

Metamorphic Rocks, Ireland

THERE appears to be confusion as to the times when metamorphic action occurred among the Irish rocks; my experience would point to the following:—

In the Carnsore district, South-East Wexford, there are metamorphic rocks for a long time supposed to be of Lower or Cambro-Silurian age; I however proved that they were upturned, contorted, metamorphosed, and denuded, prior to the overlying fossiliferous Cambro-Silurian rocks being deposited, and for the reasons given in the Geological Survey Memoir it is probable these metamorphic rocks are of Cambrian age.

In the hills north of Pomeroy, Co. Tyrone, there are metamorphic rocks, which were upturned, contorted, metamorphosed, and denuded, prior to the overlying fossiliferous "Pomeroy rocks" having been deposited. The fossils in the latter would point to their being Cambro-Silurians; consequently the metamorphic rocks are older, and for reasons given in a paper read before the Royal Irish Academy I believe they are the equivalents of the "great micelite series," West Galway, or the equivalents of the Arenig group of Wales. That is either Upper Cambrian, or *Passage beds* between the Cambro-Silurian and Cambrian.

In Erris, North-West Mayo, there is a tract of excessively metamorphosed rocks, supposed by Griffith to be older than the associated altered Cambro-Silurians, and this opinion is shared in by Mr. McHenry, who more recently examined them.

From the above it is evident that there was a *period of intense metamorphism prior to the Cambro-Silurian age*.

The Cambrian (Arenig group?) and Cambro-Silurian of Galway and South-West Mayo must, in part, have been altered prior to the deposition of the Upper Silurians on them; while the general metamorphism of the South-East Ireland Cambro-Silurians, which was quite irrespective of the intrusion of the *Leinster granite*, was probably at about the same time. If the Comeragh Mountain rocks are Glengariff grits, *i.e.* Silurians, the age of the metamorphic action is evident, as in Waterford these rocks underlie those of the Comeragh Mountains. In addition to the general metamorphism in the rocks of South-East Ireland, there was also a local and secondary action in connection with the protrusion of certain granitic rocks.

The testimony of the West Galway and South-West Mayo rocks alone, however, would prove a *period of intense metamorphic action at the close of Cambro-Silurian time*.

In South-West Mayo, as proved by Mr. Symes and myself (*Maps and Memoirs of the Geol. Survey*), there is a considerable area of metamorphosed Upper Silurian rocks, which prove another *period of intense metamorphic action subsequent to the dawn of Upper Silurian times*. The secondary metamorphism previously mentioned in South-East Ireland may also be of this age, as the granitic rocks allied with the metamorphic, in both areas, are very similar.

Thus there are records of at least three periods of intense metamorphic action, and probably there were two others subsequently—one in the Triassic and another in the Miocene time—to account respectively for the metamorphic rocks in the neighbourhood of the Mourne granite, Co. Down, and those associated with the granitic rock near Portrush, Co. Antrim.

Formerly, as mentioned by me in the "Geology of Ireland," the period of greatest metamorphism was considered to have been at the close of the Cambro-Silurian time; now, however, more recent research has taught us that metamorphic rocks, formerly supposed to be Cambro-Silurians, are Cambrians; so it seems possible the metamorphic action prior to Cambro-Silurian time may have been greater than that subsequent to it.

Ovoca, Ireland

G. H. KINAHAN

The Number of Known Species of Hemiptera-Heteroptera

As Mr. Pascoe, in his very "handy book of reference" for zoological classification, says of the Hemiptera-Heteroptera that "in round numbers there may be about 10,000 species in this sub-order," I am induced to give my census of the group.

On completing, about a year ago, MS. lists of the families which Stål unfortunately did not live to include in his "Enumeratio Hemipterorum," I was tempted to try and ascertain the total number of species that had been described. This I found to be about 7,800 (the actual number arrived at is 7,780). Of these, 7,445 belong to the Geocorisæ or Gymnocerata (mostly terrestrial bugs, but including four families which inhabit the

surface of water), and 334 to the Hydrocorisæ or Cryptocerata (almost all aquatic species). Of the Geocorisæ 1,503 are European, 3,248 are natives of the rest of the Old World, and 2,694 are American; of the Hydrocorisæ the corresponding numbers are 95, 120, and 119. The largest family of the Geocorisæ in Europe is the Capsidæ with 500 species, as against 134 and 312 in the rest of the Old World and America respectively. Amongst the Hydrocorisæ the family Corixidæ is most numerous in species, the numbers being: for Europe 72, the rest of the Old World 17, and America 34. But as these two families contain many inconspicuous species, and species having a strong resemblance *inter se*, and as Europe has been (naturally) more thoroughly investigated than the other regions, it is likely that many extra-European species of these families remain yet to be discovered.

