But let me assure him that that common sense has so many partisans among the British public, that sooner or later, in spite of all his kicks and calculations, the opinions of common sense will ultimately prevail.

THE END.

LONDON:
IBOTSON AND PALMER, PRINTERS, SAVOY STREET, STRAND.

SCRIPTURAL GEOLOGY;

OR

AN ESSAY

ON THE

HIGH ANTIQUITY ASCRIBED TO THE ORGANIC REMAINS IMBEDDED IN STRATIFIED ROCKS:

Communicated, in Abstract, to the Geological Section of the British Association, at the Annual Meeting held in Newcastle.

IN TWO PARTS.

Part I.—Proving that the Strata, instead of requiring myriads of ages for their formation, may have been deposited nearly about one period.

Part II.—Shewing that the Deluge was the period, when all the Secondary and Tertiary Rocks were formed.

BY

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LONDON:
SIMPKIN, MARSHALL, AND CO.:
OLIPHANT AND SON, EDINBURGH: M'LEOD, GLASGOW:
AND ALL OTHER BOOKSELLERS.

1838.

Printed by R. Kirby, Bridge-Street, Whitby.

PREFACE.

The substance of the following Essay was communicated to the Geological Section of the British Association, at their recent Meeting in Newcastle; but owing to the number and length of other communications made to that Section, the First Part alone was admitted, and was read only in abstract. As the subject is one of no small importance, both to religion and to science, the author, following the advice of some respected friends, has enlarged his Essay, and now presents it to the public.

While the Essay was in progress, "The Doctrine of the Deluge," by the Rev. L. Vernon Harcourt, was announced; and the author at first supposed, that the publication of that respected Divine might have superseded his own; yet upon seeing that valuable work, he found it to be chiefly occupied with the historical evidences of the question, whereas the present work takes up its geological evidences. From notices in some periodical publications, it appears that others are engaged in the same task; but not having seen their productions, the author cannot say how far their views may coincide with his own.

It is common to raise a cry against theories, and to urge the necessity of collecting more facts; and the principle might be just, if all would adopt it; but what geologist is there, even among those who are most diligent in collecting facts, that has not his favourite theory, in support of which, his descriptions and statements are selected and arranged? No collector has been more indefatigable than Mr. Lyell; and yet none is more given to theorizing. Now, if theories wild and dangerous be

advanced by one party; another may be allowed to bring forward a hypothesis more sober and rational.

In opposing the extravagant speculations of some popular geologists, the author has drawn his chief arguments from the phenomena of nature, partly as witnessed by himself, partly as described by others; and he has not scrupled to avail himself of useful statements and principles, laid down and illustrated by those authors with whom he is at variance on the main subject of his Essay. The advocates of the pre-adamite theory often speak as if all the facts and evidences were on their side, and nothing but the testimony of scripture on the other side. The gross injustice of such reflections, the reader, it is hoped, will not fail to perceive. These geologists complain, and have a right to complain, of those who stigmatize them as atheists, infidels, and enemies to revelation: yet they ought to remember, that they have no right, on their part, to denounce their opponents as bigots, fanatics, ignorant, and illiberal. It is not by hard names, but by strong arguments, that the cause of truth is to be established.

The author does not pretend to have brought forward a complete theory. He is aware that the subject is beset with difficulties: yet if these difficulties are more easily surmounted by his hypothesis, than by any other, his labour has not been in vain. He has at least exposed some of the absurdities of the pre-adamite scheme; and although he has little hope of making converts of those who have wholly given themselves up to that fascinating delusion, his Essay may be of use to guard others against running into those wild imaginations, which are alike dangerous to science and to religion.

Whitby, November 5th, 1838.

SCRIPTURAL GEOLOGY,

&c.

PART I.

Extravagant notions entertained respecting the antiquity of organic remains.—Not supported by any valid arguments.—Reasons for believing that fossil vegetables and animals did not live where they are found, but were drifted thither.—Appearances in the strata indicating that they might all be deposited about one period.—Objections answered.

