tion as a dialectic process.[1] At the same time, we may find expressed in figurative language the germs of thoughts which enter into still newer doctrines of evolution. For example, the notion of conflict (πόλεμος) as the father of all things and of harmony as arising out of a union of discords,[2] and again of an endeavour by individual things to maintain themselves in permanence against the universal process of destruction and renovation, cannot but remind one of certain fundamental ideas in Mr Darwin's theory of evolution. According to Grote, it is doubtful how far Heraclitus intended to supply by his idea of fire a physical, as distinguished from a metaphysical, doctrine of the world-process.

Empedocles.—Empedocles took an important step in the direction of modern conceptions of physical evolution by teaching that all things arise, not by transformations of some primitive form of matter, but by various combinations of a number of permanent elements. Further, by maintaining that the elements are continually being combined and separated by the two forces love and hatred, which appear to represent in a figurative way the physical forces of attraction and repulsion, Empedocles may be said to have made a considerable advance in the construction of the idea of evolution as a strictly mechanical process. It may be observed, too, that the hypothesis of a primitive compact mass (*sphærus*), in which love (attraction) is supreme, has some curious points of similarity to, and contrast with, that notion of a primitive nebulous matter with which the modern doctrine of cosmic evolution usually sets out. Empedocles tries to explain the genesis of organic beings, and, according to Lange, anticipates the idea of Mr Darwin that adaptations abound, because it is their nature to perpetuate themselves. He further recognizes a progress in the production of vegetable and animal forms, though this part of his theory is essentially crude and unscientific. More important in relation to the modern problems of evolution is his thoroughly materialistic way of explaining the origin of sensation and knowledge by help of his peculiar hypothesis of effluvia and pores. The supposition that sensation thus rests on a material process of absorption from external bodies naturally led up to the idea that plants and even inorganic substances are precipient, and so to an indistinct recognition of organic life as a scale of intelligence.

Anaxagoras.—The doctrine of Homœmeries, propounded by Anaxagoras, agrees with that of Empedocles in assigning the origin of things to combinations and redistributions of certain primordial forms of matter. Yet these are less simple than the elements of the other thinker.[3] Moreover, the idea that the diversity of things arises from a preponderance of certain elements, and not from the mere fact of various combination, removes the theory of Anaxagoras further from modern conceptions of cosmic evolution than that of Empedocles.[4] According to Grote's interpretation, Anaxagoras, in his conception of nous as the originator of movement and order which manifests itself as the vital principle in plants as well as in animals and man, would appear to lean rather to a monistic and purely materialistic than to a dualistic conception of evolution.

Atomists.—In the theory of Atomism taught by Leucippus and Democritus we have the basis of the modern mechanical conceptions of cosmic evolution. Here the endless harmonious diversity of our cosmos, as well as of other worlds supposed to co-exist with our own, is said to arise through the various combination of indivisible material elements differing in figure and magnitude only. The force which brings the atoms together in the forms of objects is inherent in the elements, and all their motions are necessary. The origin of things, which is also their substance, is thus laid in the simplest and most homogeneous elements or principles. The real world thus arising consists only of diverse combinations of atoms, having the properties of magnitude, figure, weight, and hardness, all other qualities being relative only to the sentient organism. The problem of the genesis of mind is practically solved by identifying the soul, or vital principle, with heat or fire which pervades in unequal proportions, not only man and animals, but plants and nature as a whole, and through the agitation of which by incoming effluvia all sensation arises.

The Sophists—Critias.—Of the Sophists there is but one whose doctrine need concern us here, namely, Critias. In a fragment of his writings we meet with a speculation on the past development of man, which is curious as distinctly recognizing the upward direction of human history, and so as contrasting with the prevailing view of this history as a gradual deterioration. Critias tells us there was a time when the life of man was lawless (ἄτακτος) and beast-like (θηριώδης), when he was a slave of force, and when no honour was paid to the good nor punishment administered to the bad. Laws having arisen, evil actions which could no longer be done overtly were still practised in secret, and at this stage a wise man arose who sought to instil terror into the minds of the people, and so conceived the Deity, who is made the more terrible by being localized in the region whence proceed thunder and lightning.

Plato.—Plato needs to be referred to here only because of the strongly marked opposition of his philosophy to the teaching of evolution. It is true (as Zeller remarks) that Plato's whole philosophy was directed less to the explanation of becoming than to the consideration of being. So far, however, as the highly mythical cosmology of the *Timæus* may be taken as indicating Plato's way of looking at the successive order of the world, we see that it widely deviates from that of the evolutionist. Thus the notion of the Demiurgus is distinctly contradictory of the idea of a natural process of evolution. Again, the supposition that the world of particular things is somehow determined by pre-existing universal ideas lends itself rather to a theory of emanation as a descent from the more perfect to the less perfect than to a doctrine of evolution. It became the basis of that doctrine of universal essences or types which for ages interfered with a scientific explanation of organic forms. Again Plato exactly reverses the order of evolution in his way of looking at the scale of organic beings and souls, since he sets out with the highest and most perfect, the divine cosmos, and passes downwards to man and the lower animals viewed as successive degradations.

