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OR

VOL. IX. OF THE NEW SERIES.

Quiconque a une trop haute idée de la force et de la justesse de ses raisonnemens pour se croire obligé de les soumettre à une expérience mille et mille fois répétée, ne perfectionnera jamais la physiologie du cerveau.—GALL.

The first business of philosophy is to account for things as they are; and till our theories will do this, they ought not to be the ground of any practical conclusion.—MALTRUB.

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III. NOTICES OF BOOKS.

- I. *Explanations: A Sequel to "Vestiges of the Natural History of Creation."* By the AUTHOR of that Work. London: J. Churchill. 1845. Post 8vo, pp. 198.

In vol. xviii., p. 69, of this Journal, we reviewed the *Vestiges of the Natural History of Creation*. The work has excited an extensive and vivid interest in the public mind; it has been criticised in almost every journal in the kingdom; and five editions have appeared within little more than a year after its publication. The leaders in science have attacked it in decided terms, and the present *Explanations* have been elicited in answer to their objections. Somewhat inconsistently, however, the men of science did not confine their attention to its alleged scientific defects, but urged against it moral and theological objections, calculated to rouse popular prejudices against the unknown author and his work. The foremost among the assailants in this discreditable course of opposition were writers in the *Edinburgh* and *North British Reviews*, who are generally said to be Professor Sedgwick and Sir David Brewster. The *Explanations* are written in the same calm, clear, and philosophic style which characterizes the *Vestiges*; and whatever may be thought of the merits of the hypothesis, no enlightened and impartial reader can withhold his admiration of the author's talents and scientific learning, while the elevated views, the gentle, and we should say, reverential spirit, which pervade the work, afford pleasing evidence of the excellence of his moral dispositions. He states, that the object of the *Vestiges* was "to shew that the whole revelation of the works of God presented to our senses and reason, is a system based in what we are compelled, for want of a better term, to call LAW; by which, however, is not meant a system independent or exclusive of Deity, but one which only proposes a *certain mode of his working*." We can perceive no reasonable objection to such an inquiry, if it be conducted on scientific principles, and in a right spirit, which it assuredly is in the work in question. Our object at present, however, is not to enter into a discussion of the scientific merits of the hypothesis of "development," but to offer some remarks on its moral and religious bearing, regarding which, in our opinion, much error and prejudice are afloat.

The following questions appear to us to be distinct in themselves, although in the hostile reviews of the *Vestiges*

we have often seen them confounded:—1. Does the physical universe, so far as known to man, afford evidence of the *existence* of an intelligent arranging Cause? 2. Does it afford evidence of the form or state in which this intelligent Cause exists? 3. Does it afford evidence of the manner in which this intelligent Cause proceeded in constituting the universe? We believe that if philosophers and the public were in possession of clear ideas on these topics, much prejudice and vituperation against scientific investigations, and their supposed tendencies to atheism and infidelity, would be averted.

The author of the criticism in the *Edinburgh Review* says: "What know we of the God of nature (we speak only of natural means), except through the faculties He has given us, rightly employed on the materials around us? In this we rise to a conception of material inorganic laws, in beautiful harmony and adjustment; and they suggest to us the conception of infinite power and wisdom. In like manner, we rise to a conception of organic laws—of means (often almost purely mechanical, as they seem to us, and their organic functions well comprehended) adapted to an end—and that end only the wellbeing of a creature endowed with sensation and volition. Thus we rise to a conception both of Divine power and Divine goodness; and we are constrained to believe not merely that all material law is subordinate to His will, but that He has also (in the way He allows us to see His works) so exhibited the attributes of His will, as to shew Himself to the mind of man as a personal and superintending God, concentrating His will on every atom of the universe."

We agree with the reviewer, that "we know nothing of the God of nature (we speak only of natural means) except through the faculties He has given us, rightly employed on the materials around us." Let us inquire, then, what our faculties enable us to reach on this subject.

