THE LAW OF SUBSTANCE

extremely divergent, they frequently contradict each other on the most important points. One is, therefore, free to choose among the contradictory hypotheses according to one's knowledge and judgment. I will put in the following eight theses the view which has approved itself to me after mature reflection on the subject, though I am no expert in this department.

I.—Ether fills the whole of space, in so far as it is not occupied by ponderable matter, as a continuous substance, it fully occupies the space between the atoms of ponderable matter.

II.—Ether has probably no chemical quality, and is not composed of atoms. If it be supposed that it consists of infinite homogeneous atoms (for instance, indivisible etheric particles of a uniform size), it must be further supposed that there is something else between these atoms either "empty space" or a third, completely unknown medium, purely hypothetical, "inter ether," the question as to the nature of this brings us back to the original difficulty, and so on in infinitum.

III.—As the idea of an empty space and an action at a distance is strictly possible in the present condition of our knowledge (at least, it does not help to establish a monistic view), I postulate for ether a special structure which is not atomistic, like that of ponderable matter, and which may be visualized as without further determination, etheric or dynamic structure.

IV.—The consistency of ether is also peculiar, on our hypothesis, and different from that of ponderable matter. It is nor gaseous, as some conceive, nor solid, as others suppose; the best idea of it can be formed by comparison with an extremely attenuated elastic, and light jelly.

V.—Ether may be called imponderable matter in the sense that we have no means of determining its weight experimentally. If it really has weight, it is very probable, it must be so slight as to be far below the capacity of our most delicate balance. Some physicists have attempted to determine its weight by the energy of the light waves, and have discovered that it is some fifteen trillion times lighter than atmospheric air; on that hypothesis, a sphere of ether of the size of our earth would weigh at least two hundred and fifty pounds (°).

VI.—The ethereal consistency may probably (in accordance with the pyknotic theory) pass into the viscous state under certain conditions by progressive condensation just as water may be converted into a fluid and ultimately into a solid, by lowering its temperature.

VII.—Consequently, these three conditions of matter may be arranged and it is a point of great importance in the monistic cosmos, only in a continuous order. We may distinguish five stages in it: (1) the atomic, (2) the gaseous, (3) the fluid, (4) the viscous in the living protoplasm, and (5) the solid state.

VIII.—Ether is boundless and immeasurable, like the space it occupies, it is in eternal motion, and this persistent movement of ether (it is immaterial whether we conceive it as vibration, strain, condensation or reciprocated motion with mass movement or gravitation) is the ultimate cause of all phenomena.

The next question of the nature of ether, is how justly it fills it, includes the question of its relation to ponderable matter, for these two forms of matter are not only always in close external contact but also in eternal dynamic reciprocal action. We may divide the most general phenomenon of nature, which are distinguished by physics as natural forces or "functions of matter," into two groups, the first of them may be regarded mainly (though not exclusively) as a function of ether, and the second a function of ponderable matter—

* * *

THE WORLD (NATURE, OR THE COSMOS)

| 1 Consist | Imp indetectable |
|———|———|

| 2 Etheric | (e) neither gaseous nor fluid nor solid |

| 3 Structure | Not ultimate, not made up of separate particles (atom) but continuous |

| 4 Chief functions | Light radiant heat, electricity, and magnetism |

———

| 1 Nature | Mass—Ponderable |

|———|———|

| 2 Not etheric (but gaseous if fluid or solid) |

| 3 Characteristic of a functioning small mass of particles (1 min, 1 sec) continuous |

| 4 Chief function | Gravity, intermolecular heat, and chemical affinity |
The two groups of functions of matter, which we have opposed in this table, may, to some extent, be regarded as the outcome of the first "division of labour" in the development of matter, the "primary ergonomy of matter." But this distinction must not be supposed to involve an absolute separation of the two antithetic groups, they always retain their connection, and are in constant reciprocal action. It is well known that the optical and electrical phenomena of ether are closely connected with mechanical and chemical changes in ponderable elements, the radiant heat of ether may be directly converted into the mechanical heat of the mass, gravitation is impossible unless the ether effects the mutual attraction of the separated atoms, because we cannot admit the idea of an action at a distance. In like manner, the conversion of one form of energy into another, as indicated in the laws of the persistence of force, illustrates the constant reciprocity of the two chief types of substance, ether and mass.

The great law of nature, which, under the title of the "law of substance," we put at the head of all physical considerations, was conceived as the law of "the persistence of force" by Robert Meyer, who first formulated it, and Helmholtz, who continued the work. Another German scientist, Friedrich Mohri, of Bonn, had clearly outlined it in its main features ten years earlier (1837). The old idea of force was, after a time, differentiated by modern physics from that of energy, which was at first synonymous with it. Hence the law is now usually called the "law of the persistence of energy." However, this finer distinction need not enter into the general consideration, to which I must confine myself here, into the question of the great principle of the "persistence of substance." The interested reader will find a very clear treatment of the question in Tyndall's excellent paper on "The Fundamental Law of Nature," in his Fragments of Science. It fully explains the broad significance of this profound cosmic law, and points out its application to the main problems of very different branches of science. We shall confine our attention to the important fact that the "principle of energy" and the correlative idea of the unity of natural forces, on the basis of a common origin, are now accepted by all competent physicists and are regarded as the greatest advance of physics in the nineteenth century. We now know that heat, sound, light, chemical action, electricity, and magnetism are all modes of motion. We can, by a certain apparatus, convert any one of these forces into another, and prove by an accurate measurement that not a single particle of energy is lost in the process.

The sum-total of force or energy in the universe remains constant, no matter what changes take place around us; it is eternal and infinite, like the matter on which it is inseparably dependent. The whole drama of nature apparently consists in an alternation of movement and repose, yet the bodies at rest have an inalienable quantity of force, just as truly as those that are in motion. In this movement that the potential energy of the former is converted into the kinetic energy of the latter, "as the principle of the persistence of force takes into account repulsion as well as attraction, it affirms that the mechanical value of the potential energy and the kinetic energy in the material world is a constant quantity. To put it briefly, the force of the universe is divided into two parts, which may be mutually converted, according to a fixed relation of value. The diminution of the one involves the increase of the other. The total value remains unaltered in the universe." The potential and the actual, or kinetic, energy are being continually transformed from one condition to the other, but the infinite sum of force in the world at large never suffers the slightest curtailment.

Once our modern physical education and philosophy have taken up the story, and proved its application to the entire province of the organic world, it showed that all the vital activities of the organism—without exception—are based on a constant "reciprocity of force" and as correlative change of chemical or metabolic just as much as the simplest processes in "lifeless" bodies. Not only the growth and the nutrition of plants and animals, but even their functions of sensation and movement, their sense action and psychic life, depend on the conversion of potential into kinetic energy, and vice versa. This supreme law dominates also those elaborate performances of the nervous system which we call, in the higher animals and man, "the action of the mind." Our monistic view, that the great cosmic law applies throughout the whole of nature, is of the highest moment. For it not only
involves, on its positive side, the essential
unity of the cosmos and the causal connec-
tion of all phenomena that come within
our cognizance, but it also, in a negative
way, marks the highest intellectual prog-
ress, in that it definitely rules out the three
central dogmas of metaphysics—God,
freedom, and immortality. In assigning
mechanical causes to phenomena every-
where, the law of substance comes into
line with the universal law of causality.

CHAPTER XIII
THE EVOLUTION OF THE WORLD

The notion of creation Miracles, Creation of
the whole universe and of its various parts
Creation of substance (cosmological creation)
Deism one creative div Creation of
separate entities Five forms of ontological
creationism Theory of evolution I Monistic
cosmogony Beginning and end of the
world The immortality of the universe
Space and time Universal perpetuum
mobile Entropy of the universe II Monistic
genealogy History of the inorganic and organic
worlds III Monistic biogony Theism and
the theory of descent Lamarck and
Darwin IV Monistic anthropogeny Origin
of man.

The greatest, widest, and most difficult
of all cosmic problems is that of the origin
and development of the world—the “ques-
tion of creation” in a word. Even to the
solution of this most difficult problem
in the nineteenth century has contributed
more than all its predecessors, in a certain
sense, indeed, it has found the solution.

We have at least attained a clear view of
the fact that all the partial questions of
creation are indivisibly connected, that they
represent one single, comprehensive “cosmic
problem,” and that the key to this problem
is found in the one magic word—evolution.
The great questions of the creation of
man, the creation of the animals and plants,
the creation of the earth and the sun,
etc., are all parts of the general question.
What is the origin of the whole world?
Has it been created by supernatural power,
or has it been evolved by natural process?
What are the causes and the manner of
this evolution? If we succeed in finding
the correct answer to one of these ques-
tions, we have, according to our monistic
conception of the world, cast a brilliant
light on the solution of them all, and on
the entire cosmic problem.

The current opinion is to the origin of
the world in earlier ages was almost an
universal belief in creation. This belief
has been expressed in thousands of inter-
esting, more or less fabulous, legends,
poems, cosmogonies, and myths. A few
great philosophers were devoid of it,
especially those remarkable free thinkers of
classical antiquity who first conceived the
idea of natural evolution. All the creation-
myths, on the contrary, were of a super-
natural, miraculous, and transcendent-
ental character. Impotent, as it was, to
investigate for itself the nature of the
world and its origin by natural causes, the
undeveloped mind naturally had recourse
to the idea of miracle. In most of these
creation myths antiropism was blended
with the belief in the miraculous. The
creator was supposed to have constructed
the world on a definite plan, just as man
accomplishes his artificial constructions.
The conception of the creator was generally
completely anthropomorphic, a palpable
“anthropistic creationism.” The “all-
mighty maker of heaven and earth,” as he
is called in Genesis and the Catechism, is
just as humanly conceived as the modern
creator of Agassiz and Reincke, or the
intelligent “engineer” of other recent
biologists.

Entering more fully into the notion of
creation, we can distinguish two entirely
different arts the production of the universe
as a whole and the successive production
of its various parts, in harmony with
Spinosa’s idea of substance (the universe) and
accidents or modes, the individual phenom-
enon of substance.) This distinction is of
great importance, because there are many
eminent philosophers who admit the one
and reject the other.

According to this creationist theory,
then, God has “made the world out of
nothing.” It is supposed that God (a
rational, but immaterial, being) existed by
himself for an eternity before he resolved
to create the world. Some supporters of
the theory restrict God’s creative function
to one single act, they believe that this
extraordinary god (the rest of whose life is
shrouded in mystery) created the substance
of the world in a single moment, endowed
it with the faculty of the most extensive
evolution, and troubled no further about it.
This view may be found, for instance, in the
English Deists in many forms. It ap-
proaches very close to our monistic theory.
of evolution, only abandoning it in the one instance in which God accomplished the creation. Other creationists contend that God did not confine himself to the mere creation of matter, but that he continues to be operative as the "sustainer and ruler of the world." Different modifications of this belief are found, some approaching very close to pantheism and others to complete theism. All these and similar forms of belief in creation are incompatible with the law of the persistence of matter and force; that law knows nothing of a beginning.