From the nature of the materials with which Geology has to do, it might be thought to discourage the flights of imagination; and yet there is scarcely a science in which imagination has had more scope. The extravagant theories of ancient cosmogonists are well known, and have often been held up to ridicule; but many speculations of modern geologists are almost equally extravagant. Valuable collections of facts, illustrating the subjects of geological study, are indeed rapidly accumulating, and must eventually turn to good account; yet even some of the most diligent and zealous collectors of such facts, indulge in the wildest fancies, instead of making a legitimate use of the phenomena before them.

Such is the case with those authors who ascribe an almost immeasurable antiquity to the organic remains occurring in the crust of the earth. Assuming that the animals and vege-

tables imbedded in stratified rocks, have lived and flourished on the spots where we find them, and calculating on a number of ages as required for the gradual deposition of the strata, and for the production, increase, decay, and destruction of these organic bodies; each group or division of which, they assign to a distinct period in the annals of our globe;—such geologists would thus carry back its antiquity to a time inconceivably remote; the older groups being supposed to have existed millions of years, if not ages, prior to the creation of man. According to them, there have been on the face of this planet, a long succession of creations and destructions, corresponding with the successive formations of stratified rocks; the lowest fossiliferous bed being the first, and the present living world, the last in the series. In this process of extension, they eagerly lay hold on the most trivial circumstance that seems to favour their theory, as if resolved to spin out the duration of the globe to as great a length as possible. They picture to themselves a multitude of primeval worlds, each garnished with its peculiar race of animals and vegetables, each subsisting for thousands of years, but at length overwhelmed, to make way for a new race, destined in its turn to grow, to flourish, and to be destroyed.

In these sports of fancy, there is doubtless something fascinating, as well as novel. The imagination delights to fly back into such remote ages, and to enjoy itself in roving amidst the

beauties and singularities of such distant and diversified worlds. But if we would follow the maxims of sound philosophy, we must not suffer our imagination to mislead our judgment. However gratifying to the fancy these pre-adamite creations may appear, we must regard them as utterly fabulous, unless we can discover some clear proofs of their existence. Is there, then, any thing in the strata, or their imbedded relics, to indicate such high antiquity? We see the crust of the earth composed of a vast series of beds, which must have been deposited one over another by water; with a number of irregular masses, which appear to be of igneous origin, and may be supposed to have been ejected from below, by some volcanic expansive force: but, as we discern nothing in the latter class of rocks to shew how long they were in being heaved up, so we perceive not any thing in the former, to shew what time was occupied in their deposition.

The regularity with which the depositions have been made, and the remarkable thinness of some of the seams, are, indeed, urged as proofs, that the process has been very slow, and that an immense period of time must have been required to form the whole series. The ripple-marks on many of the beds, and the laminated texture of others, are particularly appealed to, as decisive evidences of a leisurely and long protracted deposition. But do we not witness on our sandy shores, where ripple-marks abound, the formation of strata in miniature, often accumulating

to a considerable thickness in a few days? When a storm, or high tide, has broken down, and swept away, any large sand bank; its materials, in less than a week, are redeposited on another part of the beach, where they form a new bank, perhaps some yards in thickness, composed of regular layers of sand, clay, gravel, sea-weed, and comminuted coal. The orderly appearance and laminated texture of stratified rocks, therefore, cannot prove, that a vast period was employed in producing them. Suppose that the *laminæ*, or seams, of the strata, are so thin that twenty are required to make an inch; if each successive wave deposits such a seam, and five waves occur in a minute, it will require only four minutes to deposit an inch: and as the ocean takes no rest at night, and keeps no sabbath, it is easy to see that, with every minute so employed, thirty feet of strata may be formed in a day, and no less than nine hundred feet in a month; provided there are currents to supply the materials. At this rate, the whole series of stratified rocks, instead of requiring ages, might be formed within a very limited period. In some instances, the process of deposition might be considerably slower; but in others it might be much more rapid, without causing any confusion or derangement in the beds produced.

