

DARWINISM.

I. Development Theories are Ancient and Protean.

TH E recent form given the development hypothesis, by Messrs. Darwin and Wallace, has arrested very general attention among both the learned and unlearned. The development hypothesis is a Proteus, and of hoary years. Said the old Egyptian :

This earth-globe was at first a ball of wet clay ; the clay drying in the sun, little blisters arose ; these becoming impregnated by some subtle physical influence, became the embryos of all future terrestrial organisms, and, upon the bursting of the clayey shells, the earth became peopled by creatures of low grade, which in time, were developed into the beauty and perfection of the living forms (man included) now inhabiting the earth.

The Epicureans held that men were originally formed from little bags in the earth, which, when they became ripe, they burst open, and their souls were formed of the smoothest, roundest atoms. "Which," quaintly remarks old John Howe, "are of the neatest fashion, and every way, you must suppose, the best conditioned the country can afford."

Lucretius, the interpreter of this school, declares the earth to have

grown effete, and that she who first created all races of animals and man, now scarcely creates very little animals. According to Lucretius, the concurrence of atoms forming earth, sea, the heavens, the creatures, was a concurrence not directed by intelligence, but a happen, preceded by infinite other chance concursi. In modern scientific dialect, he might have said the world exists and endures as product of natural selection, and survival of the fittest. So we find the Roman Strato Physicus claiming all power is placed in Nature, which contains in itself the causes of generation, increase or diminution, but is wholly devoid of sense.

Thus, without referring to the old Greek "*αρχη*,"—whether regarded earth, water, air, or fire—we get glimpses far back in the depths of time, and down along the centuries of this Proteus. From the middle of the last century to our own day he has been ever taking upon himself new shapes. Maillet, in his *Telliamed*, published (after his death) in 1750, describes the ocean as "that great and fruitful womb of Nature, in which organization and life first began." He held that the earth was at first wholly covered with water; that the first animals, therefore, were aquatic, were fishes. When the waters retired the fishes underwent metamorphoses. The fishes which kept to the bottom of the waters, creeping amongst the mud, became reptiles, those which occasionally rose above the waters, became flying animals, their fins were turned into wings, their scales into feathers. Mammifers, and man himself, came into existence from this aquatic origin.

Robinet, of the same century, makes what he calls Nature, his agent. Nature began by creating worms, then insects. Later, by a bold step, she fabricated crustaceans. Then she placed inward the external plates of the crustaceans, and made vertebræ of them,—thence came the serpent. After the serpent, the lizard; the front part of the lizard was transformed into wings,—thence the bird. And thus progressing, Nature formed the quadrupeds, the quadrumanous animals, and last of all, man.

Buffon (obit 1788) held that originally there were elementary particles of living matter, viz., animalculæ, whose fortuitous aggregation formed larger animals; larger animals are, therefore, only heaps of animalculæ.

Lamarck (from 1744 to 1829), as Maillet, referred the origin of all terrestrial organisms (man included) to the ocean. "In the water," he says, "Nature has performed, and continues to perform, under favorable circumstances, her direct and spontaneous generations; and there, in the first place, she gives rise to the most

simple animalculæ, from which has proceeded all the animal creation." He derives all animals from a monad, but does not tell us the nature of the monad. Then comes the polypus, out of which, successively, all forms of life have arisen. He held that the exercise of habit and the effort at action is the transforming power,—animals have aimed at certain faculties, and have thus attained them; a process by which they have gradually become new animals. Some kinds of fowl—*e. g.*, by making continuous effort to swim—finally became web-footed; the heron dislikes to plunge into the flood, and drawing itself up when going into the water, has finally become long legged; the wood-pecker likes aphides, and little creatures under the tree bark, and by continuous reaching for them, has become long-billed; so of the long-necked giraffe, reaching up among the tree limbs for its food; and so of all other creatures. Besides habits, he also calls into aid transmutation, "efforts of internal sentiment," "influence of subtile fluids," "acts of organization." "He substitutes," says Lyell, "names for things, and with a disregard to the strict rules of induction, resorts to fictions as ideal as the 'plastic virtue,' and other phantasms of the geologists of the middle ages." The German Professor Oken (ob. 1851) maintained:

There are two kinds of generation in the world, creation proper, and the propagation that is consequent therefrom. No organism has been created of larger size than an infusorial point. No organism is, or ever has been created, which is not microscopic. Whatever is larger has not been created, but developed. All life is from the sea; man is a child of the warm and shallow parts of the sea, in the neighborhood of the land.

W. Spencer, Dean of Manchester, England (pub. 1837), held that a single species of each animal was created in an originally highly plastic condition, *i. e.*, with capacity for metamorphoses,—and that these have produced, by intercrossing, all our existing species.

The author of the "Vestiges of Creation" (pub. 1845) claims the basis of all animal and vegetable substances to be nucleated cells, *i. e.*, cells with granules in them. He holds man has risen from these cells of the sea, and regards the dolphin as man's ancestor.

