VIII. *On the Strata in the Neighbourhood of Bristol.*

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With Notes extracted from the Communications of

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AN elevated ridge of land divides the vale of Bristol from the plain which is watered by the Severn. The parallel strata which compose this ridge rise towards the north-west at an angle of about 45° emerging from beneath the horizontal beds upon which the lower part of Bristol is built, and are afterwards broken off as they come in succession to the surface. At the base of the western escarpment of this ridge the lowest of the highly inclined strata abut with their broken edges against the horizontal beds of another formation, which there occupy the plain forming low hillocks almost to the Severn. The Avon passing through a precipitous ravine cuts all these strata almost at right angles to their planes, and exposes a section of them which may easily be observed, and has supplied me with the principal materials for the present paper.

In the channel of the New River at Bristol a stratified red and yellow sandstone may be observed in strata nearly horizontal, but a little inclined to the north-west. The thickest of these strata are

singularly divided into regular cubical or rhomboidal concretions,* the planes of which cut the planes of stratification at angles of about 45°. Some parts of this rock make a fine building stone, as may be seen in the docks, where the stonework is constructed of it. There is a number of small cavities in the sandstone filled with crystals of sulphate of strontian of a red or dull white colour, both colours appearing sometimes in the same crystal.

In the low ground, on which great part of Bristol is built, hollows occur in the surface of the sandstone, which are filled with alluvial matter, such as clay, peat, &c. The clay is of a blue colour, and from 10 to 20 feet thick. On digging the channel of the New River 12 or 14 feet below the surface, a bed of peat was found more than 2 feet thick. At the top of the peat were a number of oak trees, tolerably sound, all lying towards the north.†

On rising from the vale of the Avon to the higher part of Bristol a siliceous iron-stone appears. Great part of Clifton is built upon this rock, which is also found in the country south of the Avon, forming that part of the hill above Ashton on which Sir H. Smith's house stands, and passing a little to the south-east of Belmont. It is in the cavities and veins of this rock that the beautiful quartz crystals, called Bristol stone, are found. They form 6-sided

* George Cumberland, Esq. of Bristol, has observed the same concretions, of which he has presented to the Society a drawing. According to Mr. Cumberland the sandstone alternates in its lower part with layers of a blue or greenish colour, and abounds with sulphate of strontian, the masses of which contain in their cavities crystals of the same substance of a lanceolate form and of an opake white colour. The masses are very fragile, and fall to pieces on attempting to disengage the crystals by the hammer. Sulphate of barytes is also found in the sandstone, but in small quantity.

† In the alluvial matter the horns and teeth of deer, the grinders of the boar, and nuts have been discovered. Blue phosphate of iron has also been found imbedded in a brown clay. The trees, according to Mr. Cumberland, had all fallen towards the south-west. Water worn pebbles and rounded blue flints were found at the bottom of the Canal near to the dam.

pyramids; some are of the highest lustre and transparency, others variously coloured by iron ore, or containing acicular crystals of that substance, or of manganese; some are said to be pierced with needles of sulphate of strontian.

Behind Brandon Hill there are beds of sand highly impregnated with iron, and containing impressions both of shells and vegetables.* In the descent on the south of Brandon Hill some singular masses of breccia project from the ground, containing rich iron ore, and assuming nearly a cubical form. The siliceous iron-stone of Brandon Hill has been found to make the best grinding stone for enamel colours. Below the siliceous iron-stone, upon the banks of the river near the Hot-well House, three small beds of coal make their appearance. These have been worked close to the river on its southern bank: and on the northern at the distance of two miles, near the Fort, a trial for coal was made some years since, but the seams found were not worth working.

Upon the banks of the Avon, immediately below the coal, there is found an extensive series of beds consisting principally of limestone, which form that high ridge of land which has been already noticed. This ridge passes on the north to Almonsbury and Alveston, and on the south to Clevedon, where the coal field of Nailsea begins. These beds upon the banks of the Avon are remarkably regular in their stratification, being all nearly parallel to one another and dipping to the north-west at an angle of about 45°. They are better observed on the northern than on the opposite bank, being on the former very much exposed by the operations of the quarrier.

