

Mr. Thos. Codrington, F.G.S.,¹ I would be glad to state in a sentence or two the results of my examination.

These vegetable remains are certainly *roots*. The method of branching shown in some of the specimens, and shown still better in a pencil-sketch by Major C. C. King, from a Sarsen which has been weathered in a wall at Abury, leave no doubt as to this. The rootlets leave the main root in every direction at right angles. The roots are in their original position. The soft sand, now indurated by siliceous cement, has been the soil on which the plants grew. An examination of the preparations shows the main stem to have been composed of a small central vascular bundle, surrounded by a considerable thickness of soft parenchyma, consisting of uniform cells of short rectangular shape. The cells have not been distorted by pressure, but retain the size and form of the original tissue,—which is a further evidence of the roots being preserved in the position in which they grew. There are not sufficient data in the specimens to enable one to determine with certainty what was the nature of the plants to which the roots belong; but it appears to me probable that they were monocotyledonous plants; and they may have been *Palms*, a group represented in the Eocene Flora of England.

NOTICES OF MEMOIRS.

GASTORNIS KLAASSENII, NEWTON. A GIGANTIC BIRD FROM THE LOWER EOCENE OF CROYDON.² By E. T. NEWTON, F.G.S.

MR. H. M. KLAASSEN, F.G.S., in his paper on the Series of Lower Tertiary Strata exposed in the railway cutting at Park Hill, near Croydon, read before the Geologists' Association (Proc. vol. viii. p. 226, 1883), mentions that he had obtained the remains of a very large bird which would as soon as possible be described. The description of these most interesting specimens has been delayed, in the hope that additional material might be brought to light, but as there seemed no longer any probability of other specimens being found, a full account of them, with detailed descriptions, was given in a paper read before the Zoological Society on the 5th of May last, and is in due course to appear in the Transactions of that Society. In the mean time the following account of the paper which is published with the assent of the President, Prof. Flower, may be of interest to the readers of the GEOLOGICAL MAGAZINE.

¹ In 1865 Mr. Thomas Codrington, C.E., F.G.S., described in a paper "On the Geology of the Berks and Hants Extension and Marlborough Railways," in the "Magazine Wilts Archaeol. Nat. Hist. Soc.," 1865, the occurrence of fossilized vegetable tissue in the pipe-like holes traversing some Sarsen Stones lying on the ground westward of Little Bedwin. In the "GEOLOGICAL MAGAZINE, new series, Vol. II. 1875, p. 589, Prof. Rupert Jones, noticed some similar tubular cavities in the Sarsen Stones near Frimley, Surrey, and in other geological formations; and in *GEOL. MAG.*, new series, Vol. III. 1876, p. 523, he described similar vegetable marks in the Greywethers or Sarsens of the Chalk Downs near Marlborough, and particularly in the enormous upright stones at Avebury (Abury). These and other similar markings seen elsewhere, are also alluded to by him in the "Trans. Newbury District Field-Club," vol. ii. 1878, p. 249, etc.

² Abstract of a paper read before the Zoological Society, May 5th, 1885.

These gigantic bird-bones were obtained from the "Blue Clay" and lignite patches of the Woolwich Beds, which lie immediately above the "Mottled Clays," and are marked *f* and *g* in Mr. Klaassen's section. The most interesting among these specimens are the portions of two large tibiotarsi and parts of a femur. The most perfect tibiotarsus when complete must have had a length of at least twenty inches, and its trochlear extremity is three inches and a half wide. Of the second tibiotarsus only the lower end is preserved, but this is larger, being a little over four inches wide. These bones resemble very closely the corresponding parts of *Gastornis Parisiensis*, but present differences sufficient to prevent their being referred to the same species, and they have therefore been named after their discoverer, *Gastornis Klaassenii*. This Eocene bird must have been as large and heavy in build as the *Dinornis crassus* of New Zealand.