Tremaux (pub. 1865), claims that the soil has created or produced all animals, and has been the cause of their various transformations (for temperature, crossings and food, something is to be allowed). In the recent soils the tendency is toward perfection, in the primitive soils towards degradation. The relative time of transformation was short. Man is from the ape. The ape intellect developed into the

human, by being continually exercised in passing judgment on the elasticity and strength of boughs, as it leaped from limb to limb. Animals have now reached their resting place in development.

The distinguished British anatomist, Owen, claims that the rise of the different species, genera, etc., etc., along the centuries, is the result of a special power with which living organisms were originally endowed by the Creator,—a power under favorable circumstances producing such new forms.

While the name of Alfred Russel Wallace is not to be forgotten as an independent co-propounder of the "natural selection" phase of the development hypothesis, yet the name of Charles Darwin has become so eminent as to overshadow the former name, and stand as cognomen of the present peculiar phase so popular in our day of this Proteus, as Lamarckionism was the cognomen of the peculiar phase worn by the same Proteus thirty years ago. Darwin makes "Natural Selection" the main power in developing the (so-called) varieties, species, genera, etc., of organisms.

I am fully convinced [he says] that species are not immutable, but that those belonging to what are called the same genera, are lineal descendants of some other, and generally extinct species, in the same manner as the acknowledged varieties of any one species are the descendants of that species. Furthermore, I am convinced that Natural Selection has been the main but not exclusive means of modification.

He allows some room for the working of circumstances of condition and sexual selection. He defines natural selection thus :

If variations useful to the being in the great and complex battle for life, should sometimes occur in the course of thousands of generations, can we doubt that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel assured that any variation in the least degree injurious, would be rigidly destroyed. This preservation of favorable variations and the rejection of injurious variations, I call natural selection. . . . As many more individuals of each species are born than can possibly survive; and, as consequently, it follows that any being, if it vary however slightly in a manner profitable to itself under the complex and sometimes varying conditions of life, will have a better chance for surviving, and thus be *naturally selected*. From the strong principles of inheritance, any selected variety will tend to propagate its new and modified form.

And thus have arisen new species, new genera, etc. Such are some of the past phases of this Proteus, development,—such its to-day

phase. Let us examine the phase this Proteus presents himself in to-day,—Darwinism.

II. Darwinism and Scripture.

“Natural philosophy,” says Ewen (Essay on Creation), “causes the world to proceed from the streaming together of atoms, from chemical affinity, from the balancing of the working and counter-working of dead masses, because it has a horror of the spirit that ‘brooded over the waters.’” This charge can hardly be laid at the door of the Egyptian, deriving all terrestrial life from the earth womb; the Egyptian was a pantheist, and he saw the divinity working and producing in the earth. Nor can this charge be laid at the door of the Greek sages who, for their “*αρχη*,” chose earth, water, fire, air, etc.

This word [says Archer Butler] was not the *cause* of the world, nor yet the final element, but rather that thing which should be *assumed* to give a rational explanation of the rest. The word “Principle” is, perhaps, nearest to its significancy. The “*αρχη*” was the last term to which the inquirer’s analysis brought him.

The “*αρχη*,” then, of the Greek schools, was not something selected by them as a recession from an infinite cause by them previously known, but was some agent seized upon provisionally as a *κου στω* from which they might proceed onward, and by and by attain, as they did, a knowledge of the ultimate Worker.

Ewen’s charge, doubtless with truth, may be brought against some of the scientists of our day; they seem to delight to ungod the universe, ignore God; they have a decided horror of ascribing anything to the spirit that “brooded over the waters.” Tell these men that “chemical affinity” does anything, they are satisfied. So if you say, “electricity,” “magnetism,” “gravitation,” “nature (?)”; tell them God does anything in the universe, they will tell you you talk like a man belonging to the world’s babyhood, a superstitious man; you talk unphilosophically, very unphilosophically, to claim that the Infinite Worker does anything. Yet ask these men what are “chemical affinity,” etc., their all-potent workers? They say: “We do not know; we see effects only, the cause eludes us, we must have a name for it, we call it ‘chemical affinity,’ etc.; if you do not like our name, call it anything but ‘God,’ and we are with you.” For the ordering of the world, the rise of life in it, its continuance, its governance, they make God a mere supernumery, a superstitious figment, which men up with the times must rid themselves of. They claim this is the high fruit of modern scientific method; but on the contrary, it is a mere repetition of the old; the world is ever repeating

itself. The old Hindoo philosopher, Kapila, *e. g.*, rejecting revelation, taking reason for his guide, claimed from a cause not rational, blind, by constant development all are evolved; intelligence in man is an evolved property of material essence, like weight or dimension. Lao-tse, of China,¹ rejecting revelation, ascribes the rise of all things to an indefinable cause, eternal, impassible; it is the initial principle of life, but it is not God, it has no will, no intelligence. Confucius claimed that "underlying all nature is a principle of cohesion—*Tae-keih*—beyond which thought cannot reach. From this the fundamental and absolute force of nature, undetermined, inconceivable, without intelligence, providence or purpose, all beings animate and inanimate, rise into existence." Had he read Spencer, he might have spoken of the "Inscrutable Cause." Confucius shut God out of his moral system and philosophy, and to this day he has succeeded in shutting him out from the minds of his countrymen. To the men of our day, who are seeking to ungod the universe, and are repeating these old Pagan saying for new things, evolved by recent scientific method and advance of thought, the utterance of Bacon is apposite:

This I do affirm in knowledge of nature, that a little natural philosophy, and the first entrance into it, doth dispose the opinion to atheism; but on the other side, much natural philosophy, and a wading deep into it, will bring back again men's minds to religion; for in the entrance of philosophy, when the second causes, which are next unto the senses, do offer themselves to the mind of man, if it dwell and stay there, it may induce some oblivion of the highest cause; but when a man passeth on farther, and seeth the dependence of causes, and the works of Providence, then, according to the allegory of the poets, he will easily believe that the highest link of nature's chain must needs be tied to the foot of Jupiter's chair.

I do not here charge the excluding of God from the universe upon the two originators of the natural selection phase of the development hypothesis—Darwin and Wallace—but undoubtedly its tendency upon the minds of many sciolists has been in this direction.

Darwin, in his first work propounding his hypothesis, "Origin of Species," distinctly attributes the origin of terrestrial life to God. "One primordial form, into which life was first breathed." Wallace, in his "Natural Selection," distinctly and fully recognizes God's activity. He says, page 368:

It does not seem improbable that all force may be will force, and thus, that the whole universe is not merely dependent on, but actually

¹ Fifth century, B. C.

is, the will of higher intelligences or of one Supreme Intelligence. It has been often said that the true poet is a seer, and in the noble verse of an American poetess, we find expressed what may prove to be the highest fact of science, the noblest truth of philosophy:

“God of the granite and the rose!
 Lord of the sparrow and the bee!
 The mighty tide of Being flows
 Through countless channels, Lord, from thee;
 It leaps to life in grass and flowers,
 Through every grade of being runs,
 While from Creation's radiant towers
 Its glory flames in stars and suns.”

We find in both Darwin and Wallace the recognition of God as the ultimate force of all the manifestations of terrestrial organisms.

The inception of the natural selection hypothesis, in Darwin's mind, was evidently not through bias to atheism nor for atheistic purpose. It germinated in the genuinely scientific spirit, under impulse of large store of observed facts in his Beagle tour—impulse to generalize and include facts in one unifying law—the direction in which all modern thought is drifting. Natural selection, he claims, is the unifying law, is the key of the problem. He, with a master's power, has made use of this key amid much labor, wide, minute observation, much contumely, in a calm, incisive, broad, philosophic spirit, and to-day stands *facile princeps* among those of his generation who have given shape to modern thought. Britain, the Continent, America, are alike to-day widely and deeply feeling the influence of Darwin.

Avaunt! and quit my sight! let the earth hide thee!
 Hence, horrible shadow!

may put to flight Banquo's ghost; Darwinism will not thus down. That utterance which is able to arrest, hold, shape the thinking of the world, as Darwinism does to-day, is worthy more than a sneer, is worthy calm, serious thought.

Does the method of the introduction of life upon the earth urged by Darwinism, conflict with Scripture? No.

Darwin, in his “Origin of Species,” ascribes the origin of terrestrial life to “one primordial form, into which *life was first breathed* by the Creator.” Wallace makes God the author both of matter and organisms: “Matter as an entity,” he says, “does not exist, force is a product of mind. My view exhibits the universe as a universe of will power.” Huxley is rather inclined to “expect,” could he

“look beyond the abyss of geologically recorded time to the still more remote period when the earth was passing physical and chemical conditions, which it can no more see again than a man recall his infancy, he should be witness of the rise of living protoplasm from not living matter.” Yet this does not exclude God as the ultimate force giving rise to life by power manifested in law, through “not living matter;” he would simply deny the “interference” of God’s working. It is simply, as Wallace says, “a question as to *how* God has worked” in the introduction of life upon our globe,—by “law,” or by the “continual interference” method. Scripture does not detail the *modus operandi* of God in introducing life, it simply asserts the fact. The method we may give over into the hands of science, to work over and determine, knowing that whatever method it may finally fix upon, it can not be in conflict with Bible statement, for the Bible makes no statement on the matter.

Does the method of the rise of species, genera, etc., urged by Darwinism, conflict with Scripture? No.