Our leading intellectual powers which take cognizance of the external world, are Individuality, Eventuality, Comparison, and Causality. Under Individuality we may here comprehend all the minor faculties, such as Form, Size, Colouring, and so forth, which enable us to perceive the qualities of objects. Individuality, then, gives us a conception of the *existence* of matter, but throws no light whatever on its *essence*. The essence or ultimate principles of matter are as completely beyond our conception as they are beyond that of the inferior animals. Eventuality observes the evolutions of matter, but its powers extend no farther; it ob-

serves the changes which take place in substances, whether organic or inorganic, and there its functions terminate. Comparison enables us to contrast one portion of our knowledge with another, and to perceive resemblances or differences; but it throws no new light on the essence or modes of action of the objects compared. It is to Causality that we owe the power of perceiving the relation of cause and effect. When two events are presented to our observation, the one following the other,—if they are contemplated exclusively by Individuality, Eventuality, and Comparison, they appear as mere phenomena or occurrences. No impression arises in the mind, of efficiency in the one to occasion the other. The universe, contemplated by these faculties, seems only as a collection of substances evolving certain phenomena, and the series of existence and events appears to be without beginning and without end. There are individuals in whom the organs of these faculties so much predominate, that this is the view which the universe actually presents to their minds. It is to the organ of Causality that we owe the first conception of *efficiency*. When this faculty contemplates a series of events constantly following each other in similar circumstances, it gives rise to an impression of efficiency in the antecedent to produce the consequent. It leads us to regard the antecedent as a cause, and the consequent as an effect. But its function terminates in giving rise to this impression. It does not enable us to penetrate into the essence or nature of the thing, so as to detect in what its efficiency consists. The ultimate nature of that which constitutes efficiency in, or communicates efficiency to, any existing object, is as much hidden from the human understanding as is the *essence* of matter.

What, then, do these faculties enable us to discover regarding the first question above alluded to—namely, Whether the physical creation, so far as known to us, affords evidence of the existence of an intelligent arranging Cause? We have no hesitation in answering that it does. To the three faculties of Individuality, Eventuality, and Comparison, the universe might appear as nothing more than an assemblage of objects undergoing changes; but Causality adds a perception of the adaptation of means to produce ends. It gives us the idea of design, and through the perception of design in nature we arrive at conviction of the existence of a presiding designing Mind. When we contemplate the agency of inorganic matter, as in the falling of a stone to the ground, or the attraction of steel to the magnet, we receive the impression of the efficiency of some quality re-

siding in the earth or magnet to produce these effects ; but, as already mentioned, we cannot obtain even a glimpse of its nature. In this direction, therefore, our researches are speedily cut short. If we saw nothing more than the exertion of power, Causality could not lead us to the discovery whether that power inhered in the essence of matter, or was communicated to it by an intelligent mind.

When, however, Causality and Comparison, acting together, survey the adaptations of different parts of the universe to each other, the conviction of a designing Mind presiding over the arrangements becomes irresistible. The sun, for example, is 95,000,000 miles distant from the earth ; yet we find in this sublunary sphere innumerable eyes in men and animals adapted to its rays. The annual revolution of the earth around the sun, gives rise to a succession of various seasons, and we find all vegetable substances adapted to the different degrees of temperature consequent on this succession. In descending into the minuter departments of being, the adaptations are found to be innumerable, and interesting in the highest degree ; but they are so well known that it is unnecessary farther to allude to them here.

None of our faculties gives us the least reason to suppose that the sun is an intelligent being, or that it, of design, produced this adaptation ; or that the earth is such a being ; and we know positively that neither the human eyes nor the substances which constitute the vegetable kingdom are themselves intelligent agents. Here, then, is an intelligent adaptation of objects which in themselves are wholly unintelligent, to produce beneficial effects. From the contemplation of such phenomena, Causality leads us to the conclusion that an intelligent arranging Cause of the universe exists.

The second question is, Whether the universe affords evidence of the *form* or state in which this Cause exists ? It appears to us that the answer must be in the negative. Before we can judge of the *form* in which a cause exists, it must be submitted to the faculties of Form and Individuality. Mr Combe, in his *System of Phrenology*, under the head of Causality, observes : "When a watch is presented to us, the knowing faculties perceive its spring, lever, and wheels ; and Causality discerns their object or design. If the question is put, Whence did the watch proceed ? from the nature of its materials, as perceived by the knowing faculties, Causality infers that it could not make itself ; and from discovering intelligence and design in the adaptation of its parts, this faculty concludes that its cause must have pos-

