

a notice of a Batrachoid fossil, which he observed in the Earl of Enniskillen's collection (then Lord Cole), from British Coal-shale, the exact locality from which it was obtained being doubtful, but probably from Carluke, in Lanarkshire, named by him *Parabatrachus Colei*; and in the same volume *Dendrerpeton Acadianum* (Wyman and Owen) is described from the Coal-shale of Nova Scotia.

In January 1854 (JOURN. GEOL. SOC., vol. x., p. 207), Professor Owen described under the name of *Baphetes planiceps*, a Sauroid Batrachian of the family Labyrinthodontia, from the Pictou Coal of Nova Scotia; and in March 1857, Professor Wyman, in the American Journal of Science and Art, describes a species of *Raniceps* found in Cannel Coal at Yellow Creek, Ohio, United States.

Other Reptilian remains, amongst them *Hylonomus Lyelli*, etc., found with terrestrial mollusca, and an insect in the hollow trunk of an erect *Sigillaria*, from the same Coal formation, and a new species of *Dendrerpeton* are alluded to in vols. 16 (1860) and 19 (1863), Quarterly Journal Geological Society, by Dr. J. W. Dawson. In the same, vol. 19 p. 56, Professor Huxley describes *Anthracosaurus Russellii*, a Labyrinthodont from the Lanarkshire Coal field. Lastly, Professor Owen described a new genus of air-breathing reptiles from the Coal Measures of Llantrissant, Glamorganshire, discovered by Mr. John E. Lee, F.G.S., of Caerleon, which he named *Anthrakerpeton crassosteum*, in the GEOLOGICAL MAGAZINE, vol ii., p. 6, pl. I. and II.

It will be seen, therefore, that in accordance with the progress of Palæontological knowledge during the period of the Coal formation in Ireland, we have further confirmation only of what was previously known as to the existence of a peculiar group of Reptiles adapted to the conditions of living in marshes, or amidst the vegetation of a humid climate, such as the Flora of the Coal period discloses to us, consisting of large succulent Arboreal Plants and Ferns, accompanied by Sauroid Fishes and amphibian Reptiles.

At a subsequent period, we find a distinct type of Labyrinthodonts come into being, adapted for a less aqueous existence, represented by the *Labyrinthodon* or *Mastodonsaurus* of the Trias or New Red Sandstone.

We see, therefore, that the laws which governed the creation and distribution of Animals and Plants in the past, remain still the same, each being adapted to its peculiar conditions of life: and, remembering this harmony of existence as displaying the perfection of wisdom in the Great Creator, we should not be led to expect, neither do we find, any departure from such laws in these records of the past which Palæontological discovery discloses to us.—Very truly yours,

WILLIAM HELLIER BAILY.

DUBLIN, January 16, 1866.

THE EFFECTS OF WEATHERING ON ROCKS.¹

• To the Editor of the GEOLOGICAL MAGAZINE.

SIR,—Some kinds of rocks waste freely under the influence of

¹ See the January number of the GEOLOGICAL MAGAZINE, p. 46.

atmospheric agencies. Various Traps weather freely, also some kinds of Limestone; Granites generally waste, more especially some of the Granite Porphyries and Vein Quartz, which, when exposed, usually split up and crumble away.

If the atmospheric agencies (that is *Chemical action, the Sun's rays, Wind, ordinary Frost, Rain and Rivers*) have formed the features of this country, should not these kinds of rocks be those on which they acted most? I should answer "Certainly;" but this is not the case. The plain of Limerick is diversified by *Carrigs, Ridges, and Doons*, most of which are composed of the Traps and Ashes that are associated with the Limestones of that country. These Traps and Ashes weather much more freely than the Limestones; why, therefore are the hills formed of Trappean rocks? Should not the Limestones that are less affected by the atmospheric agencies be found in the hills and the Trappean rocks in the low ground?

