



LI. Letter to the Right Honourable the Countess of Gosford, on the similitude, and difference, in the original formation of the Island of St. Helena, and the basaltic districts in the county of Antrim; with the similitudes and differences of the posterior operations of nature performed upon each

W. Richardson D.D.

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LI. *Letter to the Right Honourable the Countess of Gosford, on the Similitude, and Difference, in the original Formation of the Island of St. Helena, and the Basaltic Districts in the County of Antrim; with the Similitudes and Differences of the posterior Operations of Nature performed upon each.* By W. RICHARDSON, D.D.*

WHEN your ladyship persuaded me again to take up my geological pen; and, as an inducement, permitted me to address my speculations to yourself, I intended to have limited them to the facts exhibited in our own country, part of which I had the honour of showing to your ladyship.

I then intended to proceed to the application of these facts, and others within the reach of your own observation, to the theories maintained by the Neptunian philosophers, to which your ladyship had recalled my attention, through a recent publication of some celebrity.

I find, however, that I cannot stop, but must avail myself of your permission to carry your ladyship to more distant regions:—drawing general conclusions both from the magnificent scenes I led you through, and from the corresponding features of a remote island, exhibited on a still grander scale.

The similarities of these countries so distant from each other, and the facts establishing them, shall form the subject of the present letter: while the greater part of the next shall be limited to the conclusions fairly drawn from them. But when rigid demonstration can no longer be obtained, I hope your ladyship will excuse me for indulging my imagination, and wandering into the regions of probability, and even of conjecture.

I am, with much respect,

Your ladyship's most obedient humble servant,
Clonflecle, Moy, May 31, 1816. W. RICHARDSON, D.D.

St. Helena.

It is now some years since my ingenious and philosophic friend Dr. Macdonnel sent me a small volume he had lately received from London, which bore strongly on a subject that had been the topic of frequent discussions between us, and had given occasion to some pleasant excursions which we made together, with a view to examine with the greatest care and accuracy the scenes where the objects connected with it were displayed in the greatest abundance and to the best advantage.

The little book was entitled "A Description of the Island of St. Helena." It was written by a gentleman who spent some weeks on that curious little spot on his return from India; and

* Communicated by the Author.

had examined the materials of which the island was formed, and the manner in which they were arranged, with much accuracy.

My author does not claim to be a scientific naturalist, but he is obviously a very acute observer; and though he seems to have adopted, without examination, the volcanic theory of the origin of basaltes, which was in fashion when he left Europe, he possesses a degree of fairness and impartiality which I have seldom met with in naturalists attached to a particular opinion or theory. My friend was induced to send me this pleasant little volume, because the picture it gave of St. Helena bore so striking a resemblance to the features of the basaltic area in the north of Ireland, that had so much occupied the attention of each of us, and to which my own observations on the natural history of my country had been nearly limited.

It was not only the similitudes in the original arrangement of each of these districts, which were numerous and obvious, but also the differences, that strongly arrested my attention; the former affording demonstration of the exact similarity of original formation, while the latter proved irresistibly that the posterior operations of nature, which have taken place in St. Helena and in our part of Ireland, though in some instances the same, are very different in others.

Hence a new field is opened, and new materials afforded for geological discussion, particularly interesting to me, as the facts which I observed in my own country, that led me to sustain positions sometimes deemed paradoxical, are not only exhibited in equal abundance in St. Helena, but also so diversified as to afford new arguments and further demonstration of the truth of those positions.

That island has now acquired a new interest—the eyes of the world are directed towards it and its new inhabitant. The Latin poet seems to allude to this sequestered spot, as now colonized, which he describes,

“ Ut maris Ægæi rupem, scopulosque frequentes
Exulibus magnis——”

While the English nation is making such exertions to secure the comfort of this great exile—let us find amusing employment for him; let us direct his attention to the natural history of his new country, and we shall probably protect him from the misery into which the exiled Ovid fell; and from disgracing himself by unmanly complaints, as that poet did, on the harshness of a climate nearly as mild as that of St. Helena itself.