When it is said, “God divided the light from the darkness, and called the light day,” etc., God did not, by direct and continual interference every twelve hours, do this dividing, but did it by the law which courses the earth’s rotation,—does it thus to-day. When God said, “Let the waters under the heaven be gathered unto one place, and let the dry land appear,” not direct supernatural action of God accomplished this instantaneously, but the gradual operation of those same laws that in our day is ever modifying the distribution of land and water. If Darwinism claims, when in the same connection we read, “Let the earth bring forth grass, the waters the moving creature, let us make man,” we are not here to introduce an entirely new method of God’s working—direct action without intervening action of law—but still find God in the progressive, gradual, regular operation of law, there is here nothing to which hermeneutics can object—no conflict with Bible statement. How God collected and shaped the particles of dust needful for the first man’s body, we are not told, but we may expect to find God here operating in law. Darwin’s hypothesis is simply the announcement of one possible method by law of fashioning the first human body. There is nothing in Darwin’s method conflicting with Scriptural statement,—Scripture makes no statement in the matter. And when Darwin claims that, although it is written, “God created man,” yet that a natural process intervened, he does nothing more than commentators do in interpreting the old Jewish writing *passim*.

Does the Darwinian hypothesis of the development of man’s

intellectual and moral natures from some brute creature, lessen the dignity of man, or impair his responsibility? No.

The dignity and moral responsibility of man do not depend upon his "whence," but upon what he now is. It no more derogates from man to claim, with Darwin, that he has passed through the form, "in the dim obscurity of the past, in the early progenitor of all the vertebrata, of an aquatic animal, provided with bronchiæ, with the two sexes united in the same individual, and with the most important organs of the body (*e. g.*, the brain and heart), imperfectly developed; this animal being more like the larvæ of our existing marine ascidians than any other known form," than that he in each individual of the race to-day, originates from a cell, than a larger mass of unconscious animated pulp, than the non-intellectual, non-moral babe. Not what I was untold centuries ago, or a few years ago, but what I find myself to-day, is the all-absorbing question. Is man to-day intellectually capable of abstract thought, deduction, generalization,—capable of perceiving moral distinctions, of comprehending the significance of the "ought" and the "ought not," feel them pressing in upon him in their absolute sovereignty over him? This, this alone, aside from all question of "whence," tells man of his intellectual dignity, of his moral responsibility, of his alliance with and his image of the One who is Absolute Intellect and Absolute Holiness.

Does Darwinism, by the process of development of man from a monad, during untold millions of years, render the gulf between man and God wider than does the hypothesis of his direct creation? No.

The man who rises by slow development to moral consciousness from a cell, we regard no whit more widely separated from God than was Adam, created (as some suppose) instantaneously. God is equally near every moral creature of his universe, whether angel spoken (mayhap) into full moral conscious by instantaneous fiat, or man, the cell, the vegetative pulp, the mere eating, breathing, sleeping animal, and after process of years the moral creature, or man risen into the moral creature by process of development, yet more prolonged through ascidian, reptile, quadruped. Not the length of time consumed by the creature in attaining a moral nature, is the measure of God's intimacy with the creature, but the simple fact of the creature's possessed of a moral nature.

Darwinism, we thus find, does not conflict with Scripture. Further, Darwinism commends itself to us by being in the current of the most advanced modern thought,—generalization, a unifying of phenomena under law, the reign of law. Buckle, in the extreme

application of this tendency, discards the idea that even human action "depends on some capricious and personal principle peculiar to each man, as free will, or the like," but claims that "men's actions only form part of one vast scheme of universal order." Quetelet, by statistics, seeks to prove that crime itself is subject to law. The (so called) "science" of sociology is created in our day by impulse of this same tendency. The tendency is found everywhere in modern thought; Darwinism lying in this current so far commends itself to us.

We may, then, enter upon the examination of Darwinism, free from prejudice against its hypotheses as anti-scriptural; we may come to it as something in tune with the present current of thought,—generalization. We may treat it as a mere scientific question, involving in its proof or disproof no scriptural statement, having only a scientific interest, and to stand or fall as it gives or fails to give facts to sustain its hypotheses.

But this is to be noted: Darwinism does not in its most trustworthy expounders (however sciolist) claim to be proven; it is merely set forward as probable; and our inquiry is, Does this hypothesis present us with sufficient probability to decide us to accept it provisionally?

III. Origin of Life, Species, etc.

Huxley, while denying that he has evidence sufficient upon which to base a "belief," yet has an "expectation" that "living protoplasm has originated from not living matter." This view cannot be called Darwinian, yet being put forth by one of Huxley's prominence, who favors Darwin's hypothesis, deserves notice. Being only an "expectation," presenting us no grounds for "belief," the view has no claims upon our scientific faith. Further, in this "expectation" Huxley has to assume that "the earth was passing through physical and chemical conditions," never known to exist;—this is simple assumption and not science, and a hypothesis requiring this assumption has no claim upon us. Further, Huxley assumes a power to exist in "not living matter," by simple change of conditions, physical and chemical, which it has never been known to exhibit under any conditions,—the originating of life. He himself declares his positive disbelief that any man has yet "brought not living matter into those conditions by artificial means as to cause it to assume those properties we call 'vital'"; he thinks "M. Pasteur's experiments have given the doctrine of spontaneous generation a final *coup de grace*." The recent claims of Dr. Bastian¹ as to spontaneous generation, must be held in abeyance until further tested.