Early Platonists.—Among the early followers of Plato, Speusippus deserves mention here in so far as he assimilated the course of the world to the development of the individual by regarding it as a progress from imperfection to perfection.[5] Xenocrates again appears to have viewed the

[1] This is brought out by F. Lassalle, *Die Philosophie Heraklietos*, p. 126.

[2] Zeller observes that Heraclitus fails to tell us what are the elements which conflict.

[3] Grote says the idea of these multifarious forms of matter was suggested by the phenomena of animal nutrition.—*Plato*, i. 55.

[4] It is observed by Ferrier that the doctrine of Anaxagoras reverses the order of the Atomists, by regarding the transition as one from the complex to the seemingly simple. It is no doubt true that the chief aim of Anaxagoras was to explain not so much the diversity as the orderly arrangement of individual things. Yet his conception of the primal chaos involves at least the notion of an apparent homogeneity or uniformity, no particles being distinguishable from the rest. (See Grote, *op. cit.*, i. 51). Grote even assimilates the chaos of Anaxagoras to the primordial indeterminateness of Anaximander.

[5] Speusippus differed from Plato by making good the end and not the efficient cause of being (see Zeller, *Plato*, p. 568 *sq.*).

whole of the cosmos as a graduated scale of animate existence.

Aristotle.—Aristotle is much nearer a conception of evolution than his master. It is true he sets out with a transcendent Deity, and follows Plato in viewing the creation of the cosmos as a process of descent from the more to the less perfect according to the distance from the original self-moving agency. Yet on the whole Aristotle leans to a teleological theory of evolution, which he interprets dualistually by means of certain metaphysical distinctions. Thus even his idea of the relation of the divine activity to the world shows, as Zeller and Lange remark, a tendency to a pantheistic notion of a divine thought which gradually realizes itself in the process of becoming. Aristotle's distinction of form and matter, and his conception of becoming as a transition from actuality to potentiality, provides a new ontological way of conceiving the process of material and organic evolution.[1] To Aristotle the whole of nature is instinct with a vital impulse towards some higher manifestation. Organic life presents itself to him as a progressive scale of complexity determined by its final end, namely, man.[2] In some respects Aristotle approaches the modern view of evolution. Thus, though he looked on species as fixed, being the realization of an unchanging formative principle (φύσις), he seems, as Ueberweg observes, to have inclined to entertain the possibility of a spontaneous generation in the case of the lowest organisms. Aristotle's teleological conception of organic evolution often approaches modern mechanical conceptions. Thus he says that nature fashions organs in the order of their necessity, the first being those essential to life. So, too, in his psychology he speaks of the several degrees of mind as arising according to a progressive necessity.[3] In his view of touch and taste, as the two fundamental and essential senses, he may remind one of Mr Spencer's doctrine. At the same time Aristotle precludes the idea of a natural development of the mental series by the supposition that man contains, over and above a natural finite soul inseparable from the body, a substantial and eternal principle (νοῦς) which enters into the individual from without. Aristotle's brief suggestions respecting the origin of society and governments in the *Politics* show a leaning to a naturalistic interpretation of human history as a development conditioned by growing necessities.

Strato.—Of Aristotle's immediate successors one deserves to be noticed here, namely, Strato of Lampsacus, who developed his master's cosmology into a system of naturalism. Strato appears to reject Aristotle's idea of an original source of movement and life extraneous to the world in favour of an immanent principle. All parts of matter have an inward plastic life whereby they can fashion themselves to the best advantage, according to their capability, though not with consciousness.

The Stoics.—In the cosmology of the Stoics we have the germ of a monistic and pantheistic conception of evolution. All things are said to be developed out of an original being, which is at once material (fire) and spiritual (the Deity), and in turn they will dissolve back into this primordial source. At the same time the world as a developed whole is regarded as an organism which is permeated with the divine Spirit, and so we may say that the world-process is a self-realization of the divine Being. The formative principle or force of the world is said to contain the several rational germinal forms of things. Individual things are supposed to arise out of the original being, as animals and plants out of seeds. Individual souls are an efflux from the all-compassing world-soul. The necessity in the world's order is regarded by the Stoics as identical with the divine reason, and this idea is used as the basis of a teleological and optimistic view of nature. Very curious, in relation to modern evolutional ideas, is the Stoical doctrine that our world is but one of a series of exactly identical ones, all of which are destined to be burnt up and destroyed.

