

NATURAL THEOLOGY CONSIDERED WITH REFERENCE TO MODERN PHILOSOPHY. By Rev. G. HENSLOW, M.A., F.L.S., F.G.S., M.V.I.

Introduction.

NATURAL THEOLOGY, or “the Discovery of Evidences of Design attesting to the existing attributes of the Deity collected from appearances of Nature,”* or “the consideration of the Power, Wisdom, and Goodness of God as manifested in the Creation,”† is a subject which has engaged the attention and interest of devout men of at least the Jewish and Christian faiths from the earliest periods until now.

That God has created all things, as well as ordained all the circumstances of the universe, was the firm belief of probably the most ancient writer whose works have come down to us in the Book of Job. It forms the basis of the Mosaic dispensation. The Psalms and Proverbs, as well as the Book of Ecclesiasticus and others, breathe the same spirit. And if we turn to Gentile writings, we find exactly the same views embodied in the Shastah of Brahmah; for what could be nobler than the following?‡—

“God is One : Creator of all that is. God is like a perfect sphere, without beginning or end. God rules and governs all creation by a general Providence resulting from first-determined and fixed principles. Thou shalt not make inquiry into the essence and nature of the existence of the Eternal One, nor by what laws he governs. An inquiring into either is vain and criminal. It is enough that day by day and night by night thou seest in his works his Wisdom, Power, and Mercy. Benefit thereby!”

Again, if we pass on to later times—the early days of Christianity—we find S. Paul making it an express point of his argument wherewith to convince the heathen Greeks at Athens (see Acts xvii. 22—25); and again, in his Epistle to the Romans

* Archdeacon Paley’s *Natural Theology*.

† See the *Bridgewater Treatises*.

‡ Quoted in Holwell’s *Events relative to the Religion of the Gentoos of India*.

(i., 20) he declares that the attributes of God—the invisible things of the Godhead—should have been recognized by them from the visible creation, and that those who have not so seen them are without excuse.

That the Deity, one and the same with the Lord God Jehovah, the Personal God of Israel, was the Creator of the universe,—that all animate and inanimate objects of this world owe their existence to His divine power—has, therefore, undoubtedly been in some form or other the creed of the large majority of mankind in all ages.

During the last two centuries many volumes have been written in this country with the express purpose of bringing out more fully the objects of natural theology. Thus we find the names of More, Cudworth, Stillingfleet, Parker, Rae, and Boyle in the last century; while Paley, the authors of the *Bridge-water Treatises*, Brougham, Smith, and others in the present, who have discussed from various points of view and with ever varying illustration the doctrines of natural theology.

On the other hand it must not be forgotten that there have ever been atheists, pantheists, materialists, positivists, &c., who would not concede the existence of design or recognize an overruling Mind apart from Nature at all. Such was Lucretius, the poetical exponent of the Democrital philosophy; while atheists, pantheists, and materialists of various denominations have ever been and are only too numerous at the present day. But besides such dissentients to the belief of a Personal God, the newly-established doctrine of Evolution has amongst its advocates men who, while believing in God as the Creator of the world, yet professedly deny design to be anywhere present in it. So far, therefore, are they in opposition to the writers mentioned above.

The main object of the present essay is to endeavour to find an answer to the question, Is design* compatible with evolution? I would state, before entering upon the inquiry, my firm conviction that it is; and that both *design* and *evolution* are incontrovertible facts of creation.

Definitions of Views on Natural Theology.

In accounting for the existence of the works of creation, various elements of cause, so to say, must be considered. I think it will be, therefore, not without advantage to attempt to classify chief or typical opinions by some such method as the following.

* It will be seen, hereafter, that the word "design" must have a more extended meaning than the somewhat restricted use hitherto assigned to it.

1. That there is NO GOD, consequently NO DESIGN at all in nature, and NO REASON displayed ; but that all things are due solely to CHANCE.

This is the hypothesis of Lucretius and the Epicureans.

2. That the formative energy of structure may or may not be due to God ; but as God is unknowable, Deity is an unallowable element in philosophical considerations : in other words, an agency external to the organism as originating "types" is not recognized. That all structures are the resultants of IMMANENT MOMENTA and of the POLARITIES OF SUBSTANCE ; so that organs and forms issue from them in accordance with concurrent conditions.

This is the view of the modern Positivist.

3. That the CREATOR IS GOD, that *everything* is DESIGNED and *created by fiat*, with a display of REASON everywhere. That NO CHANCE has interfered ; the results being generally ABSOLUTELY PERFECT, both in organs and organisms.

This is the view of the majority of natural theologians.

4. That the CREATOR IS GOD : but there is NO DESIGN ; that the existence of organisms, and therefore all organic structures, has been brought about by law [evolution] ; though CHANCE has largely affected the processes of elaboration of species ; which processes have resulted in MUCH IMPERFECTION. This, I think, will represent the *true* Darwinian view.

5. That the CREATOR IS GOD. That He has created all things by LAW [evolution], with *one* partial exception or special interference, viz., *man*. That DESIGN, in the ordinary sense of the word, cannot be severed from many structures ; that CHANCE has largely contributed to modify special results, which never rise beyond an *inideal*,* or RELATIVE STATE OF PERFECTION. And lastly, to fully grasp the rationale of Creation, FAITH (not *credulity*) and HUMILITY are as needful to the student of nature as they are to the believer in revelation.

This is the view of the present writer.

These representations must not be regarded as being rigidly exact. Indeed, it is impossible to draw up any definitions which will embrace the precise opinions of all who hold main ideas in common, but differ in minor details. I think, however, that they will give a fair notion of the principal points of diversity existing, and represent typical forms of thought. In considering these views in detail, attention will be given more especially to the third ; while the opinions of the Positivist and of Mr. Darwin will be alluded to when dis-

* *Inideal* and *inideality* are terms proposed to express this relative state of perfection, and signify that the *ideal* is never reached.

cussing the different elements of the teleological view respectively.

The Philosophy of Lucretius.

The first, Epicurean or Democrital view is scarcely worth considering at any length. The arguments are so puerile as to be, at this age, absolutely contemptible. For instance, Lucretius, starting from the dictum that *nothing can proceed from nothing*, asserts all bodies, and indeed all souls, to be composed of solid material atoms: the composition of all things to have resulted from the cohesion of atoms meeting in their course *downwards*, as they are supposed by him to have been impressed from all eternity with proper motions. But he fails to show how such proper motions were acquired, and does not perceive that in infinite space, direction is *absolute*, and not *relative*; so that "downwards" has no meaning at all. He maintains that the soul, being material and intimately connected with the body, perishes with it; and consequently, ridiculing the fear of death, boasts that he has, by his philosophy, freed men's minds from its terrors.

Perhaps his greatest perversion of reason appears in his assertion that eyes, hands, feet, &c., were not made for seeing, handling, and walking, but that men, finding them well adapted for these purposes, used them for such: * their origin having been simply due to a fortuitous concourse of atoms meeting in their downward and slanting courses through space—and which atoms have thereby formed them by their closer unions. Such processes, by the nature of the case, could not involve intention or design. Nature, he adds, is the origin of all living creatures, natural wombs having formed (how formed he does not describe) on the surface of the earth, to which they adhered by fibres, gave rise to the first races. Such are specimens of his positive statements. On the other hand, he maintains that the world could not have been made by the Gods for the sake of man or their own pleasure, from the many evils existing in it. Now this is a most important assertion. Although his conclusion is erroneous, yet this very reason goes a long way towards establishing that spirit of scepticism, not only in natural theology, but in a belief in a God at all, which is so prevalent at the present day. There are other and perhaps as weighty objections raised by unbelievers; but this is one. On the other hand, the so-called physical evils of the world have been far too

* I am well aware that Positivism maintains that "structure is the cause of function, not function the cause of structure;" but that does not lessen the absurdity of the above.

much ignored by writers on natural theology. The consequence is that their arguments are often very one-sided, and lie open to attack where they are not ably prepared to defend them.

Now, the idea of design being utterly rejected by Lucretius, the "Argument of Design" is obviously in direct opposition to his scheme of philosophy. The two ideas are based on totally different assumptions. On the one hand, *chance* forms the groundwork; on the other hand, it is assumed that, as man works, so God has worked; that, since man can design, invent, and construct, so, when he sees some curiously constructed object he never saw before, he at once judges from his own experience, and pronounces upon the design of that object. Hence it is that because he does invent, contrive, and construct things both like and even totally unlike anything in nature, as a watch or a steam-engine, the idea is *forced upon him* that an eye *was made* for seeing and an ear for hearing. And, moreover, by no mental effort can he throw off the impression that there is really some Higher Power who out of His own intelligence made it.*

With Lucretius an eye was made by chance cohesion of atoms moving in space without order and without law!

With the Darwinian the eye was evolved by a long series of gradual improvement, still influenced by chance, but guided by law; yet to this result he inconsistently denies the application of the term "design"; though he cannot but recognize the creation as the work of God's laws.†

I shall have occasion to revert to this, and will say no more than that there are grounds for showing that the Darwinian believes in design in spite of himself.‡

The argument of design is, therefore, directly opposed to the

* I cannot speak for Pantheists, who profess to do so; but I have strong reasons for suspecting the above statement to be true, even with them. See what is said below about Lotze.

† See *The Descent of Man*, vol. ii. p. 396.

