and metatarsals of *Homo* is seen a repetition of the same structure in *Troglodytes*. Few but those who have studied the subject with the anxiety of the practised observer, can appreciate the pleasure with which the morphological student detects in the gorilla skull a structure, however trivial, which he has also found in man, even when he recognizes such an organ as the styloid process of the temporal in man in the angular termination of that "ridge which extends from the ectopterygoid along the inner border of the *foramen ovale* in the Gorilla," such "styloid" being absent in the Chimpanzees, Orangs, and Gibbons, and probably in the fossil *Dryopithecus*. In every structure that shows on the part of the lower forms of man an approach, either in degree or in kind, with a similar structure in the higher *Quadrumana*, the disciple of unity of descent finds a basis for his arguments; whilst he who abides, and may be working out, a demonstration of the mode of origin of species, accepting the evidence of their origin by law, and the maintainer of the faith in special creation, gives due weight to, and watches for the distinctions which limit the sub-class *Archencephala*.

GEOLOGY OF CASTLETON, DERBYSHIRE.

BY JOHN TAYLOR, F.G.S.

Now that the "season" is fast approaching for field-work, a few remarks concerning the geology of the above locality will doubtless be acceptable to many of our readers. Such of them who may have broken ground on it will remember with pleasure its beautiful scenery and the peculiar charms which attract the naturalist to it. That it is interesting in more respects than a merely geological one, is shown by the botanists who wander there in search of rare and beautiful plants, and the antiquarian who finds in its old keep and other more ancient relics subjects for thought. Above all "Moultrassie Hall" and "Peveril Castle" hold an honoured place in our literature enshrined by the genius of Scott. The flora of the locality is particularly interesting, especially that of the lower class.

Fig. 1.—The "Peak" Cavern.

Maidenhair, spleenwort, and rue-leaved spleenwort grow upon almost every wall; and the cystopteris in several species is also common, whilst the adder's-tongue and the little moonwort are exceedingly plentiful

in the richer pastures. The number of mosses is exceedingly great. The beautiful *Bryum dendroides* and others abound in the moister spots of the Cave Dale. In fact, the botanical character of the vegetation hereabout is so peculiar to the three formations which are found as to form a geological map to the underlying rocks, coloured by nature herself! The limestone clothed with its short and beautiful carpet of green; the black shales of the Yoredale rocks covered by their stunted and brown vegetation; and the millstone-grit in the glowing summer-time quite purple with the flowers of the heather. And for land shells no other locality can compete with it. From the robust *Helix aspersa* to the diminutive *Pupa* numerous species intervene; some of them, such as *Clausilia* and *Pupa*, being more numerous in individuals than any other place that I have visited.

But to the geologist the rocks present treasures of fossils most beautifully preserved. I have found the *Terebratulula hastata* retaining its purple colour-bands as beautifully as when alive in the carboniferous seas; and in some places every slab that is turned up is matted with *Retepora* and *Fenestrella*. Coming here from Manchester, along the new road from Chapel-en-le-Frith, the first place where we meet with the limestone is about a mile and a half distant from the town. This hill, Trecliff, is about six hundred feet in height, and the dip of the beds is about 25° in a direction N.N.E. It is in this hill that the "Blue John" mines are situated; and is the only locality in the country where this peculiar mineral is met with. It lies in "pipe-veins," having the same inclination as the rocks which the veins traverse. One of these veins lies in a sort of clayey stratum, and another seems to be imbedded in the nodule state in a mass of indurated *débris*. Besides these, the whole of the limestone masses are fractured and cracked, and, in addition to the pipes, the sides of the cavities are lined with the most perfect and beautiful sky-blue cubes of fluor, and the rhombic crystals of calcite. I remember scarcely anything with greater pleasure than an adventure in search of minerals a year or two ago, in one of these caverns, which was richly rewarded. Witherite, fluor-spar, varying in colour from transparency to rose, blue, violet and other colours, selenite, and occasionally phosphate of lead, are all found in the lead-mines of the neighbourhood. Some varieties of calcspar have the property of double refraction, like Iceland spar.

