feet from the ground. All in all these birds are individual enough to be well worth a little study, and I personally have been much interested in watching them through the summer months.

State Agricultural College, Athens, Ga.

A FOSSIL BIRD'S EGG FROM THE POST-TERTIARY MUD-ROCKS OF FIJI.

BY CASEY A. WOOD,

Plate XX.

IN September, 1923, while examining an extensive collection of Polynesian curios and antiquities made during the previous 40 years by the Hon. Mr. Turner[1] of Suva, Fiji, the writer discovered a well-preserved fossil egg (or, as he prefers to call such a specimen, a partially petrified egg shell) that had been dug out of the Suvan "soapstone." During an excavation made less than 200 yards from the seashore and about a mile and a half from the town, the workmen came upon a number of fossilized objects, among them, fifteen feet below the surface, the egg in question. It was a very good example of a fossilized egg, the shell being intact except at two or three small, scattered points and at one more extensive patch close to the larger rounded end. The color was a dirty gray, sparingly spotted with reddish-brown. The shell was quite free of dried earth or mud, although it had evidently not been cleaned. Both the naked eye and lens examination (through the cracks and defects in the outer covering) showed that the solid contents filled the shell completely, and were identical in appearance with and of similar structure to the friable rock by which it was originally surrounded.

The egg measured 1.90 × 1.45 in. The photographs give a good idea of its external aspects. Like the age of the fossil, its specific character is quite speculative, except that it is *probably* (in view of its size, coloring and proximity to the ocean) the egg of a water

[1] This gentleman has since donated his collection to the Museum of the City of Auckland, New Zealand, his native town.

bird. The present writer would be greatly in debt to the geologist or oölogist who will throw some light on these mysteries.

Something further will be said about the antiseptic, volcanic mass in which this fossil egg shell was preserved through the centuries as it seems an ideal embalming agent for the indefinite preservation of avian egg shells. Meantime it does not require much exercise of the scientific imagination to conceive a rivulet of partially cooled mud slowly finding its way into the Tertiary ocean upon whose shore a waterfowl had made her nest. An egg is soon buried in the mobile mass and (it maybe) covered by successive waves of hot, semi-fluid detritus. Ere long the contents of the egg soak through the cracks in the shell and are lost in the surrounding sediment, and eventually their place is taken by the soapy debris. In the course of time, the air excluded and putrefaction lacking, the egg and its now foreign contents are embalmed, dried and consolidated into the form discovered by modern man.

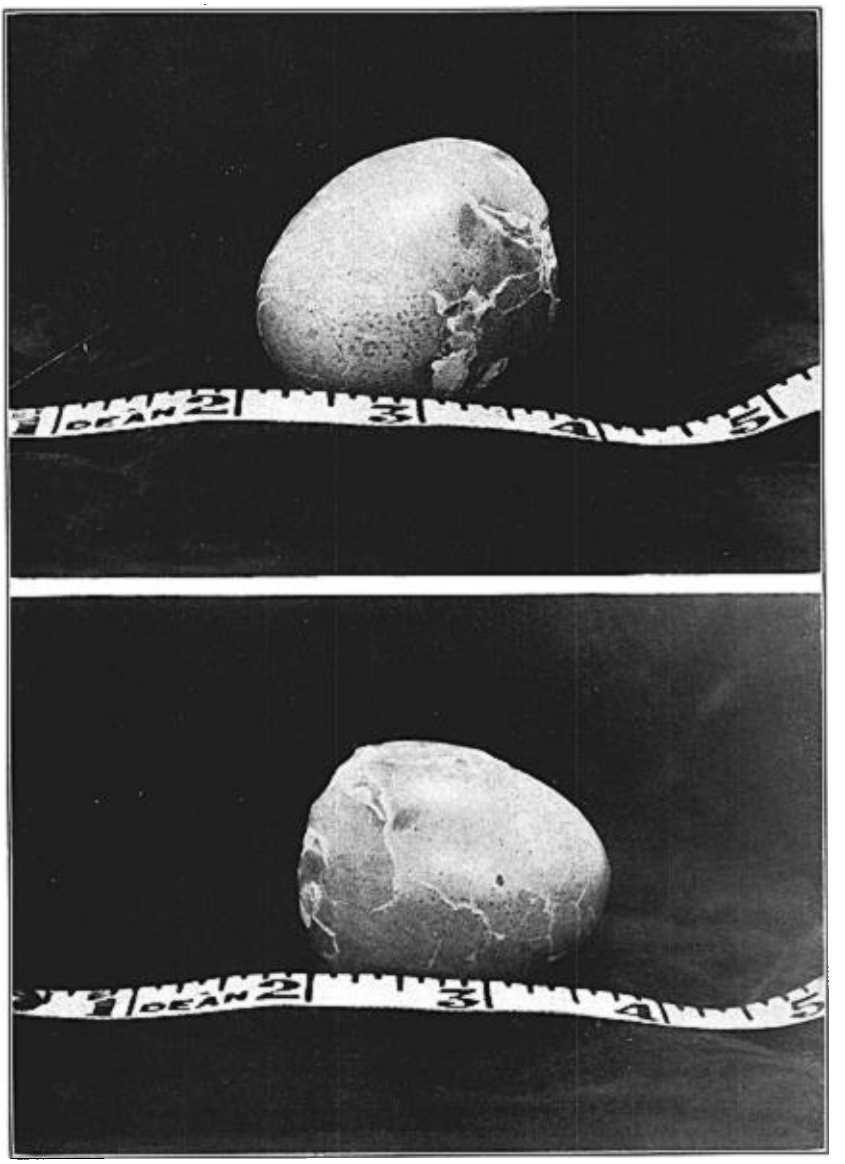
The writer had an excellent opportunity of studying this subject in connection with his observations on the 'Fossil Eggs of Bermudan Birds from the Paget Limestone' (*Ibis*, Vol. V, No. 2, April, 1923, p. 191); and to that illustrated article he would refer the interested reader. It may, however, be here repeated that fossil egg shells are much rarer than other avian fossils. Of these, struthious eggs (from the Australian region) are more common and better known than carinate specimens. The only fossil eggs of Nearctic origin fully described in literature were found in South Dakota and Bermuda.