Of what may be the actual number of species of Hemiptera-Heteroptera existing it is difficult to form an estimate. It is only of late years that much attention (comparatively) has been directed to the order, and from the number of new species sent home by the few collectors who condescend to collect bugs, it is evident that very great additions to the list will in course of time be made. Even within the last twenty years the list has been more than doubled, as in A. Dohrn's catalogue, published in 1859, only 3,627 are mentioned.

Of the sub-order Homoptera it would be rather difficult to make a census. In Dohrn's catalogue somewhere about 3,000 species are catalogued—a number not very far short of that of the Heteroptera. In the British and European lists the number of Homoptera is about two-thirds that of the Heteroptera.

Perth, October 19

F. BUCHANAN WHITE

On the Classification of Rivers

It has often occurred to me that a convenient classification of rivers might be obtained by arranging them according to their "water-discharge." Such a classification would not only indicate the relative position of one river to another in a descending scale, but would enable a rough estimate to be borne in the memory of the amount of water any particular river may discharge.

I therefore venture to suggest the following arrangement: and have given below the names of seventeen rivers, the discharges of which I have obtained from various sources, for which I would refer the reader to NATURE, vol. xxii. p. 486.

Discharge of Cubic Feet per second

First Rate. Above 2,000,000.	Second. Above 1,000,000.	Third. Above 500,000.	Fourth. Above 250,000.	Fifth. Above 100,000.
Amazon.	Congo.	Yang'tse. Plate. Mississippi.	Danube. Shat-el-Arab.	Ganges. Indus. Atrato. Nile. Yellow River.
Sixth. Above 50,000.	Seventh. Above 25,000.	Eighth. Above 10,000.	Ninth. Above 5,000.	Tenth. Below 5,000.
Rhone. Rhine. Po.			Pei-ho.	Thames.

Woodlane, Falmouth, October 19

H. B. GUPPY

Yuccas under Cultivation

IN NATURE, vol. xxi. p. 315, in the report of the *Proceedings* of the Linnean Society, it is stated that "the yuccas fruit rarely under cultivation, the large white pendulous flowers being in the wild plant fertilised by a moth of the genus *Pronuba*." The yucca has been introduced and is very abundant in this colony, especially round Noumea. It fruits freely; in fact I rarely see a plant in which many, if not most, of the flowers do not produce seed-pods. In my own garden they seem to be fertilised by the common bee, of which I have a hive, others being in the neighbourhood. If I remember rightly, *Pronuba* is a genus of large moths having yellow underwings. We have a species identical with, or closely resembling, an old Ceylon friend, but it is rare; still it does exist here, and may assist in the fertilisa-

tion, though I should say, from the number of flowers fertilised, that other agencies preponderate.
E. L. LAYARD
British Consulate, Noumea, New Caledonia, July 31

Intellect in Brutes

I CONFESS I do not see much "intellect" in a snake biting its own tail (cf. NATURE, vol. xxii, p. 40); on the contrary, I consider the creature evinced remarkable stupidity. Perhaps however you will think what I now relate will show that snakes do possess reasoning powers.

Many years ago, while in Ceylon, I lived in a house in "Slave Island," raised on a high platform. The steps up to the door had become loosened, and behind them a colony of frogs had established themselves. One morning I watched a snake (a cobra) creep up, insert his head into a crack, and seize a frog, which he there and then swallowed. But the crack that admitted the thin flat head and neck of the ophidian would not permit of the same being withdrawn when the neck was swollen with the addition of the frog inside it. The snake tugged and struggled, but in vain, and after a series of futile attempts disgorged its prey and withdrew its head. But the sight was too tantalising. Again the head was inserted in the crack and the coveted morsel swallowed, and again the vain struggles to withdraw were renewed. *I saw this repeated several times*, till, gaining wisdom by experience, the snake seized the frog by one leg, withdrew it from its coigne of vantage, and swallowed it outside.

E. L. LAYARD

I SEND you the following dog story, the truth of which is vouched for by the young lady who owned the animal. Her pet dog, a black-and-tan-terrier, was well known to the neighbours for his intelligence. He had established a remarkable friendship for a certain kitten, although given to fierce attacks on all others. This kitten was infested with fleas, which, when the dog discovered, he took her by the nape of the neck, in truly parental fashion, and *soused her up and down in a bucket of water*. He would then take her out into the sunshine and carefully pick out the drowned fleas.

