

## NOTICES OF MEMOIRS.

I.—THE GEOLOGY OF THE CARBONIFEROUS ROCKS NORTH AND EAST OF LEEDS, AND THE PERMIAN AND TRIASSIC ROCKS ABOUT TADCASTER. By W. T. AVELINE, A. H. GREEN, M.A., J. R. DAKYNS, M.A., J. C. WARD, and R. RUSSELL. 1870. 8vo. pp. 14. (London: Longmans & Co.)

THIS little work is an explanation of quarter-sheet 93 S.W., of the one-inch Geological Survey Map of England, portions of which area have, we presume, been surveyed by each of the authors therein mentioned. They give a brief sketch of the leading geological and physical features of the country, reserving all details for a promised memoir on the Yorkshire Coal-field.

The strata represented are the Millstone Grit, the Lower Coal Measures or Ganister Beds, the Middle Coal Measures, Magnesian Limestones and Marls of Permian age, and the Bunter Sandstone. Glacial deposits in the shape of Boulder-clay, Gravel and Sand lie here and there, and River and Estuary deposits likewise occur in places.

The authors furnish a table of the Carboniferous rocks shown in the area, marking the maximum, minimum, and average thicknesses of the different beds, with the local names under which they are known. They point out those which are applied to economic purposes, in this, as well as in the other series of rocks to which they refer.

## II.—ON THE BORING OF THE PHOLADIDÆ.

The following notice on the Boring of the Pholadidæ, by the late Alexander Bryson, Esq., President of the Royal Physical Society, extracted from the Edinburgh Philosophical Transactions (1859, p. 321), will be read with interest as bearing upon the *Pholas*-origin of certain perforated Limestones.

In this communication the author referred to the various theories advanced to account for the boring of the Pholadidæ in rocks.

The first hypothesis, which supposes that the molluscs perforate by means of the rotation of the valves acting as augers, he disproved by exhibiting old individuals of the *Pholas crispata* with the dentated costæ on the shells as sharp as in any young specimen. That these animals bore by siliceous particles secreted by the foot, as suggested by Mr. Hancock, has been disproved by microscopic observation; and that currents of water set in motion by vibratile cilia seemed also insufficient to account for the phenomenon.

Another theory supposes that an acid is secreted by the foot, capable of dissolving the rock.

*Wrightii* (also from the Wenlock-shale and Limestone, Dudley), figured and described by H. Woodward in the Quart. Journ. Geol. Soc., vol. xxi., pl. xiv., figs. 1a to 1i. See also the Geol. Mag., Vol II., 1865, p. 470 (Woodcut). Can it be possible that any actual relationship exists between these two remarkable and aberrant forms?—H. W.

This the author showed was not tenable, as the strongest Nordhausen sulphuric acid fails to dissolve aluminous shales and Silurian slates; and also that any such acid secretion would act more readily on the valves themselves. From many experiments on the cutting of hard siliceous substances, the author found that the softer the substance was in which the cutting material was impacted, the greater the amount of the work done. He was thus led to the conclusion that the Pholadidæ bore with the strong muscular foot alone, and that they obtain the minute particles of silica from the waves or the arenaceous rocks in which they are found; and hence there is no necessity for either an acid or silicious secretion. That the foot was the boring apparatus, and not the valves, he proved from a specimen of a Pholas-hole in shale, where the pedal depression of the animal was distinctly seen.

He also exhibited a piece of glass bored to the depth of 1.50 of an inch, by means of the point of the finger and emery alone.

### III.—THE TERRACES OF NORWAY.—By Prof. KJELLMANN, of Christiania.

[Translated from the Norsk, by Marshall Hall, Esq. Reprinted from "Scientific Opinion" of Feb. 23, March 2, and March 9, 1870.]

**T**HE terrace-like steps, which it is the object of this paper to describe, are remarkable features of the Norwegian valleys. These valleys are filled with various deposits of clay, sand, and gravel, but the floor of each valley does not slope evenly from its commencement to the lower end of the valley, where it opens into the sea, but it rises thence by steps, from lower to higher plains, irrespective of the river which traverses it along an inclined plane. These steps, the surfaces of which are apparently horizontal, have a gentle slope at the upper portion, and usually terminate below in a steep slope of about 30°. These are the Terraces.

It seems most reasonable to suppose (says the author) that these valley terraces were caused by a water-surface on a level with them. If the sea be the agent, marine remains ought to occur from the highest terrace far up the valley to the lowest, at the present sea-shore, and at the same time a certain uniformity might be expected in the nature of the materials filling up the valley. But marine remains are only to be found at the lower altitudes, under 500 to 600 feet. At about the same altitude the nature of the bottom of the valley is evidently different. From 500 to 600 feet is, therefore, the highest beach-mark, and it will be presumed that steps found lower than this are marks of the sea-level, whilst for the other steps higher up some different cause must be assigned.