‡ In order to avoid misapprehension, it will be as well to observe that an evolutionist like myself is not necessarily a Darwinian. Evolution is a great fact of nature; and Mr. Darwin is to be thanked for having brought it out from obscurity and elevated it upon an enduring pedestal; but he has endeavoured to account for it by the process of *natural selection*, just as the author of the *Vestiges of Creation* endeavoured to account for it by an *inherent principle of progressive development*. Both these authors have put prominently before us what are undoubtedly real facts in nature; for natural selection is an indubitable truth, and the principle of progression is an obvious fact; but neither the one nor the other can account for a vast amount of phenomena. This natural selection, so largely due to chance, cannot, in spite of Mr. Darwin, account for the structure of the eye. The painfully elaborate reasoning in the *Origin of Species*, both as to this, as well as the bee-cell, clearly shows to my mind the hopelessness of the task he has set himself. Again,

hypothesis of Lucretius; for had not man any inventive powers at all, there would have been some show of reason in his philosophy.

Thus, we might argue,—man, feeling instinctively the pangs of hunger, would eat what he accidentally found to suit him, and could with justice say that he had no reason for supposing that it was made for him to eat, but, finding it agreeable, he used it as food.* Again, having no knowledge or belief in any futurity, he could see no use in his existence; but finding out that some things or circumstances gave him the sensation of pleasure, others of pain, he could only be led to think that it was best to get as much of the former as possible, and avoid as much of the latter. We know too well to what this would lead!

Now, reverse this view, and look on the other picture, where man recognizes God, sees His actions in the hosts of heaven and the myriads on earth; sees in himself the final stroke of that elaborate design which has taken incalculable ages to work out, and which no being on earth but himself could understand; feels in his own soul an internal evidence to the existence of Deity of which he is a reflection, and feels in himself an instinctive yearning for better things to come, together with the conception of the possibility of a realization of his hopes; the very existence of which conception is an evidence of his natural fitness for eternity.

The ordinary Teleological Views of Natural Theologians.

Dismissing the Epicurean hypothesis, let us take up the third, which more nearly concerns us, or that which is held by the majority of teleologists. Their stand-point is that all things were created by God as we see them now. That every species of animal and plant is an absolute entity designed and executed by the Great Artificer, and that all structures are *perfect* † in form and function; so that every portion of struc-

the principle of necessary progressive development leaves untouched the fact that animals of the lowest groups abound at the present day, *i.e.*, it ignores the principle of *Retention of Type*, which must be united hand to hand with that of evolution.

* The only illustration that I can think of at the moment which would tally with the Lucretian idea is, that writing-clerks, finding their ears suitable for holding their pens, use them as such.

† Some modification of the idea of *perfection* of organs is held by a few teleologists who have more extensive knowledge of facts than the majority; and so have not failed to recognize the existence of rudimentary and “useless” organs, perceiving thereby the *relative* and not *absolute* character of nature’s perfections.—See *Plurality of Worlds* (by Dr. Whewell), p. 345.

ture in an organism has its designed use. Moreover every adaptation of the creature to its sphere of existence or surrounding conditions is a proof of a wise and prescient Designer and witness to a divine intelligence. *Reason* is displayed in every direction, and chance is eliminated altogether.

As these opinions will form the chief matter for review in this essay, it will be necessary to consider carefully each of the elements involved in this view.

First, then, let us clearly define what is implied by design; and as there are several phases of it, it will be well to enumerate and then consider them in order, thus:—

1. Design in organs, *e. g.* eye, hand, heart, &c.
2. Design in the uses of such organs.
3. Design in the spiritual element or life of an organism, which requires such bodily structures; inclusive of man.
4. Design in the plan of animal life, or the unity of type observable in groups of organized beings.
5. Design in the range of animal life from an “*amœba*” up to man.
6. Design in the adaptations of man, of animals and plants to their sphere of existence.
7. Design in the elaboration of the present condition of the inorganic world through past geologic ages.

Design No. 1.—The first and most obvious may be called *design of structure*. This has been well explained and illustrated by Archdeacon Paley in the Introduction to his *Natural Theology* in his argument of the watch, by which he wishes to show that, as man designs, if not creates, constructs and produces an object which of itself witnesses to great intelligence, so do the works of Nature, *e. g.*, the eye, hand, or heart, as well as leaves, flowers, and fruits of plants, by a like reasoning witness to a far higher and superhuman intelligence. Now it must be observed that the argument of design as limited to structure does not rise higher than to prove the existence of that intelligence, and the power of the intelligent being who possesses it to put such designs into execution. And it is worth repeating, that however much men may try and persuade themselves to the contrary, by no effort of mind is it possible to sever the idea of design from such structures as I have mentioned. The Lucretian idea *cannot* be entertained now. Our minds cannot separate such from the existence of a spiritual agency that has brought them into existence.* But while the

* Of course this position will not be allowed by the Positivist, at least so far as the assertion of the impossibility of severing design from nature is concerned. For, starting from the dictum that Deity is unknowable, and that the finite mind cannot pronounce at all upon final causes, the Positivist

conviction of design is forced upon us in contemplating such organs as I have mentioned, we must bear in mind that there exist a great number of structures, not only of such a character as to leave us in doubt as to their use, but which are so atrophied and rudimentary that it would be grossly illogical to say they had any use at all. Now, natural theologians for the most part have ignored these latter altogether; while those few who do refer to them imagine they have escaped the difficulty of explaining their presence by saying that they are only witnesses to the conformity of plan—"a specimen of pedantic trifling," Mr. Lewes says,* "worthy of no intellect above the Pongo's." Thus, Dr. Whewell (who did not live to read this statement) says in his *Plurality of Worlds*, p. 345:—"In the plan of creation we have a profusion of examples where similar visible structures do not answer a similar purpose,—where, so far as we can see, the structure answers no purpose in many cases, but exists, as we may say, for the sake of similarity, the similarity being a general law, the result, it would seem, of a creative energy, which is wider in its operation than the particular purpose."

The consideration of rudimentary organs has arisen of late years into a prominence quite unexpected, in consequence of the great value they afford to the deductions of biological science. In fact, the now thoroughly-established doctrine (at least amongst scientific men) of evolution owes its existence in great part to their presence; nor, indeed, could it dispense with them.

I do not think it needful on the present occasion to give illustrations of rudimentary organs beyond what I may occasionally have to mention, as their existence is indisputable. But their importance in regard to my subject does not so much lie in their support to the doctrine of evolution as in their

denies us the right of using the word design as indicative of mind apart from *immanent* causes.

That God is unknowable in His essence and action—"that His judgments are unsearchable and His ways past finding out" (Rom. xi. 33), I readily admit; but I maintain, dealing with purely objective structures, not only is it perfectly logical to attribute design to the eye (without attempting to discover how it came into existence), and utterly illogical to deny it. I do not pretend now, for argument's sake, to pronounce who, or of what character, the Being was who made it, but simply to say, there is palpable design, and of such a character as transcends the power of man.

The immediate causes of its structure may be *immanent momenta in matter*. And here I would join hands with the Positivist, provided he see they cannot be self-existent; but, constituted as our minds are, with their inevitable tendencies to pronounce like results as due to like causes, I cannot understand how any man can think he speaks logically who denies mind as, in some sort, connected with the origin of such organic structures.

* See "Mr. Darwin's Hypotheses," by Mr. G. H. Lewes, in April, June, and July Nos. of *Fortnightly Review*, 1868.

witness to the *relative character of design* in structure revealed by their presence. Hence, as will be seen more fully hereafter, it cannot be too strongly borne in mind—indeed it may be laid down as a universal law—that no structure can be called absolutely perfect, or than which we cannot conceive a better. So that from such an elaborate organ as the eye to a mere pigment spot of an echinoderm, or from the well-developed legs of the majority of lizards to the rudimentary and useless representative of legs in certain snake-like genera, organs of varying degrees of character can be found which impress us proportionately with corresponding degrees of evidence to design. The word “design” cannot convey more than the structures themselves; and as structures apparently adapted for certain ends in some organism are found less and less so in kindred forms, so design, as applied to the former, from being very pronounced, becomes, as it were, less and less so until it disappears altogether. Thus, if the following genera be compared, it will be seen how a gradual degeneration of the limbs indicates, so to say, a corresponding dying out of purpose, till at last nothing remains but rudiments of legs under the skin, in which the purpose of locomotion is finally gone, and design has disappeared altogether: *Zonurus griseus*, *Tachydromus sexlineatus*, *Sauropis tetradactylus*, *Chamæsauria anguina*, *Pseudopus Pallasii*. (These genera will be found illustrated in the *English Cyclopædia*, v. s. *Zonuridæ*.) Now these examples are isolated instances in as many distinct *contemporary* genera. The same phenomenon may be witnessed in hereditary but long antecedent forms. Thus, the *Plagiolophus* had three well-developed toes, the central one being slightly the larger. In the *Hipparion* of a later epoch the two lateral ones became much smaller, and nearly resemble the pair of rudimentary toes of a cow, while the central toe and its supporting bones are proportionally larger. In the present epoch we have its descendant, the horse, with only one toe (the hoof), the two rudimentary ones having disappeared altogether, nothing but the “splint-bones” remaining. Nature is replete with such illustrations of rudiments, and the tertiary strata at least abound with evidence of “generalized” types and “transitional” forms. Hence we see that while, on the one hand, innumerable examples can be found, such as teleologists have hitherto seized upon for their illustrations, and which to a believer in a personal creating God evince unmistakable and admirable design; on the other hand, a large class of structures can be pointed out which either scarcely admit of the word at all, or else seem to militate against it altogether.