essed these qualities, and therefore assigns its production to an intelligent artificer." Suppose the question were next put, In what form does this artificer exist?—if no farther information were afforded than what is derived from the structure and design of the watch, no answer could be given. While Causality enables us to reach the conviction that an intelligent artificer must have made the watch, it can infer nothing from the mechanism concerning his form, colour, size, and other physical or personal attributes. In attempting to judge from a survey of physical nature, concerning the form and mode of being of the designing Cause of the universe, we are in the same predicament as the observer would be who was required to discover the form and mode of being of the watchmaker by *inspecting the watch alone*. In other words, it is impossible, by means of our natural faculties, to obtain any knowledge concerning the form and mode of being of the Deity. By the phrase "a personal God," we presume the Edinburgh Reviewer to mean, not a God existing in a specific form (which form our faculties do not enable us to ascertain), but, in accordance with Locke's definition of a person, "a thinking, intelligent being, that has reason and reflection, and can consider itself as itself, the same thinking thing in different times and places." In this sense of the word, our faculties enable us to assign a personal character to the Deity; and such, we presume, is the view of the subject generally taken by philosophers.

The third question is, Does the universe afford evidence of the manner in which the Deity proceeded in constituting it? Again appealing to our faculties, and with the limitation to be afterwards specified, we must answer this also in the negative. Individuality recognises only the present existence of matter; Eventuality, only the phenomena of matter which occur under its own experience, or are recorded on credible testimony of actual observers. It cannot penetrate into the manner in which the series of changes originated. Comparison is equally incapable of solving the mystery. It is able to contrast only the things and conditions which are seen or recorded to exist, but cannot trace the origin of existence. Causality, also, is in no better condition; for although in certain circumstances it gives rise to an impression of efficiency in the antecedent to produce the consequent, it cannot penetrate into either the nature or the origin of the quality which produces efficiency. The human understanding, therefore, in vain employs its observation and reflection to discover the origin of the universe. It perceives matter existing, events occurring, and efficiency acting; but in

tracing the whole of these perceptions backwards, they present to it the appearance only of an endless succession. As already stated, the arrangements and adaptations displayed by physical objects and their phenomena, excite the conviction that, besides the material substances which constitute the universe, there exists a vastly powerful designing Mind; but how this Mind operated in giving its original constitution to the universe, is a question on which our faculties shed not a ray of light.

The question between the author of the *Vestiges* and his opponents is, whether the universe was *created* or *developed*. In Bailey's Dictionary, we find the following definition: "CREATION is a forming something out of nothing, or of no pre-existing materials, and is proper to God only. It differs from all other sort of formation; whereas they all suppose something to work upon, this supposes nothing at all." Dr Johnson defines the verb TO CREATE as follows: 1. "To form out of nothing; to cause to exist;" his example of which definition is the verse of Genesis, "In the beginning, God *created* the heaven and the earth." 2. "To produce; to cause; to be the occasion of," &c. And he defines CREATION to be "the act of creating or conferring existence." Bailey's definition is the one generally understood when we speak popularly of God creating the world; but from what has been said above, it appears that we have no evidence from science concerning the manner in which the universe originated. In deciding this question, the inquirer's first object should be to ascertain what the record of nature enables him to discover; and it appears to us that, judging from natural evidence alone, the idea of the universe being evoked by an act of the Divine Mind out of nothing, is as purely a hypothesis (in other words, an assumption as unsupported by scientific evidence) as any notions of the author of the *Vestiges* can be. Supernatural information apart, our understandings must plead entire ignorance of the manner in which the universe originated.

The author of the *Vestiges* states, that the book "is not primarily designed, as many have intimated in their criticisms, and as the title might be thought partly to imply, to establish a new theory respecting the *origin* of animated nature; nor are the chief arguments directed to that point." The purpose is (as we mentioned on p. 159) to shew that the works of God *are a system based in law*. In order to establish this idea, the author sketches a hypothetical history of the universe, from its supposed first elements in the form of "fire-mist," or nebulous atoms, and represents it as having

been evolved from these atoms under the guidance of law. The basis of his hypothesis, he says, "lies in the material laws found to prevail throughout the universe, which explain why the masses of space are globular; why planets revolve round suns in elliptical orbits; how their rates of speed are high in proportion to their nearness to the centre of attraction; and so forth. In these laws arise the first powerful presumption that the formation and arrangements of the celestial bodies were brought about by the Divine Will, *acting in the manner of a fixed order or law*, instead of any mode which we conceive of as more arbitrary." (P. 5.)