I too have prepared a source of entertainment for him, as my pupil Colonel Wilkes, the late governor, after showing the great success with which he raised Fiorin grass at Madras, since his

appointment to the government of this island, not fruitful in provisions either for man or his domestic animals, has taught its inhabitants how to supply the wants of the latter most abundantly, by the introduction of this valuable grass, of which he has lately sent home, to be transmitted to me, some magnificent specimens raised by himself in this new field.

The emperor Diocletian, a mighty conqueror also, after wielding his sceptre a long time over nearly the same territory with the emperor Bonaparte, found content and amusement in the culture of his cabbages.

Let then his successor take cordially to the culture of the vegetable he finds just established in St. Helena, and he will pass the remainder of his time smoothly, showing the world, quite contrary to their expectations, that he will end his days in peaceful amusement, and that

“Finem animæ quæ res humanas miscuit olim
Non gladii non saxa dabunt non tela.”

I shall now return to the natural history of this curious little island, and shall endeavour to trace the exact similitude in original construction between our own basaltic district and this remote spot.

The first and most striking point of resemblance seems to be in the accurate stratification of both countries, and the sameness of the arrangement of the same materials in each.

Our author, in his preface, tells us of the “horizontal beds of basaltes;” and in his 52d page, “stratified appearances of the declivities of the hills, consisting of layers which rise one above another.”

“All the matters of which the island is composed are placed in beds, various in their depth, colour, and texture.”

“On the steeper declivities, the projecting ends of the strata resemble flights of steps rising above one another.”

Could I have given a more accurate description of the arrangement of the strata, so beautifully displayed, in both the perpendicular and steep precipices lining so much of our northern coast?

Our author talks of the terraced form of St. Helena.—Terraces are common with us.—The island of Rathlin is a mass of terraces; this form arises from original stratified construction, and posterior removals.

The leading, and I believe the sole material in each, is basaltes; a fossil upon which Nature seems to have impressed a peculiar character, wherever she has been pleased (as often) to form a distinct area of this curious stone.

Our author tells us: “the rock which forms the principal strata

strata of the island appears evidently to be basaltes; it is always regularly fissured, and running in distinct layers; these layers have always somewhat of a columnar appearance."

"The front of the columns is sometimes flat, but more generally prominent and angular."

Again, "We sometimes find a series of columns of equal height, resembling a piece of artificial work."

Are not these series the beautiful groups so abundant with us, to which the country-people give the name of organs?

There is not any circumstance in our Antrim façades which has struck me more than the general tendency of the basaltes to assume a columnar form, though often very imperfect; and this not from decay, but from failure in the original effort to obtain greater regularity.

The same effort of Nature is observable at St. Helena:—"In the most irregular masses we can always observe a tendency towards this columnar form."

The next material I shall mention common to St. Helena and Antrim, and disposed exactly in the same manner in each, is OCHRE; this bright red substance Mr. St. Fond sustains to be basalt which has undergone some chemical process of Nature with which we are not acquainted. In this opinion I have acquiesced: but my author calls it clay, and it seems equally abundant and similarly arranged in both countries.

"Numerous layers of clay; that of a bright red is the most common, often seen in layers of only a few inches thick; these red veins traverse the whole island."

This red matter, with my author *clay*, with me *rock*, is disposed everywhere as with us: "In the heart of the rock we find nodules of clay, and among the clay nodules of rock."

There is not any circumstance on our whole coast, that always struck me more forcibly, than the transitions of our strata into each other in a vertical direction; for though there be a great difference between the component rocks, both in material and in the principle of internal construction, yet they invariably pass into each other nearly *per saltum*, and we never find the solidity or continuity of the so different materials interrupted. Such, too, seems to be the style of the junctions of the strata at St. Helena—"The rock in some places terminates, above and below, in indurated blue or black clay, continuous with it; but passing so insensibly into it, that we cannot discern at what point the stone ends or the clay begins."

I discovered a very curious fact, sometimes, though rarely occurring with us, in a few distinct strata; that is, cavities; some *now*, the rest probably *once*, filled with pure fresh water, as in a quarry or stratum, open at Ballylagan, the stratum at Islamore,
and

and the 11th stratum counting from the water at Bengore promontory:—in the debris from this stratum, both at Portmoon, and near the causeway, on its west side, I find such cavities; but at the causeway itself, or its more contiguous strata, I never found either water or internal cavity:—at St. Helena this singular fact also occurs, but seems still more rare—"In a quarry, the stone when broken is found to have many large internal cavities, which contain a pure and wholesome water, shut up in the body of the rock."