The Epicureans—Lucretius.—The Epicureans differed from the Stoics by adopting a purely mechanical view of the world-process. Their fundamental conception is that of Democritus; they seek to account for the formation of the cosmos, with its order and regularity, by setting out with the idea of an original (vertical) motion of the atoms, which somehow or other results in movements towards and from one another. Our world is but one of an infinite number of others, and all the harmonies and adaptations of the universe are regarded as a special case of the infinite possibilities of mechanical events. Lucretius regards the primitive atoms (first beginnings or first bodies) as seeds out of which individual things are developed. All living and sentient things are formed out of insentient atoms (*e.g.*, worms spring out of dung). The peculiarity of organic and sentient bodies is due to the minuteness and shape of their particles, and to their special motions and combinations. So, too, mind consists but of extremely fine particles of matter, and dissolves into air when the body dies. Lucretius traces, in the fifth book of his poem, the progressive genesis of vegetal and animal forms out of the mother-earth. He vaguely anticipates the modern idea of the world as a survival of the fittest when he says that many races may have lived and died out, and that those which still exist have been protected either by craft, courage, or speed. Lucretius touches on the development of man out of a primitive, hardy, beast-like condition. Pregnant hints are given respecting a natural development of language which has its germs in sounds of quadrupeds and birds, of religious ideas out of dreams and waking hallucinations, and of the art of music by help of the suggestion of natural sounds. Lucretius thus recognizes the whole range of existence to which the doctrine of evolution may be applied.

Neo-Platonists.—In the doctrines of the Neo-Platonists, of whom Plotinus is the most important, we have the world-process represented after the example of Plato as a series of descending steps, each being less perfect than its predecessors, since it is further removed from the first cause.[4] The system of Plotinus, Zeller remarks, is not strictly speaking one of emanation, since there is no communication of the divine essence to the created world; yet it resembles emanation inasmuch as the genesis of the world is conceived as a necessary physical effect, and not as the result of volition. In Proclus we find this conception of an emanation of the world out of the Deity, or the absolute, made more exact, the process being regarded as threefold—(1) persistence of cause in effect, (2) the departure of effect from cause, and (3) the tendency of effect to revert to its cause.

The Fathers.—The speculations of the fathers respecting the origin and course of the world seek to combine Christian ideas of the Deity with doctrines of Greek philosophy. The common idea of the origin of things is that of an absolute creation of matter and mind alike. The course of human history is regarded by those writers who are most concerned to refute Judaism as a progressive divine education. Among the Gnostics we meet with the hypothesis of emanation, as, for example, in the curious cosmic theory of Valentinus.

Middle Ages—Early Schoolmen.—In the speculative

[1] Zeller says that through this distinction Aristotle first made possible the idea of development.

[2] See this well brought out in Mr G. H. Lewes's *Aristotle*, p. 187.

[3] Grote calls attention to the contrast between Plato's and Aristotle's way of conceiving the gradations of mind (*Aristotle*, ii. 171).

[4] Zeller observes that this scale of decreasing perfection is a necessary consequence of the idea of a transcendent deity.

writings of the Middle Ages, including those of the schoolmen, we find no progress towards a more accurate and scientific view of nature. The cosmology of this period consists for the most part of the Aristotelian teleological view of nature combined with the Christian idea of the Deity and His relation to the world. In certain writers, however, there appears a more elaborate transformation of the doctrine of creation into a system of emanation. According to John Scotus Erigena, the nothing out of which the world is created is the divine essence. Creation is the act by which God passes through the primordial causes, or universal ideas, into the region of particular things (*processio*), in order finally to return to himself (*reversio*). The transition from the universal to the particular is of course conceived as a descent or degradation. A similar doctrine of emanation is to be found in the writings of Bernhard of Chartres, who conceives the process of the unfolding of the world as a movement in a circle from the most general to the individual, and from this back to the most general. This movement is said to go forth from God to the animated heaven, stars, visible world, and man, which represent decreasing degrees of cognition.

Arab Philosophers.—Elaborate doctrines of emanation, largely based on Neo-Platonic ideas, are also propounded by some of the Arabic philosophers, as by Alfarabi and Avicenna. The leading thought is that of a descending series of intelligences, each emanating from its predecessor, and having its appropriate region in the universe.

