

when plain evidence is within their reach, and in order to account for a few broken shells, a whole continent had to be sunk and re-elevated, a thing that is entirely out of the question, as there is not the least evidence as far as we can see to support it. Lake Champlain and the Gulf of St. Lawrence at one time formed an arm of the sea, which may account for the marine fossils found in the drift of that region. Shells could be washed up on the top of high gravel beds, as at Airdrie, where the writer of this article was born, as easily as the pieces of conglomerate found on Harber (Harbour?) Hill, and other acclivities of like nature on Long Island. It may seem like presumption for one like myself, who is by no means a scientist, to advance views in conflict with such learned authorities; but I am confident that when the whole drift phenomena is better understood, these theories will be found to be in the main correct.

NOTICES OF MEMOIRS.

I.—SHORT NOTICES OF MEMOIRS.

1. "*RIVERS*" is the title of a paper by Mr. T. Mellard Reade (reprinted from the Transactions of the Liverpool Geological Association, 1882): he treats of the subject practically and poetically. He thinks "there is no doubt that every river basin must have had its fluctuations of rainfall within certain limits; but there is no reason to suppose that on the whole there was more or less rain in previous periods than now; at all events the onus of proof lies on those who assert that there was." He deals with the mechanical and chemical denudation of rivers and with their age, remarking also upon the great thickness of the delta-deposits of the Ganges, Mississippi, etc.

2. A useful paper "*On the Classification of Lake Basins*" has been prepared by Mr. William M. Davis (Proc. Boston Soc. of Nat. Hist. vol. xxi. Jan. 1882). He gives notes on the literature of the subject, and describes various lakes, under the headings, *A. Construction or Orographic Basins, B. Destruction or Erosion Basins, and C. Obstruction, Barrier or Enclosure Basins.* He observes that "The theory of the glacial origin of lakes was first proposed by Hind in 1855, but did not attain prominence until advocated in a more general way by Ramsay in 1859, and especially in 1862."

3. Mr. W. M. Davis has also contributed some notes on "*The Little Mountains East of the Catskills*" (Appalachia, vol. iii. No. 1), which are made up of Devonian and Silurian Beds, showing interesting synclinal, anticlinal and monoclinical structures.

4. A paper "*On the Löss and associated deposits of Des Moines,*" Iowa, has been communicated by Messrs. W. J. McGee and R. E. Call (Amer. Journ. Science, vol. xxiv. Sept. 1882). Lists of land and freshwater shells from the deposit are given, as well as figures of some of the species—the authors observing that "In similar deposits to that now under consideration in Belgium many of the same genera and some few of the same species are found. This is

really an important fact as establishing the former wide geographical distribution of forms now confined almost solely to one or the other of the two continents." In the district under consideration, it appears that the löss is confined to elevated plateaux, its upper portion is broken up, contorted and commingled with glacial drift, and the whole is overlain by unmodified glacial drift. The authors consider that the löss was deposited in an ice-bound basin, the coldness of the waters and the low temperature of the air, being attested by the depauperate shells found imbedded in it. The observations of the authors indicate the unipartite character of the drift-sheet above the löss, and lead them to disbelieve in the hypothesis of a ground-moraine and a superficial moraine being formed by each glacier; finally, from the disappearance of the blue colouration downward in certain sections of drift clay, they conclude that this colour is not normal but is changed to brown or yellow by oxidation from above.

5. Mr. W. J. Harrison, in a paper "*On the Quartzite Pebbles contained in the Drift, and in the Triassic Strata of England; and on their Derivation from an Ancient Land Barrier in Central England*" (Proc. Birmingham Phil. Soc. vol. iii. p. 157, 1882), has treated of a subject of great interest to English geologists. Describing first the lithology, he passes on to enumerate the fossils obtained in the pebbles, which belong to Lower and Upper Silurian and Devonian species; and it is remarkable that the *Orthis Budleighensis* is the most abundant fossil in the quartzite pebbles at Birmingham, and also at Budleigh Salterton. Mr. Harrison says: "It seems perfectly clear that the quartzite pebbles, which occur so abundantly in the Drift of the Midland Counties, were derived from the Pebble-bed or Conglomerate which forms the middle member of the Bunter Sandstone, or Lower Trias." The author discusses the origin of this conglomerate, and points out its formation from the Palæozoic axis of the Midlands. An appendix giving a list of papers on the subject, and another by Mr. J. J. H. Teall on the microscopic structure of certain specimens of Quartzite, complete this very carefully prepared paper.

6. "*On the Geological Effects of a Varying Rotation of the Earth*" (American Naturalist, Jan. 1883) is the title of a paper by Prof. J. E. Todd. The forces tending to accelerate rotation are, the contraction of the earth, and the transfer of matter (in the form of ice, sediment, etc.) from lower to higher latitudes. The retarding influences are, the friction of the tides, the transfer of matter from higher to lower latitudes, elevation of the earth's crust in lower latitudes, and distortion of the earth's body by the attraction of the sun and moon. The author enters into a brief theoretical view of the action of these forces. He then proceeds to compare the theory with recorded facts relating (1) to changes during the present epoch, (2) to changes in the early Quaternary period, and (3) to changes in earlier ages. In conclusion he indicates certain important lines of investigation in connexion with the subject.

7. Dr. Charles Barrois has described the Raised Beaches on the west coast of Finistère ("*Sur les plages soulevées de la côte occidentale du Finistère,*" Ann. Soc. Géol. du Nord, vol. ix. 1882). In connexion

with this subject, Mr. Ussher's paper on the Recent Geology of Cornwall (GEOL. MAG. 1879) may be studied with advantage. Dr. Barrois points out indications of glacial phenomena in Finistère, which he attributes to transport by floating ice.