Most of the rocks in the hills that occupy the north-west part of the County of Galway are dressed and scratched by Glacial action, therefore the effects of weathering since that period can be well observed. The Schist Quartzite and some of the Gneiss retain the scratches well, but the scratches are rare on the other kinds of rock. From this we see that the Limestones, Vein Quartz, Altered Traps (*Hornblende rock, Epidote, Granite, etc.*), and Granites, weather most, and therefore ought principally to have been eaten away, when the features of the country were being formed by atmospheric influence. This, unfortunately is not the case, as in most of the summits of the hills Granite or Altered Traps are found. Besides, associated with the Quartzite is Vein Quartz, full of minute joints, which causes it to break up with each winter's frost, while the Quartzite remains intact; and yet when the features of the country were formed, the former must have resisted better than the latter, as the Vein Quartz now stands out in marked reefs and projecting courses.

The Limestones of the N.W. of the County of Galway, when exposed, are deeply scored by the atmospheric agencies; and as they occur frequently in the large valley that extends from Oughterard to Clifden it might be said—"This feature is due to the wasting away of the Lime rock." However, I believe their occurrence here is purely accidental, as the Limestones are not found in the whole length of the valley, and in those parts of it where they do occur, they are often in hummocks above the associated Gneiss and Schist. A mass of Limestones strike across the hills N.W. of Oughterard, and if the existence of the valley just mentioned is due to the waste of the Lime-rocks, then Limestone ought also to have wasted away and formed another valley. Moreover, on the north slope of the hills that lie south of the Maum branch of Lough Corrib, there is an isolated boss of this Limestone, forming a well marked *Carrig* on the hill side. Ought not this Lime-rock to have disappeared before the surrounding Gneiss and Schist?

These facts which I have mentioned, and that seem to me to be against atmospheric agencies, would be in favour of marine denuda-

tion and ice action. The Trappean rocks of the County Limerick are naturally harder than the associated Limestone, therefore, as the land rose, and came under the influence of Marine denudation, the Limestones would have been much more rapidly worn away, leaving the Trappean rocks standing up as Skerries, Carricks, and Carrickgeens; and also when the country was covered with ice, they would have resisted its grinding action much more than the Limestone. Similar results would occur in the hills of the N.W. of the County Galway, as the Granites and Altered Traps are naturally harder than the Gneiss and Schist, and the Vein Quartz than the Quartzite. Some of the Limestones were naturally harder than the Schist and Gneiss, but not all; therefore some parts of it project above the other rocks, while other parts were cut away equally with the Gneiss and Schist.

Yours truly,

G. H. KINAHAN.

DOUGHTERARD, IRELAND.

ON THE DENUDATION OF SOUTH AFRICA.

To the Editor of the GEOLOGICAL MAGAZINE.

SIR,—That part of the interior of South Africa extending from the eastern slopes of the Zwartbergen and Zuurbergen, and the continuous chain of hills which dies out on the sea-coast, near the mouth of the Qualana River, to beyond the Vaal River, and from Beaufort, far west to some undetermined line a long way to the north of Faure-smith, is occupied geologically by a series of nearly horizontal beds of hard Sandstone, Clays, and Marls, intersected by numerous dykes of Greenstone, Syenite, and Basalt. These strata contain, throughout their whole extent, as far as it is known at present, numerous bones of Reptiles, stems of *Calamites*, leaves of *Glossopteris* and other ferns; shells of a species of *Iridina*, and some Fish with heterocercal tails have been found at Fort Beaufort, Spitzkop, and elsewhere. All these remains concur to prove that Mr. Bains' conjecture that these beds were of lacustrine origin is correct. No fossil of any kind, even possibly marine, has yet been found in them. Professor Owen inferred, from a pretty extensive series of reptilian bones and fish remains, that the age of the formation corresponded nearly with the Triassic of Europe.

Now, with the exception of a few beds of Recent or Tertiary Limestones, where the Lacustrine strata reach the sea-coast, there is no evidence of any part of this formation having been covered by the sea at any time since the desiccation of the lake; and, therefore, it is clear that the denudation which the country has undergone is not due to marine action. It may, I think, be safely inferred, that had the ocean rested upon these strata sufficiently long to produce any serious amount of denudation, some beds of rock, containing sea-shells, would have been left. The action of Glaciers may, I think, be left out of our estimate of denuding forces, considering the latitude, and probably not very great elevation of the country. The denudation