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EXHIBITING A VIEW OF THE

PROGRESSIVE IMPROVEMENTS AND DISCOVERIES

IN THE

SCIENCES AND THE ARTS.

CONDUCTED BY

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the precipitate which formed in the water became so considerable, that M. de S. deemed it proper to intermit the use of the powder, and sent for some more, promising to inform me on his return from Italy, of what, according to his expression, had happened. M. de S. returned at the end of six months, and sent me back the powder in question, which I submitted to the following experiments.

1*st*, This powder put into a quantity of cold water, double that which is necessary for dissolving the two salts, rendered it milky.

2*d*, Dissolved in a large quantity of water, it deposited a white powder, which, on being washed several times and dried, was found to be subcarbonate of magnesia.

The liquor in which this deposit was formed was limpid after being filtered, and was not rendered turbid, either cold or hot, by the soluble alkaline subcarbonates. All the acids stronger than the carbonic disengaged this latter from it. Lastly, when suitably evaporated, sulphate and carbonate of soda were obtained, part of the latter of which was in the form of subcarbonate. To explain here the presence of the carbonate of soda, it requires to be known that the quantity of bicarbonate mixed with the sulphate of magnesia, was more than sufficient to decompose this latter salt.

There results from this observation, that the sufficiently prolonged contact of sulphate of magnesia and bicarbonate of soda in a dry state, determines a chemical action similar to that which the concurrence of water and heat would produce, affording a new example of the inaccuracy of the old chemical axiom: Corpora non agunt nisi soluta.—*Journal de Pharmacie, March* 1826.

Observations on the Nature and Importance of Geology.

A CELEBRATED school of philosophy among the ancients, maintained that there was only one virtue. With as much, nay even more, propriety, it might be maintained, that there is only one science, at least one physical science. The various departments

of this science are so framed, as, in some measure, to accommodate the incommensurability of nature to our capacity; and by connecting things that are homogeneous, they enable us to take a survey of natural phenomena; but, while we are occupied with a single department, we become sensible of its dependence on others, and are frequently at a loss to assign to each its peculiar province.

Of all the departments of physical science, geology is the most intimately connected with other branches, and stands in need of their assistance, or assists them more frequently than any other. This mutual relation, which contributes, in no small degree, to bestow a peculiar charm on geology, has, at the same time, a tendency to render it a difficult study.

When speaking of Geology, it must be understood to comprehend Oryctognosy as its foundation; the latter gives us a knowledge of the characters, the former of their combination. Whoever is in danger of mistaking one character for another, will never learn to read accurately; and he who continually devotes his attention to nothing but the characters, may, indeed, owing to the difficulty of recognising them, be very profitably engaged, but he will be frustrated as to the ultimate and most essential object of their study.

The terrestrial globe, whose structure, so far as it is exposed to our view, is the proper object of geognostic investigation, is the extensive workshop wherein the powers of nature, with which natural philosophy and chemistry are engaged, have operated, and are still operating. It is not therefore matter of surprise, though these two sciences have both a kindred affinity for geology to which the latter is indeed so closely related, that geology may be considered as practical chemistry. In addition to this, geology has, with other departments of science, many points of contact, from which it may be allowable to select a single example.

Geometry, guided by simple principles, formed regular bodies from limited plane surfaces, and determined their peculiar properties, without foreseeing that models of them would be found in Nature herself; but since observation has brought us acquainted with the regular figures of mineral bodies, they exhibit in relation to this science one of the most important applications, as well as one of the most unerring standards, by which they are distinguished.

When the geometer, by his measurements, proves that the figure of our earth may, like that of other planets, be determined by its revolutions, and hence draws conclusions regarding its original state of fluidity, we find that the phenomena of geology lead to the same result. When he weighs its mass in a balance, whose arm is the semidiameter of the sun's orbit, we are unable to confirm his statement by immediate observation; but we obtain, in this way, a basis on which we can, in some measure, rest our conclusions regarding the internal structure of the earth.

