

period, with the gravels of which (?) they are partly occupied. On the other hand, the great deposits of soft Tufa near Caerwys could not have resisted the marine submergence, and their deposition subsequently to the drift is also evident from their resting on its eroded surface.

The subterranean dissolution of the limestone commenced, therefore, some time before the submergence of several hundred feet that filled the Cefn caves with gravel, and continued afterwards sufficiently long to provide materials for the great masses of Tufa, near Caerwys.

It is worthy of observation that no evidence is to be found that the calcareous deposition is still proceeding, and that with an apparently similar condition of surface, the causes tending to the formation of a Tufa have entirely ceased.

NOTICES OF MEMOIRS.

I.—ON THE *RHINOCEROS LEPTORHINUS* OF OWEN.

By W. BOYD DAWKINS, M.A., F.G.S.

[Abstract of a Paper read before the Royal Society, April 26th, 1866.]

THE fossil remains of the genus *Rhinoceros*, found in Pleistocene deposits in Great Britain, indicate four well-defined species. Of these the *R. tichorhinus*, or the common fossil species, ranged throughout France, Germany, and Northern Russia, and like its congener, the Mammoth, was defended from the intense winter cold by a thick clothing of hair and wool. Its southern limit in the Europæo-Asiatic Continent was a line passing through the Pyrenees, the Alps, the northern shore of the Caspian, and the Altai mountains. It has not yet been proved to have existed in Europe anterior to the deposit of the Boulder-clay. The second species, the *R. megarhinus*¹ of M. de Christol, characterized by its slender limbs, and the absence of the "cloison," has been determined by the author among remains from the brick-earths occupying the lower part of the Thames Valley, and from the Pre-glacial Forest-bed of Cromer. The species ranged from the Norfolk shore, southwards, through Central France, into Italy. In France and Italy it characterizes the Pliocene deposits, being found in the former country in association with *Mastodon brevirostris*, and *Halitherium Serresii*, in the latter with *M. Arvernensis*. From its southern range we may infer that the megarhine species was fitted to inhabit the warm and temperate zones of Europe, just as the tichorhine was peculiarly fitted for the endurance of an Arctic winter.

The third species is the *R. etruscus* of Dr. Falconer, confined to

¹ For Paper on the *Rhinoceros megarhinus* see Dawkins, Nat. Hist. Review, 1865. p. 399.

the forest-bed of the Norfolk shore, and like the *R. megarhinus*, found in the Pliocene of France and Italy; it ranged across the Pyrenees as far as Malaga, and is the only species known to occur in Spain. The fourth, the *R. leptorhinus* of Professor Owen, is the equivalent of the the *R. hemitæchus* of Dr. Falconer. In common with the other British rhinoceroses, it possessed a molar series of six only on either side, and was two-horned. It ranged through England from the Hyæna-den of Kirkdale, Yorkshire, in the north, as far south as the plains of Somersetshire, and as far to the west as Pembrokeshire. It is very generally found in association with *Elephas antiquus* and *Hippopotamus major*, both of which species lived in Pliocene times.

Its association in Wookey Hole Hyæna-den with *Elephas primigenius*, and *R. tichorhinus* and other characteristic Post-glacial mammals, proves that the leptorhine rhinoceros co-existed with the tichorhine species, to which it probably bore the same geographical relation as the elk does to the reindeer in the high northern latitudes. The sum of the evidence proves that it was coeval with the mammoth and tichorhine rhinoceros, and does not characterize the deposits of an earlier epoch than the Pleistocene. It has not as yet been found in Pre-glacial formations. The *R. leptorhinus* is more closely allied to the bicorn rhinoceros of Sumatra than to any other living species.

II.—AN EPITOME OF THE EVIDENCE THAT PTERODACTYLES ARE NOT REPTILES, BUT A NEW SUBCLASS OF VERTEBRATE ANIMALS ALLIED TO BIRDS (*SAURORNIA*).