Nor do we find in the imbedded relics any decisive evidence of extreme antiquity: for although each bed, or series of beds, may generally be distinguished by some peculiar fossils, it

does not follow, that they are of different creations. There is nothing to demonstrate, that long periods intervened between the successive depositions; nor are we warranted to affirm, that these diversified groups of animals and vegetables could not have been coexistent.

Some have alleged, in proof of the pre-adamite theory, that in tracing the beds upwards, we discern among the inclosed bodies, a gradual progress from the more rude and simple creatures, to the more perfect and completely organized; as if the Creator's skill had improved by practice. But, for this strange idea there is no foundation: creatures of the most perfect organization occur in the lower beds, as well as in the higher. Nor is there much more to support the assertion, that in ascending from the lower formations, we can trace a gradual approximation to the present living races. In some of the tertiary strata, or the beds above the chalk, the fossil genera and species are, indeed, nearly identical with those now existing; but what approximation can be seen in the secondary strata? Fishes, zoophytes, ammonites, belemnites, terebratulæ, &c., occur in almost every portion of them; but those in the inferior strata have as much similarity to the living races as those in the superior. The fishes and reptiles of the lias have fully more resemblance to existing species, than those of the chalk; and there are no shells in the cretaceous or oolitic beds, more closely allied to those of living mollusca,

than the shells of the cardium, nucula, mya, unio, and ostræa families, found in the lias. The alleged approximation, therefore, is in a great measure imaginary, and cannot be admitted as an argument on the point in question.

But the grand source of error, as to the antiquity of the strata and their contents, is the assumption, that the imbedded animals and vegetables lived, flourished, and died, on the spots which they now occupy, instead of being drifted thither. This is a subject which requires close investigation. Let us begin with the vegetable remains. It is now almost universally allowed, that coal is of vegetable origin, produced from the trees and plants of a former world; and of course, that vast forests must have perished, to compose the immense beds of coal, occurring in Britain, and other countries. Did each of these beds, then, originate in a submerged peat bog, or a forest overwhelmed *in situ*, as some allege? There are coal beds twenty or thirty feet thick: was there ever a forest or peat bog in the world, that when overwhelmed, and consequently compressed, could yield a bed of coal of such thickness? To produce such a stratum, the vegetable matter of a forest, or bog, must have been set afloat, and drifted together, one part being heaped up over another.

But, should we suppose it possible, that a submerged forest or bog could produce such a bed, without drifting or accumulation, a much stronger objection to the submerging system still remains.

There are numerous beds, or seams, of coal, in each coal field; in some instances, thirty, forty, or even fifty seams; alternating with strata of sandstone, shale, limestone, or ironstone; which strata have been all deposited by the waters of the ocean. Was each of these coal seams once a forest, growing on the spot? Did the land sink down, to become the bed of the sea; and then rise again, to become the site of a forest, fifty times in succession; without destroying the conformity of the strata, or leaving the slightest vestige of such mighty agitation? An idea so monstrous can never be maintained. It is clear, that the carboniferous series of rocks, both in the greater and smaller coal fields, have all been formed by ocean currents, drifting and depositing the materials, whether vegetable, animal, or mineral, in successive layers. Accordingly, Professor Phillips, in his valuable Treatise on Geology, p. 180, inquires from what land the materials of the carboniferous strata of England were drifted; and remarks on the subject; "The Lammermuir mountains, to the north, seem not to be of such composition as would yield the coarse quartzose sandstones; we must therefore appeal to the Grampian or Scandinavian ranges; or finally close all further discussion, by admitting that tracts of land which supplied part of the sediments, mixed with the limestone of the carboniferous period, have disappeared from the Northern and Western Oceans."