Upon the top of this ridge and upon the fractured edges of the limestone strata, behind Clifton, there has been a partial deposition

* Mr. Cumberland mentions the anomia producta as found in the sandstone which lies above the limestone.

of stratified yellow sandstone, forming what has been called an up-filling. In the fissures of this rock crystals of carbonate of lime are found, and crystals of sulphate of strontian, which often assume a radiated form. This sandstone, having sometimes the appearance of a breccia extends to Redland. It is probably spread over the surface of the siliceous iron-stone already described; and in such a position it seems to have been found on Kingsdown in digging the vaults of Portland Chapel. The sandstone was there less firmly agglutinated, and the sulphate of strontian occurred about 4 feet below the surface in large irregular balls weighing many pounds.* At Redland this sandstone and the strata upon which it rests are rather abruptly terminated, being covered by a limestone stratified horizontally in thin layers, containing ammonites, gryphites, and anomiæ in abundance, and agreeing in all its characters with the well known limestone called *lyas*. The lyas extends to Cotham, where some of the strata are remarkable for taking a beautiful polish, being known at Bristol by the name of the Cotham stone. This lyas burns to a brown lime which sets hard under water.

But to return to the limestone. I do not intend to describe in detail all the beds of it; but the following are what I thought best deserving of notice, from their commencement immediately below the coal down to the lowest in the series. The first part of the series is best observed on the northern bank of the river.

* A beautifully crystallized specimen from these excavations was presented to the Society by Mr. Cumberland. It was found together with many other masses of the same substance imbedded in yellow marl. On digging the excavation for some houses at Clifton, according to Mr. Cumberland, the following minerals were found, but it is not known in what bed the vein occurred to which they belonged. Crystals of galena with foliated sulphate of strontian upon a matrix of sulphate of barytes. Quartz crystals enveloping needles of sulphate of strontian. These excavations are now closed, and the ground being built upon the minerals can no longer be procured.

1. A mass of limestone composed almost entirely of organic remains, and containing much iron, with madrepores between the strata . . . . . 90 feet

2. Ten thin beds of blue and close-grained limestone, with clay between them, in which madrepores are imbedded . . 8

3. Limestone composed entirely of particles bearing marks of organization 18

4. A very thin stratum of red clay, covering

5. *A layer of coaly matter, one inch thick.

* *The following more detailed section of the beds lying above the coal marked No. 5, in the text, has been communicated to the Society by G. Cumberland, Esq.*

	Ft.	In.
1.—Sparry limestone, the edges of which being tinged with iron resemble lepidolite ..... feet	10	
2.—Red, blue and white schistose clay	26	
3.—A stratum very full of fissures, the laminæ composed of quartzose sand united by a quartzose cement	9	
4.—A stratum of what is called "Dun marle," containing very angular fragments of limestone and ironstone: the marl is red, blue and white, and is speckled with ferruginous sand and pieces of schistose clay	6	
5.—A very hard mixture of ironstone and quartzose sand with portions of an oolitic texture.....	9	
6.—A ruddy and arenaceous limestone, ochreous, passing into ironstone of a fine grain	2	
7.—A stratum of ironstone 1 inch thick; then a very hard and fine grained arenaceous stratum	6	1
8.—A fine grained arenaceous stratum	2	6
9.—A stratum containing fragments of shells	4	
10.—A stratum containing fragments of shells and corals, in part argillaceous, and having the oolitic texture; of a brown colour.....	4	
11.—Three inches of ochreous clay with blue schistose clay, with oblong geodes of red iron ore very compact and hard		3
12.—Limestone having throughout the oolitic texture.....	12	
13.—Schistose clay or stone with nodules of coral		5
14.—Very arenaceous limestone with oolitic texture.....	1	
15.—Schistose wet clay coloured by iron with nodules		2
16.—Limestone, somewhat oolitic, tinged with iron, containing broken shells..		4

6. Blue clay divided by bands of yellow clay . . feet 12

7. Limestone resembling No. 3, this occurs at the distance of about 100 yards west of the Well house.

8. Limestone that is quarried as being fit for burning, forming magnificent cliffs about $\frac{1}{4}$ mile beyond the Hot-well house.