BY HARRY SEELEY, F.G.S.

[ANN. AND MAG. NAT. HIST. MAY, 1866.]

AFTER a discussion on the several opinions regarding the zoological relations of the Pterodactyles, Mr. Seeley explains, from his own researches, the anatomical structure of those so-called "flying reptiles," and sums up in the following words:—"From facts, such as these, it seems to me no hard task to determine whether the Pterodactyle has the organization of a reptile or of a bird, I find it in every essential principle to be formed on the avian plan. Yet it differs more from existing birds than they do among themselves, and therefore cannot be included as an order of Aves; for the points of structure in which it differs from birds are those in which all existing birds agree. I therefore regard it as forming a group of equal value with Aves (*Saurornia*), each as a sub-class, forming together a great class of birds. Its distinctive characters are—in having teeth, in the simple convex or concave articulation of the vertebræ in the separate condition of the tarsal and metatarsal bones, in having three bones in the forearm instead of two, in a peculiar carpal bone, in the sacrum formed of few vertebræ, and in the modification of the wing by the enormous development of the phalanges of one finger. The sub-class so characterized forms a parallel group with the true birds. Whether it may not in some points of organization rise above birds,

is a question on which I offer no opinion, further than to state that in none of the typical mammalian characters does it approach the mammals."

III.—SCIENCE AND ART LECTURES AT NORWICH.

LECTURE ON THE GEOLOGY OF NORFOLK.—This lecture, forming one of the Science and Art series, was delivered at Norwich on April 23rd, 1866, by the Rev. John Gunn, F.G.S., president of the Norwich Geological Society.

As the whole geology of Norfolk was too large a subject for one lecture, Mr. Gunn confined his remarks to the Tertiary strata, more especially those exhibited in the section exposed along the sea-coast. Commencing at Yarmouth, he detailed the circumstances from which the presence there of the Woolwich and Reading beds, and the London clay, was determined, by Mr. Prestwich.¹ He then passed on to the Norwich Crag: it appears north of the jetty at Cromer, whence it gradually rises to an altitude of nearly twelve feet above the level of the Chalk at Weybourne; at the bottom of it is invariably a bed of flints, yielding many interesting mammalian remains. The lecturer referred to the recent paper of Mr. J. E. Taylor² on the fossils of the upper part of the Norwich Crag series, which are of a more arctic character than those of the lower part, and which, when brought together, increase the percentage of recent to extinct shells, probably from 65 in the lower to 95 in the upper, so that the Norwich Crag, in reality, is approximated to the Red Crag more closely than was imagined. The Norwich Crag at Horstead has yielded, during the last year, five fine specimens of the teeth of *Mastodon Arvernensis*, and several of the *Elephas meridionalis*. Mr. Gunn next described the Forest bed. He believed that it was "an estuary of a large river which flowed from the west, and that, as all Belgium was covered with crag formations, it was an extension of the great river bed of the Rhine." After directing attention to the laminated bed, so called from the number of laminæ in it, he made some concluding observations on the nature of the soil. Norfolk is overspread for the most part with Boulder-clay, and to this Boulder-clay the county is indebted for its good agricultural soil. Dr. Buckland used to say that he did not want to disturb the soil; he knew what strata he was upon by the appearance of the people. When he saw the rosy cheeks of the lasses in Norfolk he knew that he was upon a rich plain, and they were indebted to the Boulder-clay for the agricultural pre-eminence of the county of Norfolk.

TWO LECTURES ON COAL AND PETROLEUM. By Professor H. D. Rogers, F.R.S., F.G.S., delivered at Norwich, in connection with the Science and Art series, on April 27th, and May 1st, 1866.

In the first lecture Prof. Rogers considered "Coal, its origin, the

¹ Quart. Journ. Geol. Soc., 1860, p. 449.

² See reports of Norwich Geological Society, p. 273.