There is, to our apprehension, some obscurity in these expressions. A law of nature is not an entity distinct from nature. The atoms of matter act invariably in certain definite manners in certain circumstances; the human mind perceives this regularity, and calls the action characterized by it action according to law. But the term "law," in this sense, expresses nothing more than the mind's perception of the regularity. The word does not designate *the efficient cause* of the action; yet many persons attach a meaning to the term, as if it implied causation. The cause of the regularity which we observe in the motions and reciprocal influences of matter, may be supposed to be either some quality inherent in the atoms, or certain powers and tendencies communicated to them at first by the Divine Mind, which adapt and impel them to all their modes of action; that is, to perform every evolution, and to enter into every combination, which He preordained that they should execute in all time and all space. This latter is the hypothesis of the author, as we understand it. According to it, matter at one time existed in the form of extremely minute and widely diffused atoms; the Divine Mind impressed upon these atoms powers, energies, or tendencies, in virtue of which they first congregated into masses, and formed suns, planets, and satellites; being so formed, they (still in virtue of the energies or tendencies first impressed upon them) evolved themselves into seas, continents, mountains, and subsequently into germs of organized matter, animals, and vegetables; they afterwards formed the combinations which we see; in short, proceeding through a long succession of changes in space and time, they formed themselves, by a series of regular pre-arranged and ordained evolutions, into the universe, animate and inanimate, such as it now exists. According to this view, the Divine Mind is assumed to have conceived and pre-arranged the whole phenomena of the universe, and to have impressed upon matter the power and tendency to evolve all that we

behold; and to have accomplished this with such an all-pervading wisdom and efficiency, that no subsequent interference on His part, in order to rectify errors, supply deficiencies, or provide for new circumstances, has ever been necessary. The most remote and minute event, according to the author, was as completely designed by the Deity at the first, and produced by His will then exercised, as if He had made a special exertion to evoke it at the moment when the human mind first perceived it to happen.

It is obvious that this hypothesis ascribes every thing that exists, and its modes of existence and action, to the will of the Great First Cause,—the pre-arranging and pre-ordaining Mind; and we cannot, therefore, coincide in the charge of impiety or atheism brought against the author by some of his opponents.

Another view of the mode in which the Deity constituted and sustains the universe, is, that His intelligence and power at first formed, and continue constantly and immediately to operate in the evolutions of matter—that, for example, when an acorn becomes an oak, the changes which we contemplate take place, not in virtue of energies, tendencies, and adaptations conferred on matter, and made to inhere in it from the beginning, by the Divine Mind; but in consequence of the action (regulated, it may be,*) of that Mind on matter, commencing when its changes began, and continued until every one of its evolutions be completed.

But this view, equally with that of the author of the *Vestiges*, is a pure hypothesis. To be able to judge whether the efficiency which gives rise to the phenomena exhibited by matter inheres in matter itself, or was, countless ages ago, by one grand fiat communicated to it,—or whether at every moment the Divine Will, by direct action, impels it,—we should require to know the essence of matter, and also the nature and mode of action of the Divine Mind—points utterly beyond the reach of our faculties. On such subjects, we have no alternative but to bow our heads in reverence, and confess our profound ignorance, apparently interminable while our present constitution of mind and body shall endure.

In regard to the *origin* of matter, then, there is really no collision between the hypothesis of the author and that of his critics. He does not attempt to shew the *origin* of the "fire-mist," of which, according to him, the universe primarily consisted. It may have been evoked out of nothing by an

* "The Great First Agent may lay down a rule of action for himself, and that rule may become known to man by observation of its uniformity."—Sir John Herschel's *Address to the Br. Ass. at Cambridge, 1845.*

act of the Divine Will, without the slightest effect upon his argument.

The real subject of difference between him and his critics seems to be the following:—they not only assume that the Deity evoked the universe out of nothing, but insist that on the occasion of every new and important change in the arrangement of the elements of which it consists, He specially or miraculously interferes. Somewhat inconsistently, however, they seem to allow that this interference has not occurred on the occasion of each purely physical evolution of the material world; limiting themselves to the assertion of its occurrence when inorganic matter became organized, and non-sentient became sentient (*i. e.*, when vegetable and animal life was first introduced), and on every subsequent occasion when new species of animals and vegetables appeared.