The explanation, then, hitherto offered by natural theologians of the existence of rudimentary organs is quite inadequate, not

to say unphilosophical, and directly opposed to the very principles upon which the argument of design is based. On the other hand, they form one of the strongest witnesses to evolution. They may be said to be a necessary part of it; for, were any abrupt changes of structure constantly occurring, we should at once begin to infer that some power was as constantly at work to interfere and make such changes, somewhat after the notions of the cataclysms and recreations of early geological theorists. When such sudden breaks appear to occur, the balance of probability is greatly in favour of the inference of the previous existence of, but now extinct forms, which once united such well-differentiated types as may now exist.

It may be objected that I have regarded rudimentary organs too much in the light of atrophied conditions, and not as origins for future development; and it is worth while observing that there are two ways of regarding them, both, however, equally in harmony with the doctrine of evolution; and in many cases it is at present impossible to say with certainty which would be the correct view. Thus, in the case of the lizards, it may be that the condition of the limbs of the *Pseudopus*, which are rudimentary and concealed beneath the skin, was the forerunner of the state of the limbs represented by the other genera given above. We cannot say. The argument, however, is equally sound on either supposition. On the first, the design of the limbs dies out, and is replaced by the snake-like method of progression; on the other, the latter mode of locomotion gradually disappears, and is replaced by limbs.

Design No. 2.—I must now consider the second instance of design, or USE.* Having acknowledged an organ, as the eye, to be designed, we see design in the use of it. Here is the supposed stronghold of the teleologist. Many organs seem so obviously intended for definite uses, that they love to dilate upon the requisite adaptations which conspire to fulfil the use of an organ. Thus no one can deny the use of sight to the eye, or hearing to the ear, and so forth. And no one can deny that the mechanism or structure of such organ is most admirable. But natural theologians very often go too far, and try to discover a use in everything; the result is, they not unfrequently

* It will probably be felt immediately that, as a general rule, *structure* and *use* stand or fall together. But there are some instances where an organ, by its elaborate or peculiar structure, seems to justify a purpose, yet that purpose may remain undiscovered. Such, for example, was the spleen. When, however, we see an organ with a decided use, as the leg of a lizard, which is used for running, I repeat that we are justified in describing such an organ as useless when it remains concealed, in a rudimentary condition, under the skin.

foist upon organs and organisms a use or design, which further experience shows clearly was never intended. For example: That the pollen of flowers is destined to fall upon the stigmas in order to secure a development of seed is an undoubted and admitted fact. That the stamens should be in the same flowers as the stigmas was looked upon as an instance of perfection; and flowers having all the members well represented were accordingly placed at the head of the list. Now in Dr. Whewell's contribution to the Bridgewater Treatises, and in Archdeacon Paley's work on *Natural Theology*, these authors both allude to the statement attributed to Linnæus, that pendulous flowers have their stigmas at a lower level than that of the anthers, so that the pollen may fall from them upon the former; while in erect flowers, the anthers, they say, are elevated above the stigma, so as to secure the same end. Now how much of this is true? how much is fact? The first statement, that pollen must fall on stigmas to secure seed, is the only one that will stand investigation; and even that requires qualification, as we shall see. With regard to the second; in a great many plants the "sexes" are separated; that is to say, in some, as the cucumber, the stamens are never in the same flower with the pistils. In others, as the yew-tree, willows, &c., the flowers bearing stamens are not even on the same tree or plant as those having the pistils. Now, with regard to the next statement brought forward by the late Master of Trinity, Cambridge, as an argument of design. This is true for some flowers, *e. g.*, tulip and fuchsia; but it is *not* true for crocus, mallow, and many others. In addition to this, some flowers furnish both conditions (primrose and loosestrife), and in others the pollen is so situated that it cannot possibly escape from its confinement without external mechanical agency, and which is effected artificially in nature by insects, as in orchidaceæ. These and other facts have led physiologists to discover a very different "use" or law in nature, and which is expressed by saying that it is more beneficial for a stigma to receive pollen from the stamens of a different flower (of the same kind) than from those of the flower in which it is itself. Hence there is more reason for believing the "intention" to be that of securing the crossing of distinct flowers, as it is called, by the transmission of pollen from one to the other by insect and other agency; without, however, excluding, in those cases where the two organs are together, the possibility of the pollen of any flower falling upon and so fertilizing the stigma of the same flower. Notwithstanding this, it has been discovered by Mr. Darwin that the pollen of *Linum grandiflorum* (scarlet-flax) is absolutely effete upon the stigma of the flower from which it (the

pollen) is taken, though quite available for another flower ! The innumerable contrivances to secure intercrossing are infinitely more varied and marvellous than was ever contemplated by Lin-næus, Paley, or the late Master of Trinity College, Cambridge.

Another instance of false reasoning, which I have heard brought before this Society, is the following:—"Mountain grasses are viviparous (that is, produce a kind of bulb instead of flowers and seeds) in order that the winds, so prevalent at high altitudes, may not waft the seeds into the valleys below"! One other instance, and which will be found in the Bridgewater Treatise of Dr. Roget (*On Animal and Vegetable Physiology*, vol. i. p. 95, 8vo. ed.), who says: "The different kinds of hairs, of down, of thorns and prickles, which are found on the surface of different plants, have various uses, some of which are easily understood (?), particularly that of defending the plant from molestation by animals. The sting of the nettle is of this class." Dr. Roget does not seem to have been aware of the fact that the caterpillars of several kinds of insects feed upon nettle-leaves! With regard to mountain grasses being viviparous, it is an unfair statement, which might lead one to suppose that *all* mountain grasses are so. They are rather the exception than otherwise. Again it might be asked, how is it that the creeping willows, to the seeds of which silky hairs are attached, for the express purpose of wafting them away, flourish and carpet the mountain-tops of the Alps?

These few instances will be sufficient to show how cautious we must be in assigning a use to certain organs and organisms which experience may subsequently prove was never intended! It is by such hasty generalizations that teleologists only bring down contempt upon themselves, which natural theology is compelled to share.

Another application of the word "use" must now be considered. The healthy and vigorous action of any organ depends upon its exercise; and an increase of growth is the result of use, while a decrease or atrophied condition is the consequence of disuse. Thus when we see a bird fly, we are justified in saying that the use of its wings is for flight; but when we look at the rudimentary condition of the wings of an ostrich or apteryx, and supposing we know of no other birds, such a conclusion could never be drawn. Seeing, however, that the absence of the power of flying is exceptional, we have reason to believe, in accordance with the above law, that the power has gone in consequence of disuse. So the wing is now *useless*. But such *uselessness* is not always the case of atrophy. Take the penguin. Here, too, the wing is useless for flying, but observation tells us that it does admirably well for swimming. It

is not, then, *absolutely* useless, for its use is changed.* The ostrich and apteryx, however, neither fly nor swim, and as yet no new use has been acquired. Hence, shall we say that their wings are actually *absolutely useless*? In one sense, yes; but perhaps in another sense, no! if such an alternative be allowable. For flight the wing is *absolutely* useless: it has no actual use, but it may still retain a *potential use*; for many instances have occurred which have led naturalists to consider that rudimentary organs may be capable of such development as to acquire functional power (as in the case of mammæ of male sex, androgynous flowers, &c.), or perhaps even of a development into some new direction, as may be the case of the penguin, where a normal use has, according to such hypothesis, been displaced by another with corresponding modification of form.

We may therefore consider the *uses* of organs under the following heads:—

1. When the organs have their functions in full vigour,—as the wings of the majority of birds.
2. When the organs are becoming gradually atrophied,—as in domesticated birds; and their uses consequently enfeebled.
3. When the use is entirely gone,—as in the wings of the apteryx.

Obs.—In case 2, with perhaps 3, the organs are presumably capable of redevelopment with their uses restored. Whether an organ may become so atrophied that it is absolutely incapable of redevelopment is unknown; but the probability is that such is the case.

4. When the organs are adapted to an entirely new use,—as in the wings of the penguin.

N.B. Never forgetting, in any case of rudimentary organs, that they may represent *anterior* and not *posterior* conditions of organs with full functional power.

Design No. 3.—I now pass on to the third instance of design: the spiritual element. Having considered *organs* and their *uses*, we must regard the *beings* that use them,—the spiritual part of creation or life. And the pertinent question at once arises—“Why have animals existed at all?” or, “What is the object and design of life?” Let these questions be put touching any living object, plant or animal, that has ever lived, and no answer is forthcoming! Take man into consideration and the answer becomes plain enough. We must answer the higher question first—“Why am *I* here?” or, “Why does my

* We must not forget the other alternative, that the wing of the penguin may represent the anterior condition intended for flight.

spiritual part live and require this body of organs for its terrestrial existence?"

It appears to me that in the answer to this question is involved that of the former. The first, but least important answer, is that I could not live without animals and vegetables: *their* existence is essential to *mine*. But this obviously cannot be a complete answer, for such a necessity applies to a very small number of them.

The question "Why do I exist?" finds no satisfactory answer from nature. We *must* turn to Revelation to be completely satisfied; and no answer equals this: It was the will of God that there should be a *being* who could be *moral*, and that, he should pass through a period of probation before he be fitted to enjoy that state to which his spiritual part is naturally best adapted.