	Ft.	In.
17.—Dove-coloured, oolitic limestone with broken shells. The strata cracked.	8	3
18.—Grey compact limestone, irregularly oolitic	6	
19.—A stratum somewhat arenaceous, tinged with iron	2	6
20.—A schistose limestone	1	
21.—Two layers of soft limestone tinged with iron, separated by a layer of schistose clay 2 inches thick		
22.—Dark and fine grained limestone, divided in part by loose schistose clay	2	
23.—Seven thin layers of schistose limestone, separated by loose friable schistose clay with nodules, the whole containing many shells of the winged anomiæ and the anomia producta, with coralloids	3	
24.—Light coloured and fine grained limestone without animal remains, in texture resembling No. 22	1	
25.—Limestone with small broken encrinites	2	
26.—Dark oolitic limestone with broken shells	2	
27.—Limestone with broken shells throughout	1	
28.—Schistose clay		3
29.—Fine siliceous rock without shells	1	6
30.—Rock with oolitic structure partially coloured by blue clay	2	3
31.—A reddish limestone with small arms of the encrinite, their cavities filled with ochreous matter	6	
32.—Coal about 2 inches thick, resting upon ironstone and red schistose clay, three or four inches thick		6

Of these strata only two will burn into good lime, the rest being too arenaceous for the purpose. The organic structure observed in No. 3, of Mr. Bright's section is the oolitic texture noticed by Mr. Cumberland. Mr. Cumberland observes that although this texture is still visible in the arenaceous rocks of a mixed nature, it disappears in those which are purely siliceous. He also mentions that an oolitic limestone may be observed lower in the series of the east side of the combe that separates the pure limestone from the black rock or swine-stone. The fossils of the black rock are the winged anomiæ, and rarely the anomia producta, the palates of fishes, the claws of crustaceæ, corallines of various kinds, the mycetitæ of Woodward, the medusa encrinite, and millions of the stalks of encrinites,

9. Limestone in thin strata, impregnated with ochre so as to be unfit for burning.

10. Ferruginous marl, containing a great many madrepores and shells quite detached from the rock.

11. The first quarry of limestone.

12. The second quarry of limestone. In the limestone of these two quarries the strata although separated by no intervening substance are very perceptible, preserving an uniform direction.

13. Several thin beds of limestone which are not worked.

14. At the distance of three or four hundred yards from No. 12, the assemblage of strata begins, which forms what is called the Black rock, so called from the dark colour of the stone. A third quarry is worked here. This rock is less tinged with ochreous infiltrations than the rest usually are: it contains a great many shells and entrochi, and in its cavities are found dog's-tooth spar, cubes of purple fluor, acicular crystals of sulphate of strontian, and of oxide of iron. Similar cavities occur in the rock of the preceding quarry.

15. Many thin beds of limestone divided by clay, some being very full of shells and entrochi, and others having scarcely any traces of organic matter. Some of these strata from the number of shells they contain may be recognised again on the rising ground at the foot of Leigh Down near the village of Leigh, on the southern side of the Avon.

both round and oval. There has likewise been found in it a complete specimen of the head of an encrinus, and other heads of the encrinus have been observed imbedded in the limestone, and but little distorted. They were first noticed by Mr. Miller surrounding calcareous concretions in the black rock, which are penetrated with petroleum.

Petroleum sometimes exudes from the rock in small quantity; it is very hot to the taste, and is used by the masons for an external application, assisted by friction, to remove rheumatic pains. The black rock is quarried for paving stones.

16. A thin bed of limestone breccia containing rounded pebbles, and organized substances resembling the palates of fish. This bed has not been traced on the southern bank.

17. Limestone highly crystallized, containing much iron, and composed in a great measure of organic matter. It is seen very distinctly on the northern bank of the river cropping out amongst the wood, and resembling a wall about 8 feet high.

The limestone of St. Vincent's rocks when calcined yields a very pure lime: large quantities of it are exported for the use of the sugar works in the West Indies, in an unslaked state and packed in tight casks, and it is used extensively for building. All the roads in the neighbourhood of Bristol are repaired with the limestone, as are those in the neighbourhood of Gloucester, whither it is conveyed by means of the Severn.

Calamine is the most important mineral in point of frequency and value that the limestone yields. It is found in veins of calcareous spar crossing the limestone, accompanied by heavy spar and frequently by galena. The calamine is either amorphous or assumes the form of calcareous crystals which have been encased by it and since removed. The calcareous crystals in these veins have generally the dog's-tooth form; the heavy spar is not crystallized, but appears fibrous or composed of thin laminæ lying above one another. The galena sometimes presents very regular cubes, the angles of which are generally truncated. The calamine has hitherto been worked in a very imperfect manner: the vein is broken into, when it meets the surface; a rough windlass is placed over the hole, and a bucket is attached to a few fathoms of rope; two or three men work at the vein as long as the ore is found in abundance, or until the water impedes their progress. The mine is then deserted, but

the heaps of rubbish at the mouth of the pit are often so rich in ore that considerable sums are paid for the privilege of washing them.