Jewish Philosophy.—In the Jewish speculations of the Middle Ages may be found curious forms of the doctrine of emanations, uniting the Biblical idea of creation with elements drawn from the Persians and the Greeks. In the later and developed form of the Cabala, the origin of the world is represented as a gradually descending emanation of the lower out of the higher. Among the philosophic Jews, the Spanish Avicebron, in his *Fons Vitæ*, expounds a curious doctrine of emanation. Here the divine will is viewed as an efflux from the divine wisdom, as the intermediate link between God, the first substance and all things, and as the fountain out of which all forms emanate. At the same time all forms, including the higher intelligible ones, are said to have their existence only in matter. Matter is the one universal substance, body and mind being merely specifications of this. Thus Avicebron approaches, as M. Munk observes,[1] a pantheistic conception of the world, though he distinctly denies both matter and form to God.

Later Scholastics.—Passing now to the later schoolmen, a bare mention must be made of Thomas, who elaborately argues for the absolute creation of the world out of nothing, and of Albertus Magnus, who reasons against the Aristotelian idea of the past eternity of the world. More importance attaches to Duns Scotus, who brings prominently forward the idea of a progressive development in nature by means of a process of determination. The original substance of the world is the *materia primo-prima*, which is the immediate creation of the Deity. This serves Duns Scotus as the most universal basis of existence, all angels having material bodies. This matter is differentiated into particular things (which are not privations but perfections) through the addition of an individualizing principle (*hæcceitas*) to the universal (*quidditas*). The whole world is represented by the figure of a tree, of which the seeds and roots are the first indeterminate matter, the leaves the accidents, the twigs and branches corruptible creatures, the blossoms the rational soul, and the fruit pure spirits or angels. It is also described as a bifurcation of two twigs, mental and bodily creation out of a common root. One might almost say that Duns Scotus recognizes the principle of a gradual physical evolution, only that he chooses to represent the mechanism by which the process is brought about by means of quaint scholastic fictions.

Revival of Learning.—The period of the revival of learning, which was also that of a renewed study of nature, is marked by a considerable amount of speculation respecting the origin of the universe. In some of these we see a return to Greek theories, though the influence of physical discoveries, more especially those of Copernicus, Kepler, and Galileo, is distinctly traceable.

Telesio.—An example of a return to early Greek speculation is to be met with in Bernardino Telesio. By this writer the world is explained as a product of three principles,—dead matter, and two active forces, heat and cold. Terrestrial things arise through a confluence of heat, which issues from the heavens, and cold, which comes from the earth. Both principles have sensibility, and thus all products of their collision are sentient, that is, feel pleasure and pain. The superiority of animals to plants and metals in the possession of special organs of sense is connected with the greater complexity and heterogeneity of their structure.

Giordano Bruno.—In the system of Giordano Bruno, who sought to construct a philosophy of nature on the basis of new scientific ideas, more particularly the doctrine of Copernicus, we find the outlines of a theory of cosmic evolution conceived as an essentially vital process. Matter and form are here identified, and the evolution of the world is presented as the unfolding of the world-spirit to its perfect forms according to the plastic substratum (matter) which is but one of its sides. This process of change is conceived as a transformation, in appearance only, of the real unchanging substance (matter and form). All parts of matter are capable of developing into all forms; thus the materials of the table and chair may, under proper circumstances, be developed to the life of the plant or of the animal. The elementary parts of existence are the *minima*, or monads, which are at once material and mental. On their material side they are not absolutely unextended, but spherical. Bruno looked on our solar system as but one out of an infinite number of worlds. His theory of evolution is essentially pantheistic, and he does not employ his hypothesis of monads in order to work out a more mechanical conception.

Campanella.—A word must be given to one of Bruno's contemporary compatriots, namely Campanella, who gave poetic expression to that system of universal vitalism which Bruno developed. He argues, from the principle *quicquid est in effectibus esse et in causis*, that the elements and the whole world have sensation, and thus he appears to derive the organic part of nature out of the so-called "inorganic."

Boehme.—Another writer of this transition period deserves a passing reference here, namely, Jacob Boehme the mystic, who by his conception of a process of inner diremption as the essential character of all mind, and so of God, prepared the way for later German theories of the origin of the world as the self-differentiation and self-externalization of the absolute spirit.