It is interesting to note that E. du Bois-Reymond has identified himself with this cosmological creationism in his latest speech (on "Neovitalism," 1894). "It is more consonant with the divine omnipotence," he says, "to assume that it created the whole material of the world in one creative act, unimaginable ages ago in such a wise that it should be endowed with inviolable laws to control the origin and the progress of living things—that, for instance, here on earth rudimentary organisms should arise from which, without further assistance, the whole of living nature could be evolved, from a primitive bacillus to the graceful palmwood, from a primitive microcosmus to Solomon's lovely wives or to the brain of Newton. Thus we are content with one creative day, and we derive organic nature mechanically, without the aid of either old or new vitalism." Du Bois-Reymond here shows, as in the question of consciousness, the shallow and illogical character of his monistic thought.

According to another still prevalent theory, which may be called "ontological creationism," God not only created the world at large, but also its separate contents. In the Christian world the old Semitic legend of Creation, taken from Genesis, is still very widely accepted; even among modern scientists it finds an adherent here and there. I have fully entered into the criticism of it in the first chapter of my Natural History of Creation. The following theories may be enumerated as the most interesting modifications of this ontological creationism.

1. Dualistic creation.—God restricted his interference to two creative acts: first he created the inorganic world, mere dead substance, to which alone the law of energy applies, working blindly and aimlessly in the mechanism of material things and the building of the mountains; then God attained intelligence and communicated it to the purposive intelligent forces which initiate and control organic evolution.¹

II. Triistic creation.—God made the world in three creative acts: (a) the creation of the heavens—the extra-terrestrial world, (b) the creation of the earth (as the centre of the world) and of its living inhabitants, and (c) the creation of man (in the image and likeness of God). This dogma is still widely prevalent among theologians and other "educated" people; it is taught as the truth in many of our schools.

III. Heptameral creation; a creation in seven days (testi Moses).—Although few educated people really believe in this Mosaic myth now, it is still firmly impressed on our children in the biblical lessons of their earliest years. The numerous attempts that have been made, especially in England, to harmonise it with the modern theory of evolution have entirely failed. It obtained some importance in science when Linné adopted it in the establishment of his system, and based his definition of organic species (which he considered to be unchangeable) on it: "There are as many different species of animals and plants as there were different forms created in the beginning by the Infinite." The dogma was pretty generally held until the time of Darwin (1859), although Lamarck had already proved its untenability in 1809.

IV. Periodic creation.—At the beginning of each period of the earth's history, the whole population of animals and plants was created anew, and destroyed by a general catastrophe at its close; there were as many general creative acts as there are distinct geological periods (the catastrophic theory of Cuvier [1818] and Louis Agassiz [1838]). Paleontology, which seemed, in its more imperfect stage, to support this theory, has since completely refuted it.

V. Individual creation.—Every single person—and every individual animal and plant—does not arise by a natural process of growth, but is created by the favour of God. This view of creation is still often met with in journals, especially in the "births" column. The special talents and features of our children are often gratefully acknowledged to be "gifts of God"; their hereditary defects fit into another theory.

The error of these creation-legends and the cognate belief in miracles must have been apparent to thoughtful minds at an early period; more than two thousand years ago we find that many attempts were

¹ Reinke, Die Welt als That (1899).
made to replace them by a rational theory, and to explain the origin of the world by natural causes. In the front rank, once more, we must place the leaders of the tonic school, with Democritus, Heraclitus, Empedocles, Aristotle, Lucretius, and other ancient philosophers. The first imperfect attempts which they made astonish us, in a measure, by the flashes of mental light in which they anticipate modern ideas. It must be remembered that classical antiquity had not that solid groundwork for scientific speculation which has been provided by the countless observations and experiments of modern scientists. During the Middle Ages—especially during the domination of the papacy—scientific work in this direction entirely ceased. The torture and the stake of the Inquisition ensured that an unconditional belief in the Hebrew mythology should be the final answer to all the questions of creation. Even the phenomena which led directly to the observation of the facts of evolution—the embryology of the plant and the animal, and of man—remained unnoticed, or only excited the interest of an occasional keen observer, whose discoveries were ignored or forgotten. Moreover, the path to a correct knowledge of natural development was barred by the dominant theory of preformation, the dogma which held that the characteristic form and structure of each animal and plant were already sketched in miniature in the germ (cf. p. 19).

The science which we now call the science of evolution (in the broadest sense) is, both in its general outline and in its separate parts, a child of the nineteenth century, it is one of its most momentous and most brilliant achievements. Almost unknown in the preceding century, this theory has now become the sure foundation of our whole world-system. I have treated it exhaustively in my General Morphology (1866), most popularly in my Natural History of Creation (1868), and in its special application to man in my Anthropology (1874). Here I shall restrict myself to a brief survey of the chief advances which the science has made in the course of the century. It falls into four sections, according to the nature of its object; that is, it deals with the natural origin of (1) the cosmos, (2) the earth, (3) terrestrial forms of life, and (4) man.

I.—MONISTIC COSMOGONY.

The first attempt to explain the constitu-

tion and the mechanical origin of the world in a simple manner by "Newtonian laws"—that is, by mathematical and physical laws—was made by Immanuel Kant in the famous work of his youth (1755), General History of the Earth and Theory of the Heavens. Unfortunately, this distinguished and daring work remained almost unknown for ninety years; it was only disinterred in 1845 by Alexander Humboldt in the first volume of his Cosmos. In the meantime the great French mathematician, Pierre Laplace, had arrived independently at similar views to those of Kant, and he gave them a mathematical foundation in his Exposition du Système du Monde (1796). His chief work, the Mécanique Céleste, appeared a hundred years ago. The analogous features of the cosmogony of Kant and Laplace consist, as is well known, in a mechanical explanation of the movements of the planets, and the conclusion which is drawn therefrom, that all the cosmic bodies were formed originally by a condensation of rotating nebulous spheres. This "nebular hypothesis" has been much improved and supplemented since, but it is still the best of all the attempts to explain the origin of the world on monistic and mechanical lines. It has recently been strongly confirmed and enlarged by the theory that this cosmogonic process did not simply take place once, but is periodically repeated. While new cosmic bodies arise and develop out of rotating masses of nebula in some parts of the universe, in other parts old, extinct, frigid suns come into collision, and are once more reduced by the heat generated to the condition of nebula.

Nearly all the older and the more recent cosmogonies, including most of those which were inspired by Kant and Laplace, started from the popular idea that the world had had a beginning. Hence, according to a widespread version of the nebular hypothesis, "in the beginning" was made a vast nebula of infinitely attenuated and light material, and at a certain moment ("countless ages ago") a movement of rotation was imparted to this mass. Given this "first beginning" of the cosmogonic movement, it is easy, on mechanical principles, to deduce and mathematically establish the further phenomena of the foundation of the cosmic bodies, the separation of the planets, and so forth. This first "origin of movement" is Du Bois-Reymond's second "world-enigma"; he regards it as transcendental. Many other scientists and
philosophers are equally helpless before this
difficulty; they resign themselves to the
notion that we have here "primary "super-
natural imputus" to the "scheme of things,
a "miracle."

In our opinion, this second "world-
emgna" is solved by the recognition that
movement is as innate and original a
property of substance as is sensation. The
proof of this monistic assumption is found,
first, in the law of substance, and, secondly,
in the discoveries which astronomy and
physics have made in the latter half of the
century. By the spectrum analysis of
Bunsen and Kirchhoff (1860) we have
found, not only that the millions of bodies,
which fill the infinity of space, are of the
same material as our own sun and earth,
but also that they are in various stages of
evolution, we have obtained by its aid
information as to the movements and
distances of the stars, which the telescope
would never have given us. Moreover, the
teleoscope itself has been vastly improved,
and has, in alliance with photography,
made a host of scientific discoveries of
which no one dreamed at the beginning of the
century. In particular, a closer acquaintance with comets, meteors, stellae,
clusters, and nebulae has helped us to
realise the great significance of the smaller
bodies which are found in millions in the
space between the stars.

We now know that the paths of the
millions of heavenly bodies are changing
and, to some extent irregular, whereas the
planetary system was formerly thought to
be constant, and the rotating spheres were
described as pursuing their orbits in eternal
regularity. Astrophysics owes much of its
strength to the immense progress of other
branches of physics, of optics, and electricity, and especially of the theory of ether.
And here, again, our supreme law of
substance is found to be one of the most
valuable achievements of modern science.
We now know that it rules unconditionally
in the most distant reaches of space, just
as it does in our planetary system, in the
most minute particle of the earth as well as in the smallest cell of our human frame.

We are, moreover, justified in concluding,
if we are not logically compelled to
conclude, that the persistence of matter
and force has held good throughout all
time as it does to-day. Though all
eternity the infinite universe has been, and
is, subject to the law of substance.

From this great progress of astronomy
and physics, which mutually elucidate and
supplement each other, we draw a series of
most important conclusions with regard to
the constitution and evolution of the
universe, and the persistence and trans-
formation of substance. Let us put them
briefly in the following theses —

I. — The extent of the universe is infinite
and unbounded; it is empty in no part,
but everywhere filled with substance.

II. — The duration of the world is equally
infinite and unbounded; it has no beginning
and no end; it is eternity.

III. — Substance is everywhere and always
in uninterrupted movement and transforma-
tion nowhere is there perfect repose and
rigidity, yet the infinite quantity of matter
and of eternally changing force remains
constant.

IV. — This universal movement of sub-
stance in space takes the form of an eternal
cycle or of a periodical process of evolution.

V. — The phases of this evolution consist
in a periodic change of consistency, of
which the first outcome is the primary
division into mass and ether—the ergonomy
of ponderable and imponderable matter.

VI. — This division is effected by a
progressive condensation of matter as the
formation of countless infinitesimal "centres
of condensation," in which the inherent
primitive properties of substance—feeling
and inclination—are the active causes.

VII. — While minute and then larger
bodies are being formed by this pyknotic
process in one part of space, and the
intermediate ether increases its strain, the
opposite process—the destruction of cosmic
bodies by collision—is taking place in
another quarter.

VIII. — The immense quantity of heat
which is generated in this mechanical
process of the collision of swiftly moving
bodies represents the new kinetic energy
which effects the movement of the resultant
nebulae and the constitution of new rotating
bodies. The eternal drama begins afresh
when our mother earth, which was formed
of part of the gyrating solar system millions
of ages ago, will grow cold and lifeless
after the lapse of further millions, and,
gradually narrowing its orbit, will fall
eventually into the sun.