The most striking feature of resemblance between the basaltic districts of St. Helena and Antrim, is to be found in the whyn dykes, so common to each;—these mighty walls, which seem peculiar to basaltic countries, though they are often found to extend and diverge into districts formed of different materials, seem to have excited little notice until very modern times: even Dr. Hamilton, in his celebrated Letters, which gave the first philosophical account of our curious coast, very slightly notices those contiguous to Ballycastle; letting all the others issuing from the precipices on the east and west of the Giant's Causeway, and burying themselves in the sea, entirely escape him, though more magnificent and more decidedly marked than those he mentions; nor did he examine in those he notices their singular internal construction, the consummate regularity of their masonry, not less wonderful than their external wall-like forms.

I have always considered our whyn dykes as more curious than our prismatic and columnar groups, which seem hitherto to have absorbed most of the attention given to our wonderful coast;—regular internal arrangement is not peculiar to basaltes, nor are the vertical prisms and pillars forming our magnificent colonnades more wonderful than the equally regular horizontal prisms of which our whyn dykes are constructed.

For an account of the whyn dykes on our Antrim coast, I must refer to the Transactions of the Royal Irish Academy for the year 1802. These dykes, when I gave in my Memoir on that subject, I thought sufficiently grand; but how insignificant do they now appear, when compared with the St. Helena dykes, or with those more recently discovered on the rocky mountains, the range that divides the vast American continent, the *divortia aquarum* whence the waters are poured from their elevated sources in opposite directions to the Atlantic and Pacific oceans, at a distance of some thousand miles!

Of the grandeur of the latter dykes we have sufficient evidence, but want particulars; the St. Helena dykes are well described by our author; he calls them "huge vertical strata of broken and fissured rock, which traverse the whole, from the base to the summit."

I must

I must here observe, that wherever our author uses the word *fissured*, he means the divisions into pillars or prisms; that is, the basaltic arrangement, common both to dykes and façades.—He proceeds: “Resting on the summit of these hills, we see huge detached masses of rock, which rise several hundred feet above them:” again, “One observes here, besides the horizontal and parallel strata, that they are all penetrated by huge perpendicular strata of loose and fissured rock.”

“With respect to the perpendicular strata—they are often of great breadth, and all regularly fissured; the fragments quite separate and distinct; but as uniformly fashioned, and evenly placed, as the stones of a building.”

“Several of these vertical strata rose considerably above the plane of the hills which they penetrated, and presented the appearance of huge walls of stone, surmounting their summits, and descending along their declivities to the base.”

There appears to be an exact similarity between the prismatic stones of which the St. Helena and Antrim dykes are formed.

“The fragments which compose them are of all sizes, some of them being six or eight feet long, others only a few inches, but so regular and smooth, that they seem well adapted to the purposes of masonry, without the aid of the chisel or hammer.”

I have stated the pillars of our Antrim colonnades to be formed by the accumulation (in a vertical direction) of prisms, exactly similar; but that these have no internal principle of construction, the great joint breaking irregularly, and with a conchoidal fracture—while the great prisms of which our dykes are formed, and laid as it were by a mason, in a horizontal position, have a subordinate principle of construction, breaking, not like the others, with a conchoidal fracture, but into smaller prisms, already formed, with their sides brown and polished; and I call, for distinction, these two descriptions, component and constituent prisms, a style of construction peculiar to whyn dykes, and which extends also to those in St. Helena, as appears clearly from the foregoing passage.

Our author tells us “of masses of irregular rock cemented together with a ponderous lava.” Nothing commoner with us than masses of sound basaltes, cemented together by a sort of solid basaltic mortar, the fracture of the former, blue; of the latter gray, and granular; such is the mass of rock upon which Dunjuice castle stands.