If we contemplate its surface, with all its inequalities, it is geology alone that can give us a distinct representation of them. All local descriptions, not springing from this source, either leave behind them indistinct and erroneous conceptions, or are entirely fanciful. This surface being the habitation of our species, its figure and its changes must, therefore, be closely connected with the history of the human race; and though the most important of those changes may be far anterior to their origin, and to the period of history, we may yet, in more than one geognostic fact, find suggestions and disclosures, which cannot be unacceptable to the historical investigator. These facts concur with historical testimony, in representing the elevated platforms of Asia, as the cradle of the human race, and in explaining their diffusion from that centre; and the traditions of deluges, found among all the nations of antiquity, are corroborated by the still existing traces of those violent events.

The monuments concealed in the bosom of the earth, and extending to the whole organic creation, are still more instructive. Between the dead and the living there yawns a chasm, indeed, which we can never overleap; but if any thing can lift the veil that hangs over the origin and progress of the organic world, it must be those remains of it, for the knowledge of which we are indebted to geology. So far as we have examined the crust of the earth, we have discovered in its structure and materials no transition from simple to compound. The order of time has established no relation, according to which the strata of simple

rocks of the earliest formations are the simplest; while the newer are more and more compound; on the contrary, the oldest appear to be the most compound. In complete opposition to this, the organic world, in each of its two principal divisions, exhibits a series of formations from simple to compound; the simplest being the oldest. Thus we observe animal life commencing in infusory animals, without any discernible organs. Simple digestive organs are first visible in the polypi; in the echinodermata the organ of respiration first appears; in insects a system of nerves and muscles; in crustaceous animals circulation; and in the last two, simple organs of sense make their appearance. At the same time, generation preserves the peculiar character of organic beings; and after having accomplished its purpose, by mere division and dissolution, the particular generative organs develop themselves in distinct sexes. With the avertebral animals are conjoined the series of the vertebral, in which every system appears more perfect, and more closely connected. New organs of sense are unfolded, and the brain becomes the centre of feeling, perception and life, till in man its attains the highest state of perfection and endows him with consciousness and rationality. Long ago, celebrated naturalists, relying upon these observations, attempted, with more or less success, to arrange the species of animals, sometimes according to a scale of gradation, and sometimes according to a reticulated form, without giving any distinct account of the meaning of such an arrangement. Should it, like the piling up of a collection of books, merely serve for a more convenient survey of innumerable creatures, without any reference to their origin? Or, do they intend, by means of such an arrangement, to express the design that hovered in the mind of Omnipotence, before he called these creatures into being? Or, have they originated in the way in which they appear in the scale of gradation, as if the hand of the Creator, like that of a human artist, perhaps, must first be exercised on simple formations, before it was capable of producing such as were compound?

Upon these questions, whose answer might contain no less than a key to the profoundest secrets of nature, Mr Lamarck, one of the most sagacious naturalists of our day, has expressed

himself in the most unambiguous manner. He admits, on the one hand, the existence of the simplest infusory animals; on the other, the existence of the simplest worms, by means of spontaneous generation, that is, by an aggregation process of animal elements; and maintains, that all other animals, by the operation of external circumstances, are evolved from these in a double series, and in a gradual manner. On that account, the scale of gradation, according to which he arranges the animal kingdom, is, at the same time, the history of their origin; and the discovery of this truly natural method, the most important problem of the natural philosopher. Although it should not be forgotten, that this meritorious philosopher, more in conformity with his own hypothesis than is permitted in the province of physical science, has resigned himself to the influence of imagination, and attempted explanations, which, from the present state of our knowledge, we are incapable of giving, we nevertheless feel ourselves drawn towards it, and these notions of the progressive formation of the organic world, must be found more worthy of its first Great Author than the limited conceptions that we commonly entertain.

Geology can alone inform us, how far this successive course of development may have been followed by nature. When all the races of animals, whose remains are contained in the crust of the earth, have been better ascertained than at present, and their situations better known, when we have discovered at what period of the earth's formation any species of animals makes its appearance for the first time, we shall then be able to draw conclusions, more or less accurate, concerning the order of succession. The doctrine of petrifactions, even in its present imperfect condition, furnishes us with accounts that seem in favour of Mr Lamarck's hypothesis. We, in fact, meet with the more perfect classes of animals, only in the more recent beds of rocks, and the most perfect, those closely allied to our own species, only in the most recent; beneath them occur granivorous, before carnivorous, animals; and human remains, are found only in alluvial soil, in calcareous tuff, and in limestone conglomerates.