Hobbes and Gassendi.—The influence of an advancing study of nature, which was stimulated if not guided by Bacon's writings, is seen in the more careful doctrines of materialism worked out almost simultaneously by Hobbes and Gassendi. These theories, however, contain little that bears directly on the hypothesis of a natural evolution of things. In the view of Hobbes, the difficulty of the genesis of conscious minds is solved by saying that sensation and thought are part of the reaction of the organism on external movement. Yet Hobbes appears (as Clarke points out) to have vaguely felt the difficulty; and in a

[1] *Mélanges de philosophie juive et arabe*, p. 225.

passage of his *Physics* (chap. 25, sect. 5) he says that the universal existence of sensation in matter cannot be disproved, though he shows that when there are no organic arrangements the mental side of the movement (*phantasma*) is evanescent. The theory of the origin of society put forth by Hobbes, though directly opposed in most respects to modern ideas of social evolution, deserves mention here by reason of its enforcing that principle of struggle (*bellum omnium contra omnes*) which has played so conspicuous a part in recent doctrines of evolution. Gassendi, with some deviations, follows Epicurus in his theory of the formation of the world. The world consists of a finite number of atoms, which have in their own nature a self-moving force or principle. These atoms, which are the seeds of all things, are, however, not eternal but created by God. Gassendi distinctly argues against the existence of a world-soul or a principle of life in nature.

Descartes.—In the philosophy of Descartes we meet with a dualism of mind and matter which does not easily lend itself to the conception of evolution. His doctrine that consciousness is confined to man, the lower animals being unconscious machines (*automata*), excludes all idea of a progressive development of mind. Yet Descartes, in his *Principia Philosophia*, laid the foundation of the modern mechanical conception of nature and of physical evolution. In the third part of this work he inclines to a thoroughly natural hypothesis respecting the genesis of the physical world, and adds in the fourth part that the same kind of explanation might be applied to the nature and formation of plants and animals. He is indeed careful to keep right with the orthodox doctrine of creation by saying that he does not believe the world actually arose in this mechanical way out of the three kinds of elements which he here supposes, but that he simply puts out his hypothesis as a mode of conceiving how it might have arisen. Descartes's account of the mind and its passions is thoroughly materialistic, and to this extent he works in the direction of a materialistic explanation of the origin of mental life.

Spinoza.—In Spinoza's pantheistic theory of the world, which regards thought and extension as but two sides of one substance, the problem of becoming is submerged in that of being. Although Spinoza's theory attributes a mental side to all physical events, he rejects all teleological conceptions and explains the order of things as the result of an inherent necessity. He recognizes gradations of things according to the degree of complexity of their movements and that of their conceptions. To Spinoza (as Kuno Fischer observes) man differs from the rest of nature in the degree only and not in the kind of his powers. So far Spinoza approaches the conception of evolution. He may be said to furnish a further contribution to a metaphysical conception of evolution in his view of all finite individual things as the infinite variety to which the unlimited productive power of the universal substance gives birth. Mr F. Pollock has taken pains to show in more than one essay how nearly Spinoza approaches certain ideas contained in the modern doctrine of evolution, as for example that of self-preservation as the determining force in things.

Cudworth.—One or two English writers belonging to the latter part of the 17th century must be glanced at here. Of these the first is Cudworth, who, in his work *The True Intellectual System of the Universe*, elaborately criticises the various "atheistic" modes of explaining the origin and form of the world as a natural process. Cudworth emphasizes especially the difficulty of explaining the rise of consciousness, and seeks to show how the early Greek atomical physiologists were driven to assume a spiritual principle over and above their material elements. He dwells on the signs of purpose in nature, and argues that no fortuitous combination of elements could have sufficed to produce that balance of male and female individuals on which the preservation of species depends. Yet though thus an anti-evolutionist, Cudworth provides a way of interpreting the evolution of life by means of an immanent principle, since he refers the forms of nature to a plastic principle, which does not involve consciousness, though it may be called a drowsy unawakened cognition.

Locke.—In Locke we find, with a retention of certain anti-evolutionist ideas, a marked tendency to this mode of viewing the world. To Locke the universe is the result of a direct act of creation, even matter being limited in duration and created. Even if matter were eternal it would, he thinks, be incapable of producing motion; and if motion is itself conceived as eternal, thought can never begin to be. The first eternal being is thus spiritual or "cogitative," and contains in itself all the perfections that can ever after exist. He repeatedly insists on the impossibility of senseless matter putting on sense.[1] Yet while thus placing himself at a point of view opposed to that of a gradual evolution of the organic world, Locke prepared the way for this doctrine in more ways than one. First of all, his genetic method as applied to the mind's ideas—which laid the foundations of English analytical psychology—was a step in the direction of a conception of mental life as a gradual evolution. Again he works towards the same end in his celebrated refutation of the scholastic theory of real specific essences. In this argument he emphasizes the vagueness of the boundaries which mark off organic species with a view to show that these do not correspond to absolutely fixed divisions in the objective world, that they are made by the mind, not by nature.[2] This idea of the continuity of species is developed more fully in a remarkable passage (*Essay*, bk. iii. ch vi. § 12), where he is arguing in favour of the hypothesis, afterwards elaborated by Leibnitz, of a graduated series of minds (species of spirits) from the Deity down to the lowest animal intelligence. He here observes that "all quite down from us the descent is by easy steps, and a continued series of things, that in each remove differ very little from one another." Thus man approaches the beasts, and the animal kingdom is nearly joined with the vegetable, and so on down to the lowest and "most inorganical parts of matter." Finally, it is to be observed that Locke had a singularly clear view of organic arrangements (which of course he explained according to a theistic teleology) as an adaptation to the circumstances of the environment or to "the neighbourhood of the bodies that surround us." Thus he suggests that man has not eyes of a microscopic delicacy, because he would receive no great advantage from such acute organs, since though adding indefinitely to his speculative knowledge of the physical world they would not practically benefit their possessor (*e.g.*, by enabling him to avoid things at a convenient distance).[3]