Appealing again to the intellectual faculties of man, we maintain that these opinions also of the critics are pure assumptions. Individuality, Eventuality, Comparison, and Causality, have, by experiment and observation, obtained abundant evidence that the natural elements which compose animal and vegetable beings belong originally to the inorganic kingdom. Life appears to be the result of combinations of inorganic elements, brought, and for a time held, together by some mysterious power, which we have hitherto in vain endeavoured to explain; but no facts known to us (excepting for the present the experiments of Mr Crosse and Mr Weekes) enable us to decide in what manner these combinations originated. Man has never seen a new being created out of nothing, or even fashioned out of pre-existing inorganic elements by a direct act of the Divine Will; nor has he yet observed any unequivocal instance of the transition of inorganic into organic matter without the aid of a previously existing organized medium, such as a seed or embryo; and as we know nothing of the essence or ultimate powers (whether inherent, or derived) of matter, we have no scientific data for determining whether matter is or is not capable of organizing itself. The hypothesis of the author of the *Vestiges* therefore rests on no direct evidence, if we except the experiments of Mr Crosse and Mr Weekes, which need to be verified by many inquirers before they can be received as the basis of such a momentous theory as they are called on to support. But, as we have just observed, the hypothesis of his opponents, of matter having been evolved out of nothing, and of life or sensation having been communicated, and changes of species effected, by special and

direct acts of the Divine Mind, rests on no firmer scientific foundation ; for Science utters no voice on such topics.

Weighing, however, the two hypotheses in the scales of probability, inferred from what is known and has been observed, it appears to us that the presumptions lean in favour of that of development. All that we see of the present processes of nature, and from which we can infer *by analogy* what her prior processes may have been, belongs to the department of evolution. We observe rocks formed by depositions at the bottom of the sea ; mountains elevated by subterraneous physical forces ; the seeds of vegetables evolved into flowers, fruits, and forests ; the embryos of animals evolved into reptiles, fishes, and mammalia. In all these instances, the elements of inorganic matter merely enter into new combinations and forms. But we repeat that the efficiency which causes them to perform these evolutions is a complete mystery. We have never seen the beginning of any series of changes, and our faculties do not enable us to divine its cause.

Assuming, therefore, the origin and efficient causes of the universe to be at present impenetrable by scientific means, the question remains (and in point of fact it is the only important consideration in the discussion), Whether the Deity, in the present administration of the world, acts according to the hypothesis of the author of the *Vestiges*, or in the manner of special interference ? This question is one of practical importance, and it seems to fall within the scope of the human faculties and experience.

According to the author, qualities and energies were conferred on matter at the first, which have led to all its subsequent evolutions : these qualities and energies were not left to operate blindly as the elements of a chaos ; but certain modes of action and tendencies to combination were impressed upon every atom, rendering its whole subsequent evolutions regular and certain. The critics generally admit the existence of qualities or energies in matter, and acknowledge the regularity of action and combination in the great phenomena of the physical world, so far as these have been fully subjected to scientific investigation. It is only in the unexplored or obscure departments of science, that the mode of direct interference is seriously supposed to prevail.

The Edinburgh Reviewer says, that " the Deity has (in the way He allows us to see His works) so exhibited the attributes of His will, as to shew Himself to the mind of man as a personal and *superintending* God, concentrating