A friend of mine, a naturalist, and a very conscientious man, whose word can be implicitly trusted, gives the following, to which he was an eye-witness. His grandfather, then a very old but hale and hearty man, had a splendid Newfoundland. There was a narrow and precipitous road leading from the fields to the house. It was regarded as a very dangerous place. One day when the old gentleman was doing some work about the farm his horse became alarmed and started off with the wagon along this causeway. The chances were that he would dash himself and the empty wagon to pieces. At once the dog seemed to take in the situation, although until that time he had been impassive. He started after the horse at full speed, overtook him, caught the bridle, and by his strength arrested the frightened creature until help could reach him. My friend gives many other stories of this fine dog, and thinks he had a decided sense of humour. I will repeat that both of these tales come to me well authenticated, and I could, by seeking permission, give names and places.

W. WHITMAN BAILEY

Broun University, Providence, R. I. (U.S.A.), October 10

Atmospheric Phenomenon

LAST evening (October 21) at 5.45 p.m. I observed four huge radiating arms of faint white light, like the spokes of a gigantic wheel, rising from a centre apparently on the west-south-west horizon, and extending almost to the zenith. I say apparently on the west-south-west horizon, because an intervening house prevented me from seeing the nucleus of the diverging rays. The aspect of the phenomenon was more suggestive of an aurora than anything else I know of, but the beams of light seemed to be quite stationary, and although I fancied their brilliancy increased at one time for a few moments, I cannot be sure. Other fainter rays appeared to me to divide the west-south-west sky with those I have mentioned; but on that point I am also not sure. The sun set at 4.53 p.m., and twilight ended about 6.43 p.m., at which time the appearance I have attempted to describe was no longer visible. The sky was heavily clouded.

I should very much like to know the cause of this (to me) singular exhibition of light.

B.

Kentish Town, N.W., October 22

Temperature of the Breath

WITH reference to the high reading, 107° - 108° , noticed by Dr. Dudgeon when a thermometer tightly wrapped up in the folds of a silk handkerchief was kept in the mouth for five minutes, might I ask Dr. Dudgeon if he has verified this reading by immersing the thermometer, with a handkerchief tightly rolled round its bulb, in a vessel of water, at say 108° , the temperature of the water being simultaneously taken by a standard thermometer with its bulb uncovered? It seems to me that there is some danger of actually squeezing up the reading of a delicate thermometer when twenty or thirty folds of a silk handkerchief tightly encircle its bulb.

F. J. M. P.

October 23

Crossing Rapid Streams

HAVING read some letters lately in your paper on the subject of crossing rapid streams by means of carrying heavy stones, it strikes me that the following may be of interest to your readers. It is an extract from a survey report by Lieut. (now Major) Woodthorpe, R.E., written in 1876, describing the method, which he saw practised by men of the Naga tribes, for crossing a deep stream too rapid for their feeble powers of swimming, and about twenty yards wide:—

"Taking large stones in their hands, they waded in up to their necks, and throwing up their legs and lowering their hands, the stones carried them to the bottom, along which they crept on all-fours till they reached the shallows on the other side."

The rough bottom afforded them sufficient hold to withstand the modified current and resist flotation.

C.

Mussoorie, September 28

Construction of Telescopes and Microscopes

PERHAPS some of your readers may be able to inform me whether there exists in English or French a work on geometrical optics, in which the author applies himself thoroughly to explain the optical (not the mechanical) construction of telescopes and microscopes. Works like those by Parkinson and Polter stop short exactly where the application of theory to the construction of the best instruments begins.

P. C.

September 30

BENJAMIN PEIRCE, F.R.S.

WE regret to have to record the death at Cambridge, Mass., on October 6, of Prof. Peirce of Harvard University, following upon an illness of three months from Bright's disease. Prof. Peirce was the son of a former librarian of the university, Benjamin Peirce, who died in 1831. For the past thirty-five years he has occupied a professorship at Harvard; and as a lecturer, author, thinker, and investigator, has not only ranked amongst the first of a numerous corps of professors, but also among the first of American men of science. Devoting himself originally to mathematics, Prof. Peirce has successively pursued exhaustive studies in all the branches more closely allied to mathematics, and has obtained eminence equally in physics, astronomy, mechanics, and navigation. His numerous investigations in these various departments, while read before various scientific societies, have been published, unfortunately, for the most part in the briefest possible form, and the results of many of his researches are to be found only in the manuals he published on various subjects. As an author Prof. Peirce was highly esteemed upon both sides of the Atlantic, his work on analytical mechanics, which appeared in 1857, being regarded then even in Germany as the best of its kind. His chief works are a "Treatise on Algebra," a "Treatise on Plane and Solid Geometry," "Pure Mathematics," a "Treatise on Sound," "Ocean Lanes for Steamships," "Tables of the Moon," "System of Analytic Mechanics," "Potential Physics," "Linear Associative Algebra," "Analytic Morphology," and "Criterion for the Rejection of Doubtful Observations." As a lecturer Prof. Peirce was highly esteemed in both scientific and popular circles. It is related that in 1843, by a series of popular