Geology does not inform us merely of the origin of animal species, but also of their destruction. Out of the vast number

of animal remains, but few belong to species now living, and these only, in the most recent rock-formations; by far the greater number of their primitive structures are lost, and the older the beds of rock in which they make their appearance, so much the more do they deviate in their formation from the species now n existence. May this destruction, as is commonly received, have been the result of violent accidents, and destructive revolutions of the earth; or does it not rather indicate a great law of nature, which cannot be discovered by reason of its remote antiquity? Within the narrow circle of vision in which the organic world manifests itself to our observation, we observe individuals only going to destruction, and in opposition to that, great preparations making for the preservation of the species. But if all living perish, may no point of duration have been fixed for the species; or do we not rather, in these signs of a former world, discover a proof, that, from a change in the media in which organic creatures lived, and from powerful causes operating upon them, their power of propagation may be weakened, and at length become perfectly extinct? Is the continual decrease, then, which we observe among some species, a consequence of the various modes of destruction they experience from the hand of man, or may it not rather be produced by natural circumstances, and be a sign of the approaching old age of the species?

The distinction of species is undoubtedly one of the foundations of natural history, and her character is the propagation of similar forms. But are these forms as immutable as some distinguished naturalists maintain; or do not our domestic animals and our cultivated or artificial plants prove the contrary? If these, by change of situation, of climate, of nourishment, and by every other circumstance that operates upon them, can change their relations, it is probable that many fossil species to which no originals can be found, may not be extinct, but have gradually passed into others. As there are periodical movements of the heavenly bodies, that is, movements that are visible only after hundreds of years, so there are undoubtedly periodical changes in the organic world. If these have required intervals of time that are antecedent to all historical traditions, and to the duration even of the human race, the monuments concealed in

the bosom of the earth can alone reveal them. We indeed observe that the Ibis, which was worshipped in ancient Egypt, and preserved as a mummy, is still the same in modern Egypt; but what are the few thousand years to which the mummy refers, in comparison with the age of the world, as its history is related by geology.

Geology likewise supplies us with instructive disclosures regarding the distribution of organic beings. If we, in all the regions and climates of the world, meet with a striking uniformity in the structure of the earth, we also, on the contrary, observe plants and animals of a most varied character scattered over its surface. As there are among the dicotyledons, that is, among the more perfect plants, no species, which are at the same time indigenous to the hot climates of the old and new world, so both halves of the globe in the same zone possess mammiferous animals, birds, reptiles, and insects peculiar to each. Species common to both are found only among the inferior gradations of organization, and species of a higher order are found only in those high northern latitudes, where the continents were undoubtedly at one time conjoined. From the combined results of organic geography, and the doctrine of petrifactions, it will at once follow, whether the ancient population of the terrestrial globe was distributed according to the same laws as at present. Even now, many of the petrifactions of cold climates, whose species and families are produced only in hot countries, indicate a great change in the temperature of their former situations, and phenomena, like that of the rhinoceros found on the shore of the Wilhui, and of the mammoth at the mouth of the Lena, are likewise indications of sudden changes in those places. Along with the distribution of species, we also acquire a knowledge of the distribution of individuals, and of their modes of life, from their fossil remains, because these remains, like living creatures, appear to us sometimes single, and dispersed at other times in numerous bodies, and closely crowded together.

The doctrine of petrifactions contains also the history of the organic world, as natural history contains its description. Like the coins, inscriptions, and works of art, which make us acquainted

with the varied destiny of our own species, these monuments have been buried in the earth, and, by that means, have been secured against destruction. The Siberian and Chinese popular traditions of the mammoth living in the interior of the earth, are at least figuratively correct; and, in conjunction with the remains of a former world, bear evidence of an earlier state of things. The remains of all plants and classes of animals, whose structure permitted it, have been preserved in great abundance; and, although the distinction of species not unfrequently confronts us with unsurmountable obstacles, a knowledge of them must lead to important results; at least, if we admit that the various forms have been evolved from a primitive model, and that the species have arisen from an original generic form. But to perform what may be expected from it, the doctrine of petrifactions should keep pace with the improvement of botanical and zoological methods, and renounce names and distinctions which have no longer any meaning.