His will on every atom of the universe." According to the hypothesis of the author of the *Vestiges* also, the Divine Mind is a superintending Power over all the events of the universe, as much as He is so according to the views of the opponents. In the one case, He is regarded as having made effectual provision for the preservation and enjoyment (within the limits intended by Him) of the beings evolved by the operation of matter under the impulses which He communicated to it; and this so effectually, that no special interference on His part was subsequently necessary. The phenomena of nature which man contemplates, appear to support this view. The human body may be selected as a good example, on account of our familiar knowledge of its qualities and modes of action. It seems to be constituted with the view of living in health and enjoyment for three score and ten years or more, while it is exposed to influences which may destroy it at any moment. An individual, for instance, may suffer serious injury in consequence of a fall, or from the momentum of moving bodies. When these injurious causes operate, there is no example submitted to the eye of science, of a direct interposition of the Divine power to avert the consequences of the natural agency of matter; but the individual is protected, to a certain extent, by a series of pre-arrangements, obviously originating in the Divine intention. First, he is provided by nature with an instinct of self-preservation, and faculties of caution, observation, and reflection, calculated to enable him to give effect to the Divine intention, by avoiding injurious objects and situations. Not only so; but if, by being projected from a coach or railway-car, he should break a leg,—the blood-vessels of the broken leg commence a new species of action and deposit bony matter along the fracture, and in the course of time reunite the broken edges so firmly, that the health and vigour of the limb are completely restored. If an artery be ruptured and need to be tied, a new power in the neighbouring arteries immediately evolves itself: they dilate and convey blood to the parts which have been deprived of their nourishment by the obliteration of the injured vessel; and this they accomplish so effectually, that speedily the results of the injury are no longer perceived. All animated nature is full of similar contrivances; and although they inhere, yet they lie latent in the organisms until circumstances call for their operation. The number of conservative powers lying latent and unheeded in the human body while its normal condition continues, but coming into

play the moment the necessity for them occurs, is surprisingly great—so extensive, indeed, that volumes might be written in elucidation of them. These latent powers, bespeaking intelligent pre-adaptation of the body to circumstances foreseen and anticipated before they occur, convey an irresistible impression of the agency of Divine Intelligence; but, to our understanding, they are examples of pre-ordained and pre-arranged powers of adaptation and evolution conferred on matter, and are not instances of direct interference.

The constitution of the human mind, also, endowed with spontaneous activity, and with faculties of observation and reflection, appears to bespeak a theatre of existence in which the objects and beings related to it shall act under regular laws. Under such a system, man, by his intelligence, may reap enjoyment from every object fitted to gratify his faculties, and avoid evil by shunning objects calculated to injure him; not absolutely, because he is a mortal and fallible creature, but to such an extent as the Divine Mind sees proper to permit. Were the world administered under a system of arbitrary interference, the human faculties would be confounded and useless. We agree, therefore, with the author of the *Vestiges* in the following remarks:—"The entire conduct of a large portion of society, and more or less that of nearly all the rest, is regulated, or rather cast loose from regulation, by the want of definite ideas regarding that fixed plan of the Divine working, on the study and observance of which it is evident that our secular happiness nearly altogether depends. Even acute men of the world are daily seen acting to their own manifest injury, in consequence of their utter ignorance of any system of law pressing around them. With the great bulk of society, life is merely a following of a few inferior instincts, with a perfect blindness to consequences. By individuals and by communities alike, physical and moral evils are patiently endured, which a true knowledge of the system of Providence would cause to be instantly redressed. Daily health and comfort, life itself, are sacrificed through the want of this knowledge. It is not in the heyday of cheerful, active, and prosperous existence, or when we look only to the things which constitute the greatness of nations, that we become sensible of this truth. We must seek for convictions on the subject, beside the death-beds of amiable children, destroyed through ignorance of the rules of health, and hung over by parents who feel that life is nothing to them when these dear beings are no

more; in the despairing comfortlessness of the selfish, who have acted through long years on the supposition that the social affections could be starved hurtlessly; in the pestilences ravaging the haunts of poverty, and revenging, in a spreading contagion, the neglect by the rich of the haplessness of their penury and disease stricken neighbours; in the canker of discontent and crime, which eats into the vitals of a nation in consequence of an unlimited indulgence of Acquisitiveness by those possessing the most ready natural resources and standing in the most fortunate positions; in the national degradation and misery which follow wars entered upon in the wantonness of pride, greed, and vanity. Doubtless, were the idea vitally present in the minds of all men, that from laws of unswerving regularity every act, thought, and emotion of theirs helps to determine their own future, both by its direct effects on their fate, and its reflection from the future of their fellow-creatures, and this without any possibility of reprieve or extenuation, we should see society presenting a different aspect from what it does, the sum of human misery vastly diminished, and that of the general happiness as much increased." (Pp. 182-4.)—"Is our own position affected injuriously by this view, or can our relation to the universe and its Author be presumed to be so? Assuredly not. Our character is now seen to be a definite part of a system which is definite. The Deity himself becomes a defined, instead of a capricious being. Power to make and to uphold remains his as before, but is invested with a character of tranquillity altogether new—the highest attribute we can conceive in connexion with power. Viewing him as the author of this vast scheme by the mere force of his will, and yet as the indispensably present sustainer of all; seeing that the whole is constructed upon a plan of benevolence and justice; we expand to loftier, more generous, and holy emotions, as we feel that we are essential parts of a system so great and good." (Pp. 185-6.)

