a gravel bed about sixteen feet in thickness. In the gravel at the bottom of the spring were found several hundred finely made flint arrow-heads and spear-points, such as were used by the buffalo-hunting tribes, flakers of deer antlers, bones of recent wolf, horse, bison and elk, and teeth and fragments of bone of fossil bison, horse, mammoth and mastodon, teeth of these latter being present in considerable numbers and in an excellent state of preservation. In the gravel all about were similar fossil remains, but somewhat widely scattered. It had been learned from an old Indian chief that the arrow heads and other implements were cast into the spring as offerings, but it was difficult to account for such large numbers of fossil teeth and broken bones and their mixture with those of recent animals. It was suggested by Mr. Gilbert in the discussion which followed Mr. Holmes' paper, that possibly these teeth were offerings also, having been gathered from time to time, as they might have been washed out, and cast into the spring.

W. A. Orton described 'The Wilt Disease of the Cow Pea and its Control,' stating that the disease was caused by the clogging of the water tubes by bacteria, and that it was very prevalent among all save one of the varieties of the cow pea. This variety, known as the Iron, was resistant to the wilt bacillus as well as to the nematode, causing root-knot; that it was thus doubly resistant was an additional reason for hoping that similar cases might be found among other plants.

Theo. Gill presented a paper, in conjunction with C. H. Townsend, on 'The Largest Deep-Sea Fish,' this being the species described in Science for December 13, under the name of *Macrias amissus*.

William Palmer gave 'A Study of Two Ghosts,' explaining the manner in which spectral appearances had been caused on two occasions. In one instance the shadow of a person had been thrown on a cloud of mist by a light shining through a window of an adjacent house, and in the other a similar shadow had been cast on a passing dust cloud by an electric light. The disappearance of the mist and of the dust gave the impression of a vanishing figure.

F. A. Lucas.

SHORTER ARTICLES.

ARE HUMMING-BIRDS CYPSELOID OR CAPRIMULGOID?

In the *Proceedings* of the Zoological Society of London, for April 2, 1901, there is a most interesting paper by Professor D'Arcy Thompson 'On the Pterylosis of the Giant Humming-bird (*Patagona gigas*).' It is illustrated by some excellent figures and the description is detailed and accurate. In his concluding paragraph the writer says: "On the balance of evidence, I am inclined to think that the facts of pterylosis, so far as they go, tend to justify the association of the humming-birds with the goat-suckers and swifts, and, if anything, to bring them somewhat nearer the former than the latter of the last two." But he adds that 'the evidence is confused and the judgment far from clear.'

In the *Journal of the Linnean Society*, 1888, Dr. R. W. Shufeldt published his well-known 'Studies of the Macrochires.' He, too, had investigated the pterylography of humming-birds, goat-suckers and swifts, and he reached these conclusions: The *Caprimulgi* "have their nearest kin in the owls, and they have no special affinity with the *Cypseli*, much less with the *Trochili*. * * * The true swifts must have a group or an order created for them, as the order *Cypseli*, * * * just outside the enormous Passerine circle, but tangent to a point in its periphery opposite the swallows. * * * For the *Trochili*, I have already proposed a separate order * * * and am to-day more convinced than ever of the correctness of that proposal." On page 369 Dr. Shufeldt says further regarding humming-birds and swifts: "They differ essentially in their pteryloses and in the number of their secondaries."

I have just completed a careful examination of 23 humming-birds, representing 11 species, ranging in size from *Mellisuga humilis* to *Coeligena clemenciæ*, and 15 swifts, representing 10 different species, including *Collocalia*, *Hemiprogne*, and *Macropteryx*. I have also studied carefully the pterylography of 17 goat-suckers, representing 8 species. I have, therefore, had a considerably larger number of species at my disposal than even Dr. Shufeldt

had, and it seems to me worth while to state what conclusions my studies have led me to.

No group of birds with which I am acquainted shows such remarkable uniformity in their pterylography as do the humming-birds. So far as I can see Professor Thompson's figures of *Patagona* would answer, almost without change, for any of the 11 species I have examined. The only important difference is the absence of anything like what he calls the 'lateral' tract; I have found this in none of the specimens before me. In the feathering of the occipital region, moreover, my specimens do not agree with his figure, though they answer well to his description. Even nestlings and embryos (removed from the egg before hatching) of *Mellisuga* have precisely the same pattern of pterylosis, as in all adults. The swifts are not so constant to a single pattern as the hummers, and show some considerable generic diversity, but they nevertheless possess a very characteristic type of pterylosis. I am utterly unable to agree (however much we may allow for individual diversity in the birds and the personal equation of the observer) to either Dr. Shufeldt's account, or Professor Thompson's figure, of the cypseline pterylosis. This is not the place to enter into details, but one point at least must be mentioned. The posterior cervical apterium, so conspicuous in the humming-birds, is present in every swift I have examined, and I have not seen it in any other birds. Professor Thompson failed to find it in *Collocalia* and Dr. Shufeldt says it is *never* present in the swifts!

In the feathering of the head, the humming-birds do show a slight resemblance to the goat-suckers, but this is really not so close as appears at first sight. The swifts differ from both, but some species have the feathers on the occiput few and far between, as in the hummers. It must be borne in mind, however, that the pterylosis of the head is quite variable, perhaps more so than that of any other part of the body. In the pterylosis of the neck, the swifts and humming-birds are very similar, especially on the upper side, while the goat-suckers are strikingly different. The feathering of the back shows considerable resemblance between swifts and humming-birds, for while some swifts have the femoral tracts separate, others have them more or less united with the dorsal, as they are in the humming-birds. The dorsal tract of the *Caprimulgi* is obviously different, and the femorals are always well defined and free from the dorsal. The humeral tracts in both swifts and hummers are near the dorsal, and their posterior ends tend to run into either the dorsal or the anterior end of the femorals. In the goat-suckers, the humerals are narrow and some distance from the dorsals. On the ventral side, we find the sternal tracts in the goat-suckers are more or less abruptly narrowed to form the rather long ventrals, while in the swifts and the humming-birds, the sternals pass imperceptibly into the short ventrals. As far as the number of secondaries is concerned, that is chiefly a matter of size; humming-birds have 5–7, swifts 8–11, and goat-suckers 12–14.

For these, and very similar reasons, I am led to disagree with Professor Thompson that the humming-birds are nearer to the goat-suckers than to the swifts, and I must dissent quite as strongly from Dr. Shufeldt's opinion that the pteryloses of swifts and humming-birds are 'essentially different.' To my mind, the swifts and humming-birds are pterylographically nearer each other than are grouse and guans, and almost as nearly allied as grouse and quail. I cannot see that the *Caprimulgi* have any close relationship to either.

HUBERT LYMAN CLARK.

OLIVET, MICH.,
October 30, 1901.

INJURIES TO THE EYE CAUSED BY INTENSE LIGHT.

THERE may be some general interest in the following cases of optical phenomena brought about by exposure of the eye to intense light.

Professor M., while working in a rather dark corner of his laboratory, accidentally broke a low-resistance circuit in which an electric current at a pressure of five hundred volts was flowing. The arc formed was about a foot from his eyes and appeared like a ball of fire rather more than six inches in diameter. Immediately there was a feeling that something had 'given way' in his right eye, though no