¹Beginnings of Life.

Darwin does not attempt to determine the origin of life, claiming his hypothesis is concerned simply with the origin of the variations and adaptations now found in organisms.¹ But he incidentally speaks of life being "breathed into" the first organism or organisms—and speaks of these as being "created"—clearly here recognizing God as the originator of life upon our globe. And as to the number of original creations, he says, page 419 :

I believe that animals have descended, at most, from only four or five progenitors, and plants from an equal or lesser number. Analogy would lead me one step further, namely, to the belief that all animals and plants which have ever lived on this earth, have descended from some one primordial form, into which life was first breathed.

Is Darwin's hypothesis of the rise of all life—vegetable and animal—from "one primordial form," sustained by evidence sufficient to commend it to our scientific faith?

He claims analogy leads him to this belief, but analogical argument is of weight only in removing objections, not as basis of a hypothesis. Further, legitimate argument from analogy is argument drawn from something of the same in *kind* as that to which it is applied; but Darwin can give us no case of a world of organisms—vegetable and animal—arising from "one primordial form into which life was first breathed," and from this form, by natural selection, such variety of species, genera, etc., as our world presents, has been evolved; and yet just this he needs to do to give us, for his hypothesis, even the weak support of an argument from analogy. Analogy can give us no help in framing a hypothesis of the origin of life, species, etc., in our world; we never saw life originate in a world void of life, we never saw any species originate; supposed analogy here is glamour.

Two tendencies thrust the mind towards Darwin's view of the origin of terrestrial life, species, etc. One of these tendencies is indicated in that of Herbert Spencer: "The special creation of plants and animals seems a satisfactory hypothesis, until you try and picture to yourself definitely the process by which one of them is brought into existence." This difficulty some seem to think is lessened by lessening the size of the animals created. This is utterly fallacious. Seek, *e. g.*, to picture to yourself Huxley's "protoplasm," originating from "not living matter," that "not living matter" being operated upon by "physical and chemical conditions" we do not know anything about, and I doubt whether you can "picture to yourself definitely the process," etc., any more, or nearly so much, as by the special

¹Species, 185, Amer. ed., 1860.

creation hypothesis. Or seek to "picture to yourself definitely" the coming together of the atoms of Darwin's "one primordial form," and the "breathing of life into" it, we are just as much at a loss.

The difficulty of "picturing definitely the process" of the origin of the living creature, does not lie in the size or number of the organisms originated, but in the simple *fact* of such origination,—it is something utterly outside of our observation or experience (the two eyes of science); the *modus operandi* must ever remain a mystery to us, and utterly beyond our power to "picture definitely to ourselves the process." Darwinism lends us no aid here, and consequently has in this particular no special claim to our favor.

The second tendency thrusting the mind toward the Darwinian view of the origin of terrestrial life, species, etc., is (that so strong to-day) the spirit of generalization, of unifying under law, of referring all phenomena to regularly operating irrational immanent force in matter. But whether we should accept this dogma—all force working in the universe of matter irrational immanent force—and carry this up even to that exceptional manifestation of power—the originating of life and species—as a prejudging element in our scientific formulating, may justly be questioned. If there is more in the universe than were matter, and immanent irrational force in matter, genuine science will not, without reason, illuminate nor ignore that "more" in its investigation of the origin of phenomena. Both the originators of Darwinism concede the existence of this "more"; and says Huxley:¹ "When the materialists stray beyond the borders of their path, and begin to talk about there being nothing else in the universe but matter and force and necessary laws, and all the rest of *their* 'grenadiers,' I decline to follow them." Huxley thinks there may be something "more." Says Herbert Spencer:² "The hypotheses of special creation and development, alike recognize an inscrutable cause of phenomena." If this "cause" is "inscrutable," it may be "more" than irrational immanent force. As genuine scientists, then, we are not to blink this "more" in formulating of the phenomena of the universe—it may have significance for such formulating; we are to rid our minds of prejudice against its activity in originating phenomena, we are not to prejudice, it may have been active—a force here—nor must we prejudice the methods nor extent of its activity; if it be "inscrutable," we are not hastily to dogmatize on its methods and extents; an intelligent force it may have operated through some general law in the development of the creatures of earth, but not by the method of "natural selection." As says Spencer:

¹ Lay Sermons, 340.

² Biology, I, 332.

The point at issue [between special creation and development] is, how this inscrutable cause has worked in the production of living forms. This point, if it is to be decided at all, is to be decided only by the examination of evidence. Let us inquire which hypothesis is most congruous with established facts.