It is not our intention to enter into the details of the scientific phenomena which form the subject of dispute between the author and his critics; but we conclude our notice by presenting a letter with which we have been favoured by Mr Hewett C. Watson, a former editor of this Journal, and whose attainments in the highest department of botany, are deservedly acknowledged to stand in the first rank.

"THAMES DITTON, *January 29. 1846.*

"My dear Sir,—I wrote a short letter yesterday, in reply to yours, which arrived here during my absence from home;

and I will now endeavour to meet your inquiry for those botanical *facts*, which apparently support the views of progressive development, advocated by the author of the *Vestiges*. Make any use you choose of this letter. The nature of the facts may be stated in a brief form, after the fashion of an 'ipse dixit;' but it would need a volume to give you full explanations in detail, with special instances in proof. If the Vestigian theory has any truth in it, botany should yield illustrations and proofs equally as any other part of nature. The author has passed by the familiar and the true, while he has cited some dubious cases which will scarcely bear scrutiny. The alleged conversion of the oat into the rye, is incredible under existing knowledge. The white clover is so universally scattered over Britain, and its growth so rapid, that there can be no marvel in its sudden appearance over ground newly turned up and limed—that is, rendered particularly adapted for the increase of a plant, whose roots or seeds were likely to have been in the ground previously. The pretended five distinct floras of Britain are probably nothing better than a misinterpretation of certain facts which were ascertained and published by myself ten years ago. In the seed-beds of the garden, cabbages are often seen which are almost exact counterparts of the plants of the sea-coast; though these are stated to be so different by the author of the *Vestiges*. It is not in such dubious instances, but in substantiated facts, that the author should have sought his botanical illustrations of progressive development. These facts may be grouped under the following categories:—

"1st, The mode of growth of any vascular plant, commencing from a seed and terminating in seeds (a multiplication of itself), is a continued evolution of parts and organs, through the whole being of the plant; affording, perhaps, the most complete example of progressive development to be found in nature. This is true, though less obvious, in the more simply organised cellular plants. It may be still traced in the lower orders of animals, as well as in the higher vertebrates previous to birth.

"2d, The gradations of physical character are so fine and close among plants, that they often render nugatory the attempts of botanists to distinguish order from order, genus from genus, species from species. Intermediate or transition forms come between, which might, with equal propriety, be referred to either of two orders, either of two genera, either of two species—as the case may be.

"3d, Plants brought from two distant countries are often

sufficiently dissimilar to justify systematic botanists in describing them as two distinct species; yet on placing other plants, from intermediate lands, between them, the gradual transition from one supposed species to the other becomes too apparent to allow of their being kept distinct. Occasionally, the same is observed of plants which have grown near together, though under different circumstances of soil or situation.

“4th, The seeds of one reputed species can produce forms so far intermediate between the parent and some other (allied) species, that experienced botanists will assign these intermediates to the wrong stock, if not informed of their real origin.

“5th, The seeds of one intermediate form have been known to produce both the reputed species, between which the parent plant appeared to be intermediate.

“6th, In some few instances, an individual plant of one reputed species has been observed to assume the distinctive characters of another reputed species, after change of soil or situation.

“But, on their side, botanists discard all these facts which appear like a transmutation of species. In their definition of the term ‘*species*,’ they assume that one cannot pass into or produce any other. Reasoning on this arbitrary definition, whenever a case of transition appears to be established, they forthwith declare the plants to be one single species only, holding the fact of such transition to be the proof of their unity as species. It is obvious, therefore, that botanists must continue opponents of the theory of progressive development, as extended to species, unless they consent to change their definition of the word, by leaving out the assumption that transition is impossible. Certain, however, it is, that several pairs of species (so reputed) which have been united into one for the reasons just mentioned, have differences quite as wide as are seen between other species universally considered to be truly distinct.