Idea of Progress in History.—Before leaving the 17th century we must just refer to the writers who laid the foundations of the essentially modern conception of human history as a gradual upward progress. According to Prof. Flint,[4] there were four men who in this century seized and made

[1] Yet he leaves open the question whether the Deity has annexed thought to matter as a faculty, or whether it rests on a distinct spiritual principle.

[2] Locke half playfully touches on certain monsters, with respect to which it is difficult to determine whether they ought to be called men. (*Essay*, book iii. ch. vi. sect. 26, 27.)

[3] A similar coincidence between the teleological and the modern evolutional way of viewing things is to be met with in Locke's account of the use of pain in relation to the preservation of our being, bk. ii. ch. vii. sect. 4.

[4] *Philosophy of History*, Introduction, p. 28 *sq.*, where an interesting sketch of the growth of the idea of progress is to be found.

prominent this idea, namely, Bodin, Bacon, Descartes, and Pascal. The former distinctly argues against the idea of a deterioration of man in the past. In this way we see that just as advancing natural science was preparing the way for a doctrine of physical evolution, so advancing historical research was leading to the application of a similar idea to the collective human life.

English Writers of the 18th Century—Hume.—The theological discussions which make up so large a part of the English speculation of the last century cannot detain us here. There is, however, one writer who sets forth so clearly the alternative suppositions respecting the origin of the world that he claims a brief notice. We refer to David Hume. In his *Dialogues concerning Natural Religion* he puts forwards tentatively, in the person of one of his interlocutors, the ancient hypothesis that since the world resembles an animal or vegetal organism rather than a machine, it might more easily be accounted for by a process of generation than by an act of creation. Later on he develops the materialistic view of Epicurus, only modifying it so far as to conceive of matter as finite. Since a finite number of particles is only susceptible of finite transpositions, it must happen (he says), in an eternal duration that every possible order or position will be tried an infinite number of times, and hence this world is to be regarded (as the Stoics maintained) as an exact reproduction of previous worlds. The speaker seeks to make intelligible the appearance of art and contrivance in the world as a result of a natural settlement of the universe (which passes through a succession of chaotic conditions) into a stable condition, having a constancy in its forms, yet without its several parts losing their motion and fluctuation.

Priestley.—The English materialists of the latter part of the century did little to work out the idea of evolution. Priestley needs to be mentioned here only by reason of his clear recognition of human progress.

Monboddo.—Of other British writers of the period, Lord Monboddo must be named on account of his curious speculations respecting the origin of man. In his *Ancient Metaphysics* (vol. iii.), Monboddo conceives man as gradually elevating himself from an animal condition, in which his mind is immersed in matter, to a state in which mind acts independently of body. In his equally voluminous work, *The Origin and Progress of Language*, Monboddo brings man under the same species as the orang-outang. He traces the gradual elevation of man to the social state, which he conceives as a natural process determined by "the necessities of human life." He looks on language (which is not "natural" to man in the sense of being necessary to his self-preservation) as a consequence of his social state.