It cannot be deemed extraordinary that districts formed by Nature of the same materials, should have these materials similarly arranged in each; but where we find differences, we are led to inquire whether they arise from a diversity in the original formation, or are the result of posterior operations; and if
we

we suspect the latter, by diligent attention we may perhaps be able to trace the effect to the cause, and so be able to establish the existence of these posterior operations, and their manner of acting.

The striking difference between the present appearance of St. Helena and the basaltic coast of Antrim, seems to consist in the superior magnificence of the whyn dykes of the former, and their exhibition of their real form of walls, by their immense elevation above the surface in their proper shape—while our dykes, as accurate walls as the other, and also of prodigious height, rarely emerge from the stratified materials they cut through, so as to show their real form of wall to a careless observer; yet in some few instances they do exhibit themselves as actual walls, rising above the surface, and pointing in the direction of the greater remains of the wall, unequivocally displayed in the contiguous façade, as at Port Coan and Portnabaw.

Another material difference occurs between St. Helena and Antrim.—I have sustained that the latter has never been the seat of volcanic fires, nor exhibits any marks of having been acted upon by that powerful element;—while the marks of dreadful combustion are unequivocal over the whole island of St. Helena. Our author tells us:

“The structure of St. Helena seems to demonstrate that it is the work of subterraneous fire.”

“The ancient seat of volcanic fires, and subterraneous explosion.”

How have these fires operated? Not by that instrument we call a volcano, whose mode of acting is quite familiar to us, ever since Sir W. Hamilton has been so particular in his account of our two great European volcanoes:—the combustion of St. Helena has been general; fire has acted violently upon its whole surface, but its intensity seems gradually to abate as we ascend from the water edge to the highest point of the island; at a low level the matters are so scorched and scorified, as not to admit degradation and decomposition into vegetable mould; hence the lower parts of the island are black and torrifed, naked and barren, incapable of sustaining plants; but as we ascend, vegetables begin to appear; and where the elevation is great, the verdure becomes splendid.

Thus we are told—“the exterior parts of the island, all round where they border on the sea, present the appearance of a burnt and scorified shell, black, rugged, and mouldering, without the least trace of vegetation.”

“Some of the interior ridges of hills, which are much higher, are covered with verdure.”

“The central ridge is covered to the summit with the most luxuriant

luxuriant herbage, and with groves of indigenous shrubs and trees—lower down we observe numerous groups of argillaceous hills, all perfectly naked; it is indeed near the water's edge, and under its surface, that we find the largest masses of lava, and of volcanic cinders and scoria."

We have abundant proof in our own country, that decomposed basalt produces a beautiful verdure at the greatest elevations;—the little valleys lining the bases of our most elevated basaltic façades, at Magilligan, Cave Hill, and Monyneeny, are of a brilliant green; and the high verdure of the steep precipices lining Bengore promontory, strikes every one; yet these green declivities are rarely cheered by the rays of the sun, from their northern exposure, and approach to perpendicularity.

In St. Helena, the basaltes and burnt matters are mixed in a manner that must be very embarrassing to those who undertake to account for the formation of this singular island, and few naturalists can refrain from indulging their wise conjectures.

Our author says, "All these layers consist of rock, placed alternately with deep beds of volcanic matters; this rock is evidently basaltes."

"The parallel and horizontal strata leave a wide intermediate space, which is occupied by an irregular mass of agglutinated volcanic matter."

"Frequently eight or ten ascents of rock are separated by these volcanic masses."

This steady alternation of basaltic strata with scorified matters, evidently burnt, bears no resemblance to any thing yet observed at any of our known volcanoes. Our author, though he endeavours to account for this arrangement by successive eruptions, is startled when he can discover no remaining craters. Mr. Demarets too, when he attempted to account for the basaltic colonnades in Auvergne, as produced by volcanic eruptions, admits that in many cases the craters had entirely disappeared; and in others that the currents of lava had vanished. And our author tells us expressly, "that in the island itself there are no sulphureous, bituminous, or inflammable matters."