To this I shall now address myself. Darwin thinks: ¹ "The Creator originally breathed life into a few forms, or into one; and that while this planet has gone cycling on, according to the fixed law of gravity, from so simple a beginning, endless forms, most beautiful and most wonderful, have been and are being evolved." On the contrary, it is generally believed: 1. *Many* forms were "originally" created by God; and 2, that species are not transmutable; that every species is, therefore, a special creation,—and this (if possible) still more strongly of genera, families, orders, etc. What says scientific fact of the transmutation of species?

No animal nor vegetable organism has ever been observed to put on the characteristics of a new species. Darwinists concede this. Says Herbert Spencer: "The facts at present assignable in direct proof that, by progressive modifications, races [species] of organisms that are apparently distinct, may result from antecedent races [species] of organisms, are not sufficient." So Huxley: "It is our clear conviction that, as the evidence stands, it is not absolutely proven that a group of animals, having all the characteristics exhibited by a species in nature, has ever been originated by selection, whether artificial or natural." The great body of men of science not only affirm that transmutation of species has never been observed, but maintain it has never occurred, and can never occur, as the laws of nature now are. This objection to Darwinism Huxley regards very strong, and says: "As the case stands at present, this 'little rift within the lute' is not to be disguised nor overlooked."

That neither animals nor vegetables of different species, intercrossing, produce a permanently fertile progeny, is an almost universally acknowledged law among naturalists. Among animals, hybrids seldom propagate at all. When a hybrid does propagate, it is generally with an animal of pure blood; but the race soon becomes extinct,—does not generally (when confined to the hybrids breeding (*inter se*)) reach beyond the third generation with the most competent. This crucial test of diversity of species has never been observed in varieties springing up (naturally nor artificially) within a well-defined species; all these varieties, however they may vary in form, *e. g.*, the horse, hog, or in both form and instinct, *e. g.*, the dog, the pigeon, are fertile,

¹ Species, 437, 5th ed., 1872.

and propagate a permanently fertile progeny, when crossed with the other varieties of the species from which they sprung. They thus lack the crucial test of diversity of species. Speaking of this objection to Darwin's theory of the transmutation of species, Huxley says: "A true physical cause [selection as creator of new species] is admitted to be such only on one condition,—that it shall account for all the phenomena which come within the range of its operation. If it fails to explain any one phenomenon, it is so far weak, so far to be suspected." And he claims that this weakness and suspicion must attach to Darwin's hypothesis, "so long as all the animals and plants certainly produced by selective breeding from a common stock are fertile, and their progeny are fertile with one another. For, so long, selective breeding will not be proved to be competent to do all that is required of it, to produce natural species."

Embryology. Some think foetal transformations present an argument for the development hypothesis. The brain, *e. g.*, of the mammal, it is claimed, assumes at an early stage the form found in the fish, later that of the reptile, later still, that of the bird, finally at birth, takes the form of the brain of the adult mammalia. These changes correspond to that of the geological record, viz., first the reign of fish, then the reptile, bird, mammal. Indicative this, it is urged, of the transformations through which man has passed in the geological periods. But to attain even the low rank of an analogical argument, the one who urges it must point out some spot in the universe where an adult fish becomes a reptile, a reptile a bird, etc.; he might then say: "*Perhaps* it has been even thus on our earth," but this he does not do, and he has, therefore, no reason to present us with even his "perhaps."

Moreover, these foetal transformations do not resemble so markedly the past scale of life—fish, reptile, etc.—as some suppose. In the first place, these resemblances only relate to some organ or part of the foetus at a time. Again:¹

The first set of germinal membranes are those of the organs proper to the animal life,—the nervous system and organs of motion; but, according to the hypothesis, they ought to be some vegetable resemblances. Again, the first indication of the embryo is the primitive trace, the rudiment of a back bone, and of a continuous spinal cord; whereas, according to the hypothesis, it should have been something assimilating the embryo to the avertebral classes,—radiata, mollusca, and articulata, but these three entire classes are passed over without any corresponding foetal type. All foetal transformations are confined strictly to forms in

¹ Harris' "Pre-Adamite Earth."

the range of the creature's own type,—the vertebrate never resembles at any stage of its growth anything but a vertebrate; so of the articulate, mollusk, radiate. But, by the hypothesis, the vertebrate ought to have exhibited the phases in succession of radiate, mollusk, etc., and so of the articulate, etc. Again, as to the heart of the foetus of a mammal, it does not pass through the form which is permanent in the amphibia, but it does pass through a form not found permanent in any known creature. The hearts of birds and mammals do not pass through forms which are permanent in fishes and reptiles. And the development of the brain is marked by corresponding differences.

Agassiz denies that these foetal transformations gives any support to the Darwinian hypothesis; but claims that:

Looked at in their intellectual significance, they truly reveal the unity of organic conception, of which man himself is a part; and mark not only the incipient steps in its manifestation, but also, with equal distinctness, every phase in its gradual realization. They mean that when the first fish was called into existence, the vertebrate type existed as a whole in the creative thought, and the first expression of it embraced potentially all the organic elements of the type, up to man himself; these embryonic resemblances speak only of an ideal relation, existing not in the things themselves, but in the mind that made them.