It seems to me that these modern discov-
yeries as to the periodic decay and
rebirth of cosmic bodies, which we owe
to the most recent advance of physics and
astronomy, associated with the law of
substance, are especially important in
giving us a clear insight into the universal
cosmic process of evolution. In their
light our earth shrinks into the slender proportions of a "mote in the sunbeam," of which unnumbered millions chase each other through the vast depths of space. Our own human nature, which exalted itself into an image of God in its anthropistic illusion, sinks to the level of a placental mammal, which has no more value for the universe at large than the ant, the fly of a summer's day, the microscopic infusorium, or the smallest bacillus. Humanity is but a transitory phase of the evolution of an eternal substance, a particular phenomenal form of matter and energy, the true proportion of which we soon perceive when we set it on the background of infinite space and eternal time.

Since Kant explained time and space to be merely "forms of perception"—space the form of external time of internal sensitivity—there has been a keen controversy, which still continues, over this important problem. A large section of modern metaphysicians have persuaded themselves that this "critical fact" possesses a great importance as the starting point of a purely idealist theory of knowledge, and that, consequently, the current opinion of the ordinary healthy mind as to the reality of time and space is swept aside. This narrow and ultra-idealist conception of time and space has become a prolific source of error. It overlooks the fact that Kant only touched one side of the problem, the only true side, in that theory, and recognized the equal validity of its objective side. "Time and space, he said, "have empirical reality, but transcendental ideality." Our modern monism is not so compatible with this thesis of Kant's, but not with the one-sided exaggeration of the subjective aspect of the problem, the latter leads logically to the absurd idealism that culminates in Berkeley's thesis, "Bodies are but ideas; their essence is in their perception." The thesis should be read thus: "Bodies are only ideas for my personal consciousness, their existence is just as real as that of my organs of thought, the ganglionic cells in the grey bed of my brain, which receive the impress of bodies on my sense organs and form those ideas by association of the impressions." It is just as easy to doubt or to deny the reality of my own consciousness as to doubt that of time and space. In the delirium of fever, in hallucinations, in dreams, and in double-consciousness, I take ideas to be true which are merely fancies. I mistake my own personality for another (vide p 66). Descartes's famous Cogito ergo sum applies no longer. On the other hand, the reality of time and space is now fully established by that expansion of our philosophy which we owe to the law of substance and to our monistic cosmogony. When we have happily got rid of the untenable idea of "empty space," there remains as the infinite "space filling" medium matter, in its two forms of ether and mass. So also we find a "time filling" event in the eternal movement, or genetic energy, which reveals itself in the uninterrupted evolution of substance in the perpetuum mobile of the universe. As a body which has been set in motion continues to move as long as no external agency interferes with it, the theory was conceived of constructing apparatus which should illustrate perpetual motion. The fact was overlooked that every movement meets with external impediments and gradually ceases, unless a new impulse is given to it from without and a new force is introduced to counteract the impediments. Thus, for instance, a pendulum would swing backwards and forwards for an eternity at the same speed if the resistance of the atmosphere, and the friction at the points it hangs from, did not gradually deprive it of the mechanical kinetic energy of its motion and convert it into heat. We have to furnish it with fresh mechanical energy by a spring, as in the pendulum clock, by the drag of a weight. Hence it is impossible to construct a machine that would produce, without external aid, a surplus of energy by which it could keep itself going. Every attempt to make such a perpetuum mobile must necessarily fail, the discovery of the law of substance showed, in addition, the theoretical impossibility of it.

The case is different, however, when we turn to the world at large, the boundless universe that is in eternal movement. The infinite matter, which fills it objectively, is what we call space in our subjective impression of it, time is our subjective conception of its eternal movement, which is, objectively, a periodic, cyclical evolution. These two "forms of perception" teach us the infinity and eternity of the universe. That is, moreover, equal to saying that the universe itself is a perpetuum mobile. This infinite and eternal "machine of the universe" sustains itself in eternal and uninterrupted movement, because every impediment is compensated by an "equivalence of energy," and the unlimited sum of kinetic and potential energy remains always
the same. The law of the persistence of force proves also that the idea of a *perpetuum mobile* is just as applicable to, and as significant for, the cosmos as a whole as it is impossible for the isolated action of any part of it. Hence the theory of *entropy* is likewise untenable.

The able founder of the mechanical theory of heat (1850), Clausius, embodied the momentous contents of this important theory in two theses. The first runs: "The energy of the universe is constant"—that is one half of our law of substance, the principle of energy *vide* p. 82. The second thesis is: "The entropy of the universe tends towards a maximum." In my opinion this second assertion is just as erroneous as the first is true. In the theory of Clausius the entire energy of the universe is of two kinds, one of which (heat of the higher degree, mechanical, electrical, chemical energy, etc.) is partly convertible into work, but the other is not; the latter energy, already converted into heat and distributed in the cooler masses, is irrevocably lost as far as any further work is concerned. Clausius calls this unconverted energy, which is no longer available for mechanical work, *entropy* (that is, force that is directed *inwards*); it is continually increasing at the cost of the other half. As, therefore, the mechanical energy of the universe is daily being transformed into heat, and this cannot be reconverted into mechanical force, the sum of heat and energy in the universe must continually tend to be reduced and dissipated. All difference of temperature must ultimately disappear, and the completely latent heat must be equally distributed through one inert mass of motionless matter. All organic life and movement must cease when this maximum of *entropy* has been reached. That would be a real "end of the world."

If this theory of entropy were true, we should have a "beginning" corresponding to this assumed "end" of the world—a minimum of entropy, in which the differences in temperature of the various parts of the cosmos would be at a maximum. Both ideas are quite untenable in the light of our monistic and consistent theory of the eternal cosmogenic process; both contradict the law of substance. There is neither beginning nor end of the world. The universe is infinite, and eternally in motion; the conversion of kinetic into potential energy, and *vicissim*, goes on uninterruptedly; and the sum of this actual and potential energy remains constant.

The second thesis of the mechanical theory of heat contradicts the first, and so must be rejected.

The representatives of the theory of entropy are quite correct as long as they confine themselves to distinct processes, in which, under certain conditions, the latent heat cannot be reconverted into work. Thus, for instance, in the steam-engine the heat can only be converted into mechanical work when it passes from a warmer body (steam) into a cooler (water); the process cannot be reversed. In the world at large, however, quite other conditions obtain—conditions which permit the reconversion of latent heat into mechanical work. For instance, in the collision of two heavenly bodies, which rush towards each other at inconceivable speed, enormous quantities of heat are liberated, while the pulvrised masses are hurled and scattered about space. The eternal drama begins afresh—the rotating mass, the condensation of its parts, the formation of new meteorites, their combination into larger bodies, and so on.

II.—MONISTIC GEONY.

The history of the earth of which we are now going to make a brief survey is only a minute section of the history of the cosmos. Like the latter, it has been the object of philosophic speculation and mythological fantasy for many thousand years. Its true scientific study, however, is much younger; it belongs, for the most part, to the nineteenth century. The fact that the earth is a planet revolving round the sun was determined by the system of Copernicus (1543); Galilei, Kepler, and other great astronomers, mathematically determined its distance from the sun, the laws of its motion, and so forth. Kant and Laplace indicated, in their cosmogony, the way in which the earth had been developed from the parent sun. But the later history of the earth, the formation of its crust, the origin of its seas and continents, its mountains and deserts, was rarely the subject of serious scientific research in the eighteenth century, and in the first two decades of the nineteenth. As a rule, men were satisfied with unreliable conjectures, or with the traditional story of creation; once more the Mosaic legend barred the way to an independent investigation.

In 1822 an important work appeared, which followed the same method in the scientific investigation of the history of the earth that had already proved the most
fertile—the ontological method, or the principle of "actualism." It consists in a careful study and manipulation of actual phenomena with a view to the elucidation of the analogous historical processes of the past. The Society of Science at Göttingen had offered a prize in 1818 for "the most searching and comprehensive inquiry into the changes in the earth's crust which are historically demonstrable, and the application which may be made of a knowledge of them in the investigation of the terrestrial revolutions which lie beyond the range of history." This prize was obtained by Karl Hoff of Gotha for his distinguished work, History of the Natural Changes in the Crust of the Earth in the Light of Tradition (1822–34). Sir Charles Lyell then applied this ontological or actualistic method with great success to the whole province of geology; his Principles of Geology (1830) laid the firm foundation on which the fabric of the history of the earth was so happily erected. The important geogenetic research of Alexander Humboldt, Leopold Buch, Gustav Bischof, Edward Sisson, and other geologists, was wholly based on the empirical foundation and the speculative principles of Karl Hoff and Charles Lyell. They cleared the way for purely rational science in the field of geology; they removed the obstacles that had been put in the path by mythological fancy and religious tradition, especially by the Bible and its legends. I have already discussed the merits of Lyell, and his relations with his friend Charles Darwin, in the sixteenth and seventeenth chapters of my Natural History of Creation, and must refer the reader to the standard works on geology for a further acquaintance with the history of the earth and the great progress which dynamical and historical geology have made during the century.

The first division of the history of the earth must be a separation of inorganic and organic geogeny; the latter begins with the first appearance of living things on our planet. The earlier section, the inorganic history of the earth, ran much the same course as that of the other planets of our system. They were all cast off as rings of nebula at the equator of the rotating solar mass, and gradually condensed into independent bodies. After cooling down a little, the glowing ball of the earth was formed out of the gaseous mass, and eventually, as the heat continued to radiate out into space, there was formed at its surface the thin solid crust on which we live. When the temperature at the surface had gone down to a certain point, the water descended upon it from the enveloping clouds of steam, and thus the first condition was secured for the rise of organic life.

Many million years—certainly more than a hundred—have passed since this important process of the formation of water took place, introducing the third section of cosmogony, which we call biogeny.

III.—MONISTIC BIOGENY.

The third phase of the evolution of the world opens with the advent of organisms on our planet, and continues uninterrupted from that point until the present day. The great problems which this most interesting part of the earth's history suggests to us were still thought insoluble at the beginning of the nineteenth century, or, at least, so difficult that their solution seemed to be extremely remote. Now, at the close of the century, we can affirm with legitimate pride that they have been substantially solved by modern biology and its theory of transformism; indeed, many of the phenomena of the organic world are now interpreted on physical principles as completely as the familiar physical phenomena of inorganic nature. The merit of making the first important step in this difficult path, and of pointing out the way to the monistic solution of all the problems of biology, must be accorded to the great French scientist, Jean Lamarck; it was in 1809, the year of the birth of Charles Darwin, that he published his famous Philosophie Zoologique. In this original work not only is a splendid effort made to interpret all the phenomena of organic life from a monistic and physical point of view, but the path is opened which alone leads to the solution of the greatest enigma of this branch of science—the problem of the natural origin of organic species. Lamarck, who had an equally extensive empirical acquaintance with zoology and botany, drew the first sketch of the theory of descent; he showed that all the countless members of the plant and animal kingdoms have arisen by slow transformation from simple, common ancestral types, and that it is the gradual modification of forms by adaptation, in reciprocal action with heredity, which has brought about this secular metamorphosis.