Now turn to the former question, "Why do animals exist?" or, "Why did the world see long series of developments," successive types ascending the scale of life, each in turn gaining its ascendancy, acquiring a maximum of development in some direction or other, and then gradually subsiding, yielding its position to its successor, until man entered upon the scene too, and he in turn took his place at the head of the world and then subdued it. A more complete reply will be obtained when we have considered the fourth instance of design; for it is only when we take note of the fact that a large group of animals (the vertebrates) are constituted on the same plan as man; conspicuously by their osteological characters; that we see not only a bond of union between him and them, but the design of their existence only finds its end or climax in man, whose bodily structures furnish the last links in the chain of animal creation. Physiologists have shown beyond question that in *bodily structure* he cannot be separated from the primates; that the human fœtus obeys the same laws of development and differentiation which govern the fœtuses of all other creatures: that is, it passes through certain representative forms of other vertebrates in succession upwards. Moreover, man has rudimentary organs in an exactly similar manner to all other animals. Now observe the consequence of this. The *facts* upon which the doctrine of evolution rests in its application to the animal kingdom thus become necessarily applicable to man's bodily structure also. If, therefore, evolution be true for the former, *it must be true for man's body also*. Thus far, then, at least, man cannot be severed from other animals. Away with that contemptibly false pride which ridicules, ignores, or falsifies these facts, facts which are real synonyms of truth. What care I from what I may have been descended? I am myself,

and I know my destiny, and if I have learnt my duty and mission in this world, no one is to blame but myself if I do not do it. It neither prevents nor helps me to do this, to hear either that I was or was not descended from an ape, an ascidian, or an amœba! If the probability be proved to outweigh the improbability, I am ready to accept it; and I care not so long as truth prevail.*

Having alluded to embryology, I would here venture to insert a few strictures upon Mr. Lewes's remarks touching this subject. He calls the processes through which the embryo passes "bungling." Now, granting that, for the sake of argument, he assumes a Deity to have done this, surely he is philosophizing subjectively; for how can he, any more than a teleologist, pronounce what is, and what is not, "bungling" to an Infinite Mind? He is deciding, out of his own conceptions, what is and what is not derogatory to a Deity. The Teleologist does not presume to do so: yet he is a Positivist, and denounces subjective philosophy! He appears to overlook in this case that what invariably takes place is subject to inductive law; and that the fact that all animals pass through representative conditions of inferior types in succession, while in the embryonic condition, is therefore a law of nature. If it be so, he, as a Positivist, ought to accept it as such. I regard it as a powerful witness to evolution, and that such was the method by which God chose to work, and see nothing derogatory about it at all!

I strongly protest against the expressions "tentative" and "blundering," "Nature feeling her way," &c. When we consider that the result always comes out all right; human fœtuses go on blundering every day all over the world, *yet there is no error in the result*. Nay, more, the fœtuses of all animals do the same—the results are equally good, whatever the species. If we can infer anything from this, it is that this "blundering" method is always a very successful one; and we, as human beings, have no cause to complain of having been

* In this essay I do not profess to deal with metaphysical subjects. I have therefore made no mention of the *soul* of man. I will only repeat words which I have elsewhere said (*Geology and Genesis: a Plea for the Doctrine of Evolution*. A Sermon. Hardwicke). "Admit that man's bodily structure agrees closely with that of apes; admit that his mental powers are of a *like kind* to those of the lower animals; deduct as much as there is of agreement between them from man, and what is left? An enormous amount of intellectual power; a morality which they do not possess at all, as well as the power to appreciate and love an abstraction or an idea; and I say there is no species, no genus, no family in nature that has ever existed or does exist, which affords us any ground for conceiving such an enormous impulse, as man has obtained somewhere, to have come to him by natural laws alone."

representatives of a fish, or even a hairy quadruped. As I have said, *I am Myself*, and care not what I have been. If it be truth, I am perfectly willing to abide by it; but instead of, or rather in that "bungling" recognize *law*. I refrain from pronouncing subjectively what God might or ought to have done with me, as well as from finding fault with what He did with me when "He fashioned me in the womb." (Job xxxi. 15.)

Geology has greatly extended our knowledge of the forms of beings, and has brought to light a vastly enlarged panorama of organized creatures, so that the question of design of their existence becomes more and more pressing. We may add, too, that we see a corresponding or somewhat analogous development in the inorganic world; the crust of the earth changing and elaborating itself æon after æon, fitting itself more and more for *our* existence, by producing that immense variety of substances, metals, marbles, &c., which are so invaluable to us.* When we consider all this, at which I have but here hinted, we cannot shut our eyes to the fact that a great design or purpose has been steadily maintained throughout, and that purpose was MAN. Man comes in at the right time, closes the series, and the argument of design is furnished with its final cause. The great doctrine of evolution thus throws a very different light upon the matter to the old statement that "everything was made for man, and is of some use to him." There was a truth, no doubt, underlying it, but it expressed a far too limited and presumptuous a view of the real state of things.

Man alone can look out upon the world and understand his position and destiny. He alone can recognize the broad line which severs him from all other members of creation, while he can yet recognize the links which unite him to them. He alone can see Mind in all around him, and recognize his own as a feeble image of the Creator's.

Designs Nos. 4 and 5.—The earlier and later forms of teleology may be called the "Creative Fiat" and the "Creative Plan." The second may be thus described: The organic world is part of a general scheme, in which each species represents an idea in the Divine Mind, and must be taken as an item in a plan conceived from the first in all its details, although realized in successive epochs.

The difference between them is not real, but apparent only, and has arisen out of deference to geological discovery. In other words, the *fiat* is transferred from one single period to a succession of periods. Whatever objections can be raised against contempo-

* This I considered as the 7th instance of design. I shall not, however, dwell more upon it in this essay.

aneous and specific creations, will be found to hold good with successive typical creations, or "realizations of ideas."

Now, the most potent objections lie in the fact that many species are connected by intermediate and often minutely gradational forms. Thus, just as the graduations of varieties connecting osculant species bear a *primâ facie* probability against each individual of coexisting species having been called into existence by a special creative fiat; and again, as osculant genera and osculant orders connecting prominently typical existing groups impart the same impression; so do the links found between "forms" and "types" of successive geological ages (in addition to those found frequently in contemporaneous periods) bear exactly the same *primâ facie* evidence against successive creative fiats having been made.

The following examples will furnish sufficient illustration of this. Of contemporaneous *geological* periods there are forms which unite the mastodon and elephant, the former genus being now extinct. In the Oolitic periods the *Dinosauria* furnished the link between reptiles and birds. In the Carboniferous epoch the *Archegosaurus* retains old piscine characters of Devonian fish, and links them on to the amphibia; while the amphibia, as a large group, stand intermediate between fishes and reptiles. Again, the extinct *Ictitherium* of the Miocene epoch has become differentiated into hyenas and civets, now representing two distinct families. The extinct *Palæotherium* of the Eocene and the Horse of modern times are united by the Hipparion and other forms of the Miocene and Pliocene epochs. And lastly, the very distinct shells of our seashore, *Purpura lapillus* and *Fusus antiquus*, are connected by intermediate forms during the Red Crag (Pliocene) epoch.

Again, just as in applying the argument of design to such plans or types as we see in nature, so identically the same features will appear transitional in discussing the design of individual organs. We saw that in some parts of the organism it seemed very pronounced, as in the well-developed limbs of certain lizards; while in others we could scarcely or not at all see it, as in their rudimentary or useless structures. These, however, it will be remembered, had a significance which cannot be overrated, for they bear incontestable evidence to evolution. Similarly when we consider the organs of many other animals so admirably adapted for their respective modes of life, design seems obvious; but when we examine transitional forms, and see those very structures, which appeared to be marvellous instances of design, becoming useless, while new processes take their place, we can only say that as design dies out in one direction it gradually appears in another.

More and more as the subject develops itself under investigation, and as we pass from the individual to its species and thence to its genus, and so on upwards till we see the whole of the animal kingdom or the vegetable kingdom linked together, more and more does the fact, that what we call *design* is a *relative* and not an *absolute* thing, become forced upon us; and if the term is to be retained in conjunction with evolution, it *must* be allowed to have no such determinate meaning as has hitherto been applied to it by teleologists. Whether, however, these plans or types, specific or ordinal, were conceived in the Divine Mind simply and immediately upon, or long before, their execution, is beside the real question. Whether, too, each type as it appeared was a *necessary* result of the laws of God's evolution, is beside the question, which is this: Recognizing objective types as real facts in nature, did God as a Being external to creation conceive them in any way *at all*, or are they simply the necessary issue of "concurrent conditions"; all external agency being excluded? I prefer to believe that God, as an external Personal agent, had something to do with them.

I cannot see that the statements,—“Every part [of an organism] is the effect of a pre-existing part” (p. 617, *Fortnightly Review*, No. XVIII. 1868); that, “the polarities of the organic substance assume the form” [of the organism]; that, “the type emerges from the momenta” (p. 621), or that “the type (or arrangement of parts) is the result of concurrent conditions, not the cause of their concurrence” (p. 366),—throw any light upon the question at all; they are the positivist's attempts at expression of facts, but are in no way explanatory, and simply amount to a denial of design of the types or forms of animals and vegetables; that they were but the necessary result of [fortuitous?] concurrent conditions. Have we not here something very like the Lucretian fortuitous concourse of atoms?

