



XX. On the advantages that may be expected to result, from the study of the principles of stratification; with remarks on the proper objects of inquiry in this important branch of geology

Mr. Thomas Tredgold

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124 *On the Study of the Principles of Stratification.*

- | | |
|---|-----------|
| 6. Slaty marl | 4 inches. |
| 7. Dark blueish-gray limestone, resembling the }
Gunwarden limestone | 3 feet. |
| 8. Disintegrated basalt with calcareous spar .. | 1 foot. |
| 9. Compact basalt | 4 feet. |
| 10. Slaty marl—lowest. | |

Dip south-east at an angle of 8 degrees.

Before closing this letter, it will not be amiss to notice a few phenomena usually accompanying basalt in this part of the kingdom, which may in some measure serve to develop its origin. Limestone is often rendered highly crystalline and unfit for lime, when in the vicinity of this rock, as is the case of No. 5 and No. 7, but not No. 3 of the foregoing section. Slate clay is turned into a substance like flinty slate or porcelain Jasper, No. 2; and coal is invariably charred when in contact with it. When basalt occurs in beds, its thickness varies much more than that of the rocks between which it is interposed, forming wedge-shaped masses rather than regular strata; and the sandstone on which it reposes is changed for some depth to a brick-red colour: pieces of this description of soft sandstone, taken from below the basalt at Bamborough Castle, broke into spherical fragments on being immersed in water.

I remain, sir,

Your most obedient humble servant,

Newcastle-upon-Tyne, July 20, 1817.

N. J. WINCH.

XX. *On the Advantages that may be expected to result, from the Study of the Principles of Stratification; with Remarks on the proper Objects of Inquiry in this important Branch of Geology.* By Mr. THOMAS TREDGOLD.

“Men have sought to make a World from their own conceptions, and to draw from their own minds all the materials which they employed; but if, instead of doing so, they had consulted experience and observation, they would have had facts, and not opinions, to reason about, and might have ultimately arrived at the knowledge of the laws which govern the material world.”—*Bacon*.

To Mr. Tilloch.

SIR, — IN consequence of the discovery of several facts which tend to elucidate the principles of stratification, the science of Geology has acquired an additional degree of interest and importance. Geologists have in a great measure abandoned their wild and fanciful speculations;—they have begun to make observations, and to register facts respecting the present state of the surface of the earth,—and instead of inventing hypothetical solutions

solutions of the most apparent phenomena of its formation, they now attempt to give an accurate description of its structure. Such materials, at some future period, will supply a mind like that of Newton, with the means of establishing a correct theory; for the present state of the earth's surface, is certainly not sufficiently well known, to admit of a satisfactory explanation of its origin.

The knowledge of the relative position of the Strata which form the external crust of the earth, is one of the most important branches of this inquiry; but to render it more useful, there are other objects which should always be attended to in such researches.

It has been observed, that a stratum does not always consist of the same mineral substance throughout its whole extent,—or at least that it often presents the same mineral elements in very different combinations and states; therefore, in a complete description of each stratum, all its principal variations of position, of thickness, of extent and situation of exposed surface, and of mineral character should be accurately described. The petrifications and shells it contains should be ascertained; and of those that are peculiar to it, correct descriptions should be given;—the uses to which its minerals are applied should be noticed, and the probability of obtaining them in other situations, pointed out;—the nature and qualities of the soil on its exposed surface should be described, and the best means of ameliorating or improving it, suggested. The uses of such information—to the owner of landed property—to the miner—the agriculturist—the engineer—the architect—the manufacturer; and, indeed, to every branch of civilized society, are too self-evident to need detail, and of too multifarious a nature to admit of it here. They only require to be known, to be fully appreciated.

In this as in other descriptive branches of natural history, a concise mode of expressing the leading characters of each stratum, will be necessary, by which they may be described with brevity, accuracy, and precision; as by that means the labour of comparing the facts of different observers will be materially abridged, as well as that of describing them. To accomplish this, it may be necessary to introduce some appropriate terms—for all those which refer to hypothetical notions respecting the mode of formation, should be carefully avoided;—the use of hypothesis is unquestionable, but its very nature renders its language unfit for descriptive purposes. Hypothesis may guide us in our inquiries, and give a tenfold degree of interest to our researches; but still it must rather be considered the instrument, than the end of our labours. To a candid inquirer after truth, the danger of clothing his descriptions of natural phenomena in

in the language of hypothesis, must be very evident; and the more so, when he considers the narrow views on which hypotheses must be formed, in the present state of geological science.