Manganese is also found in this district: it has not however been worked to any extent. The principal pit from which it is taken is in the parish of Ashton on the slope of the hill overlooking the valley to the west of the church. It is found in an iron-stone vein crossing the limestone. What little is found is used at the glass-houses and potteries of Bristol, and at the bleach yards in the neighbourhood.

To the limestone succeed other beds, in which a red siliceous sand is the prevailing ingredient. They lie in very regular strata from a foot to two inches thick, and parallel to those of the limestone. They are best observed on the southern bank of the river along the towing path for the distance of about half a mile from where the limestone terminates. These beds extend on the south of the Avon to Leigh, Failand and Charlton, and on the north they pass near to Sneed park towards Westbury. Some of the beds of this formation near to Abbots Leigh make a fine stone for building.

Among the uppermost of these beds are several composed of sandstone, the fissures of which are coated by calc-sinter, then a thin stratum of sandstone with evident marks of vegetable remains; below which is a red slaty sandstone very micaceous, and then a bed of siliceous puddingstone about 12 feet thick containing in some parts a number of white quartz pebbles.

About the middle of this series of sandstones there is found a singular stratum about 3 feet thick, composed of irregular balls of limestone packed closely together, the intervals being filled with fine sand. Below this the red slaty micaceous sandstone is repeated and at length disappears, being the last of the highly inclined strata that can be distinguished.

The last of these highly inclined strata at the base of their western escarpment are generally covered by beds of a very different character, which lie in horizontal layers upon the broken basset edges of the lowest beds of sandstone. This arrangement of the two formations may be observed to the south of the Avon on the towing-path just where the beds of sandstone terminate, and to the north of the river near to Sneed Park; at these places the sandstone is covered by horizontal beds of that kind of breccia which I shall presently describe. These horizontal beds form a series of low hillocks extending from where the sandstone terminates to within two miles of the Severn. They are best observed on the southern bank of the Avon, at Hûng-road near to Crokerne Pill, where their section is exposed at low tide in a perpendicular cliff nearly 60 feet high. The beds consist of a red loamy earth and of breccia arranged in the following order.

Breccia	3 or 4 feet
Red loamy earth, about . . .	30
Breccia extending to the base of the cliff, and quite below low water mark.	

The upper and lower beds of breccia present nearly the same characters. They both consist of calcareous and siliceous fragments cemented together by a calcareous base, having cavities in it, which are filled with calcareous and siliceous crystals, and sometimes with sulphate of strontian. The calcareous crystals have either the form of the primitive rhomb, or of the dog's-tooth spar, and are sometimes covered over with an incrustation of smaller crystals of carbonate of lime. The quartz is crystallized in six-sided pyramids. Besides the sulphate of strontian which is found crystallized in the cavities in small quantity, it occurs in large masses either imbedded in the breccia, or lying between the two beds of it. It occurs in blocks of

many cwts. in the fields between Ham Green and Leigh, and I am inclined to believe that these are derived from the red loam which lies between the two beds, for I found a mass of it in a ditch lately dug on the slope of the hill below the basset of the upper breccia; but the circumstances were not altogether decisive. The sulphate of strontian from this place is seldom found well crystallized, the best of the crystals that I have met with being tables not exceeding $\frac{1}{4}$th of an inch in length. The entire masses are generally snow white, having the appearance of a coarse grained loaf-sugar, but sometimes they acquire a reddish hue from a small quantity of ochre.

Small veins of galena are found in the breccia. The breccia is found near to Abbot's Leigh, from whence it extends in a position almost horizontal to Crokerne; and it probably occupies the whole space included by a line drawn from Leigh through Failand, Charlton, Portbury and Portishead, and thence returning again through Crokerne to Leigh. On the opposite side of the river it forms the stratum beneath Shirhampton, and runs up the valley below King's Weston hill, extending to the east as far as Sneed Park. In some parts it is found at so high an elevation as to lead to a belief that there may be more than two beds of the breccia: in whatever situation however it is met with its general characters are the same.