But suppose we admit that this materialistic or positive view is equally good with that of a Personal God, so far as both may be supposed to furnish a *vera causa* of the origin of organs and forms.* Then it is at this point that Revelation steps in and turns the balance in favour of a Personal God external to creation, and Who has worked by laws and evolved the present state of things from chaos.

Mr. Lewes further remarks (p. 621), that—

“The type does not *dominate* the momenta, it *emerges* from them; the animal organism is not cast in a mould, but the imaginary mould is the form which the polarities of the organic substances assume. It would seem

* Mr. Lewes defines *organs* as structures possessing definite functions; while he applies the word *forms* to rudimentary and useless structures.

very absurd to suppose that crystals assumed their definite shapes (when the liquid which held their molecules in solution is evaporated) under the determining impulse of phantom-crystals, or ideas; yet it has not been thought absurd to assume phantom-forms of organizations." (p. 622.)

Now, if we are to understand from this passage that the issue of an organism, whether merely an offspring similar to its parents, or the ultimate development of a new species altogether, is in any way to be compared to the production of a crystal from evaporation, the burden lies with Mr. Lewes to show that the *causative momenta* are analogous or are of similarly influencing power. In the one case there is *life*, in the other there is not. Life may be nothing more than physical forces, but no one will deny, as long as he can judge of it by its effects, *i. e.* as long as the organism under examination is alive, these effects do not justify us in saying that there is any analogy between them, or that they can be compared, any more than an organic cell admits of comparison with a crystal.

Mr. Lewes goes on to say that "the conception of type, as a determining influence arises from the fallacy of taking the resultant for a principle." But is it a fallacy? The whole question of final causes depends upon the answer to this question. Principles of nature are only deducible from resultants or facts; and science can only reason from the known to the unknown. It is from the facts of nature that the principle of evolution has been deduced. The *vera causa* of evolution and which includes all types and plans, is placed, however, in different directions by the teleologist and the positivist; the latter, ignoring any determining influence, puts it in the hands of the "momenta" or "polarities of the organic substance"; the former, recognizing some determining influence, places it in the hands of God.

The positivist, however, does not attempt, as far as I can discover, to account for the "*momenta*" of nature; except as "*immanent* properties." But whence came they, on the principle of conservation of force; what were their antecedents? Are they self-existent, eternal? But as this question opens up the deeper one as to whether God be Personal or Impersonal, whether force be eternal or not, &c., I must leave the matter there, only quoting one more sentence from Mr. Lewes, who says: "Even Lotze, who has argued so victoriously against the vitalists, and has made it clear (?) that an organism is a mechanism, cannot relinquish the conception of legislative ideas, though he significantly adds, these have no power in themselves, but only in as far as they are grounded in mechanical conditions." Why "significantly"? Surely we have here a wit-

ness to the usual way by which truth forces herself upon the mind? for she is far more truly and oftener *felt* than reasoned out. Lotze may argue as much as he pleases, but his intuitions are evidently rebelling against his logic. The still small voice whispers behind, as it will and must do in time to all, "There is a God for all that," who made him and all the world.

It will be desirable to observe, for it seems to have been overlooked by Mr. Lewes, that the notion of creative fiat in all probability arose from the interpretation of theologians of Genesis i.; and that confirmatory evidences appeared to be unmistakably derived from nature, because, until comparatively recent times, known species were few and their differences more obvious than their resemblances. I do not think, therefore, that the charge of having "inferred that species were ideas in the Divine Mind" is so truly applicable to the theologian as opponents seem to suppose; for it was simply regarded as an unmistakable doctrine of the Bible. All that the modern theologian has to do, therefore, is to confess that his interpretation of the first chapter of Genesis was inadequate, and requires correction; and that he has to thank science for having pointed out his mistake.

Design No. 6.—There is yet another phase of Design, and which forms the subject of one of the *Bridgewater Treatises*, viz.: "On the Adaptation of External Nature to the Physical Condition of Man," by John Kidd, M.D., F.R.S.

I cannot but think that many adaptations of man and animals, and plants, as well to their sphere of existence, have been much overrated; for, in fact, they are practically greatly limited. The conclusion now arrived at from a study of such adaptations has been expressed by scientific men as follows:—Animals and plants [and I will include man] do not necessarily live where conditions may be best suited to them, but where other animals and plants, or physical conditions, will let them live. This is the result of that intense "struggle for existence" which is a universal fact, and covers the sphere of man's existence, as well as that of all other living organisms. It requires but a slight observation, provided the mind free itself from preconceived ideas, to see that no animal or plant is absolutely and perfectly adjusted to its sphere of existence for every day of its life. These adjustments are ever varying round a mean condition of a fair state of comfort and happiness. Averages in this world must be looked for only. A vast amount of very imperfect adaptations must be taken into account in considering the conditions of life upon this planet.

I do not think it necessary to enter into many details to establish these facts. Evidences of it can be found in many works, notably *The Origin of Species*, and *Wallace on Natural*

Selection, not to add in a moderate amount of careful observation about him by the reader himself: but perhaps a few remarks upon the relative condition of man in his adaptation to his environment may not be out of place; for this element of adaptation in the argument of design has always seemed to me to be too much depended upon.

Starting with the truism that man can now exist upon this world—a possibility which, perhaps, did not exist in the greater portion of the world's history—we have to consider the degree of perfection to which that adaptability has arrived; and a careful scrutiny will not bring out more than a relatively perfect view. Consider his wants. Food stands foremost. Now his calculations on the produce of his fields can never be absolute. He may be in no way to blame; but, after all his strivings, his harvest may be ruined. Again: one of the most essential elements which nature furnishes to sustain our immense manufactures is coal. We may regard coal as providentially stored up for us; but we can conceive—if it be God's providence—that it might have been far more accessible and less dangerous to procure; for even with the most careful processes being adopted for its extraction, enormous danger to life always exists. So too, with regard to accidents and calamities by fires, earthquakes, and water. Who can foretell the fate of man, who is ever liable to destruction from natural causes which he cannot always avoid, and which he has no power to control? Not to mention diseases, hundreds of instances show an absence of a conceivably perfect adaptation between himself and his environment, and which will be apparent to any one who will reflect upon it. For example: in Dr. Kidd's contribution to the *Bridgewater Treatises*, he alludes to the beneficial effect of wind as dissipating intense heat, and as a preventive against the evils of a stagnant atmosphere,—“those currents of air which administer in various modes as well to the luxury and comforts of man, as to his most important wants” (p. 135, 8vo. ed.). But in his description he alludes as much to the destructive effects of wind as to its benefit, and to the existence of stagnant air producing (?) horrible effects, as goitre in Switzerland; while of hurricanes he can only say, “but on some occasions we have immediate demonstration of their remedying a greater evil [than the destruction of life and property which they cause]; viz., dissipating swarms of ants in the island of Grenada!” It may be questioned in passing whether the latter really is a greater evil than the destruction of hundreds of human beings! Again: of Swiss valleys, all that he can say is, “We may well be thankful that our lot has not been cast in certain regions of the earth, in those Alpine valleys, for instance, whose scarcely

human [? *sic*] inhabitants attest the dreadful consequences of a confined atmosphere." Now what are we to infer from this? And I might add much more to it; such as the atmosphere being the vehicle of epidemics, &c.; but that the physical adjustment of man to the atmosphere is anything but absolutely satisfactory. But we must remember this,—that an atheist or infidel might easily appeal to Dr. Kidd's descriptions, and tauntingly ask, "Is this the work of your Beneficent God?" Moreover, if we consider man's adjustment to external conditions, or external conditions to him, everything else besides the atmosphere furnishes similar "evils." In other words, there are the same relatively perfect or imperfect conditions, than which he can conceive far better, wishes for far better, and which he—if he does hope at all—hopes for far better hereafter.

We thus, then, find that man is not exempt from this invariable law of imperfect adaptations.

The Law of Inideality.

But, apart from infidels, many will feel disposed to ask, "Is not all this very derogatory to the Deity, who is a God of love and mercy?" I at once, and unhesitatingly, say "No!" I again say that it is not for man to pronounce what may or may not be derogatory to God. The finite mind cannot estimate the wisdom of the Infinite. It is this unphilosophical way of weighing God's actions in our own mental balance which has brought so much contempt upon the methods and assertions of the teleologist.

I maintain that natural theology, as a science, must be studied *objectively* (and not as hitherto, *subjectively*), like all other sciences. Theological deductions will only be sound as long as they are based upon a full and *thoroughly impartial* observation of the phenomena of the world. We can only discover His laws by a close examination of His works, their inter-actions, and their actions upon ourselves; and the universal principle or law—applicable, as we have seen, to all cases of design, including the adaptation of man and animals to their sphere of existence I propose to call the *Law of Inideality*; by which I would signify that nothing in nature ever reaches that *ideal* stage of perfection which is conceivable by man. It expresses what I have hitherto called *relative perfection or imperfection*. I call it a law, because law is expressive of an order of facts, and this law admits of universal application, applies to every class of "design," and is, therefore, a universal witness to the will of God.