Independent also of this connection between the inorganic and the organic world, between geology, botany, and zoology, it is surely no unprofitable occupation for a rational being, to inquire what this earth upon which we live consists of, how it is constructed, what changes it may have suffered, and what it may still be destined to undergo. Whoever is still unsatisfied, whoever estimates the value of science, not by intellectual desires but by practical advantage, ought to recollect that there are few of the arts of life to which geology is not more or less applicable. It is one of the foundations of agriculture, which cannot flourish without a knowledge of the soil: it instructs us in the course and operation of water, whether we wish to prevent it from doing injury, or to turn it to advantage: it enables us to search out materials for our habitations and furniture, and the art of working mines, with which geology originated, and which in return yields its most valuable productions. We hence conceive that the study of geology brings us in continual contact with the most exalted scenes of nature, with all that can captivate our imagination, and fill our souls with vast conceptions, and thus explains the interest that is daily more and more excited by it, and which warrants the most sanguine expectations of its future progress.

Geology has shared the fate of all experimental sciences. Its first steps, for the most part directed by necessity, consisted of loose and superficial observations on those phenomena more immediately presented to our attention. But, as it is a peculiar prerogative of our nature to entertain a desire of tracing back causes, and explaining operations, theories of the earth were early indulged in; and these, although often absurd, were not without their use. Afterwards it was considered presumptuous, from those fragments of the earth's crust which we had looked upon rather than examined, to draw conclusions as to the formation of the earth, and to relate its history, as if we had been coeval with the events; and that true geology must be a collection, arrangement, and comparison of facts, and its theories only general observations. This view being generally admitted, geology may be said to have passed from the condition of childhood, and assumed its station among the sciences.

These theories are essentially different from those of other branches of physical science. When the natural philosopher makes mention of two electric fluids, or of a luminous matter, he is perfectly well aware that the causes of electrical or luminous phenomena might be different from what he imagines; yet these modes of expression are most convenient for producing unity and connection among the facts that have come under his observation. Geological theories are, on the contrary, of a purely historical character. Whether granite be a production of fire or water, is a matter of indifference in the explanation of its origin, if we are incapable of producing it either in the one way or the other; but whoever tells us that the present crust of the earth was once in a state of fusion, and that, upon cooling, it became a solid mass, exhibits an event which, like the heroic exploit of a Curtius or a Clœlia, should be received only upon the most indisputable testimony. Geological theories are, therefore, more exclusive than physical; hence a reason why geologists have always been more at variance than natural philosophers.

It is therefore the duty of the geologist to proceed cautiously with his conclusions. In return for that, he is sufficiently indemnified by the nature of his study, which bears in the most distinguished manner the peculiar character of all physical science.

Geology obtains its materials from mineralogical geography, whose general results it selects and combines, in the same manner as state policy does with the results of civil geography. The advancement of the one, therefore, depends on the progress of the other; and although it may be advantageous to science, from time to time, to exhibit a correct view of its progressive advancement, as it is profitable for the traveller to stop sometimes and take a retrospective view of the country he has passed, geology has nevertheless to expect improvement principally from a patient and laborious investigation of single districts. There are but few who, by a glance, can determine general relations and throw light upon science, as there are but few travellers who are qualified to give any instructive information concerning the social condition of a country: On the contrary, any one provided with the necessary knowledge, may, by an accurate and detailed examination of a district, contribute, if not general views, facts that serve as a foundation for the great geological edifice. And any one who reflects how much time and perseverance are necessary for examining the geognostic character of even a limited district, especially if its interior is not laid open by mines and natural sections, will agree with us, that this investigation, like that of the character and customs of a people, must chiefly be the work of an inhabitant.

On Female Pheasants assuming the Male Plumage. By M. Isidore Geoffroy St Hilaire.

Pheasants sometimes occur in the woods, as well as in a state of domestication, which, from the dulness of their colours, while at the same time they possess the male plumage, were long considered as males in a diseased state, or with their feathers soiled and tarnished; but it has been ascertained that they are hen birds with the plumage of males; and, in fact, Vicq d'Azyr and Mauduit, from the inspection of the sexual organs in such birds, have placed this curious fact beyond the reach of doubt. Mauduit, in his account of it, in the Encyclopedie Methodique,