This is also Whewell's observation on these resemblances. What say geologic facts on the transmutation of species? Geologic facts plainly declare that there has been a progress in organisms, In the earliest epochs the lower types, in the later epochs the higher types were predominant. But we do not find in the geologic record low gelatinous, homogeneous forms of a species, then the (apparently from these) partially developed, yet aborted higher individual, imperfect in organization, apparently aiming at something it has not yet reached,—illy adapted to its circumstances of condition; then (in concatenated progression), the perfectly developed individual of the species; then this highly developed type passing over into a new species, and thence onward into a new genus, family, etc. Not a trace of such process of development is found in the rock-book. And yet, just such process of development many suppose geology exhibits; and just such process of development must geology exhibit, before it becomes auxiliary to the hypothesis of the transmutation of species by natural selection. But, on the contrary, we find in the first traces of organic life—although it may be of low family type—a perfect type of the species; the individual admirably adapted to the special conditions of its existence,—often the earlier species of higher type than the later species of the same genus.

The marine fucoids we may take as the earliest appearing and lowest

order of flora. Seas, in the early epochs, largely possessed the land. Upon the first appearance of the land flora, it bears no evidence of being a gradual development of the fucoids, but it appears all at once perfect, and of a higher development in its individuals of the same orders, than found in the present day. The early ferns and club-mosses, and the horse-tail family, *e. g.*, attained the height of forest trees. Inferior orders of plants were developed in those ages, as we now see them. "They took their place," says Miller, "not as now, among the pigmies and abortions of creation, but among its tallest and goodliest productions." As early as the carboniferous period, all the now-existing forms of vegetable tissue appear. Speaking of the fruits of the exogenous conifera of this period, Dr. Hooker says: "They belong to a highly-developed type, exhibiting extensive modifications of elementary organs for the purpose of their adaptation to special functions, and these modifications are as great, and the adaptations as special, as any to be found amongst analagous fruits in the existing vegetable world." So Lyell says of the flora of this period: "The fossil conifera and plants of this order here found, lay claim to so high a place in vegetable life, as to preclude us from characterizing it carboniferous flora as consisting of imperfectly developed plants." So the Edinburgh Review: "The carboniferous flora displays the most magnificent specimens of creative power, resembling the noblest pines of the South Sea Islands, rivalling existing species in the complexity of their organization, and surpassing them in the scale of development."

So much for the grade of the early flora of the rock record; now as to the early fauna. As in the flora, were Darwinian transmutation of species in nature, we should expect to find first the fucoids, and thence to our day a concatenated upward movement of species, genera, etc. So in the fauna we should expect to find a similar movement,—first the lowest type of life, the radiates, then some slight development; and, after indefinite periods, the higher types,—mollusks, articulates, vertebrates. The stone-book has another record. Professor Agassiz notes, in his Zoology, that the old theory that

Animals were successively created in the order of their relative perfection, so that the most ancient formation contained only animals of the lowest grade, *e. g.*, polyps, echinoderms, to which succeeded mollusks, then the articulated animals, and last of all the vertebrates, is now untenable; since fossils belonging to each of the four departments have been found in the fossiliferous deposits of every age. In the lower Silurian formation there exist not only polyps and other radiata, but also numerous mollusks, and trilobites (articulata), and even fishes [vertebrata].

So in his "Methods of Study," he says: "In the Silurian period—at the dawn of life upon our earth—the plan of the animal creation, with its four fundamental ideas, was laid out. Radiates, mollusks, articulates, and vertebrates were present at the first representation of life upon our globe."

Now as to the type of species early appearing in those four divisions,—are they aborted, little developed, illy adapted to their sphere of life, and only rising to perfection after long periods, by "transmutation" through "natural selection," and "survival of the fittest"?

Take an example from the ancient Silurian seas, the trilobite, one of the lower orders of crustaceans. We find that creature with an eye, thus early in geological time, as perfectly adapted to its peculiar functions as that of the eagle of to-day, and infinitely more complex,—its eye had four hundred lenses, spherical, arranged in distinct compartments on the cornea, which latter projected conically upward, thus enabling its possessor, while resting or seeking its food at the bottom of the waters, to take in the largest possible field of view. And we find the same modifications of this organ adapted to similar functions in our day in the serolis. Says Anderson: "In none of her subsequent creations has Nature displayed greater elaboration in the parts, or more skillful and adaptive contrivance in arrangement, than in the visual organ of this living crustaceous, the serolis, and the distinguishing type of the lowest fossiliferous rocks." Of the Briarian Pentacrinite of the Lias, Buckland says:

A comparison of this with later fossils, and with the existing *Pentacrinus Caput Medusae*, shows in the organization of this very ancient species an equal degree of perfection, and a more elaborate combination of analogous organs, than occurs in other fossil species of more recent date, or in its living representative. It exhibits an amount of muscular apparatus infinitely greater than has yet been observed throughout the entire animal kingdom,—it is estimated to have had one hundred and fifty thousand bones, and two muscles to each bone.