Under this same head of adaptation I would allude to a statement of Mr. Herbert Spencer, who, in his usually powerful reasoning in support of evolution, has made one slip (as it seems

to me) in dealing with this subject in his article on the special creative hypothesis. (*Principles of Biology*, vol. i. p. 344.) In speaking of the parasites to which man is subjected, he asks, "Shall we say that man, 'the head and crown of things,' was provided as a habitat for these parasites? or shall we say that these degraded (?) creatures, incapable of thought or enjoyment (?), were created that they might cause unhappiness to man? One or other of these alternatives must be chosen by those who contend that every kind of organism was separately devised by the Creator. Which do they prefer? *With the conception of two antagonistic powers, which severally work good and evil in the world, the facts are congruous enough.*"

In the first place, I would remark that, of the two alternatives given above, the first is obviously absurd. It is axiomatic that man has higher functions and destinies than to supply food for parasites. Of the second, I would emphatically deny that, *because* parasites live on man, that *therefore* they were created to cause unhappiness; not to notice the two questionable words he has used. Some, such as *tania*, may cause great distress; but, of some others, we should be utterly unconscious until told of the fact of their existence upon our persons; and I suspect people, as a rule, are not aware of the presence of more than four or five, the majority causing little or no inconvenience at all. The *purpose* of causing unhappiness greatly fails of its end. The real question, however, is far wider than pure personal inconvenience, even if it amount to an occasional death of the individual. It is this: Were all "evils," from unpleasant things up to destruction of life, designed to cause unhappiness? That is the question, to which I emphatically reply, "Certainly not."

Again. The sentence which I have italicised is one which appears to me utterly absurd under any hypothesis whatever. For, if parasites be an "evil" work here spoken of, and man, presumably, the "good," *the argument cannot stop with man*; and we shall soon become utterly perplexed to know which animals are "good" and which are "evil." If those which prey on others, such as parasites on man, be (as is evidently intended by Mr. Spencer) evil, then, *à fortiori*, all carnivorous animals must be "evil," and we must presume all herbivorous "good"; and man himself must therefore be "evil" too. But we have seen that he was "good," and his parasites "evil," which is absurd. *Cor.* Of what character are those animals, such as the rat and pig, which partake of a mixed diet?

The habitual use of this word "evil" has come down to us, I suspect, from the distortions of subjective philosophy; or, rather, subjective philosophy has merely expressed the idea of evil, which was hereditary from all antiquity, and inherent in

the mind of man since he became morally evil. Man being evil himself, looked out upon the world through a glass darkly, and so all nature seemed coloured with the murky aspect of his own morbid phantasy.

Recognize this world as never furnishing more than a relative condition of things; while the purpose and design of that, too, is not difficult to see, now we have the light of Revelation thrown upon it; namely, as a state of probation for man, to fit him for a higher destiny than any which this world can furnish; accept this as a great and universal truth, and you will not discolour your view of creation by erroneous views of God's goodness, much less by atheistic ideas!

We are told that "the pure in heart shall see God," and that "all things work together for the good of those who love Him!" Learn, then, to succumb to His will, try to adapt yourself to the conditions in which you are placed, not the conditions which are about you to yourself—that is reversing a natural law—and you will begin to suspect that what you irrationally called "physical evils" were, after all, but blessings in disguise. (Cf. S. James i. 2.)

The very idea of "evil" as applied to nature is, to my mind, totally uncalled for, and gladly would I limit it to sin and its effects (and even these latter, as often as not, are clearly blessings). It is not for us to find fault with nature, but to accept it as we find it, as the best for our good; and I repeat, man would never have dreamt of regarding things as evils if he was not evil himself, and so considered everything about him evil too. Here, then, come in the elements of faith and humility, which I alluded to as essential elements of the character of a student of nature.

Chance.

The preceding remarks on design will, I think, cover all that need be here said upon its former use by teleologists, and the new extension of its meaning which I would venture to give it. I now pass on to consider the next element of the argument which enters into the subject of this essay, namely, that of *chance*,—an element which forms so important an item in the process of natural selection, but which natural theologians have been very loth to admit, as being derogatory to their ideal and subjective method of Divine working.

What is meant by chance? We use the word often enough, but, when we think about it, it does not appear to be so easy of explanation as we might have at first imagined, for we discover that it may be employed in more than one sense. Let us consider some of them.

Can we mean by chance an event without a cause? Certainly not. Does it imply that the causes are so obscure and so baffle our conceptions and investigations, that we say the effects or results which we can appreciate have taken place by chance? If so, it may be somewhat of the meaning of the word; yet this can scarcely be so always, for we do not say that a plant ripens its fruit by chance, though we understand not the laws of its development nor the processes of its fructification.

To such results we assign the term *law*, and not chance, solely because we see the same effects issuing from similar causes. If the expected result do not, however, occur, as when a plant refuses to ripen its seed, we consider that it is due to some unaccountable interference of unexpected conditions. These may sometimes be accounted for in a general way, as, *e. g.*, excessive wet, blight of fungus or caterpillar, &c.; but as often not; so that, as the result is often practically uncertain, we cultivate crops knowingly at a certain risk, saying that it will be all chance whether we get a good harvest or not. Such, then, may be considered as one form of chance, namely, when events take place contrary to our expectations. A very general signification, however, would seem to imply undesignedness in the results, or when "an event takes place to the exclusion of some other event which, as far as *human* experience, judgment, or foresight can calculate, might as easily [and, perhaps, with more probability] have occurred." (*Walker's Dictionary*, s. v. "Chance.")

Thus, for example of undesignedness. A man travels from London to York, his friend travels from York to London, neither being aware of the intentions of the other. They meet *by chance*. Here, then, we have an undesigned coincidence.

A familiar instance of the latter definition, given by Walker, will be found in racing. Two men may run; one, from former experience, and from appearing to be the better runner, may be expected to win, yet from some *chance* the other may. Another explanation of the word will be found in a cause, or series of causes, although known as to their nature, yet cannot be traced and calculated. Thus a die falls from the box with ace uppermost. This we attribute to *chance*; but if we knew the position of the die in the box, all the forces and their directions which are brought into play by shaking the box, all the parabolic curves which the die describes, and all the attendant circumstances of motion upon the die, the result would be *certainty*. These causes, however, are not traceable; and we say, accordingly, that the result of the ace being uppermost was purely a matter of *chance*.

A further use of the word chance is made when we refer to future events, over the circumstances of which we have no control. When we say, "Leave it to chance," what do we mean? Simply this; that although by our previous knowledge of certain laws we might construct a proper deduction upon them, in accordance with which we might predict the future event,—in other words, expect the same result to follow after a repetition of the same circumstances; yet we know not but that certain other events or causes might intervene to subvert or alter the strict fulfilment of those known laws. Therefore we cannot be sure of the ultimate result, and we express our incapacity by saying we must leave the issue to *chance*.

The difference, therefore, between the case of a plant ripening its fruit and a die falling from the box is this: in the former case, without knowing what the laws are which govern the plant, we see the same result constantly recurring under the same circumstances; and this reduces itself to *inductive* law, while we presume tacitly that the same secondary causes are brought into play every time we see the same result occurring. But when we throw a die, we can form no inductive law in obedience to which the die will *always* appear with the ace uppermost. Experience tells us that however nearly in the same way we may shake the box and throw it out, we cannot calculate upon any particular face being uppermost; we may arrive at some degree of probability, but no certainty. So that we apply the word chance to those results for which we can trace no inductive law. And this brings us to consider its application in nature as concerning the conditions of existence for any individual organism.

Observation clearly shows that a plant or an animal is not always, if ever, placed under conditions best suited to it. Its position in the world is due to chance; or at most it can be only said to live where its existence is possible, not where conditions are most favourable. Now this is the average condition of things, and we may remember that although circumstances affecting the individual may seem to occur capriciously, yet when a large number are examined, *law* is perceptible as governing the *averages*. Thus, a large array of facts connected with social life seem, when isolated, to be due to chance, and subject to no law; yet when they are classified and averages obtained, it is found that these averages are not only subject to law, but such laws as can be practically acted upon, though individual cases may seem to belie the deduction. It is on this principle that the tables of life assurances are constructed, which are expressive of the laws which govern the rates of mortality.

In nature, then, we place under the head of chance all results

of which the immediate or secondary causes are untraceable, and which we cannot reduce to inductive law. That they are subject to law may be—nay more, is—a reasonable inference, though we are powerless to trace even the appearance of law. It is only to those persons who do not see this that the word chance in the sense in which it is used by naturalists implies anything derogatory or lawless. When Mr. Darwin speaks of chance in connection with natural selection, he alludes to what are facts, though he leaves his readers to infer that *chance* is but an expression for certain phenomena of which the laws are as yet untraceable. This may be illustrated by the weather. In this climate it has been found impossible to reduce the changes to anything like system or law beyond the most general; and it seems to be “all a chance” whether we are to have fine or wet days. Yet observations are beginning to show that there is law governing the averages, though we are powerless to bring every day’s phenomena into a general system. If we compare tropical countries with our own, we find they are far more regular, and consequently can be predicted with much greater precision.

Now it is due to the fact that chance seems to occupy so large a share of Mr. Darwin’s system of the origin of species by natural selection, that his opponents one and all have taken him to task for it; as implying a creation without a creator, and for reviving, with but slight improvement upon, the old Democrital philosophy. Even when he does let fall one or it may be a few little waifs to show, as it were, whither the wind listeth, it is instantly caught up by an opponent, paraded as a mistake on Mr. Darwin’s part, and that he evidently never could have intended it to be there. Thus does the M.A., author of *Darwinism Demolished*, make a rhetorical sally upon the gentle admission that the “works of the Creator greatly surpass those of man.* It is in this want of some distinct assertion from Mr. Darwin of natural selection being due to law (assumed but unrepresented by perceptible facts) that he has not done justice to himself; nor has he cared to consider the short-sighted charges, not only of non-scientific, but even many scientific men themselves. He has laid himself open to misconstruction, and, as history itself can now show, has aroused an enormous amount of bitterness of feeling, while innumerable speeches have been delivered, and even books of godly proportions have issued from the press, to disprove what

* I quote from memory, p. 220, *Origin of Species*, 4th ed., not having the M.A.’s work before me, but the tenour of the remarks is strongly impressed upon my memory.—The exact title of the work alluded to by Mr. Henslow is *The Darwinian Theory of the Transmutation of Species examined*, by “a Graduate of the University of Cambridge” (*J. Nisbet*).—Ed.