The red loamy earth at Hung-road is traversed by veins of fibrous carbonate of lime, which are about an inch thick, and contains hollow calcareous nodules which are often lined on their inner surfaces with beautiful calcareous and siliceous crystals. The quartz varies but little in form; it is almost always in very short six-sided prisms terminated by two six-sided pyramids. It sometimes contains acicular crystals of iron ore: is generally transparent and colourless, but sometimes assumes an amethystine tint. The calcareous crystals vary very much in form, sometimes exhibiting that of the primitive

rhomb, sometimes that of the dog's-tooth, and sometimes very complicated figures with numerous truncations. The whole cavity of the nodule is generally lined with small crystals, which are highly phosphorescent when thrown on an iron plate heated almost to redness.

On cutting through the loam there is generally found a bed of ochreous iron-stone about $1\frac{1}{2}$ foot thick. It is not known to what distance this bed of loam extends. The nodules have as yet been found chiefly in Hung-road wood, and some varying a little in appearance are seen on the opposite side of the river.

To the west of Crokerne Pill you find only a low alluvial plain, scarcely raised above high-water mark, and this continues on both sides of the Avon until it falls into the Severn.

With regard to the springs in the district I have been describing, it may be observed that those in the limestone are low and situated in the ravines, breaking out in many cases between high and low water mark. The hot spring at the Wells rises in the limestone 26 feet below high water mark, and 10 feet above low water, and no water is found at Clifton until the wells are sunk nearly to that depth. When you come to the sand-ridge upon which Leigh is situated, the springs are always found to rise in a high level, and they afford a good supply of water. In the horizontal strata to the west of Leigh very good water is obtained by sinking to the second or thick bed of breccia, or at the utmost by sinking a few feet into the stratum. There is a little spring in Hung-road wood which though perfectly clear has the property of covering every thing over which it flows with a brown calcareous crust. The quantity of water is small, and in summer the stream is frequently dried up.

As to the nature of the soil, the valley of Bristol and Ashton is as verdant an extent of pasture land as any in the kingdom. Its rich

green colour is contrasted with the dark foliage of the elm, which is the prevailing tree of the county, very few oaks of considerable size being now found.

The limestone district has as yet produced little but heath and fern, the rock in general approaching too near the surface to be favourable to vegetation. Much of it however has been lately enclosed on the southern side of the river, and a part of that is of good promise. Within the limits of the sandstone and of the breccia there is very fertile grazing land.

Note on Magnesian Breccia.

By HENRY WARBURTON, Esq.

VICE PRESIDENT OF THE GEOLOGICAL SOCIETY.

[Read 21st June, 1816.]

THE great stratum of magnesian limestone which passes from Sunderland in the north of England through the centre of the midland counties, suddenly terminates, as is well known, in the vicinity of Nottingham; and I am not aware of its reappearance in the south of England having been noticed except perhaps on the north-eastern border of the Ashby de la Zouch coal-field, where it is said to occur in great insulated masses.

The geological relations of this rock to other strata appear to have been well ascertained in the northern and midland counties, where it is described as forming horizontal beds, and as lying under and parallel to the red marl, or occasionally as alternating with it. It has been ascertained by numerous sinkings in the same counties that the

magnesian limestone lies over the coal measures; it is doubtful however whether the coal measures are conformable with the strata of the magnesian limestone; and it is not improbable that they lie under it, having the edges of their tilted and broken sills abutting against the lower surface of the superincumbent rock.

The red marl is so widely distributed in that part of England which lies between Lancashire and the southern coast of Devonshire, and is so frequently found in that district in the same geological position which it occupies in the northern and midland counties in alliance with the magnesian limestone (lying for instance in horizontal strata upon the inclined coal measures, and bounding them at their basset) that it might be expected in some part of its course to discover traces of the magnesian rock. Accordingly I shall mention some instances of the occurrence of a magnesian limestone in the district above referred to, where it either alternates with red marl, or may be considered as connected with it.

In the course of a valuable paper on the Rocks in the vicinity of Bristol, which was long ago presented to this Society, the author, Mr. Bright, has given an account of the strata of red marl which lie along the banks of the Avon. The red marl is there found either lying upon the coal measures, or filling up the vallies that are occasioned by the breaking off of the inclined strata of limestone, where instead of the series of inclined strata that should rise from beneath the limestone, horizontal strata of red marl are found resting upon the broken edges of the limestone or of the first of the rocks beneath it. It is in the red marl last described, as it occurs near Hung-road on the Avon, that Mr. Bright discovered a limestone breccia, of which there are two beds alternating with red marl.