French Writers of the 18th Century.—Let us now pass to the French writers of the last century. Here we are first struck by the results of advancing physical speculation in their bearing on the conception of the world. Careful attempts, based on new scientific truths, are made to explain the genesis of the world as a natural process. Maupertuis, who, together with Voltaire, introduced the new idea of the universe as based on Newton's discoveries, sought to account for the origin of organic things by the hypothesis of sentient atoms. Buffon the naturalist speculated, not only on the structure and genesis of organic beings, but also on the course of formation of the earth and solar system, which he conceived after the analogy of the development of organic beings out of seed. Diderot, too, in his varied intellectual activity, found time to speculate on the genesis of sensation and thought out of a combination of matter endowed with an elementary kind of sentience. De la Mettrie worked out a materialistic doctrine of the origin of things, according to which sensation and consciousness are nothing but a development out of matter. He sought (*L'homme-machine*) to connect man in his original condition with the lower animals, and emphasized (*L'homme-plante*) the essential unity of plan of all living things. Helvetius, in his work on man, referred all differences between our species and the lower animals to certain peculiarities of organization, and so prepared the way for a conception of human development out of lower forms as a process of physical evolution. Charles Bonnet met the difficulty of the origin of conscious beings much in the same way as Leibnitz, by the supposition of eternal minute organic bodies to which are attached immortal souls. Yet though in this way opposing himself to the method of the modern doctrine of evolution, he aided the development of this doctrine by his view of the organic world as an ascending scale from the simple to the complex. Robinet, in his treatise *De la Nature*, worked out the same conception of a gradation in organic existence, connecting this with a general view of nature as a progress from the lowest inorganic forms of matter up to man. The process is conceived as an infinite series of variations or specifications of one primitive and common type. Man is the *chef d'œuvre* of nature, which the gradual progression of beings was to have as its last term, and all lower creations are regarded as pre-conditions of man's existence, since nature "could only realize the human form by combining in all imaginable ways each of the traits which was to enter into it." The formative force in this process of evolution (or "metamorphosis") is conceived as an intellectual principle (*idée génératrice*). Robinet thus laid the foundation of that view of the world as wholly vital, and as a progressive unfolding of a spiritual formative principle, which was afterwards worked out by Schelling. It is to be added that Robinet adopted a thorough-going materialistic view of the dependence of mind on body, going even to the length of assigning special nerve-fibres to the moral sense. The system of Holbach seeks to provide a consistent materialistic view of the world and its processes. Mental operations are identified with physical movements, the three conditions of physical movement, inertia, attraction, and repulsion, being in the moral world self-love, love, and hate. He left open the question whether the capability of sensation belongs to all matter, or is confined to the combinations of certain materials. He looked on the actions of the individual organism and of society as determined by the needs of self-preservation. He conceived of man as a product of nature that had gradually developed itself from a low condition, though he relinquished the problem of the exact mode of his first genesis and advance as not soluble by data of experience. Holbach thus worked out the basis of a rigorously materialistic conception of evolution.

The question of human development which Holbach touched on was one which occupied many minds both in and out of France during the past century, and more especially towards its close. The foundations of this theory of history as an upward progress of man out of a barbaric and animal condition were laid by Vico in his celebrated work *Principii di Scienza Nuova*. In France the doctrine was represented by Turgot and Condorcet.

Of the English writers who discussed the question of man's development we have already spoken. The German speculations on the subject will be touched on presently.

German Writers of the 18th Century—Leibnitz.—In Leibnitz we find, if not a doctrine of evolution in the strict sense, a theory of the world which is curiously related to the modern doctrine. The chief aim of Leibnitz is no doubt to account for the world in its static aspect as a co-existent whole, to conceive the ultimate reality of things in such a way as to solve the mystery of mind and matter. Yet by his very mode of solving the problem he is led on to consider the nature of the world-process. By placing substantial reality in an infinite number of monads whose essential nature is force or activity, which is conceived as mental (representation), Leibnitz was carried on to the explanation of the successive order of the world. He prepares the way, too, for a doctrine of evolution by his monistic idea of the substantial similarity of all things, inorganic and organic, bodily and spiritual, and still more by his conception of a perfect gradation of existence from the lowest "inanimate" objects, whose essential activity is confused representation, up to the highest organized being—man—with his clear intelligence.[1] Turning now to Leibnitz's conception of the world as a process, we see first that he supplies, in his notion of the underlying reality as force which is represented as spiritual (*quelque chose d'analogique au sentiment et à l'appétit*), both a mechanical and a teleological explanation of its order. More than this, Leibnitz supposes that the activity of the monads takes the form of a self-evolution. It is the following out of an inherent tendency or impulse to a series of changes, all of which were virtually pre-existent, and this process cannot be interfered with from without. As the individual monad, so the whole system which makes up the world is a gradual development. In this case, however, we cannot say that each step goes out of the other as in that of individual development. Each monad is an original independent being, and is determined to take this particular point in the universe, this place in the scale of beings. We see how different this metaphysical conception is from that scientific notion of cosmic evolution in which the lower stages are the antecedents and conditions of the higher. It is probable that Leibnitz's notion of time and space, which approaches Kant's theory, led him to attach but little importance to the successive order of the world. Leibnitz, in fact, presents to us an infinite system of perfectly distinct though parallel developments, which on their mental side assume the aspect of a scale, not through any mutual action, but solely through the determination of the Deity. Even this idea, however, is incomplete, for Leibnitz fails to explain the physical aspect of development. Thus he does not account for the fact that organic beings—which have always existed as preformations (in the case of animals as *animaux spermatiques*)—come to be developed under given conditions. Yet Leibnitz prepared the way for a new conception of organic evolution. The modern monistic doctrine, that all material things consist of sentient elements, and that consciousness arises through a combination of these, was a natural transformation of Leibnitz's theory.[2]

Lessing.—Of Leibnitz's immediate followers we may mention Lessing, who in his *Education of the Human Race* brought out the truth of the process of gradual development underlying human history, even though he expressed this in a form inconsistent with the idea of a spontaneous evolution.