Mr. Darwin has never yet asserted to be his belief, and which may be expressed briefly thus: that "the origin of species by natural selection is *not* subject to higher law." A few sentences in the *Origin of Species* and one strong protest in his *Descent of Man* are all, as far as I can remember, that he has uttered. It is to be deeply regretted; for I believe I am right in saying that in his indifference to preconceived prejudices, in his fearless exposition of what he believes to be the truth, he has raised a great stumbling-block to the general acceptance of the theory of evolution, which, though no doubt destined ultimately to hold sway, yet has been retarded in its progress by one of its greatest advocates.

As an illustration of an utter perversion of interpretation of Mr. Darwin and others' writings, I take the following sentence from Bishop Perry's *Science and the Bible*, who, speaking of *The Vestiges of Creation*, *The Origin of Species*, and *Protoplasm*, thus writes:—"If I have spoken of these three works with severity, it has been because the object of the writers obviously (?) is to produce in their readers a disbelief of the Bible"!

Notwithstanding that I am attempting to place Mr. Darwin on a right footing with his numerous misjudging readers, I must take him to task for misjudging himself. He tells us he does not believe in design; but I find in his work that he believes in the Creator, "Whose works far surpass those of man." What can that sentence imply but an *intuitive* recognition of the very basis of the argument for design? Mr. Darwin can no more throw off those feelings than Lotze. God's works may have been evolved, and not directly created; but, take creation as we find it, and design defies us everywhere! It is solely on *design*, and nothing else, that we recognize the superiority of nature's works, and that superiority forces us to acknowledge their author as God.

When Mr. Darwin makes that solemn protest wherein he says (*Descent of Man*, vol. ii. p. 396), "The birth both of the species and the individual are equally parts of that grand sequence of events which our minds refuse to accept as the result of blind chance. The understanding revolts at such a conclusion, whether or not we are able to believe that every slight variation of structure,—the union of each pair in marriage,—the dissemination of each seed,—and other such events, have all been ordained for some special purpose," he recognizes sequence as law, and law as the will of God,—and that *is* design. Mr. Darwin believes in it in spite of himself, though he may, as I do, disbelieve in a special act of creation for each organism.

Perfection.

The next element entering into the view of the ordinary teleologist and which must be noticed, is that of *perfection*. So much has been already said about the imperfections of nature, which I call the law of *inideality*, that the general, nay, universal, absence of absolute perfection will be almost inferred. It will suffice, therefore, to allude to three* only of the phases of design; viz., in organs, in their uses, and in the adjustment of creatures to their environments.

This idea of perfection is not equally maintained by all teleologists. In the writings of some of the more advanced thinkers, such as the late Master of Trinity College, Cambridge, there appear qualifying expressions when alluding to structures in which they cannot help seeing certain imperfections. Thus, in the *Plurality of Worlds* (p. 345), Dr. Whewell alludes to rudimentary organs, which he admits have no use to the beings in which they occur. But, as we have seen, he does not advance further than what appears to be the general explanation of all others who allude to them, viz., "that they exist for the sake of similarity," and he adds "this similarity is a general law, the result it would seem of a creative energy which is wider in its operation than the particular purpose." This explanation (?) of Dr. Whewell's is worthy of criticism, for it fairly expresses the general interpretation hitherto given by natural theologians of these seemingly mysterious structures. The expression "they exist for the sake of similarity" taken *per se* seems to lead us to a *reductio ad absurdum*, for let us remember that the argument of design professes to reason from man to God. Does, then, man leave rudiments of other designs in every kind of work which comes under the same general plan? Take for example ecclesiastical buildings. Does he tack on to a plainly-built chapel a few unfinished pinnacles which find their proper place on the tower of a cathedral? Certainly not! The perfection of art in each building consists in the unity or harmony of its design as carried out in the details of its own "style."

Nor will such an idea of purpose hold good if we admit development in the progress of architecture. Thus, could we say that man leaves rudiments of antiquated styles *with the express purpose* of showing that his modern edifices are constructed on an older plan? Assuredly not! I introduce this hypothetical

* I purposely avoid alluding to the imperfections of the spiritual part of man and animals, as that would lead me away into metaphysical subjects, with which this essay is not concerned.

question in order to allude to the fact that man *does* introduce rudimentary and useless structures in modern art, which, however, *had* their uses, but which are now obsolete, but *not with such purpose*.

One illustration will suffice. In the days when roads were bad, it was necessary to have straps with loops, by which to hold on inside the carriages or coaches. When roads became good, coaches were still made with them, though their "use" had gone. First-class railway carriages, which were originally three coaches united, *have them still*. Again; boots, before vulcanized indiarubber was invented, were usually laced up over the instep; when elastic sides were adopted, *imitation lacing* was inserted. Many other instances might be given besides these two, which are suggested by Mr. Wallace.

Now, if the modern coachbuilder or railway-carriage manufacturer were asked why he still made these useless appendages, whatever his answer, I am quite sure it would not be *in order to show* that modern carriages are built on the same plan as those of the sixteenth century! If then we argue from the rudiments in man's works to those in creation, this explanation usually given is utterly preposterous, and Mr. Lewes may well say that it is "a specimen of pedantic trifling worthy of no intellect above the Pongo's." (p. 615.)

Besides atrophied and rudimentary organs, which, when compared with their homologues in full development and activity, evince an absence of that perfection which is so insisted upon by teleologists, the very organs taken to prove perfection of design and execution, such as the eye, *witness to a great want of perfection*.

Now, if it can be shown that so highly elaborate a structure as the eye is relatively perfect only, we need not attempt to prove it for any other.

Purposely omitting all diseases to which the eye is subject, the first imperfections I will notice are long and short sight. Again, eyesight is of great variability of strength. In many cases the weakness (due to degeneration and atrophy, but not disease) amounts to a positive defect. Some persons have no appreciation of distinct colours, all appearing alike; or else they cannot distinguish between complementary colours, such as red and green. In other persons, called "moon-blind," they cannot see after a certain hour of the day. Again, the achromatism is said not to be absolutely perfect, while the power of adjustment to strong light is greatly limited; and in many cases sight fails under certain employments, such as type-setting, &c., and so on.

I am not complaining that our eyes are not absolutely

perfect. All I mean to imply is this: that I can conceive of the possibility of better eyes than those with which man and animals are endowed, though what we possess are quite equal on the average, to our requirements.

The same remarks will apply to all other organs. If such imperfections are obvious on a slight consideration, whence came the idea of perfection?

I think the fact is, that an examination of the anatomy of the eye proves it to be marvellously constructed. There is a wonderful adjustment of all its parts, which immeasurably surpasses the finest execution of the most complicated optical instrument ever made by man. That the teleologist, remembering that he is told that everything, when created, was "very good," is carried away by his zeal to exalt the glorious works of the Creator, thinks he sees absolute perfection, by overlooking its relative character.

The observations made under the head of "use," when speaking of design, will have prepared the reader to infer that *uses* are not absolutely perfect; *i. e.*, the structures not being perfect themselves, their uses naturally fail to attain to that degree of perfection of which we can conceive a possibility. This is seen in rudimentary organs and their homologues, where the use, from having been admirable in the latter instances, becomes evanescent in the former. Similarly is it with the eye; if the structure be not perfect, the use obviously cannot be perfect.

There is an objection always raised by teleologists to this argument of relative use or imperfection which must be noticed. They remark that we have no right to call any structure at all "useless," for, if we knew more, its use would become apparent. If so, the burden of proof lies with the objector. But is not this a mere assumption, based upon his own subjective ideas of what ought to be characteristic of the Deity? What I have already stated is a sufficient answer to this objection, only remarking that, because *some* organs, on degradation, assume a new function, does not warrant the assumption that *all* do so.

The third instance of imperfection to which I alluded, consists in the adaptations of organisms, whether animals, inclusive of man, or plants, to their sphere of existence. The remarks made under this head in treating of design show clearly enough, that in no case whatever is there that conceivably possible state of absolute perfection, which some teleologists seem to affect in their ideas.

Perfection is the last element of the ordinary views of natural theologians to be reviewed. In considering these views it was

necessary to criticise certain objections raised by some evolutionists, such as the Darwinians, that there is no design; while natural law, which plays so important a part in all views of evolution, was scarcely alluded to.

In taking up the third, or Darwinian view of creation, law, therefore, is the only element which remains to be considered.

Law.

According to the views advocated in this paper, natural law takes the place of a direct fiat in creation. It is necessary, therefore, to point out clearly the meaning of the word law as applied to nature. This the Duke of Argyll has done for us in his *Reign of Law*, p. 64, where he maintains that "Law in its original sense signifies 'an expression of human will enforced by power,' [and] the instincts of mankind finding utterance in their language, have not failed to see that the phenomena of nature are only really conceivable to us, as in like manner the expression of a will enforcing itself with power."

