a female of *O. asio*. The enlarged syrinx is slightly greater proportionately than in *O. asio*—214 per cent of bronchial diameter. The Flammulated Owl therefore possesses basic equipment of surprisingly ample dimensions which should enable it to produce as low a note as that of the Screech Owl, *but no lower.*

Further inspection reveals some other peculiarities in *flammeolus*. The external and internal tympaniform membranes are much thicker than in other owls which I have studied. The interior surfaces of both are rugose and partly papillose. The thickening and turgor of the membranes must reduce the rate of vibration which otherwise is proportional to the length and tension. The situation may be comparable to that of the human voice when the larynx is swollen by infection; the sound produced then may be several tones lower than that ordinarily attained. The thickening of the syringeal membranes in *O. flammeolus* is associated with a peculiar swelling of the skin of the throat. This skin is loose and highly lymphatic, and it appears as though it often was stretched and distended. Mr. Joe T. Marshall, Jr., informs me that he has seen it bulge out at each side as the note is given.

Thus by means of thickened vibratile membranes, coupled, we may presume, with a maximum of neuromotor control, this owl is able to attain its remarkably low hoot. The hoot is of low intensity as would be necessarily true when it is produced by thickened, loose membranes, and it is typically somewhat hoarse in quality. Perhaps partly to compensate for low intensity there is what seems to be a special resonating device in the throat. In short, several structural modifications seem to have taken place so as to make the calling of this small owl as impressive as possible.

Two other peculiarities of the syrinx of this species I am unable to relate definitely to function. The cartilaginous half-rings of the syrinx are heavily enclosed at their free ends in dense fibrous connective tissue. As a consequence, the syrinx is especially rigid anterior to the external tympaniform membrane. Also, there are more rings involved in the syrinx than in any other species thus far studied. The intrinsic muscles attach to the ninth bronchial ring on both sides, whereas they attach to the seventh or eighth rings in other members of *Otus* and on still more anterior rings in several other species of owls.—ALDEN H. MILLER, *Museum of Vertebrate Zoology, Berkeley, California.*

The foot action of swimming ducks.—It was with extreme interest that I read Allan Brooks's account of "The under-water action of diving ducks" (Auk, 62: 517–523, 1945), and of the manner in which the alula is fully extended while beneath the surface. Brooks's figures in this paper also show, I think, an interesting action of the feet, but to this he did not call attention. Some recent observations of my own prompt me to offer a brief discussion of this subject, which has received but little attention in the literature.

There are two chief methods of propulsion through the water. One employs a direct thrust, as when rowing, swimming by the breast stroke, and when a duck is paddling along the surface of the water. It is economical of effort at low speed, but the possible rate of progression is definitely limited by the celerity with which the stroke can be made, minus (in the case of submerged feet) the retarding effect of the recovery stroke. The second method of propulsion through the water employs an oblique thrust, as effected by the screw of a steamer, a sculling oar, the feet in the Australian crawl style of swimming, and in swimming by whales, seals and sea lions. This method is efficient for two chief reasons: One is that the propulsive stroke is oblique, and thus it is theoretically possible to progress at greater speed than the rate at which the stroke is made. The other reason is that there is no stroke made purely for recovery, with consequent deceleration, but forward propulsion is effected by all movements of the appendages, which are in the transverse plane, either from side to side (as in pinnipeds, fish, a sculling oar), or up and down (as in whales), but never forward and back.

Until recently I had never had an opportunity actually to see the way in which ducks swim under water. I have seen penguins, a grebe or two, and a loon, and knew that the first of these with their wings, and at least most pygopodes with the bizarre placement of their legs and feet, employ the oblique or sculling method of swimming. With legs held to the side, the feet are waved up and down, "feathered" at each thrust. In some genera the wings are also used under water, but I have seen this only in the case of a cormorant.

I had assumed that ducks could not employ the sculling method of swimming, at least with any degree of efficiency, because their legs have not the same angle or position of articulation as in grebes and loons.

While living on a schooner during the past winter (1946), I spent two weeks in January moored at Eau Gallie, Florida. Among the many Lesser Scaups (*Aythya affinis*) in the neighborhood, some 30 individuals had become sufficiently tame to take food offered them from a distance of four or five feet. Bits of bread thrown would bring them scuttering along the surface or paddling at a great rate. When a piece of bread too large to be eaten at once was thrown, Laughing Gulls (*Larus atricilla*) usually swooped upon the duck that had caught it, which sent the duck beneath the surface, and away it went, legs to the side, sculling along grebe-wise at a speed that would be hardly possible for it to attain while paddling at the surface. Every action could be seen in the clear water. The transition from one method of swimming to the other was abrupt and invariable.

Brooks's figures (*loc. cit.*) suggest that his ducks were employing this same method of swimming by a sculling action of the feet while submerged. Accordingly it seems