With respect to their situation, the steps may be classed into two large groups: (1) Those that occur in a completely open situation; (2) Those comparatively closed in, and partially supported by the damming produced by the mountains on both sides approaching each other.

The maritime steps proper are all open. The inland steps are almost all distinctly closed.

Since 1858, when he began a series of observations on these terraces, Prof. Kjerulf has pointed out three causes to which these terraces may have been due.

1. The former position of the sea, which left its highest marks on the land at 600 feet above the present level. 2. Ancient bottom moraines, which obstructed the valley at a time subsequent to the Glacial period, creating dams, so that a basin could be formed in the water-course. 3. Obstruction by a mountain which might create a basin so long as the water-course in the valley did not erode still deeper into the dam.

In his opinion the ultimate causes of the steps of the water-courses are not different, but there was one main cause, namely, the presence of a water surface, which caused the materials washed down by the streams to be heaped up everywhere to the height marked out.

Where the watercourse joined the sea without any obstruction, the materials brought down through the valley might be piled to a considerable height at this level and below it. Where, however, a bottom moraine obstructs the passage, a basin may be formed inside this wall, and the material of the water-courses piled as high as the sill. A similar case is the obstruction caused by the spur of a mountain. Then supposing the sea-level to be lowered, the dam broken through, or the mountain obstruction opened, at each of those spots some portion of the piled-up materials will remain at the sides of the passage, subsequently to be dug out by the water, or else the terraces will show the former water-level.

The steps of the water-courses are directly connected with the question of upheaval, and the author confidently adheres to the belief that the land has only risen 600 feet since the Glacial epoch. Lyell's theory of a sinking and rising of 6,000 feet is shown to be unsupported by facts; and in regard to the question of time, that whereas this theory would require a period of 480,000 years, it is hereby reduced to 24,000.

The terraces or water-courses throw light upon the uniformity of rate of the motion of the land.

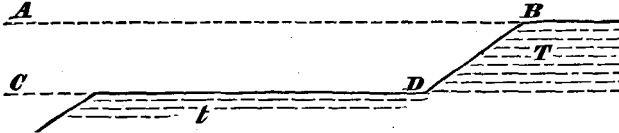
The terraces above the highest beach-mark can almost always be attributed to dams and other obstructions. The case is, however, different as regards terraces lying below this mark; for these lie entirely open to the mouth of the valley, and they are unsupported by dam or obstruction of any kind.

The formation of the terraces has been generally attributed entirely to the sea. But, Prof. Kjerulf remarks, the sea alone could never form a terrace, as may be plainly seen by any one sailing round the coast of Norway, for he will observe that the shores are not surrounded by terraces, but that they occur in few places only—in those, namely, where a water-course opens out. The chief work of these latter consists in transporting gravel and mud down to the nearest water-basin. The terrace is formed by the joint labour of the stream and the sea. Now if the sea sank equally and slowly, there is no cause at hand for the formation of high, distinct, regular, and open terraces, one below another. On the contrary, for the

formation of a plurality of terraces, it is requisite that the sea-level shall remain for some time and then rapidly change, therefore suggesting not a regular, but an irregular or periodical movement.

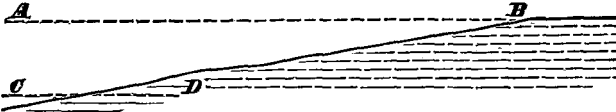
In illustration of this, the following woodcuts are given. If the water level A B (Fig. 1) sinks suddenly to C D, and then comes to

FIG. 1.



a state of comparative quiet, the terrace T will be laid dry, and the formation of the lower terrace *t* begins at the lower level. If, on the contrary, the water at the level A B sinks gradually and slowly to C D, and continues to sink, the materials of the water-course will be heaped up to the water-level of each year, and high and low tide will affect the detritus at the same time, and a slope will be formed from B to C, but no distinct steps (Fig. 2).

FIG. 2.



These facts lead the author to conclude that the motion occurred with several shocks, with intervals of comparatively slow motion, if not of rest. And it follows from this that any computations of time derived from such motion cannot be very accurate.

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## REVIEWS.

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- I.—THE TRUTH OF THE BIBLE: EVIDENCE FROM THE MOSAIC AND OTHER RECORDS OF CREATION; THE ORIGIN AND ANTIQUITY OF MAN; THE SCIENCE OF SCRIPTURE; AND FROM THE ARCHEOLOGY OF DIFFERENT NATIONS OF THE EARTH. By the Rev. BOURCHIER WREY SAVILE, M.A. 8vo., pp. 325. London: Longmans, Green, & Co., 1871.

THE number of books treating of Science and Religion, which have been and continue to be issued, is astonishing, and, so far as we are aware, few, if any, solid results are gained by their publication. Indeed, this is so manifest, that we are led to inquire whether after all there is any direct relation between the subjects. Most of these authors, it seems to us, start with a misunderstanding, and it is because of this misconception that so many of these Geographical books continue to be written. First, they are under the