The word, however, is now retained even by those who deny the analogy as well as by those who recognize it, and is used merely to signify an observed order of facts, whether traceable to causal forces or not, and whether the combination of forces which, by their resultant, produce the order of facts, have any reference to the fulfilment of purpose or not.

Thus, if we dissolve alum, and evaporate the solution, and so recrystallize it, we can tell beforehand the exact number of degrees that will be between any two faces of the crystals, before a single particle of alum assumes the solid state.

Again, we can examine the motions of the heavenly bodies, and foretell to a minute an eclipse 1,000 years beforehand. Here then we have fixed and invariable law.

Now, in applying this term to organism, we note a certain marked peculiarity in the resulting effect of the combination of forces which act upon an individual endowed with life, and very different from that of forces acting upon inorganic matter. Consider the latter first. There is an exactness about them which admits of positive foreknowledge; and in examining minerals of nature the composition of one found early in the world's history is identical with that found yesterday. Similarly the physical force of gravitation by which the rain-drop impressed its form on the Silurian slates was identically the same as produces them now. But now turn to the organic world. Although it is true that a large number of observed orders of facts can be mentioned which represent fixed laws; such, for example, as the structure of some animals compels them to be

carnivorous, others graminivorous; some are viviparous, others oviparous, &c. Yet there are certain other facts and orders of facts which do not seem invariable. Such notably is the case that, although *parents produce offspring like themselves* (this being usually a recognized law), yet *they never are absolutely like them*; such differences as may appear in the offspring being due, it is said in our ignorance, to the "laws of variation." This, however, is no explanation, but themselves are orders of facts, and therefore we are once more driven backwards to find higher law or will.

Here, then, we observe the difference between the laws of variation in the offspring of living beings and laws governing the lifeless physical phenomena of the world. The result of the latter can be with tolerable or perfect accuracy predicted. The resultant of laws of variation can never be foreseen. No one can tell what are the preceding forces which give rise to variation at all, nor in what direction the offspring may vary. Here, then, is the occasion where chance is apt to find a place in theories of specific origin; but, as I have already said, taking a long and consecutive view of nature's offspring we are compelled to acknowledge the presence of an over-ruling Law, though we cannot see it in the individual variations.

Some of those forces which produce variation in the offspring have been thought to be the exercise of muscular action, an inherent principle of progression; while food and external conditions acting upon the organs of reproduction is reservedly suggested by Mr. Darwin, though he prefers to state more emphatically that "our ignorance of the laws of variation is profound." (*Origin of Species*, 4th edit., p. 195.)

Now, as evolution hinges upon these so-called laws of variation, especial attention must be paid to them: for while we can all recognize family likenesses, yet we can at once distinguish any two members of a family from each other. This may be a truism, but it lies at the bottom of evolution, for all that. If, therefore, an offspring *can* be different, however slight, from its parent, there are no *à priori* reasonable grounds for asserting that the second generation may not differ from the first as much as the first differs from the original parents, until at last a being may be produced so far different from the original parents, that it would (if its history were unknown) be classed by a naturalist as a different genus altogether.

This, it will be remembered, has actually been done in the case of pigeons, as described by Mr. Darwin in his *Origin of Species*. On the other hand, some opponents of his views have maintained that the power of variation is limited; if so, the

onus probandi rests with them, and no proof has ever yet been given. Whereas the possibility of the other view has been proved, and the probability of its truth elsewhere derived amounts to a moral conviction.

I would only here add one more remark upon this objection, and that is, because well-marked types may and have continued unchanged for indefinite periods, that does not controvert the possibility of their subsequently changing when new forces are brought to bear upon them by being in altered conditions; nor does it at all interfere with the doctrine of evolution.

It is worth while here observing that no form of the doctrine of evolution can be maintained which does not recognize this fact, which has been called a "Retention of Type"; by which is meant that co-existent with a gradual evolution of forms of life in an ascending scale, there are members of nearly every group still living and retaining the characters generally of a comparatively lower grade of that group. To say that naturally less highly organized or complex forms are less liable to vary, and are more adaptable to surrounding conditions, is to state a palpable fact, and accounts so far for their present existence. Such *retention of types* must, therefore, be recognized by every one who holds to the doctrine of evolution.

Now, admit the fact of indefinite variation in offspring; admit the possibility of a higher, but apparently untraceable, law regulating the variation with an ultimate purpose, as Mr. Darwin does in the passage I have quoted, wherein he says: "The birth of the species and of the individual are equally parts of that grand sequence of events which our minds refuse to accept as the result of blind chance,"—and you will find no difficulty in embracing the doctrine of evolution. Secondary causes, such, for example, as natural selection, may be the means of controlling those variations, favouring some rather than others; but those secondary causes are themselves subject to higher laws, which are recognizable when we take in a broad and extended view of nature, but apparently absent in a contracted view: and it is the contracted view which encourages all ideas of chance without a higher and Providential Power.

The fourth view, or that of the author of this essay, requires no further elucidation than is expressed in the terms given on p. 4, as he ventures to think each point or element has been established in considering those of the other views.

Conclusion.

The general result which will be gathered from this essay, the writer trusts, will be, that if the word "design" is to be retained at all, it must have a far more extended and qualified, if not very different meaning to that which has hitherto been assigned to it. At present it fails to embrace a very large class of structural phenomena in living creatures: it fails to account for the so-called evils inflicted by physical forces which in their more beneficent forms are loudly applauded as witnesses to the goodness of God: thus, electricity in its use to man for telegraphic purposes might be pronounced as designed as much as coal and steam; but the teleologist hesitates to say it was made to kill when pent up in a thunderstorm. Or again, that although God has given us coal, natural theologians do not recognize the awful destruction of life which year after year is unavoidably made in getting it, as a judgment upon his presumption.

The word design, therefore, cannot be any longer entertained in so absolute a sense as heretofore. All those so-called "physical evils" *must* be taken into account in any scheme of creation which professes to have at least some show of philosophy and comprehensiveness. And although, as the writer in the *Quarterly* (for July, 1869) has forcibly shown, that in such structures as the eye and hand design "clings to the facts," and by no mental effort can we throw it off—witness Lotze!—yet to some students those innumerable cases of imperfection, as seen in rudimentary organs and ill-adaptations, and so forth—"bunglings," as they have been called by materialists—weigh so heavily upon their minds that they cannot see the power of *law* which governs them, and which *itself* is a proof of design. There can be no law without a lawgiver. Order, method, law, and plan are but expressions of mind. In the words of Mr. Darwin, I say, "that the understanding revolts at such a conclusion, whether or not we are able to believe that every slight variation of structure,—the union of each pair in marriage,—the dissemination of each seed,—and other events, have all been ordained for some special purpose."

With regard, then, to the present aspect of the argument of design, two important deductions have been made,—first that design is never more than *relative*, and not *absolute* in nature; and secondly, that we must no longer adopt any such comparison between man's method and God's method of making, as has been implied in the argument of design; for, while man operates upon the materials furnished him by the world, combines and adjusts the forces of nature, and so elaborates

structures, as steam-engines, clocks, &c. ; and, moreover, only in the sense of *improvements* can evolution be applied to his works,—God does not operate in such a way at all. He evolves, by means of natural laws established of His own will, those structures and organisms which appear to our sight to be so full of what we call design when applied to human productions. We must, however, distinctly bear in mind that no examinations or speculations can disclose to us the real method of God's working which gives rise to such appearances as are usually called designed. There they are as objective facts, but to state how they came about is a mystery which philosophy will never solve.

The CHAIRMAN.—I have much pleasure in proposing a vote of thanks to Mr. Henslow for his paper, which appears to me to contain a great deal of truth ; and also to suggest some points for our consideration, which may go a good way towards the solution of difficulties that seem to be pressing, and towards the nearer approach to a union of different schools of thought, each of which may hold a great deal of truth. Whether Mr. Henslow's paper has fully brought out, at every point, all that is in harmony with the more old-fashioned notions, I will not undertake to say. Here and there he was on a certain track which, if followed out, would have led to a fuller and more pronounced comparison of his own scientific views with those views of creation which have been held in the past, and which, though imperfect in their expression, as all such views must be, had, as I have no doubt Mr. Henslow will himself say, substantial truth at their basis. We must all admit that this paper is full of scientific thought, and evidently the production of one who has given a very reverent and very religious consideration to the whole breadth of the subject before us, both as respects the relations of Deity with this world, and the work of Deity in this world. (Hear, hear.) I must confess, however, that there is one point in which the paper has a little disappointed me. I thought that the author would have spoken more of that gap to which he himself referred when I was last here. I mean the gap between inorganic matter with its laws, and life. Now, he has spoken of evolution as if it were one complete, continuous, consecutive thing, the links of which melted into each other right up to man, and as if man were the only object in the whole series of successive existences, which did not coincide with the theory—man the only creature which, upon the pure principles of evolution — of consecutive evolution — could not be harmonized with the evolution theory. But it has appeared to me, in trying to think over this matter, that there is not only a gap at the end, but at the beginning also. Professor Huxley has himself intimated, in a form, negative indeed, that we have not the least reason to believe that such a thing as life has ever been developed out of inorganic matter ; that, so far as scientific evidence bears upon the subject, a negative conclusion is the only conclusion that is admissible ; and that, though life may bind up under its seal