While the most judicious geologists allow

that the materials forming the coal strata, have been drifted into their present positions; some authors take a very different view of the vegetable remains occurring in certain portions of the oolitic series. In the Isle of Portland many silicified stumps of trees occur, and as several of these are in an upright position, and the bed containing them is of a dark colour, called the dirt-bed, it is presumed that they grew on the spot, and that this bed was the soil. Professor Buckland and Mr. Lyell are decidedly of this opinion; yet Professor Phillips speaks doubtfully on the subject: and there is good reason for questioning their judgment on this point, especially as they grant, that the conformity of this bed with the strata above and below, has not been at all affected by the convulsions which, according to their theory, must have here taken place. That such alternate elevations and submersions of the strata as Professor Buckland enumerates in his Notes on this subject (Bridgewater Treatise, pp. 495, 496), could take place without disturbing the parallelism of the beds, is highly improbable, or rather, utterly incredible. A much better solution of the phenomena is furnished elsewhere by Mr. Lyell himself. He states in his Principles of Geology, I. p. 216, (second edit.), on the authority of Capt. Hall, that several trunks of trees, drifted down the Mississippi, cast anchor in the mud of the channel, where their broken stumps, known by the name *snags*, standing up in the water, occasion no small danger to

boats navigating the river. This fact Mr. Lyell employs, to account for the upright position of many trees and plants in the coal strata (Elements of Geology, p. 449); and it explains as readily the phenomena of the Portland and Lulworth beds. The trees and stumps imbedded there, are only a lot of snags, accidentally planted by the weight of their roots, and of the soil adhering to them when transported thither; which soil may account for the dark colour of the bed, if its colour was not occasioned by the decayed leaves and twigs.

On the same principles, appearances of a similar description may be satisfactorily accounted for. Thus, at High Whitby, on the Yorkshire coast, there is a bed of sandstone, belonging to what some call the coal measures of the oolite series, where we find numerous specimens of a kind of reed, or large equisetum, in an erect position, as if they had grown on the spot; while in some instances, their roots, or lower joints, descend into a bed of shale that is below. "These appearances," says Professor Phillips, (Illustrations, I. p. 95), "have led some persons to conjecture, that the plants are preserved in the place of their growth; that the shale served them for soil, and that they were buried by an influx of sand and water." But he very judiciously adds, "A more probable hypothesis, perhaps, will suggest itself, to those who have seen plants transported by great floods, floating down the streams in a perpendicular position, in con-

sequence of the superior specific gravity of their roots."

The occurrence of fossil wood bored by the Teredina, has been appealed to, as an evidence of the long period occupied in the deposition of the strata; but, on the contrary, it may well be adduced as a proof, that the fossil wood of our strata, has not grown where we find it, but has been drifted. It is not in a forest, or a bog, but in the sea, that the Teredo and other borers perform their excavations. The wood has been floating about in the ocean, when attacked by its devourers, and after suffering much from the attack, it has been deposited, and fossilized. But when or where it grew, what set it afloat, or how long it endured the process of excavation, are questions which we have no means of solving. A beautiful specimen of silicious wood, from the London clay, thus excavated, is in the Whitby Museum; where there is also a piece of recent wood which was found floating at sea, curiously perforated in all directions by the Teredo.

On the whole, there is no ground for believing, that any of the fossil vegetables grew where they are found: all of them appear to have been drifted by currents, and deposited in strata.

Let us now inquire, if the fossil animals have lived and died on the spots which they occupy. As those occurring in the carboniferous strata are associated with vegetables which are known to have been drifted by currents, it is reasonable to think, that they have been brought hither by

the same means. The beds containing shells are every way conformable to those containing coal, and we have a right to conclude, that they have been deposited in the same way. This remark may be extended to the oolitic series, for there also we find seams of coal, interstratified with sandstone, shale, limestone, and ironstone; and as the limestone, which abounds with shells, is parallel to the other beds containing drifted vegetables, we are not warranted to assign a different mode of formation to each.