In my different memoirs on the subject of our basaltic country, I had repeatedly asserted that it did not afford a particle of burnt matter, scoria, or cinder; and that our solid basaltic rocks did not exhibit the slightest trace of having ever sustained the action of fire;—of late, however, a discovery has been made of some quantity of cinders, and scorified matter; small indeed,—but the fact becomes important, when we find that these matters are disposed in the very same manner in which our author found similar matters, to an immense amount, at St. Helena;
that

that is, between the strata of columnar basalt, alternating with them in every variety of thickness.

I have in the Transactions of the Royal Society given a minute list of the strata composing the promontory of Bengore. The magnificent stratum forming the upper range of pillars at Pleaskin, is the tenth, counting from the sea—this is surmounted by another stratum of massive pillars, (the eleventh,) of greater diameter, coarser material, more imperfect workmanship, and much shorter.

We have different views of portions of these strata, from Dunseveric to the cascade at Portmoon, where the upper one is taken away for a mile; it appears again at the depression west of Pleaskin, and is often seen for another mile, always resting on the tenth; and wherever the junction is exposed, these strata pass into each other *per saltum*, without interrupting the solidity or continuity of the material: so that I have no doubt, could we quarry (as we often do at the junction of other strata), the stones would not break at that junction, but we would find masses containing the junction, and portions of each stratum adhering solidly.

After being thus connected for nearly three miles, without any interruption of their continuity, as they arrive at the western point of Port Knoffer, almost immediately above the Giant's Causeway, they are separated for a short space by a layer of scoria and cinders placed between them, as happens so often at St. Helena.

There is another remarkable feature in which St. Helena exhibits strong marks of having been acted on by intense fire, to which I find nothing similar in our basaltic country;—the heat has been so violent between the basaltic strata, as to act on the ends of pillars terminating them, without affecting the middle of the strata.—Hear what our author says:

“The middle of the rock, where it has not been injured by time, or the effects of fires.”

“We can generally trace somewhat of the columnar appearance yet, from the scorification of their bases and summits.”

“The summits and bases of the basaltic rock are always more or less scorified, cellular, and honeycombed.”

“The bases and summits of the columns are so black and scorified, that they look like trunks of trees burnt to charcoal at each end.”

These facts are of extreme importance, when we direct our speculations to original formation and arrangement; for, first—in respect to the long received opinion, that basaltic pillars are of igneous formation: it now appears, that in St. Helena, the action of intense heat, *in situ*, has tended, so far as it could reach,

reach, to injure and deface them; and as to the violent volcanic explosion, by which our author supposes this island may have been raised at once from the bottom of the sea; the facts I have just quoted are utterly irreconcilable to such supposition, and would rather lead us to a long train of alternate operations; violent ignition, regularly followed in succession by gigantic basaltic formation, and the result a mighty accumulation of steady, parallel strata, at length laid bare by posterior operations, removing much, but disturbing nothing, and disclosing in the vast precipitous façades of the island, the early arrangements of Nature, with the materials still retaining the positions in which they were originally placed.

I shall now proceed to try if the new matter furnished by this singular island affords any additional support to the wild positions I have already sustained, to wit—that our *present*, is not the *original* surface of our globe, but much less elevated, and greatly diversified by the action of powerful agents, with which we are not acquainted.—That these agents have carried off immense masses of our original materials without disturbing what they left behind—and that the accumulations of our strata once reached higher than the summits of the loftiest mountains I have had it in my power to examine.

The facts from which these positions follow as conclusions, must be reserved for another letter, in which I mean to generalize; and after proving that these positions receive the fullest support from the facts found in St. Helena, I shall probably extend my views, and show that similar operations have been performed on other parts of the world, which I have not examined.

And what may appear yet more wild—that there is a portion of the world still reserved for similar operations.

W. RICHARDSON, D.D.

LII. *On the Excitement of Voltaic Plates; in Reply to Mr. DE LUC's Objections to the Doctrines maintained by the Author.*
By J. D. MAYCOCK, M.D.

[Concluded from p. 172.]

IT has never been my intention to propose a new hypothesis for explaining the excitement of the Galvanic pile: but as M. Volta's (differently modified) appeared to be very generally and implicitly received, I noticed in my Essay some objections to which I considered it liable; and as it will not take up much of the time of your readers, it may not be amiss to touch on that subject again.

The