Having examined this breccia on the spot, after having consulted Mr. Bright's paper, and having seen some breccias from the Mendip

Hills of which I knew the nature, and which very much resembled those from the banks of the Avon, I had no difficulty in ascertaining that the cement of the latter was composed of *magnesian* limestone; of which indeed the characters are so strongly marked as to be evident on mere inspection. This breccia consisted of rolled fragments of milk white quartz, and of angular fragments of limestone and sandstone such as are found in the neighbouring inclined strata cemented together by yellow magnesian carbonate of lime; the cement being in great excess. I must refer to Mr. Bright's paper (which I understand will soon be published) for the further description of this rock.

Shortly before seeing the rocks of Hung-road, I had been with the late Smithson Tennant, Esq. to examine the magnesian breccia which he had observed on the Mendip Hills near to the celebrated cliffs of Cheddar. The southern declivity of that limestone chain is there deeply furrowed by wide and extensive combs, in which immense blocks of the breccia many yards in diameter are found lying upon the surface of the limestone. The strata of limestone dip to the south under an alluvial valley, by which they are separated from a low chain of red marl that is found at the distance of about half a mile to the south.

The breccia of the Mendip Hills very much resembles the breccia from the Avon, consisting of fragments of limestone, magnesian limestone, and sandstone cemented together by a yellow magnesian carbonate of lime; but I never discovered in it any of the quartz pebbles which are imbedded in the breccia from the Avon.

Until I had seen the breccia at Hung-road I was unable to account for the presence of these immense insulated blocks upon the sides of the Mendip; but I have since ventured to conjecture that they once formed a subordinate bed in the strata of red marl which are found

on the other side of the alluvial valley of the river Axe, and which perhaps were originally continuous across the valley and rested mediately or immediately upon the limestone; but which have since been removed by denudating causes, the hardest and most durable part of their mass, the magnesian limestone, being left behind.

I have heard of the following additional cases in which a magnesian breccia is found in connection with red marl. Dr. Wollaston in the first instance and afterwards Mr. Greenough informed me that a similar rock was found near to Cowbridge in South Wales, a specimen of which was presented by the latter to the Society. Mr. Aikin also has noticed a breccia of the same description at Caerdeston and Loton in Shropshire.

In thus comparing the magnesian breccia of Bristol with the yellow limestone of the northern and midland counties, I have assumed that the red marl which lies above the coal measures is of the same order with that which lies at the bases of those escarpments, where strata of mountain limestone are broken off; and where instead of the lower beds rising from beneath the limestone we find horizontal strata of red marl filling the plains. I am not prepared to establish this by any positive proof; such evidence as the geology of the plain of Carlisle would afford is already in the hands of Mr. Buckland;* the appearances that are to be sought after for determining this question, and which perhaps may be observed in the neighbourhood of Bristol, are the following: no disposition of the strata is more common in the country between Bristol and the Mendip than that described in Mr. Bright's paper; where a ridge of mountain limestone separates two plains from one another, each containing horizontal beds of red sandstone or marl, the one lying above the lime-

* See his paper, page 105 of the present volume.

stone with the intermedium (perhaps) of the coal measures, the other abutting against the broken edges of the strata of limestone at the base of its escarpment. Perhaps there may be found some valley of denudation connecting together the two plains, which being itself filled with red marl of the same description, there may be an uninterrupted bed of marl through the valley from one plain to the other.

The determining of this question would be of some importance as a matter of speculation, and of some practical consequence to the coal viewer. Those who consider the red marl as one of a complete series of beds succeeding one another in a uniform order, will in every case expect to find the coal measures on sinking through the red marl. If on the contrary we suppose denudatory or other disturbing causes to have been in action previously to the deposition of the red marl, we might expect to find the red marl immediately incumbent upon any rock from the coal measures to the granite inclusive, just as the alluvial beds in which the bones of elephants are found in consequence of previous denudation are discovered resting either upon the blue clay of London, upon the Oxford oolite, or any other bed: and on this view of the subject the red marl will no more be an indication of coal than of any other member of the lower strata.