I have fully appreciated the merit of Lamarck in the fifth chapter, and of Darwin in the sixth and seventh chapters, of the
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Natural History of Creation

Darwin, fifty years afterwards, not only gave a solid foundation to all the essential parts of the theory of descent, but he filled up the lacuna of Lamarck's work by his theory of selection. Darwin reaped abundantly the success that Lamarck had never seen, with all his merit. His epoch-making work on *The Origin of Species by Natural Selection* has transformed modern biology from its very foundations, in the course of the last forty years, and has raised it to a stage of development that yields to no other science in existence. Darwin is the Copernicus of the organic world, as Iud in 166, and B. du Bois Reymond repeated fifteen years afterwards. *

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CHAPTER XIV.

UNITY OF NATURE


One of the first things to be proved by the law of substance is the basic fact that any natural force can be directly or indirectly converted into any other. Mechanism and chemical energy, sound and heat, light and electricity, etc. mutually convertible, they seem to be but different modes of one and the same fundamental force or energy. This follows the important thesis of the unity of all natural forces, or, as it may also be expressed, the "monism of energy." This fundamental principle is now generally recognised in the entire province of physics and chemistry, as far as it applies to inorganic substances.

It seems to be otherwise with the organic world and its wealth of form and color. It is, of course, obvious that a great part of the phenomena of life may be immediately traced to physical and chemical energy, and to the effects of electricity and light. For other vital processes, however, especially for psychic activity and consciousness, such an interpretation is vigorously contested. Yet the modern science of evolution has achieved the task of constructing a bridge between these two apparently irreconcilable provinces. We are now certain that all the phenomena of organic life are subject to the universal law of substance no less than the phenomena of the inorganic universe.

The unity of nature which necessarily follows, and the demolition of the earlier dualism, are certainly among the most valuable results of modern evolution. Thirty three years ago I made an exhaustive effort to establish this "monism of the cosmos" and the essential unity of organic and inorganic nature by a thorough critical

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* Cf. Monism, by E. Haecckel.  
  ** The Last Link, translated by Dr. Gadow.
THE UNITY OF NATURE

demonstration, and a comparison of the accordance of these two great divisions of nature with regard to matter, form, and force. A short epitome of the result is given in the fifteenth chapter of my *Natural History of Creation*. The views I put forward are accepted by the majority of modern scientists, but an attempt has been made in many quarters lately to dispute them, and to maintain the old antithesis of the two divisions of nature. The abler of these efforts is to be found in the recent *Welt als That* of the botanist Reinke. It defends pure cosmological dualism with admirable lucidity and consistency, and only goes to prove how utterly untenable the teleological system is that is connected therewith. According to the author, physical and chemical forces alone are at work in the entire field of inorganic nature, while in the organic world we find "intelligent forces," regulative or dominant forces. The law of substance is supposed to apply to the one, but not to the other. On the whole, it is a question of the old antithesis of a mechanical and a teleological system.

Before we go more fully into it, let us glance briefly at two other theories, which seem to me to be of great importance in the decision of that controversy—the carbon-theory and the theory of spontaneous generation.

Physiological chemistry has, after countless analyses, established the following five facts during the last forty years:

1. Other elements are found in organic bodies than those of the inorganic world.

2. The combinations of elements which are peculiar to organisms, and which are responsible for their vital phenomena, are compound protoplasmic substances, of the group of albuminoids.

3. Organic life itself is a chemico-physical process, based on the metabolism (or interchange of material) of these albuminoids.

4. The only element which is capable of building up these compound albuminoids, in combination with other elements (oxygen, hydrogen, nitrogen, and sulphur), is carbon.

5. These protoplasmic compounds of carbon are distinguished from most other chemical combinations by their very intricate molecular structure, their instability, and their jelly-like consistency.

On the basis of these five fundamental facts the following "carbon-theory" was erected thirty-three years ago: "The peculiar, chemico-physical properties of carbon—especially the fluidity and the facility of decomposition of the most elaborate albuminoid compounds of carbon—are the sole and the mechanical causes of the specific phenomena of movement, which distinguish organic from inorganic substances, and which are called life, in the usual sense of the word" (see *The Natural History of Creation*). Although this "carbon-theory" is warmly disputed in some quarters, no better monistic theory has yet appeared to replace it. We have now a much better and more thorough knowledge of the physiological relations of cell-life, and of the chemistry and physics of the living protoplasm, than we had thirty-three years ago, and so it is possible to make a more confident and effective defence of the carbon-theory.

The old idea of spontaneous generation is now taken in many different senses. It is owing to this indistinctness of the idea, and its application to so many different hypotheses, that the problem is one of the most contentious and confused in the science of the day. I restrict the idea of spontaneous generation—also called abiogenesis or archigny—to the first development of living protoplasm out of inorganic carbonates, and distinguish two phases in this "beginning of biogenesis": (1) autogony, or the rise of the simplest protoplasmic substances in a formative fluid, and (2) plasmogony, the differentiation of individual primitive organisms out of these protoplasmic compounds in the form of monera.

I have treated this important, though difficult, problem so exhaustively in the fifteenth chapter of my *Natural History of Creation* that I may content myself here with referring to it. There is also a very searching and severely scientific inquiry into it in my *General Morphology* (1866). Naegeli has also treated the hypothesis in quite the same sense in his mechanico-physiological theory of descent (1884), and has represented it to be an indispensable thesis in any natural theory of evolution. I entirely agree with his assertion that "to reject abiogenesis is to admit a miracle."

The hypothesis of spontaneous generation and the allied carbon-theory are of great importance in deciding the longstanding conflict between the teleological (dualistic) and the mechanical (monistic) interpretation of phenomena. Since Darwin gave us the key to the monistic explanation of organisation in his theory of selection,

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forty years ago, it has become possible for us to trace the splendid variety of orderly tendencies of the organic world to mechanical, natural causes, just as we could formerly in the inorganic world alone. Hence the supernatural and telic forces, to which the scientist had had recourse, have been rendered superfluous. Modern metaphysics, however, continues to regard the latter as indispensable and the former as inadequate.

No philosopher has done more than Immanuel Kant in defining the profound distinction between efficient and final causes, with relation to the interpretation of the whole cosmos. In his well-known earlier work on *The General Natural History and Theory of the Heavens* he made a bold attempt "to treat the constitution and the mechanical origin of the entire fabric of the universe according to Newtonian laws." This "cosmological nebular theory" was based entirely on the mechanical phenomena of gravitation. It was expanded and mathematically established later on by Laplace. When the famous French astronomer was asked by Napoleon I. where God, the creator and sustainer of all things, came in in his system, he clearly and honestly replied: "Sire, I have managed without that hypothesis." That indicated the atheistic character which this mechanical cosmogony shares with all the other inorganic sciences. This is the more noteworthy because the theory of Kant and Laplace is now almost universally accepted; every attempt to supersede it has failed. When atheism is denounced as a grave reproach, as it so often is, it is well to remember that the reproach extends to the whole of modern science, in so far as it gives a purely mechanical interpretation of the inorganic world.

Mechanicism (in the Kantian sense) alone can give us a true explanation of natural phenomena, for it traces them to their real efficient causes, to blind and unconscious agencies, which are determined in their action only by the material constitution of the bodies we are investigating. Kant himself emphatically affirms that "there can be no science without this mechanism of nature," and that the capacity of human reason to give a mechanical interpretation of phenomena is unlimited. But when he came subsequently to give an elucidation of the complex phenomena of organic nature in his *critique* of the teleological system, he declared that these mechanical causes were inadequate; that in this we must call final causes to our assistance. It is true, he said, that even here we must recognise the theoretical faculty of the mind to give a mechanical interpretation, but its actual competence to do so is restricted. He grants it this capacity to some extent; but for the majority of the vital processes (and especially for man's psychic activity) he thinks we are bound to postulate final causes. The remarkable § 79 of the *critique* of judgment bears the characteristic heading: "On the Necessity for the Subordination of the Mechanical Principle to the Teleological in the Explanation of a Thing as a Natural End." It seemed to Kant so impossible to explain the orderly processes in the living organism without postulating supernatural final causes (that is, a purposive creative force) that he said: "It is quite certain that we cannot even satisfactorily understand, much less elucidate, the nature of an organism and its internal faculty on purely mechanical natural principles; it is so certain, indeed, that we may confidently say, 'It is absurd for a man to conceive the idea even that some day a Newton will arise who can explain the origin of a single blade of grass by natural laws which are uncontrolled by design'—such a hope is entirely forbidden us." Seventy years afterwards this impossible "Newton of the organic world" appeared in the person of Charles Darwin, and achieved the great task that Kant had deemed impracticable.

Since Newton (1682) formulated the law of gravitation, and Kant (1755) established "the constitution and mechanical origin of the entire fabric of the world on Newtonian laws," and Laplace (1796) provided a mathematical foundation for this law of cosmic mechanicism, the whole of the inorganic sciences have become purely mechanical, and at the same time purely atheistic. Astronomy, cosmogony, geology, meteorology, and inorganic physics and chemistry are now absolutely ruled by mechanical laws on a mathematical foundation. The idea of "design" has wholly disappeared from this vast province of science. At the close of the nineteenth century, now that this monistic view has fought its way to general recognition, no scientist ever asks seriously of the "purpose" of any single phenomenon in the whole of this great field. Is any astronomer likely to inquire seriously to-day into the purpose of planetary motion, or a mineralogist to seek design in the structure of a crystal? Does the physicist investigate the purpose of electric force, or the chemist
that of atomic weight? We may confidently answer in the negative—certainly not, in
the sense that God, or a purposive natural
force, had at some time created these
fundamental laws of the mechanism of the
universe with a definite design, and caused
them to work duly in accordance with his
rational will. The anthropomorphic notion
of a deliberate architect and ruler of the
world has gone for ever from this field,
the "eternal, iron laws of nature have
taken his place.

But the idea of design has a very great
significance and application in the animal
world. We do undoubtedly perceive a
purpose in the structure and in the life of
an organism. The plant and the animal
seem to be controlled by a definite design
in the combination of their several parts,
just as clearly as we see in the machines
which man invents and constructs, as living
as life continues the functions of the several
organs are directed to definite ends—just as
is the operation of the various parts of a
machine. Hence it was quite natural that
the older naive study of nature in explaining
the origin and activity of the living
being, should postulate a creator who had
"arranged all things with wisdom and
understanding," and had constructed each
plant and animal according to the special
purpose of its life. The conception of this
almighty creator of heaven and earth
was usually quite anthropomorphic, he
created "everything after its kind." As
long as the creator seemed to man to be of
human shape, to think with his brain, see
with his eyes, and fashion with his hands,
it was possible to form a definite picture of
this "divine engineer" and his artistic
work in the great workshop of creation.
This was not so easy when the idea of God
became refined, and man saw in his
invisible God a creator without organs
—a gaseous being. Still more unintel-
ligible did these anthropomorphic ideas
become when physiology substituted for
the conscious, divine architect an uncon
scious, creative "vital force"—a mysterious,
purposive, natural force, which diffused
from the familiar forces of physics and
chemistry, and only took these in part
during life, into its service. This vitalism
prevailed until about the middle of the
nineteenth century. Johannes Muller, the
great Berlin physiologist, was the first to
menace it with a destructive dose of facts.
It is true that the distinguished biologist
had himself (like all others in the first half
of the century) been educated in a belief in
this vital force, and deemed it indispensable
for an elucidation of the ultimate sources
of life, nevertheless, in his classical and
still unrivaled Manual of Physiology (1833)
he gave a demonstrative proof that there is
really nothing to be said for this vital force.
Muller himself, in a long series of remark-
able observations and experiments, showed
that most of the vital processes in the
human organism (and in the other animals)
take place according to physical and
chemical laws, and that many of them are
capable of mathematical determination.