When we examine the aluminous or lias strata, and their contents, the fact of their having been brought by currents, forces itself on our notice. Here we see crocodiles, and other large saurians; fishes, both great and small; nautilites, ammonites, belemnites, and myriads of other shells; associated with trees, and fragments of wood: and all, with very few exceptions, lying parallel to the plane of the strata. Such an assemblage, and so arranged, could have been formed only by ocean currents, collecting these substances together, and depositing them in their places. Even the beds of sea shells give indications of the fact. In the marlstone bands, occurring in the lias of Yorkshire, there is a seam composed chiefly of oyster shells, about four or five inches thick, extending for many miles along the coast, being found wherever the marlstone beds appear, and reaching far into the interior, where it is seen in the front of the Cleveland hills. The shells of this seam are chiefly single valves,

many of them are water-worn, and all of them appear to have been floated into their present positions, their flat sides being laid in the plane of the bed. No unprejudiced observer can affirm, that this is an ancient oyster bed, in its original place and form: its contents must have been drifted together, to produce this extensive and singular stratum.

The same observations will apply to the higher rocks. The upper oolite beds, which abound with corals and shells, owe their origin to depositions from what Professor Phillips calls "the oolitiferous sea," into which sea these corals and shells have been borne by currents. Some assert, that the beds of coralline oolite have been coral rocks, and that the fossil zoophytes found there have grown on the spot. But it requires the creative power of fancy, to discover in these strata any thing like groves or beds of coral, such as exist in recent coral reefs. The corals of the oolite are generally laid flat, like the shells with which they are mixed; and those which are found in an upright position, might acquire that position in the same way as the vertical plants and trees in the carboniferous strata: their roots, or points of attachment, might be heavier than their tops; especially if portions of the rocks from which they have been detached, adhered to the roots, and were drifted along with them. That they grew on the shelly rocks usually occurring under them, and partly mixed with them, is a notion for which there is no proof

whatever. Respecting the quarter from whence some of the materials of these and other strata might be drifted, Professor Phillips asks, "May we venture to suppose, that the primary tracts of the Scandinavian peninsula and Scotland, with other land now sunk beneath the German Ocean, has been the source of most of the arenaceous and argillaceous deposits of the carboniferous, oolitic, and Wealden formations of England?" (Treatise, p. 217.)

From whence the materials of the cretaceous strata have been derived, this judicious writer does not venture to conjecture. Mr. Lyell, in his Elements, p. 55, supposes that white chalk may have had its origin in microscopic organic bodies; as Professor Ehrenberg has discovered myriads of infusoria in the white coating of flints, as well as in tripoli, and mountain meal. In a subsequent part of his interesting work, p. 320, Mr Lyell considers white chalk as resulting from the decomposition of corals. But whether we adopt one, or both, or neither of these hypotheses, the time required for depositing the cretaceous rocks is not thereby determined. If they originated in corals, or in animalcules, it does not follow, that either the one or the other lived on the spot. The microscopic discoveries of Professor Ehrenberg are indeed wonderful. That substances, hitherto considered as minerals, or portions of rocks, should be found to be composed of creatures so minute that above 40,000 millions exist in a cubic inch, may well fill us

with astonishment, and excite us to admire and adore that infinite Being, who is glorified in the formation of the smallest as well as the greatest of his creatures. If but an hundredth part of our chalk rocks has been made of such animalcules, what countless multitudes must have been required for even that proportion! Yet, if we admit this hypothesis, we have no means of ascertaining, from what extent of surface these animalcules have been swept; or what time was required for their growth, or for their accumulation. The ancient world appears to have been much more prolific than the present; and yet even now, immense myriads of insects, of various descriptions, are produced in a single season. Prodigious swarms of gnats, flies, locusts, &c., are often seen, especially in hot climates: and even in Britain, those beautiful insects called *cow-ladies* frequently alight in such vast numbers, as to seem like a shower of hail falling. The sea is as prolific as the land. In many instances, the ocean appears illuminated by night far and wide, to the extent of many leagues; and when, in such cases, a portion of the water has been taken up and examined, the light was found to proceed from myriads of animalcules, with which every part of the water was densely crowded. Shoals of herrings, of great breadth and depth, are, in some instances, found to extend for several miles, on our own coasts, forming almost one continuous living mass. If we grant, therefore, that some rocks are formed of countless

accumulations of animalcules, this is no proof that ages were required for their deposition.