“It is needless to trouble you with a string of Latin names, as examples of reputed species which slide into each other through intermediate forms. Those who want such examples may find some of them in the *Phytologist* for 1845 (vol. ii., pp. 161, 217, 225.) But the illustration of progressive development, afforded by the growth of a plant, may be traced and explained in everyday language. The seed of a plant includes an embryo, equally as the egg of a bird during incubation. When that embryo swells and bursts the shell of the seed, the young plant protrudes in a form widely unlike that

which it will afterwards very gradually assume ; while the newly-hatched bird has all the organs, and even the general form, of its adult parent. The young plant must add to its dimensions, not only by the growth of organs already visibly existent, but also by the development of superadded organs. Take a common sunflower as an example of this. In winter it is a seed or embryo, which vegetates in spring, and then appears a small seedling plant with two or more leaves. In summer it has expanded into a stout stem, on which numerous leaves have been developed. By autumn it becomes a stately herb, of six feet high ; its stem now terminating in a large head of flowers (a single large flower, in the eyes of non-botanical observers), and divided into several lateral branches, each one terminating also in its own head of flowers. Hundreds of seeds are produced in these heads of flowers, each of them adapted to repeat the same course of progressive development the ensuing season. The sunflower dies wholly after producing its seeds ; but many other plants are familiarly known to endure from year to year, by the survival of their roots, or roots and stems ; these surviving parts being able to re-develop any lost organs, as leaves and flowers, season after season.

“ This is trite and familiar enough ; but it is not the less clearly an example of progressive development. It is more striking than the progressive growth of animals, because fresh parts or organs are successively added through the whole existence of the individual, whether we take an annual herb, which lives only a season, or a tree which endures for centuries of years. The ultimate state or production is a return to the first state—that of seed, many times multiplied ; these two extremes being totally dissimilar from the intermediate stages of development. Experience alone could enable mankind to infer that the seed would develop into the leaf-clad stem ; nor could anything else authorise an inference, that the development of leaves would stop and give place to flowers. We know well the fact, simply because we watch the whole process where so short a space of time is required for its completion.

“ In thus describing the process, just as it is seen by the eyes of a non-botanical observer, there is left untold a very important part of its bearing upon the theory of progressive development. It is now an established doctrine in botany, that the flowers and fruits of plants, as well as all their constituent organs (bracts, sepals, petals, stamens, pistils), and even the final production, the seed or egg itself, are not strictly organs of a new kind, successively added to those

kinds which previously existed ; but that they are more properly repetitions of those previous organs, modified or metamorphosed into something apparently quite different, by influences which change the course of their development at an early stage. The reality of this metamorphose is admitted by all botanists ; though explanations may differ, and the efficient causes of the change remain to be discovered. Under different conditions or influences, the same rudimentary organ appears capable of becoming a leaf, or a bract, or a petal, or a stamen, or a seed-pod. Thus, all the successive changes of the plant, in the production of leaves and flowers, of fruits and seeds, when closely examined and analyzed, only prove to be more thoroughly examples of progressive development. It may be difficult for a general observer to conceive that an apple or an orange is simply a cluster of leaves, to the course of whose development some peculiar direction had been given while they were young or rudimentary. But it will be less difficult to see how easily the pod of a pea might be formed, by folding a single leaf in such manner as to bring its edges into even contact, while young and capable of forming adhesions ; thus producing a hollow leaf, united all round—a pod to receive and nourish the vesicles which are to become seeds, or the embryos of future plants. My dear Sir, very truly yours,

“ HEWETT C. WATSON.”

II.—*The Phrenological and Psychological Annual for the Year 1846.* Edited by DAVID G. GOYDER. Glasgow : J. and G. Goyder. 8vo, pp. 80.

This publication belongs to the series which formerly bore the title of “ *The Phrenological Almanac*,” a title now judiciously dropped. It contains seven articles, with some notices of books, phrenological intelligence, and a list of phrenological societies and lecturers. Article I., entitled “ What is Phrenology ? by Mr Robert Brown,” aims at correcting the misconception of those who, knowing nothing of Phrenology except from the doings of itinerant manipulators, suppose that it is merely the art of predicating mental qualities from the shape of the head. As nobody who has ever read an elementary work on the subject can fall into such a mistake, we fear that Mr Brown’s paper has little chance of reaching the class for whose instruction it is intended. “ The examining of