As pointed out, there are numerous difficulties in identifying a fossil bird's egg, among them the chance that it may be of reptilian (especially of lacertilian or chelonian) origin.

As previously suggested, it is probably only the shell, with its external layer and lining membrane, that undergoes a process of fossilization (one might call it *heterocalcification*), the emptied shell being afterwards filled with mud, comminuted rock or sand of the same quality in which it was imbedded.

It is only when the egg contains bones or immature feathers that a genuine fossilization occurs—such as one finds in the more common forms of body petrifaction.

In deciding the class or genus to which may be referred a given



FOSSIL EGG FROM THE FIJIAN POST-TERTIARY MUDSTONES (CASEY WOOD).

petrified egg the microscope is to some extent an aid; and, as fossil eggs generally retain their original shape and most of their external markings, the usual measurements and color indications are useful guides.

The preserving medium that so thoroughly embalmed the Fijian bird's egg deserves more than a passing mention. N. D. Cochrane (Report on the Rocks of Vitilevu and Vaualevu, *Council Paper* No. 15, Fiji, pp. 2 and 16) well describes these sedimentary mudstones of the larger islands, and refers to their modifications in various localities.

For example, in Bau, the ancient capital, he noticed a fine, greenish mudstone which the writer has observed not only on that island but elsewhere. In exploring many parts of the country after a recent rain, the slippery, soapy character of this volcanic deposit is emphatically in evidence. It is then with the greatest difficulty that one is able to climb the hills or even to follow the natives through the jungle.

They had the great advantage of being able to go about in their bare feet, and to dig their functionating toes into the semisolid, greasy soapstone and so to push and pull themselves along, while the Europeans of the party had to drag themselves over the treacherous trail without much help from their boots or rubber shoes.

Cochrane says of the Bau mudstone that in its dried, stratified form it readily splits up into pieces two or three yards long by two or three feet wide and a few inches thick, but is not sufficiently solid to use as flagstones. It contains glauconite material, and also shows remains of formanifera. He remarks further that in Vitilevu the mudstones are locally known as "soapstones," from their fine, slippery character, but at times the material has been coarser, when the beds become more of the nature of sandstones. These strata have been mostly derived from the volcanic output, more especially from the ash, and at times no doubt they and the tuffs are the equivalent of each other at the submarine and leeward positions of the same bed. They form extensive and usually only slightly inclined strata along most of the coastal plains, extending at low levels as far inland as Serea on the Rewa and Waisa on the Sigatoka rivers. Cochrane believes that a great

elevation of the larger islands, especially of Vitilevu, occurred during tertiary time.

The labor of excavating these sedimentary deposits, both stratified and other, is by no means difficult, and rarely calls for any tools except pickax and shovel. It was by these simple means that the present fossil was unearthed.

From the same excavation were taken a number of other organized petrefactions—shells of mollusks, leaves, small cocoanuts, branches of trees, etc., evidently fallen into the fresh volcanic stream of soft mud, beneath which they sank, perhaps to be still more deeply buried by further waves of hot, semi-liquid material. It was an ideal preservative—this aseptic, pultaceous, marly mudstone, and in that particular reminds one of the tarry lakelets that engulfed and preserved through geologic ages the wild life of the Los Angeles asphalts. In any event, all the resurrected remains found in the Suvan soapstones had preserved their external markings despite the many eons they had lain in their rocky bed.

In this connection, H. B. Brady (*Quarterly Journ. Geolog. Soc.*, Vol. XLIV, 1888) believes that the volcanic mud-rocks of Vitilevu are undoubtedly of post-tertiary origin. Samples of Suva soapstone examined by him were found to contain 5 to 6 per cent of lime and displayed shells of pteropods and other mollusks, formainifera, etc., in deposits of different heights up to 100 feet above sea level. All but five species of the foraminifera are known to be now living in the Pacific.

Kandy, Ceylon.

BIRDS OF BARDSTOWN, NELSON COUNTY, KENTUCKY.

BY BENEDICT J. BLINCOE.

DURING the ten years from 1911 to 1921, I identified one hundred and fifty-seven bird species in the vicinity of Bardstown, Nelson County, Kentucky. About thirty years before my observations commenced, Charles Wickliffe Beckham collected and observed at Bardstown, and in 1885, his 'List of Birds of Nelson County,' comprising one hundred and seventy-one species, was published by the Kentucky Geological Survey, his studies covering a period