It was no less true of the animal
functions of the muscles and nerves, and
of both the higher and the lower sense-organ,
than of the vegetal functions of
digestion, assimilation, and circulation.
Only two branches of the life of the
animal, mental action and reproduction, retained
any element of mystery, and seemed inexplicable without assuming a vital force.

But immediately after Muller's death such
important discoveries and advances were
made in these two branches that the uneasy
phantom of vital force was driven from
its last refuge. By a very remarkable coinci-
dence, it was in the year 1858, which saw the publication of Darwin's
first communication concerning his famous
theory. The theory of selection solved the
great problem that had mystified Muller—
the question of the origin of orderly arrange-
ments from purely mechanical causes.

Darwin, as we have already said, had a
twofold immortal merit in the field of
philosophy—firstly, the reformation of
Lamarck's theory of descent, and its establish-
ment on the mass of facts accumulated in the course
of the half century; secondly, the concep-
tion of the theory of selection, which first
revealed to us the true causes of the gradual
formation of species. Darwin was the first
to point out that the "struggle for life" is
the unconscious regulator which controls
the reciprocal action of heredity and adap-
tation in the gradual transformation of
species, it is the great "selective divinity"
which, by a purely "natural choice," without
preconceived design creates new forms,
just as selective man creates new types by
an "artificial choice, with a definite design".

That gave us the solution of the great
philosophic problem "How can purposive
contrivances be produced by purely
mechanical processes without design?"
Kant held the problem to be insoluble,
although Empedocles had pointed out the
direction of the solution two thousand
years before. His principle of "teleological
mechanism” has become more and more accepted of late years, and has furnished a mechanical explanation even of the finest and most intricate processes of organic life by “the functional self production of the purposive structure.” Thus have we got rid of the transcendental “design” of the teleological philosophy of the schools, which was the greatest obstacle to the growth of a rational and monistic conception of nature.

Very recently, however, this ancient phantom of a mystic vital force, which seemed to be effectually banished, has put in a fresh appearance, a number of distinguished biologists having attempted to reintroduce it under another name. The clearest presentation of it is to be found in the Welt als Idee, of the kiel botanist, J. Reineke. He takes upon himself the defence of the notion of muscle, of thymus, of the mosaic story of creation, and of the constancy of species; he calls “vital forces,” in opposition to physical forces, the directive or dominant forces. Other neovitalists prefer, in the good old anthropomorphistic style, a “supreme” engineer, who has endowed organic substance with a purposive structure, directed to the realization of a definite plan. These curious teleological hypotheses, and the objections to Darwinism which generally accompany them, do not call for serious scientific refutation today.

Thirty three years ago I gave the title of “dysteleology” to the science of those extremely interesting and significant biological facts which, in the most striking fashion, give a direct contradiction to the teleological idea of the purposive arrangement of the living organism. This “science of rudimentary, abortive, vestigial, distorted, atrophied, and atrophied individuals” is based on an immense quantity of remarkable phenomena, which were long familiar to zoologists and botanists, but were not properly interpreted, and their great philosophical significance appreciated, until Darwin.

All the higher animals and plants, or, in general, all organisms which are not entirely simple in structure, but are made up of a number of organs in orderly cooperation, are found on close examination, to possess a number of useless or inoperative members, sometimes, indeed, hurtful and dangerous. In the flowers of most plants we find, besides the actual sex-leaves that effect reproduction, a number of other leaf-organs which have no use or meaning (arrested or “miscarried” pistils, fruit, corona and calyx leaves, etc.) in the two large and variegated classes of flying animals, birds and insects, there are, besides the forms which make constant use of their wings, a number of species which have undeveloped wings and cannot fly. In nearly every class of the higher animals which have eyes there are certain types that live in the dark, they have eyes, as a rule, but undeveloped and useless for vision. In our own human organism we have similar useless rudimentary structures in the muscles of the ear, in the eye lid, in the nipple and milk gland of the male, and in other parts of the body, indeed, the vermiform appendix of our caecum is, not only useless, but extremely dangerous, and inflammation of it is responsible for a number of deaths every year.

Neither the old mystic vitalism nor the new, equally irrational, neovitalism can give any explanation of these and many other purposeless contrivances in the structure of the plant and the animal, but they are very simple in the light of the theory of descent. It shows that these rudimentary organs are utilitarian, owing to disuse. Just as our muscles, nerves, and organs of sense are strengthened by exercise and frequent use, so, on the other hand, they are liable to degenerate more or less by disuse or suspended exercise. But, although the development of the organs is promoted by exercise and adaptation, they by no means disappear without leaving a trace after neglect, the force of heredity retaining them for many generations, and only permits their gradual disappearance, after a lapse of a considerable time. The blind “struggle for existence” between the organisms determines their historical disappearance, just as it effected their first origin and development. There is no internal “purpose” whatever in the drama.

The life of the animal and the plant bears the same universal characteristics of incompleteness as the life of man. This is directly attributable to the circumstance that nature organic as well as inorganic—is in a perennial state of evolution, change, and transformation. This evolution seems on the whole—at least as far as we can survey the development of organic life on our planet—to be a progressive improvement, an historical advance from the simple to the complex, the lower to the higher
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the imperfect to the perfect I have proved in my General Morphology that this historical progress—or gradual perfecting (teleosis)—is the inevitable result of selection and not the outcome of a preconceived design. That is clear from the fact that no organism is perfect, even if it does perfectly adapt itself to its environment. Given moment, this condition would not last very long, the conditions of existence of the environment are themselves subject to perpetual change, and they necessitate a continuous adaptation on the part of the organism.

Under the title of Design in the Life of an Organism, the famous embryologist, Carl Ernst Baer published a work in 1828 which, together with the article on Darwinism which accompanied it, proved very acceptable to our opponents, and is still much quoted in opposition to evolution. It was a revival of the old teleological system under a new name and we must devote a line of criticism to it. We must picture that the Baer was a scientist of the highest order his original monistic views were gradually mired by a tinge of mysticism with the advance of age, and he eventually became a thorough dualist. In his profound work on “the evolution of animals” (1828) which he himself entitled Observations in Experiment, these two methods of investigation are equally applied. By careful observation of the various phenomena of the development of the animal ovum Baer succeeded in giving the first consistent presentation of the remarkable changes which take place in the growth of the vertebrate from a simple egg cell. At the same time he endeavoured, by careful comparison and keen reflection, to learn the cause of the transformation, and to reduce them to general constructive laws. He expressed the general result of his research in the following thesis: “The evolution of the individual is the story of the growth of individuality in every respect. He meant that “the one great thought that controls all the different aspects of natural evolution is the same that gathered the scattered fragments of space into spheres, and linked them into solar systems. This thought is no other than life itself, and the words and syllables in which it finds utterance are the varied forms of living things.”

Baer, however, did not attain to a deeper knowledge of this great genetic truth and a clearer insight into the real efficient causes of organic evolution, because his attention was exclusively given to one half of evolutionary science, the science of the evolution of the individual, embryology, or, in a wider sense, ontogeny. The other half, the science of the life of species, phylogeny, was not yet in existence, although Linnæus had already pointed out the way to it in 1809. When it was established by Darwin in 1859 the aged Baer was no longer in a position to appreciate it, the fruitless struggle which he led against the theory of selection clearly proved that he understood neither its real meaning nor its philosophic importance. Theological and, subsequently, theological speculations had long preceded the scientific scientist from appreciating this greatest reform of biology. The teleological observations which he published against it in his Species and Studies in his eighty-fourth year are mere repetitions of errors which the teleology of the dualists has opposed to the mechanical or monistic system for more than 2000 years. The “real idea,” which, according to Baer, controls the entire evolution of the animal from the ovum is only another expression for the eternal “idea” of Plato and the eitelchisma of his pupil Aristotle.

Our modern biology gives a purely physiological explanation of the facts of embryology, in assigning the functions of heredity and adaptation to certain organs which are the result of natural selection of the individual, and the physiognomy of the ancestors, the former seem to be a repetition of the latter. Now, however, in the evolution of animals and plants do we find any trace of design, but merely the inevitable outcome of the struggle for existence, the blind controller, instead of the provident God, that effects the changes of organic forms by a mutual action of the laws of heredity and adaptation. And there is no more trace of “design” in the embryology of the individual plant and animal, or man. This ontogeny is but a brief epilogue of phylogeny, an abbreviated and condensed recapitulation of it, determined by the physiological laws of heredity.

Baer ended the preface to his classical Evolution of Animals (1828) with these words: “The palm will be awarded to the fortunate scientist who succeeds in reducing the constructive forces of the animal body to the mechanical forces or life processes of the entire world. The tree has not yet been planted which is to make his cradle.” The.
Great physicists err once more. That very year, 1826, witnessed the arrival of Charles Darwin at Cambridge University for the purpose of studying theology—the "fortunate scientist" who richly earned the palm thirty years afterwards by his theory of selection.

In the philosophy of history—that is in the general reflections which historians make on the destinies of nations and the complicated course of political evolution—there still prevails the notion of a "moral order of the universe." Historians seek in the vivid drama of history, including its acts, ideals, and events, a moral order, or a personal God, who "hand hitherto did all things in wisdom and understanding." And the same must be said of the entire field of biology, the whole constitution and history of organic nature. If we set aside the question of man for the moment, Darwin has not only proved by his theory of selection that the orderly progress in the life and structure of plants and animals have arisen without any preconceived design but also has shown us in the "struggle for life" the powerful natural forces which have exerted supreme control over the entire course of organic evolution for millions of years. It may be that the struggle for life is the "survival of the fittest" or the "victory of the best," that is only correct when we regard the strongest as the best (in a moral sense). Moreover, the whole history of the organic world goes to prove that, besides the predominant advance towards perfection, there are at all times cases of retrogression to lower stages. Even Baer's notion of "design" has no moral feature whatever.

Do we find a different state of things in the history of peoples, which man, in his anthropocentric presumption, loves to call "the history of the world"? Do we find in every phase of it a lofty moral principle or wise rule, guiding the destinies of nations? There can be but one answer in the present advanced stage of natural and human history. No! The fate of those branches of the human family, those nations and races which have struggled for existence and progress for thousands of years, is determined by the same "eternal laws of iron" as the history of the whole organic world which has peopled the earth for millions of years.