And here it may be proper to remark, that the discovery of fossil shells, encrinites, or corals, pierced by pholades, or covered with serpulæ, anomiæ, acorn-shells, or coralline substances, can furnish no evidence as to the length of time occupied in the deposition of the chalk, oolite, or other rocks containing them; unless it could be proved, which it has not been, that these accidental changes took place on the spot, or during the time of deposition. Mr. Lyell, in his Elements, pp. 46, 374, &c., appeals to some instances of this description, as triumphant proofs of his theory. But what proof do they afford? Might not shells, encrinites, and corals, which had met with such accidents in places where they formerly grew, be drifted into their present positions, as easily as those which are found entire and unencumbered?

The tertiary strata, which are above the chalk, are remarkable for containing a multitude of shells coinciding with existing species. These strata occupy but a small space in the crust of the earth; yet three or four ages have been assigned to them; which ages are distinguished by the greater or less approximation of the fossil shells to those of the living world. The beds that have very few living species among the extinct, are termed *eocene;* those which have somewhat more, *meiocene;* those with about one half of each kind, *elder pleiocene;* and those in

which nearly the whole correspond with existing shells, *newer pleiocene.* In addition to these, there is a post-tertiary period, comprising some more ages; particularly, the age of diluvial detritus and of erratic blocks, and the age of ossiferous caverns: and these supplementary ages, with perhaps one or two more, are all supposed to have preceded the creation of man. These divisions, and subdivisions, of pre-adamite worlds, display more of imagination than of sound judgment. The whole tertiary strata cover but a small portion of the face of our globe, and each of the four sections can claim but a few patches; yet to these patches a whole age is assigned! What became of the rest of the earth, when one of these sections, say the meiocene, had its reign? Did the process of life stand still elsewhere, while a few meiocene spots monopolized the concerns of the living world? Or, was there a general meiocene creation, the whole of which was lost, except these favoured spots, before the pleiocene era began? To give the dignity of a world to such insignificant patches, is like attempting to erect a pyramid on a single point.

The tertiary strata abound with shells, and contain also, in no small quantity, the remains of quadrupeds, and other animals of various classes. Many of these relics, particularly the shells, are in a high state of preservation; and this is advanced as an argument, that the animals imbedded here, must have lived and died in their

present localities. But, under favourable circumstances, the most delicate shells might be drifted unharmed, from vast distances. Glass bottles, containing letters or papers, have in not a few instances, been floated across the Atlantic, from the banks of Newfoundland, and landed unbroken on the coasts of Ireland, or of the Hebrides. We can, therefore, have no difficulty in conceiving, how shells, and other fragile substances, might be floated from afar by ocean currents, and deposited among fine sand, or soft mud, which may also have been transported along with them, without their sustaining the slightest injury.

On the whole, it appears, that no valid proof has yet been given, to demonstrate that the animals and vegetables imbedded in the strata, have lived and flourished where they are found; but that, on the contrary, there is every reason to believe, that they have all been drifted or floated thither. What evidence, then remains, to establish the enormous longevity ascribed to the world by some popular geologists? What is there to shew, that the stratified rocks might not all be deposited within a very limited period?

Mr. Lyell and others would maintain, that the strata have been formed in the same gradual way in which sediment is now being deposited in the bed of the ocean, furnished by the waste of sea cliffs, and the mud of rivers; that no extraordinary convulsion has changed the crust of the globe, but that all the phenomena appearing in our rocks may be accounted for by existing

causes, still in operation. But there are facts presenting themselves to our view almost every where, which cannot be reconciled with any such opinions. It is clear to an unprejudiced observer, as some of the best geologists have acknowledged, that the stratified beds have been formed on a grander scale, and deposited at a rate much more rapid. And, although we distinguish a succession of beds, and speak of different formations, rising one above another, we must not suppose that there is any such line of demarcation between them, as to favour the idea, that a long interval might occur between the deposition of any one bed and that which immediately succeeds it. On the contrary, the strata are found to run into one another, so that it is often very difficult to say, where one ends and another begins. Hence, every geologist takes the liberty of grouping the strata in his own way; there being no fixed boundaries, to indicate how many, or how few, must be assigned to any particular series. In fact, although in describing them we may distinguish a succession of deposits, they are so connected together as to form one whole,—one grand deposit; leading us to conceive, that one age might give birth to the entire series. Accordingly, Mr. Phillips, in noticing how the secondary strata gradually pass into one another, or are, as he terms it, intercalated with each other, aptly observes; "These transitions are merely examples of the general harmony, which connects together the whole system of stratified deposits,