The original specimen of *Gastornis* from the Lower Eocene beds of Meudon near Paris, was described by M. Hébert in the Comptes Rendus for 1855 (vol. xv. pp. 579 and 1214), and the genus named after their discoverer, M. Gaston. These Parisian bird-remains were afterwards more fully described and compared with recent forms by Prof. (now Sir Richard) Owen, in the Quarterly Journal of the Geological Society (vol. xii. p. 204, 1856), and by M. Milne-Edwards (*Oiseaux Fossiles*, vol. i. p. 165). Unfortunately the trochlear extremity of the tibiotarsus of *G. Parisiensis* was so badly preserved as to render the comparison most difficult and unsatisfactory. Other specimens referable to the same genus have since been discovered in Lower Eocene beds near Reims, and described by Dr. Victor Lemoine under the name of *Gastornis Edwardsii* (*Recher. Oiseaux Foss. envir. d. Reims*, 1878 and 1881); these include parts of the head, vertebrae, etc., and are therefore extremely valuable; but the lower ends of the tibiotarsi are far from being well preserved, and consequently do not help us much in comparing this most important bone with the same parts in recent birds. Mr. L. Dollo, of the Brussels Museum, has described the distal end of the femur of a large bird which he has referred to *Gastornis Edwardsii*, Lemoine, from the Lower Landenien of Mesvin, near Mons, Belgium (*Bull. Mus. Roy. Hist. Nat. Belg.* tom. ii. p. 297, pl. xi. 1883).

These large tibiotarsi from Croydon have their distal ends so perfect that every detail of their structure can be studied. It is not a little remarkable that, in this part of its organization, *Gastornis* is quite unlike any of the large birds, recent or fossil, at present known; the living Ratitæ having a tibiotarsus quite unlike that of *Gastornis*; and that of *Dinornis*, although making a somewhat nearer approach, has the trochlear extremity of an entirely different type. Indeed, the known forms of Ratitæ all differ more from *Gastornis*, in regard to the tibiotarsus, than do some of the living Carinatae; and it is interesting to find that opinions, expressed by some previous writers, as to the Anserine affinities of *Gastornis*, are confirmed by the detailed comparison with recent forms, which the more perfect Croydon specimens now render possible. Although the tibiotarsus of *Gastornis Klaassenii* more nearly resembles that of the Anserine

than of any other form of bird, yet it differs in certain particulars from every genus with which it has been possible to compare it, and seems to represent an entirely new type. According to the researches of Dr. Victor Lemoine, *Gastornis*, in other parts of its organization, shows Ratite affinities. At present the median portion of the sternum is unknown; but the small size of the wings, in some species at least, leads one to expect that it will prove to be without a keel, and thus show a further resemblance to the Ratitæ.

R E V I E W S.

I.—RUSSIAN CENTRAL ASIA, INCLUDING KULDJA, BOKHARA, KHIVA, AND MERV. By HENRY LANSDSELL, D.D. Two volumes. (London: Sampson Low & Co., 1885.)

IN these interesting volumes, describing a long and somewhat adventurous journey, Dr. Lansdell incidentally imparts to his readers a considerable amount of information on the Geology of Turkestan and some other parts of Central Asia, obtained partly by personal observation, partly by careful compilation from books and papers in languages other than English. The author's route from Sergiopol to the valley of the Ili, and thence to Chimkeut, ran in a general south-westerly direction. Near the first-named place he notes the occurrence of coal and graphite. Mesozoic and Tertiary rocks, from Triassic upwards, are then traversed, until on attaining higher ground Palæozoic and Metamorphic rocks are reached. The mountain ranges forming the huge *massif* of the Thian Shan are said to be largely composed of metamorphic and of various igneous rocks. Beyond the Ili the base of a chain composed of Palæozoic rocks with granite is skirted, and about Chimkeut many valuable minerals are found, such as rock salt and coal, besides iron, lead, silver, and even gold in workable quantities.

Not the least interesting part of the work is the author's description of the region south of the Sea of Aral from western Bokhara to the Caspian, the scene of some of the latest advances of Russia towards "the gates of India." Except for ulterior purposes, this enlargement of her empire does not seem one that need be envied. The region, as a whole, is singularly barren; not-seldom a waste of shifting sands, among which the rivers lose themselves—thin beds, quite dry, or occupied only by shrunken streams, are frequently encountered, and Dr. Lansdell more than once calls attention to the impression, produced on his mind by the scenery, that he was travelling along the bed of a desiccated sea. At the present time he states that the Sea of Aral—many parts of which are extremely shallow—is distinctly drying up, and the effect of this on the country is very well described from the author's personal observation. His course for some 300 miles was down the Amu or Oxus, and he enters upon an interesting discussion as to the former variability of course of this river and the diversion of its waters from the Aral to the Caspian.