Geologists distinguish three great epochs in the organic history of the earth, as far as we can read it in the monuments of the science of fossils—the primary, secondary, and tertiary epochs. According to a recent calculation, the first occupied at least 340,000,000, the second 110,000,000, and the third 3,000,000 years. The history of the family of vertebrates, from which our own race is sprung, unfolds clearly before our eyes during this long period. Three different stages in the evolution of the vertebrates correspond to the three epochs, the fishes characterizing the primary (gammaic) age, the reptiles the secondary (mesozoic), and the mammals the tertiary (cenozoic). Of the three groups the fishes rank lowest in organization, the reptiles come next, and the mammals take the highest place. We find, on careful examination of the history of the three classes, that their various orders and families also advanced progressively during the three epochs towards a higher stage of perfection.

May we consider this progressive development as the outcome of a conscious design or a moral order of the universe? Certainly not. The theory of selection teaches us that this organic progress, like the earlier organic differentiation, is an inevitable consequence of the struggle for existence. Thousands of beautiful and remarkable species of animals and plants have perished during those 480,000,000 years, to give place to stronger competitors, and the victors in this struggle for life were not always the noblest or most perfect forms in a moral sense.

It has been just the same with the history of humanity. The splendid civilization of classical antiquity perished because Christianity, with its faith in a loving God and its hope of a better life beyond the grave, gave a fresh, strong impetus to the soaring human mind. The Papal Church quickly degenerated into a pitiful caricature of real Christianity, and ruthlessly scuttled the treasures of knowledge which the Hellenic philosophy had gathered; it gained the dominion of the world through the ignorance of the credulous masses. In time the Reformation broke the chains of this mental slavery, and assisted reason to secure its right once more. But in the new
as in the older, period the great struggle
for existence went on in its eternal fluctuation,
with no trace of a moral order.

And it is just as impossible for the impartial and critical observer to detect a "wise providence" in the fate of individual human beings as a moral order in the history of peoples. Both are determined with iron necessity by a mechanical causality which connects every single phenomenon with one or more antecedent causes. Even the ancients recognized amana i, the blind herma mene, the fate that rules gods and men, as the supreme principle of the universe. Christianity replaced it by a conscious Providence, which is not blind but sees and governs the world in patriarchal fashion. The anthropomorphic character of this notion, entirely closely connected with belief in a personal God, is quite obvious. The idea of a 'loving Father,' who unceasingly guides the destinies of 1,500,000,000 men on our planet and is attentive at all times to their millions of contradictory prayers and pious wishes, is absolutely impossible that it is at once perceived on looking at the coloured spectacles of "faith and reflecting rationally on the subject.

As a rule, this belief in Providence and the tutelary of a "loving Father" is the intense in the modern civilised man just as in the uncivilised savage when some good fortune has befallen him an escape from peril of life, recovery from sickness, the winning of the first prize in a lottery, the birth of a long desired child, and so forth. When on the other hand a misfortune met with or an indescribable is not fulfilled ' Providence is forgotten. The wise rule of the world submerged—or refused his blessing.

In the extraordinary development of commerce in the nineteenth century the number of catastrophes and incendies has necessarily increased beyond all imagination, of that the journal is a daily witness. Thousands are killed every year by shipwreck, railway accidents, mine accidents, etc. Thousands die each other every year in war, and the preparation for this whole sale massacre absorbs much the greater part of the revenue in the highest civilised nations, the chief professors of "Christian charity." And among these hundreds of thousands of annual victims of modern civilisation, strong, industrious, courageous workers predominate. Yet the talk of a "moral order" goes on.

Since impartial study of the evolution of the world teaches us that there is no definite aim and no special purpose to be traced in it, there seems to be no alternative but to leave everything to "blind chance." This approach has been made to the transformism of Lamarck and Darwin, as it had been to the previous systems of Kant and Laplace, the latter a number of dualist philosophers who lay on it strewed. It is, therefore, worth while to make a brief remark upon it.

One group of philosophers affirms, in accordance with its ideologen conception, that the whole cosmos is an orderly system, in which every phenomenon has its aim and purpose, there is no such thing as chance. The other group, holding a mechanical theory, expresses itself thus:

The development of the universe is a monistic mechanical process, in which we discover no aim or purpose whatever, what we call design in the organic world is a special result of biological agencies, neither in the evolution of the heavenly bodies or in that of the crust of our earth do we find any trace of a controlling purpose—all is the result of chance. Each party is right—according to its definition of chance. The general law of causality, taken in conjunction with the law of substance, teaches us that every phenomenon has a mechanical cause in this sense there is no such thing as chance. Yet it is not only lawful, but necessary to retain the term for the purpose of expression, the simultaneous occurrence of two phenomena, which are not causally related to each other, but of which each has its own mechanical cause, independent of that of the other. Everybody knows that chance, in this monistic sense, plays an important part in the life of man and in the universe it huge. That however, does not prevent us from recognising, in each "chance event, is we do in the evolution of the entire cosmos, the universal sovereignty of nature's supreme law, the law of substance.

CHAPTER XV.

GOD AND THE WORLD


For thousands of years human thought has placed the first and supreme basis of all phenomena in an efficient cause to which it assigns the title of God (divus, thn). Like all general ideas, this notion of God has undergone a great number of transformations in the course of the evolution of reason. Indeed, it may be said that no other idea has had so many metamorphoses, for no other belief affects to so high a degree the chief objects of the mind and of national science as well as the deepest interests of the emotion and poetic fancy of the believer.

A comparative criticism of the many different forms of the idea of God would be extremely instructive and instructive, but we have not space for it in the present work. We must be content with pointing out the most important forms of the belief and their relation to the modern thought that has been evolved by a sound study of nature. For further information on this interesting question the reader would do well to consult the distinguished work of Adalbert Nyboda, I of 1 of the (1887).

When we pass over the finer shades and the variegated clothing of the God idea and confine our attention to its chief element, we can distribute all the different presentations of it in two groups: the theistic and pantheistic groups. The latter is closely connected with the monistic, or rational, view of things, and the former is associated with dualism and mysticism.

1. **THENTHEISM**

In this view God is distinct from, and opposed to, all things as its creator, sustainer, and ruler. He is always conceived in a more or less human form, as an organism which thinks and acts like a man—only on a much higher scale. His anthropomorphic God, polyphyletically evolved by the different races, assumes an infinity of shapes in their imagination, from fetishism to the refined monotheistic religions of the present day. The chief forms of theism are polytheism, tri-theism, amphitheism, and monotheism.

The polytheist peoples the world with a variety of gods and goddesses, which enter into its machinery more or less independently. It is supposed that such subordinate deities in the lifeless bodies of nature, in rocks, in water, in the air, in human productions of every kind—trees, animals, and men. This kind of polytheism is found in all uncivilized forms, even in the lowest tribes. It reaches its highest stage in Hellenic polytheism, in the myths of ancient Greece, which furnish the finest images to the modern poet and artist. At a much lower stage, we have the Catholic polytheism, in which innumerable "gods" (many of them of very equivocal repute) are regarded as subordinate divinities, and prays to exist them in their supernatural beings.

The dogma of the "Trinity," which still comprise three of the chief articles of faith in the creed of Christian peoples, culminates in the notion that the one God of Christianity is truly made up of three different persons:

1. God the Father, the omnipotent creator of heaven and earth (this unalterable myth was refined long ago by scientific cosmogony, astronomy, and philosophical speculation). 2. Jesus Christ, and 3. the Holy Ghost, a mystical being over whose incomprehensible relation to the Father and Son millions of Christian theologians have raved through the ages for the last 1,900 years. The Gospels, which are the only direct sources of this tri-theism, are very obscure as to the relation of these three persons to each other, and do not give a satisfactory answer to the question of their unity. On the other hand, it must be carefully noted that what confusion this obscure and mystic dogma of the Trinity must necessarily cause in the minds of our children even in the earlier years of instruction. One morning they learn (in their religious instruction) that three times one are one, and the very next hour they are told in their arithmetic class that three times one are three. I remember well the reflection that this confusion led me to in my early school days.

For the rest, the "Trinity" is not an original element in Christianity, like most of the other Christian dogmas, it has been borrowed from earlier religions. Out of the sun worship of the Chaldean magi was evolved the Trinity of Ihu, the mysterious
source of the world; its three manifestations were Anu, primeval chaos, Bel, the architect of the world, and Aa, the heavenly light, the all-enlightening wisdom. In the Brahmanic religion the Trimurti is also conceived as a "divine unity" made up of three persons—Brahma (the creator), Vishnu (the sustainer), and Shiva (the destroyer). It would seem that in this and other ideas of a Trinity the "sacred number, three," as such—as a "symbolical number"—has counted for something. The three first Christian virtues—Faith, Hope, Charity—form a similar triad.

According to the amphitheists, the world is ruled by two different gods, a good and an evil principle, God and the Devil. They are engaged in a perpetual struggle, like rival emperors, or pope and anti-pope. The condition of the world is the result of this conflict. The loving God, or good principle, is the source of all that is good and beautiful, of joy and of peace. The world would be perfect if his work were not continually thwarted by the evil principle, the Devil; this being is the cause of all that is bad and hateful, of contradiction and of pain.

Amphitheism is undoubtedly the most rational of all forms of belief in God, and the one which is least incompatible with a scientific view of the world. Hence we find it elaborated in many ancient peoples thousands of years before Christ. In ancient India Vishnu, the preserver, struggles with Shiva, the destroyer. In ancient Egypt the good Osiris is opposed by the wicked Typhon. The early Hebrews had a similar dualism of Aschera (or Keturah), the fertile mother-earth, and Elian (Moloch or Sechos), the stern heavenly father. In the Zend religion of the ancient Persians, founded by Zoroaster 2,000 years before Christ, there is a perpetual struggle between Ormuzd, the good god of light, and Ahriman, the wicked god of darkness.

In Christian mythology the devil is scarcely less conspicuous as the adversary of the good deity, the tempter and seducer, the prince of hell, and lord of darkness. A personal devil was still an important element in the belief of most Christians at the beginning of the nineteenth century. Towards the middle of the century he was gradually eliminated by being progressively explained away, or he was restricted to the subordinate role he plays as Mephistopheles in Goethe's great drama. To-day the majority of educated people look upon "belief in a personal devil" as a medieval superstition, while "belief in God" (that is, the personal, good, and loving God) is retained as an indispensable element of religion. Yet the one belief is just as much (or as little) justified as the other. In any case, the much-lamented "imperfection of our earthly life," the "struggle for existence," and all that pertains to it, are explained much more simply and naturally by this struggle of a good and an evil god than by any other form of theism.