Nearly all the characteristic fossils of the carboniferous limestone abound, as may be seen by glancing at the names of the localities given in Professor Phillips's 'Geology of Yorkshire.' The richest localities for obtaining them is just below the "Blue John cavern," and in the gorge at the back of the town, which goes by the name of the Cave Dale. In geologizing along the side of Trecliff hill, one cannot but be struck with the various groups of fossils which the different beds present. The lower beds contain great quantities of *Phillipsia*—heads, carapaces, etc., being very frequently met with, and occasionally they are found whole. Just as we should have expected from knowing that the family of Trilobites died out with the moun-

tain limestone, as we continue our researches higher up in the beds we find their remains becoming more scanty, until at the top they are exceedingly rare. One bed is rich in zoophytes, another in goniatites, whilst another is composed of the broken fragments of *Sanguinolaria*, and the whole of the beds contain numbers of *Spirifer imbricatus*, which connects them like a huge bracket from top to bottom. Some rare geologizing may be had along the lower beds; almost every stroke of the hammer lays open something novel.

The remarkable fissures which occur in the limestone of Derbyshire have afforded matter of speculation to the curious for centuries; the most remarkable one is called the Winnats, and is about a mile distant from Castleton. It gives rise to the most sublime scenery, for the fissure is caused by the splitting of a hill in twain, and the steep precipices on either hand for the distance of a mile and a half, resemble the ruins of old towers and buttresses, in some places clad with ivy, and tenanted by bats and owls. Another such fissure is at the back of the town, and has been already referred to. In some places the passage at the bottom of this is not above three yards in width, and is much of a character, in other respects, with the Winnats. Much speculation has arisen as to the origin of these rents; they occur at nearly right angles to the line of strike, and have doubtless been formed in the first instance by the upheaval and desiccation of the rocks, thus:—

Fig. 2.

Subsequent to this they have been worn and channelled by atmospheric and aqueous action. They have been attributed to plutonic agency, but it needs little geological knowledge to see that the above theory is the true one. Along the lower beds in the Cave Dale there is another good spot or two for the geologist. Here are found numbers of trilobites, some quite entire; groups of the entomostracan *Cytheræ*, and that rare fossil the *Cyclas radialis*. One bed seems quite a nest of *Pleurorhyncus armatus*, although they are very fragile and require great care to extract them with the cone entire. Plutonic action has not been absent in the neighbourhood, for at the top of this fissure are beds of greenstone, and an imperfectly columnar basalt, whilst the limestone around seems to be somewhat crystallized by the heat to which it has been subjected by the intrusion.

Old Mam Tor, the "Shivering Mountain," in geological position lies just above the limestone. The shales which compose it are speedily decomposed by atmospheric agency, and hence have given rise to the popular name which the mountain bears. The inclination of its beds is E.N.E., and the intensity of their dip about 40° . These

beds can be traced through Hope on to Hathersege; and along the brook side, below Mam Tor, a good section is displayed, where they are seen abutting against the lower limestones. Along the stream at Hope good sections are also exposed, and they are seen in several places on the road to Bradwell. The bottom beds of the shales are intercalated with stony bands composed of the remnants of encrinite-stems and fragments of shells, and have been caused by the denudation of the limestone during their formation. The bottom shales are rich in *Aviculo-pectens*, *Goniatites*, *Posidonia*, etc., and the numerous iron-stone bands higher up the hill are rich in small goniatites, which are frequently found pyritized.

The most striking peculiarity of these shales is the fact that about a couple of miles from Castleton, where they rest upon the limestone, the bitumen which has steeped them has also percolated and oozed out into the limestone, turning it quite black, as also the fossils which, when split open, are often seen to contain a little globule of bitumen. Here we see the decomposed remains of two subdivisions separated by a great gulf of time, mingling together, both testifying to the great law of death which has prevailed since the dawn of life. When the fossils of the limestone are cleft open, they are often seen to contain a little globule of bitumen. Do not all the labours of the geologist prove that death is as much a natural law as that of birth, and that creation has been concomitant with extinction, as with individuals has been life and death?

NOTES ON A NEW MASS OF METEORIC IRON FROM THE CORDILLERA OF COPIAPO, CHILE.

BY WM. BOLLAERT, F.R.G.S.,

Cor. Mem. Univ. Chile and Amer. Ethnological Society, etc.

This was found by a muleteer, in June, 1858, when passing the Cordillera from Catamarca to Copiapo, and brought by him to the latter city. He took it to be a *rodado*, or piece of silver-ore that had been broken from a vein and rounded by being washed with stones, say in the bed of a river; but on its being examined by Dr. David Garcia (a pupil of Domeyko), at Copiapo, he pronounced it to be a mass of meteoric iron.

Dr. D. Garcia is the manager of the "Transito" maquina or silver amalgamating works, and has this specimen in his possession. Mr. Abbott tells me it is considered a most interesting specimen, being so perfect (not a broken fragment), and whole.

Meteorite from Copiapo.