The same author says:

The history of chambered shells shows that it is not always by a regular gradation from lower to higher degrees of organization that the progress of life has advanced. Many of the more simple forms have maintained their primeval simplicity through all the varied changes of our globe, whilst higher organizations preceded many of the lower, some of the latter appearing for the first time, after the total annihilation of many species and genera of more complex character. The carnivorous trachelipodes of the tertiary, brought in to fill the place of the higher carnivorous cephalopodes, affords an example of retrogression which seems fatal to the doctrine of regular progression. The nautili

have perished in their simplicity,—the earliest fossil structure fundamentally, is seen in nautilus pompilus of our seas. Meantime the cognate family of ammonites, whose shells were more elaborately constructed than those of the nautili, commenced their existence at the same early period with them, and became extinct at the termination of the secondary period.

The mollusca and radiata of the very earliest periods, were more highly organized than the great mass of those now existing.

This tendency to degradation is found also in some cases among vertebrate fishes. Sauroids, of the greatest magnitude and very abundant, are found in the carboniferous and secondary periods, whilst their modern representatives (only two genera), the lepidostens of Lake Superior, and the polypterins of the Nile and Senegal, are mere pigmies; the latter only three or four feet long, the ancient saurins thirty or forty feet, furnished with teeth thrice longer than those of the hugest alligator, and ten times larger than those of the bulkiest lipidostens, and from mouth to tail covered with an impenetrable mail of enameled bone. Agassiz, speaking of the sauroidi of the early periods, and the degradation of their living representatives, says: "These ancient fishes bear the same relation to their living representatives, as our present elephants and tapirs [another example of degradation] do to the mastodon and anoplotherium of the primitive world." These ancient sauroidi occupy the same level in organization during the vast period represented by five succeeding geological formations, and when a change in their form takes place, it is degradation.

So also "the ganoids, one of the very highest groups of fishes ever known to have been developed, is a group now poorly represented, but for which the sturgeon may stand as a type, and which, in many important respects, more nearly resemble higher vertebrata than do the ordinary osseous fishes."

So Professor Owen claims that degradation has taken place among the reptiles—that the period of reptiles is past—and that the change in their species, genera and families, has been, upon the whole, from the complicated to the simple. The ophidians of the tertiary, *e. g.*, indicate degradation in the absence of limbs, total in some families, in others (*e. g.*, boas and pythons) represented by mere aborted hinder limbs concealed under the skin. They are also monstrous from the redundancy of parts, *e. g.*, a vegetative repetition of vertebra and ribs, to the number of three or four hundred, forming the special contrivance by which the want of limbs is compensated.

If it be objected (as has been done) that the ancient saurins referred to are complex in type, combining the reptile and true fish,

and therefore are not of the highest grade, I will give an example precisely answering such objection :

The *macrauchenia* a very recently extinct beast, presents a highly generalized type of structure, uniting in one organic form both artiodactyl and perissodactyl characters. At the same time the differentia of artiodactyl and perissodactyl forms existed as long ago as in the period of the Eocene ungulata, and that differentiation is very marked. [Mivart, 124.]

And the same author notes that

No *armadilla now living* presents nearly so remarkable a speciality of structure as was possessed by the *extinct glyptodon*; and also that the *extinct machairodus*, or sabre-toothed tiger, is characterized by a more highly differentiated and specially carnivorous dentition than is shown by any predaceous beast of the *present day*.

Says Hugh Miller: "There is not one of the great divisions in which, in at least some prominent feature, through this mysterious element of degradation, the present is not inferior to the past."

Another geologic fact bears on our problem, viz., in the rock-record lines are found at which (almost) all previously existing life suddenly ceases, and suddenly there arises a new world of life. Such a gap is found between the eocene and cretaceous at the commencement of the tertiary period,—also between the trias and permian, abruptly cutting off secondary life from palaeozoic. Further, Agassiz claims "the ensemble of organized beings was renewed, not only in the interval of the great geological formations, but also at the time of the deposition of each particular member of all the formations."

Again, the geologic record fails to furnish us with those intermediate transition forms of life we should expect to find, had all life in concatenated development arisen out of "one primordial form."

All the most marked groups, bats, pterodactyls, chelonians, ichthyosauria, anoura, etc., appear at once upon the scene. Even the horse, the animal whose pedigree has been probably the best preserved, affords no conclusive evidence of specific origin by infinitesimal, fortuitous variations; while some forms, as the labyrinthodonts and trilobites, which seemed to exhibit gradual changes, are shown by further investigation to do nothing of the sort.

Sudden rise of new marked forms of life is a geologic fact,—so far as the record has yet spoken.

In a second article I shall use the data presented in this, and add another in seeking to reach the answer to our query: "Is Darwinism probable, and thus worthy of provisional acceptance?"

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