The dogma of the unity of God may in some respects be regarded as the simplest and most natural type of theism; it is popularly supposed to be the most widely accepted element of religion, and to predominate in the ecclesiastical systems of civilised countries. In reality that is not the case, because this alleged "monotheism" usually turns out on closer inquiry to be one of the other forms of theism we have examined, a number of subordinate deities being generally introduced besides the supreme one. Most of the religions which took a purely monotheistic standpoint have become more or less polytheistic in the course of time. Modern statistics assure us that of the 1,500,000,000 men who people the earth the great majority are monotheists; of these, nominally, about 600,000,000 are Brahma - Buddhists, 500,000,000 are called Christians, 200,000,000 are heathens (of various types), 180,000,000 are Mohammedans, 10,000,000 are Jews, and 10,000,000 have no religion at all. However, the vast majority of these nominal monotheists have very confused ideas about the deity, or believe in a number of gods and goddesses besides the chief god angels, devils, etc.

The different forms which monotheism has assumed in the course of its polyphyletic development may be distributed in two groups—those of naturalistic and anthropistic monotheism. Naturalistic monotheism finds the embodiment of the deity in some lofty and dominating natural phenomena. The sun, the deity of light and warmth, on whose influence all organic life insensibly and directly depends, was taken to be such a phenomenon many thousand years ago. Sun-worship (solarism or heliotheism) seems to the modern scientist to be the best of all forms of theism, and the one which may be most easily reconciled with modern monism. For modern astrophysics and geogeny have taught us that the earth is a fragment detached from the sun, and that it will eventually return to the bosom of its parent.
Modern physiology teaches us that the first source of organic life on the earth is the formation of protoplasm, and that this synthesis of simple inorganic substances, water, carbonic acid, and ammonia, only takes place under the influence of sun-light. On the primary evolution of the plasmodomous plants followed, secondarily, that of the plasmphagous animals, which directly or indirectly depend on them for nourishment; and the origin of the human race itself is only a later stage in the development of the animal kingdom. Indeed, the whole of our bodily and mental life depends, in the last resort, like all other organic life, on the light and heat rays of the sun. Hence, in the light of pure reason, sun-worship, as a form of naturalistic monotheism, seems to have a much better foundation than the anthropistic worship of Christians and of other monotheists who conceive their god in human form. As a matter of fact, the sun-worshippers attained, thousands of years ago, a higher intellectual and moral standard than most of the other theists. When I was in Bombay in 1881, I watched with the greatest sympathy the elevating rites of the pious Parsees, who, standing on the sea-shore, or kneeling on their prayer-rugs, offered their devotion to the sun at its rise and setting.¹

Moon-worship (lunarism and selenotheism) is of much less importance than sun-worship. There are a few uncivilised races that have adored the moon as their only deity, but it has generally been associated with a worship of the stars and the sun.

The humanisation of God, or the idea that the "Supreme Being" feels, thinks, and acts like man (though in a higher degree), has played a most important part, as anthropomorphic monotheism, in the history of civilisation. The most prominent in this respect are the three great religions of the Mediterranean peoples—the old Mosaic religion, the intermediate Christian religion, and the younger Mohammedanism. These three great Mediterranean religions, all three arising on the east coast of the most interesting of all seas, and originating in an imaginative enthusiast of the Semitic race, are intimately connected, not only by this external circumstance of an analogous origin, but by many common features of their eternal contents. Just as Christianity borrowed a good deal of its mythology directly from ancient Judaism, so Islam has inherited much from both its predecessors. All the three were originally monotheistic; all three were subsequently overlaid with a great variety of polytheistic features, in proportion as they extended, first along the coast of the Mediterranean with its heterogeneous population, and eventually into every part of the world.

The Hebrew monotheism, as it was founded by Moses (about 1600 B.C.), is usually regarded as the ancient faith which has been of the greatest importance in the ethical and religious development of humanity. This high historical appreciation is certainly valid in the sense that the two other world-conquering Mediterranean religions issued from it; Christ was just as truly a pupil of Moses as Mohammed was afterwards of Christ. So also the New Testament, which has become the foundation of the belief of the highest civilised nations in the short space of 1,000 years, rests on the venerable basis of the Old Testament. The Bible, which the two compose, has had a greater influence and a wider circulation than any other book in the world. Even to-day the Bible—in spite of its curious mingling of the best and the worst elements—is in a certain sense the "book of books." Yet, when we make an impartial and unprejudiced study of this notable historical source, we find it very different in several important respects from the popular impression. Here again modern criticism and history have come to certain conclusions which destroy the prevalent tradition in its very foundations.

The monotheism which Moses endeavoured to establish in the worship of Jehovah, and which the prophets—the philosophers of the Hebrew race—afterwards developed with great success, had at first to sustain a long and severe struggle with the dominant polytheism which was in possession. Jehovah, or Yahweh, was originally derived from the heaven-god, which, under the title of Moloch, or Baal, was one of the most popular of the Oriental deities (the Sethos or Typhon of the Egyptians, and the Saturn or Cronos of the Greeks). There were, however, other gods in great favour with the Jewish people, and so the struggle with "idolatry" continued. Still, Jehovah was, in principle, the only God, explicitly claiming, in the first precept of the decalogue: "I am the Lord thy God; thou shalt have no other gods beside me."

Christian monotheism shared the fate of its mother, Mosaism; it was generally only

¹ Vide A Visit to Ceylon, E. Haeckel, translated by C. Bell.
monotheistic in theory, while it degenerated practically into every kind of polytheism. In point of fact, monotheism was logically abandoned in the very dogma of the Trinity which was adopted as an indispensable foundation of the Christian religion. The three persons, which are distinguished as Father, Son, and Holy Ghost, are three distinct individuals (and, indeed, anthropomorphic persons), just as truly as the three Indian deities of the Trimurti (Brahma, Vishnu, and Shiva) or the Trinity of the ancient Hebrews (Aâd, Bel, and Aâ). Moreover, in the most widely-distributed form of Christianity—the "virgin" mother of Christ plays an important part as a fourth deity; in many Catholic countries she is practically taken to be much more powerful and influential than the three male persons of the celestial administration. The cult of the madonna has been developed to such an extent in these countries that we may oppose it to the usual masculine form of monotheism as one of a feminine type. The "Queen of Heaven" becomes so prominent, as is seen in so many pictures and legends of the madonna, that the three male persons practically disappear.

In addition, the imagination of the pious Christian soon came to increase this celestial administration by a numerous company of "saints" of all kinds, and bands of musical angels, who should see that "eternal life" should not prove too dull. The Popes—the greatest charlatans of any religion ever produced—have constantly studied to increase this band of celestial satellites by repeated canonisation. This curious company received its most interesting acquisition in 1870, when the Vatican Council pronounced the Popes, as the vicars of Christ, to be infallible, and thus raised them to a divine dignity. When we add the "personal Devil" that they acknowledge, and the "bad angels" who form their court, we have in modern Catholicism, still the most extensive branch of Christianity, a rich and variegated polytheism that dwarfs the Olympic family of the Greeks.

Islam, or the Mohammedan monotheism, is the youngest and purest form of monotheism. When the young Mohammed (born 570) learned to despise the polytheistic idolatry of his Arabian compatriots, and became acquainted with the Nestorian Christianity, he adopted its chief doctrines in a general way; but he could not bring himself to see anything more than a prophet in Christ, like Moses. He found in the aogma of the Trinity what every emancipated thinker finds on impartial reflection—an absurd legend, which is neither reconcilable with the first principles of reason, nor of any value whatever for our religious advancement. He justly regarded the worship of the immaculate mother of God as a piece of pure idolatry, like the veneration of pictures and images. The longer he reflected on it, and the more he strove after a purified idea of deity, the clearer did the certitude of his great maxim appear: "God is the only God"—there are no other gods beside him.

Yet Mohammed could not free himself from the anthropomorphism of the Golden. His one only God was an idealised, almighty man, like the stern, vindictive God of Moses, and the gentle, loving God of Christ. Still, we must admit that the Mohammedan religion has preserved the character of pure monotheism throughout the course of its historical development and its inevitable division much more faithfully than the mosaic and Christian religions. We see that to-day, even externally, in its forms of prayer and preaching, and in the architecture and adornment of its mosques. When I visited the East for the first time in 1875, and admired the noble mosques of Cairo, Smyrna, Brussa, and Constantinople, I was inspired with a feeling of real devotion by the simple and tasteful decoration of the interior, and the lofty and beautiful architectural work of the exterior. How noble and inspiring do these mosques appear in comparison with the majority of Catholic churches, which are covered internally with gaudy pictures and gilt, and are outwardly disfigured by an immoderate crowd of human and animal figures! Not less elevated are the silent prayers and the simple devotional acts of the Koran when compared with the loud, unintelligible verbosity of the Catholic Mass and the blatant music of their theatrical processions.

Under the title of mixotheism we may embrace all the forms of theistic belief which contain mixtures of religious notions of different, sometimes contradictory, kinds. In theory this most widely diffused type of religion is not recognised at all; in the concrete it is the most important and most notable of all. The vast majority of men who have religious opinions have always been, and still are, mixotheists; their idea of God is picturesquely compounded from the impressions received in childhood from their own sect, and a number of other impressions which are received later on, from
contact with members of other religions, and which modify the earlier notions. In educated people there is also sometimes the modifying influence of philosophic studies in mature years, and especially the unprejudiced study of natural phenomena, which reveals the futility of the theistic idea. The conflict of these contradictory impressions, which is very painful to a sensitive soul, and which often remains undecided throughout life, clearly shows the immense power of the heredity of ancient myths on the one hand, and the early adaptation to erroneous dogmas on the other. The particular faith in which the child has been brought up generally remains in power, unless a "conversion" takes place subsequently, owing to the stronger influence of some other religion. But even in this supersession of one faith by another the new name, like the old one, proves to be merely an outward label covering a mixture of the most diverse opinions and errors. The greater part of those who call themselves Christians are not monotheists (as they think), but amphitheists, tritheists, or polytheists. And the same must be said of Islam and Mosnism, and other monotheistic religions. Everywhere we find associated with the original idea of a "sole and triune God" later beliefs in a number of subordinate deities—angels, devils, saints, etc.—a picturesque assortment of the most diverse theistic forms.

All the above forms of theism, in the proper sense of the word—whether the belief assumes a naturalistic or an anthropistic form—represent God to be an extramundane or a supernatural being. He is always opposed to the world, or nature, as an independent being; generally as its creator, sustainer, and ruler. In most religions he has the additional character of personality, or, to put it more definitely still, God as a person is likened to man. "In his gods man paints himself." This anthropomorphic conception of God as one who thinks, feels, and acts like man prevails with the great majority of theists, sometimes in a cruder and more naive form, sometimes in a more refined and abstract degree. In any case the form of theosophy we have described is sure to affirm that God, the supreme being, is infinite in perfection, and, therefore, far removed from the imperfection of humanity. Yet, when we examine closely, we always find the same psychic or mental activity in the two. God feels, thinks, and acts as man does, although it be in an infinitely more perfect form.

The personal anthropism of God has become so natural to the majority of believers that they experience no shock when they find God personified in human form in pictures and statues, and in the varied images of the poet, in which God takes human form—that is, is changed into a vertebrate. In some myths even God takes the form of other mammals (an ape, lion, bull, etc.), and more rarely of a bird (eagle, dove, or stork), or of some lower vertebrate (serpent, crocodile, dragon, etc.).