into one varied and locally disturbed series of phenomena." (Treatise, p. 218.) — Yes, however numerous the beds, and however we may attempt to sub-divide them, they are but parts of the same whole; and, instead of being very slowly formed during a long succession of ages, they bear the marks of having been deposited about one period. To some of these marks let us now attend.

1. The general conformity of the strata, and their undisturbed succession, indicate that they must have been deposited about the same era.— Had an age intervened between the formation of the several beds, the hand of time, with numerous accidental causes, must have produced inequalities on the surface of each, before it was covered by its successor; and thus marred their conformity. When, therefore, we see each member of the series succeeding another, without interruption or irregularity, must we not conclude, that they followed each other so closely, as not to allow time for such disturbance or derangement?

In several instances, however, notwithstanding this general conformity, derangements have occurred, and the strata are unconformable; examples of which may be seen at some spots where the tertiary strata succeed the secondary. To these and other irregularities, I will hereafter advert; but may remark, in the mean time, that as such disturbances have doubtless been caused by volcanic agency, the operation of which is usually sudden, there is no necessity for admitting that, in such cases, the interval between the

deposition of the two sets of strata has been of long duration.

2. The breaks, or faults, in the strata, affect the whole mass of rocks, in almost every instance where they occur, instead of being limited by the boundaries of particular formations. Had there been a series of creations, belonging to different ages, we ought to have found dislocations peculiar to each, and leaving off at their several boundaries. Now when, instead of this, we see such dislocations, or faults, traversing the whole series of beds, without any regard to such divisions, have we not a right to presume, that the whole should rather be assigned unto one age? That remarkable fault, usually termed at Newcastle *the ninety-fathom dyke*, which commencing at Cullercoats, runs up the vale of the Tyne to Brampton, and from thence bends southward and eastward, pursuing a course of 110 miles, pays no respect to formations, ages, or creations, but is one continuous fracture of the earth's crust, as far as it reaches; the whole beds, of every description, on the north and west of this enormous fault, being sunk below those on the south and east, to the depth of from 1000 to more than 2000 feet! (Phillips's Treatise, p. 182.) In like manner, the great *whinstone dyke* of the eastern part of Yorkshire, has been traced from Maybecks, near Robin Hood's Bay, to Cockfield Fell, in the County of Durham, a distance of 60 or 70 miles; traversing indiscriminately all the beds that occur in its course, though it does not

always rise to the surface. Do not such facts indicate, that the division of the strata into a long series of formations is wholly imaginary?

3. Several of the smaller faults, or slips, have taken place when the strata were but half consolidated, so hard as to break, yet so soft as also to bend. Instances of such bent strata occur in the Newcastle coal-field, as exhibited in Mr. Buddle's sections; and the same phenomena are not uncommon on the coast of Yorkshire. The undulations in the ironstone and hard sandstone, on both sides of Scarborough; those in the sandstone, at Haiburn wyke; those in the hard bands of the aluminous strata, at Peak and Robin Hood's Bay; and those in the dogger near Saltwick, on the east side of Whitby harbour, and in the sandstone on the west side, may be quoted as examples. In such undulations, indeed, the curvature of a bed is generally owing, in some degree, to small rents or cracks; but, there is also a real bending of the mass of the stratum, shewing that it was somewhat flexible when the break took place. Now, as these breaks and bendings, wherever they occur, affect the lowest beds as much as the highest, the one cannot be much older than the other; the whole having been in a semi-indurated state at the same time.

4. The denudations of the strata speak the same language. When the dry land was beginning to appear, the tides and currents of the retiring ocean, sweeping over the surface, have borne away immense masses of the strata, scooping out