It may be difficult to form a regular and general principle of classification, independent of some hypothesis respecting the formation of the strata;—a difficulty perhaps to be removed, only by more complete information respecting the stratification of other parts of the globe: however, as far as relates to this island, the strata might be arranged, according to the order in which they follow one another, beginning at the highest in the series. No doubt mistakes will sometimes occur, in assigning each stratum its proper place in the series, but in the progress of the science, these will be corrected.

The attention of geologists is earnestly called to this, or to some superior arrangement of the British strata; for were such an arrangement once made, and a proper and scientific method of describing the phenomena adopted—the number of observers would soon increase, and the knowledge of this important branch of geology would make rapid advances towards perfection.

The landed proprietor will soon find it as much his interest, to know the nature of the strata that form his estate, as to know the number of acres it contains, and a correct mineral survey of his property, will form an useful and valuable appendage to the plan of his estate. And in thus ascertaining the value of his own property, he will have an opportunity of forwarding the progress of science, by adding the result of his inquiries to the common stock;—every mine that he opens, every shaft that he sinks, will either add additional facts or confirm those already known—even in digging a well, something worthy of note may be observed. And should he previously have made himself acquainted with the principles of stratification, he would then have the pleasure of anticipating the general results, while the progress of the work would enable him to ascertain the accidental variations which frequently occur.

But if the study of stratification afford pleasure and useful information to the settled individual; how much more must it afford to the well-informed traveller!—He will no longer need to confine himself to hasty notices of those geological subjects only, that are apparent to the most careless observer—a wider field will open before him, and the structure and mineral production of the country will form one of the most interesting objects of his research. Other travellers have noticed such mineral productions only, as were in use, or plentifully scattered over the face of the countries they have passed through; but the traveller who knows the nature and principles of stratification will be able, not only to give more satisfactory information respecting the minerals
already

already known, but also to display the apparently hidden resources of other countries, and to furnish those data, which the extended views of modern science have rendered necessary.

As the labour of gaining any new source of knowledge never fails to bring with it its own reward, by a proportional increase of the sources of pleasure, I hope an attempt to bring that of the principles of stratification into more general notice, may not be without effect. It is a branch of knowledge, which, on account of its useful nature, is perhaps better calculated to become popular, than any other. In proof of the truth of this remark it is only necessary to say, that it includes the principles of the important art of draining land;—that from it the probability of obtaining certain minerals in certain situations may be inferred from the nature of the superior strata, without the expensive process of boring;—that it is calculated to check the delusive mining projects, which have ruined thousands, and at the same time to encourage those which are likely to be attended with success; that it also points out the best methods of working new mines, as well as the most effectual means of extending old ones, with security and profit. I am, sir, yours, &c. &c.

London, August 11, 1817.

THOMAS TREDGOLD.

P.S. As the recommendation of any particular branch of science may seem imperfect, without saying something on the means of obtaining it, I have subjoined the following list of works on the subject of stratification. Perhaps some of your correspondents may think proper to extend it, with critical notices on the comparative merits of the writers.

Mr. Wm. Smith's Mineralogical Map of England and Wales: and several numbers of the works he is now publishing, to explain it.

Mr. Farey's Derbyshire Report.

Mr. Bakewell's Introduction to Geology, 2d edition.

The articles "Coal" and "Stratification" in Dr. Rees's New Cyclopædia.

Mr. Sowerby's Mineral Conchology.

Williams's Natural History of the Mineral Kingdom.—And several valuable facts are collected, in

Mr. Whitehurst's Inquiry into the Original State and Formation of the Earth.

Mr. W. Forster's Treatise on a Section of the Strata. Newcastle. 1809.

The Transactions of the Geological Society.

The 25th and following volumes of the Philosophical Magazine, &c. &c. and The Monthly Magazine. T. T.