Herder.—Herder, on the other hand, Lessing's contemporary, treated the subject of man's development in a thoroughly naturalistic spirit. In his *Ideen zur Philosophie der Geschichte*, Herder adopts Leibnitz's idea of a graduated scale of beings, at the same time conceiving of the lower stages as the conditions of the higher. Thus man is said to be the highest product of nature, and as such to be dependent on all lower products. All material things are assimilated to one another as organic, the vitalizing principle being inherent in all matter. The development of man is explained in connection with that of the earth, and in relation to climatic variations, &c. Man's mental faculties are viewed as related to his organization, and as developed under the pressure of the necessities of life.[3]

Kant.—Kant's relation to the doctrine of evolution is a many-sided one. In the first place, his peculiar system of subjective idealism, involving the idea that time is but a mental form to which there corresponds nothing in the sphere of noümenal reality, serves to give a peculiar philosophical interpretation to every doctrine of cosmic evolution. Kant, like Leibnitz, seeks to reconcile the mechanical and teleological views of nature, only he assigns to these different spheres. The order of the inorganic world is explained by properly physical causes. In his *Naturgeschichte des Himmels*, in which he anticipated the nebular theory afterwards more fully developed by Laplace, Kant sought to explain the genesis of the cosmos as a product of physical forces and laws. The worlds, or systems of worlds, which fill infinite space are continually being formed and destroyed. Chaos passes by a process of evolution into a cosmos, and this again into chaos. So far as the evolution of the solar system is concerned, Kant held these mechanical causes as adequate. For the world as a whole, however, he postulated a beginning in time (whence his use of the word creation), and further supposed that the impulse of organization which was conveyed to chaotic matter by the Creator issued from a central point in the infinite space spreading gradually outwards.[4] While in his cosmology Kant thus relies on mechanical conceptions, in his treatment of organic life his mind is, on the contrary, dominated by teleological ideas. An organism was to him something controlled by a formative organizing principle. It was natural, therefore, that he rejected the idea of a spontaneous generation of organisms (which was just then being advocated by his friend Forster), not only as unsupported by experience but as an inadequate hypothesis. Experience forbids our excluding organic activity from natural causes, also our excluding intelligence from purposeful (*zweckthätigen*) causes;[5] hence experience forbids our defining the fundamental force or first cause out of which living creatures arose.[5] Just as Kant thus sharply marks off the regions of the inorganic and the organic, so he sets man in strong opposition to the lower animals. His ascription to man of a unique faculty, free-will, forbade his conceiving our species as a link in a graduated series of organic developments. In his doctrine of human development he does indeed recognize an early stage of existence in which our species was dominated by sensuous enjoyment and instinct. He further conceives of this stage as itself a process of (natural) development, namely, of the natural disposition of the species to vary in the greatest possible manner so as to preserve its unity through a process of self-adaptation (*Anarten*) to climate. This, he says, must not be conceived as resulting from the action of external causes, but is due to a natural disposition (*Anlage*). From this

[1] Mr Lewes points out that Leibnitz is inconsistent in his account of the intelligence of man in relation to that of lower animals, since when answering Locke he no longer regards these as differing in degree only.

[2] Both Mr Lewes and Prof. Du Bois Reymond have brought out the points of contact between Leibnitz's theory of monads and modern biological speculations (*Hist. of Phil.* ii. 287, and *Leibnitzsche Gedanken in der modernen Naturwissenschaft*, p. 23 *sq.*).

[3] For Herder's position in relation to the modern doctrine of evolution see F. von Bärenbach's *Herder als Vorgänger Darwins*, a work which tends to exaggerate the proximity of the two writers.

[4] Kant held it probable that other planets besides our earth are inhabited, and that their inhabitants form a scale of beings, their perfection increasing with the distance of the planet which they inhabit from the sun.

[5] Kant calls the doctrine of the transmutation of species "a hazardous fancy of the reason." Yet, as Strauss and others have shown, Kant's mind betrayed a decided leaning at times to a more mechanical conception of organic forms as related by descent.