8. An article "*On the Fauna of the Lower Carboniferous Limestones of Spergen Hill, Ind., with a revision of the descriptions of its Fossils hitherto published, and illustrations of the species from the original type series*" (Bulletin of the American Museum of Nat. Hist. vol. i. No. 3), by Mr. R. P. Whitfield, furnishes us with descriptions of Foraminifera, Echinodermata, Brachiopoda, Lamellibranchiata, Gasteropoda, Heteropoda, Pteropoda, Cephalopoda, Annelida, and Ostracoda.

9. Mr. G. H. Kinahan, in a paper entitled "*Palæozoic Rocks of Galway and elsewhere in Ireland, said to be Laurentians*" (Scientific Proc. Roy. Dublin Soc. vol. iii.), discusses the evidence on which this classification has been based. He considers that the claim to the title of Laurentians for rocks in counties Donegal, Tyrone, and Mayo, has not been satisfactorily proven; on the contrary, the facts already put forward elsewhere, in favour of their being of Cambrian age, remain unanswered. In county Wexford, he points to the occurrence of *Oldhamia* as proving the Cambrian age of certain rocks, similar in character to others asserted to be older. Again, in West Galway, Mr. Kinahan points out that there is no conclusive evidence for identifying rocks of Laurentian age, observing that years ago Dr. Haughton classed the granitic rocks of Donegal and Galway together, and Dr. Hull also refers them to the same period of time. Mr. Kinahan remarks "that the Laurentianists pin their faith too much on lithological characters; while they nearly altogether neglect petrological or stratigraphical evidence; and it would appear to me that if they go on as they have begun, we shall have, before long, every metamorphic region, no matter what the age of its strata, dotted over with their Laurentian rocks." H. B. W.

II.—GEOLOGY OF CROMER.

1. THE GEOLOGY OF THE COUNTRY AROUND CROMER. By CLEMENT REID, F.G.S. (with Notes by H. B. WOODWARD, F.G.S.). Memoirs of the Geological Survey, England and Wales. (London: 1882.)
2. SECTION OF THE NORFOLK CLIFFS, FROM HAPPISBURGH, THROUGH BACTON, MUNDESLEY, TRIMINGHAM, SIDESTRAND, OVERSTRAND, CROMER, RUNTON, BEESTON, AND SHERRINGHAM, TO WEYBOURN. By CLEMENT REID. 1882.
3. EXPLANATION OF (THE ABOVE) HORIZONTAL SECTION, Sheet 127. By CLEMENT REID.

THE country described in the Memoir and Section above noted, is that embraced by Quarter-sheets 68 N.E. and S.E. and a part of 68 N.W. of the Geological Survey Map. The chief interest of the district lies in the coast-section, which includes the finest exhibition of Glacial Drift in the country, and shows these beds in connexion with the so-called "Forest Bed" of Pre-Glacial or Pliocene Age: the inland sections (described by Mr. Reid and Mr. Woodward)

furnishing, for the most part, details of a very local and far from interesting nature.

Some of the newly ascertained facts concerning the Pliocene and Glacial beds of Norfolk have been communicated by Mr. Reid to the *GEOLOGICAL MAGAZINE* (see Decade II. Vol. IV. pp. 300-305; Vol. VII. pp. 55-66, 238, 239, 548, 549), while earlier papers by Mr. John Gunn, Messrs. Wood and Harmer, the Rev. O. Fisher, and others, treating of the same subjects, have also appeared in former volumes of this *MAGAZINE*.

Excellent diagrams of the cliffs were published by Samuel Woodward in 1833, and by Mr. S. V. Wood in 1865; but these of course were exaggerated in outline, and on a much smaller scale than the very carefully drawn Section by Mr. Reid, to which we now call attention. Being on a true scale, the character of the contortions in the Contorted Drift may be well studied. This section is described in detail in the Memoir, and more briefly in the Explanation above mentioned: why this latter should be published in addition to the Memoir it is hard to say.

The chief feature in Mr. Reid's Memoir is the detailed account of the Pliocene beds shown in the cliffs: the notes are far more systematic than any previously attempted, while the organic remains obtained by Mr. Reid and Mr. A. C. Savin, of Cromer, have added very largely to our knowledge of the fauna and flora of the beds. Occasional woodcuts and a coloured plate give details which are not shown in the large sheet of sections. One very interesting chapter is devoted to the Climate, Physical Geography, and Natural History of the Newer Pliocene Period, and here Mr. Reid remarks that the most important feature in the scenery was the "Forest Bed" river, which in all probability was the same as the Rhine—for not only do the rocks found in the Pre-Glacial gravels support the view, but in the "Forest Bed" there is a distinctly southern land fauna contemporaneous with an equally marked arctic marine fauna.

The Glacial beds and their method of formation are treated of at some length, the author further explaining his views on the origin of the Contorted Drift, and its huge transported masses of chalk.

Nor are the Alluvial deposits neglected, but their description occupies little space; the phenomena of Denudation are noticed in one chapter, and the concluding one is devoted to Economic Geology, the Soil, Road-metal, Lime, Brick-earth, Peat, etc., Mineral Waters, and Water Supply.

REVIEWS.

I.—THE VERTEBRATA OF THE FOREST BED SERIES OF NORFOLK AND SUFFOLK. By E. T. NEWTON, F.G.S., etc. [Memoirs of the Geological Survey of England and Wales. (London. 8vo. pp. 143, 19 Plates. Price 7s. 6d.).]

THE fossils of the celebrated "Forest Bed" of Cromer are of very great interest to Geologists and Zoologists, for they belong