In the higher and more abstract forms of religion this idea of bodily appearance is entirely abandoned, and God is adored as a "pure spirit" without a body. "God is a spirit, and they who worship him must worship him in spirit and in truth." Nevertheless, the psychic activity of this "pure spirit" remains just the same as that of the anthropomorphic God. In reality, even this immaterial spirit is not conceived to be incorporeal, but merely invisible, gaseous. We thus arrive at the paradoxical conception of God as a gaseous vertebrate.

II. — PANTEHISM.

Panthemism teaches that God and the world are one. The idea of God is identical with that of nature or substance. This pantheistic view is sharply opposed in principle to all the systems we have described, and to all possible forms of theism; although there have been many attempts made from both sides to bridge over the deep chasm that separates the two. There is always this fundamental contradiction between them, that in theism God is opposed to nature as an extramundane being, as creating and sustaining the world, and acting upon it from without, while in Pantheism God, as an intramundane being, is everywhere identical with nature itself, and is operative within the world as "force" or "energy." The latter view alone is compatible with our supreme law—the law of substance. It follows necessarily that pantheism is the world-system of the modern scientist. There are, it is true, still a few men of science who contest this, and think it possible to reconcile the old theistic theory of human nature with the pantheistic truth of the law of substance. All these effects rest on confusion or sophistry—when they are honest.

As pantheism is a result of an advanced conception of nature in the civilised mind, it is naturally much younger than theism,
the crudest forms of which are found in great variety in the uncivilised races of ten thousand years ago. We do, indeed, find the germ of pantheism in different religions at the very dawn of philosophy in the earliest civilised peoples (in India, Egypt, China, and Japan), several thousand years before the time of Christ; still, we do not meet a definite philosophical expression of it until the hylozoism of the Ironic philosophers, in the first half of the sixth century before Christ. All the great thinkers of this flourishing period of Hellenic thought are surpassed by the famous Anaximander of Miletus, who conceived the essential unity of the infinite universe (unio) more profoundly and more clearly than his master, Thales, or his pupil, Anaximenes. Not only the great thought of the original unity of the cosmos and the development of all phenomena out of all pervading primitive matter found expression in Anaximander, but he even enunciated the bold idea of countless worlds in a periodic alternation of birth and death.

Many other great philosophers of classical antiquity, especially Democritus, Heraclitus, and Empedocles, had in the same or an analogous sense, a profound conception of this unity of nature and God, of body and spirit, which he obtained its highest expression in the law of substance of our modern monism. The famous Roman poet and philosopher, Lucrèce Carus, has presented it in a highly poetic form in his poem, De Rerum Naturae. However, this true pantheistic monism was soon entirely displaced by the mystic dualism of Platon, and especially by the powerful influence which the idealistic philosophy obtained by its blending with Christian dogmas. When the papacy attained to its spiritual despotism over the world, pantheism was hopelessly crushed; Giordano Bruno, its most gifted defender, was burnt alive by the "Vicar of Christ" in the Campo dei Fiori at Rome, on February 17th, 1600.

It was not until the middle of the seventeenth century that pantheism was exhibited in its purest form by the great Dutchman Spinoza; his title for the totality of things a definition of substance in which God and the world are inseparably united. The clearness, confidence, and consistency of Spinoza's monistic system are the more remarkable when we remember that this gifted thinker of 350 years ago was without the support of all those sound empirical bases which have been obtained in the second half of the nineteenth century. We have already spoken, in the first chapter, of Spinoza's relation to the materialism of the eighteenth and the monism of the nineteenth century. The propagation of his views, especially in Germany, is due, above all, to the immortal works of our greatest poet and thinker, Wolfgang Goethe. His splendid God and the World, Prometheus, I nd, etc., embody the great thoughts of pantheism in the most perfect poetic creations.

Atheism affirms that there are no gods or goddesses, assuming that God means a personal, external unity. This "godless world system" substantially agrees with the monism or pantheism of the modern scientist, it is only another expression for it, emphasizing its negative aspect, the non-existence of any supernatural deity. In this sense Schopenhauer justly remarks, "Pantheism is only a polite form of atheism. The truth of pantheism lies in its destruction of the dualist antithesis of God and the world, in its recognition that the world exists in virtue of its own inherent forces. The maxim of the pantheist, 'God and the world are one,' is merely a polite way of saying the Lord God is one." During the whole of the Middle Ages, under the bloody despotism of the popes, atheism was persecuted with fire and sword as a most pernicious system. As the "godless" in is plainy identified with the "wicked in the Gospel, and is threatened—simply on account of his "want of faith"—with the eternal fires of hell, it was very natural that every good Christian should be anxious to avoid the suspicion of atheism. Unfortunately, the idea still prevails very widely. The atheistic scientist, who devotes his strength and his life to the search for the truth, is freely credited with all that is evil, the theistic church-goer, who thoughtlessly follows the empty ceremonies of Catholic worship, is at once assumed to be a good citizen, even if there be no meaning whatever in his faith, and his morality be deplorable. This error will only be destroyed when, in the twentieth century, the prevailing superstition gives place to rational knowledge and to a monistic conception of the unity of God and the world.
CHAPTER XVI.

KNOWLEDGE AND BELIEF


Every effort of genuine science makes for a knowledge of the truth. Our only real and valuable knowledge is a knowledge of nature itself, and consists of presentations which correspond to external things. We are incompetent, it is true, to penetrate into the innermost nature of this real world—the "thing in itself"—but impartial critical observation and comparison inform us that in the normal action of the brain and the organs of sense the impressions received by them from the outer world are the same in all rational men, and that in the normal function of the organs of thought certain presentations are formed which are everywhere the same. These presentations we call true, and we are convinced that their content corresponds to the knowable aspect of things. We know that these facts are not imaginary, but real.

All knowledge of the truth depends on two different, but intimately connected, groups of human physiological functions: firstly, on the sense-impressions of the object by means of sense-action, and, secondly, on the combination of these impressions by an association into presentations in the subject. The instruments of sensation are the sense-organs (sensilla or aesthetes); the instruments which form and link together the presentations are the organs of thought (phroneta). The latter are part of the central, and the former are part of the peripheral, nervous system—that important and elaborate system of organs in the higher animals which alone effects their entire psychic activity.

Man's sense-activity, which is the starting-point of all knowledge, has been slowly and gradually developed from that of his nearest mammal relatives, the primates.

The sense-organs are of substantially the same construction throughout this highest animal group, and their function takes place always according to the same physical and chemical laws. They have had the same historical development in all cases. In the mammals, as in the case of all other animals, the sensilla were originally parts of the skin; the sensitive cells of the epidermis are the sources of all the different sense-organs, which have acquired their specific energy by adaptation to different stimuli (light, heat, sound, chemical action, etc.). The rod-cells in the retina of the eye, the auditory cells in the cochlea of the ear, the olfactory cells in the nose, and the taste cells on the tongue, are all originally derived from the simple, indifferent cells of the epidermis, which cover the entire surface of the body. This significant fact can be directly proved by observation of the embryonic development of man or any of the higher animals. And from this ontogenetic fact we confidently infer, in virtue of the great biogenetic law, the important phylogenetic proposition, that in the long historical evolution of our ancestors, likewise, the higher sense-organs with their specific energies were originally derived from the epidermis of lower animals, from a simple layer of cells which had no trace of such differentiated sensilla.

A particular importance attaches to the circumstance that different nerves are qualified to perceive different properties of the environment, and these only. The optic nerve accomplishes only the perception of light, the auditory nerve the perception of sound, the olfactory nerve the perception of smell, and so on. No matter what stimuli impinge on and irritate a given sense-organ, its reaction is always of the same character. From this specific energy of the sense-nerves, which was first fully appreciated by Johannes Muller, very erroneous inferences have been drawn, especially in favour of a dualistic and à priori theory of knowledge. It has been affirmed that the brain, or the soul, only perceives a certain condition of the stimulated nerve, and that, consequently, no conclusion can be drawn from the process as to the existence and nature of the stimulated environment. Sceptical philosophy concluded that the very existence of an outer world is doubtful, and extreme idealism went on positively to deny it, contending that things only exist in our impressions of them.

In opposition to these erroneous views,
we must recall the fact that the "specific energy" was not originally an innate, special quality of the various nerves, but it has arisen by adaptation to the particular activity of the epidermic cells in which they terminate. In harmony with the great law of "division of labour" the originally indifferent "sense-cells of the skin" undertook different tasks, one group of them taking over the stimulus of the light rays, another the impress of the sound waves, a third the chemical impulse of odorous substances, and so on. In the course of a very long period these external stimuli effected a gradual change in the physiological, and later in the morphological, properties of these parts of the epidermis, and there was a correlative modification of the sensitive nerves which conduct the impressions they receive to the brain. Selection improved, step by step, such particular modifications as proved to be useful, and thus eventually, in the course of many millions of years, created those wonderful instruments, the eye and the ear, which we prize so highly; their structure is so remarkably purposive that they might well lead to the erroneous assumption of a "creation on a preconceived design." The peculiar character of each sense-organ and its specific nerve has thus been gradually evolved by use and exercise — that is, by adaptation — and has then been transmitted by heredity from generation to generation. Albrecht Rau has thoroughly established this view in his excellent work on Sensation and Thought, a physiological inquiry into the nature of the human understanding (1866). It points out the correct significance of Muller's law of specific sense-energies, adding searching investigations into their relation to the brain; and in the last chapter there is an able "philosophy of sensitivity," based on the ideas of Ludwig Feuerbach. I thoroughly agree with his convincing work.

Critical comparison of sense-action in man and the other vertebrates has brought to light a number of extremely important facts, the knowledge of which we owe to the penetrating research of the nineteenth century, especially of the second half of the century. This is particularly true of the two most elaborate "esthetic" organs, the eye and the ear. They present a different and more complicated structure in the vertebrates than in the other animals, and have also a characteristic development in the embryo. This typical ontogenesis and structure of the sensilla of all the vertebrates is only explained by heredity from a common ancestor. Within the vertebrate group, however, we find a great variety of structure in points of detail, and this is due to adaptation to their manner of life on the part of the various species, to the increasing or diminishing use of various parts.

In respect of the structure of his sense-organs man is by no means the most perfect and most highly-developed vertebrate. The eye of the eagle is much keener, and can distinguish small objects at a distance much more clearly than the human eye. The hearing of many mammals, especially of the carnivora, ungulata, and rodentia of the desert, is much more sensitive than that of man, and perceives slight noises at a much greater distance; that may be seen at a glance by their large and very sensitive cochlea. Singing birds have attained a higher grade of development, even in respect of musical endowment, than the majority of men. The sense of smell is much more developed in most of the mammals, especially in the carnivora and the ungulata, than in man; if the dog could compare his own fine scent with that of man, he would look down on us with compassion. Even with regard to the lower senses — taste, sex-sense, touch, and temperature — man has by no means reached the highest stage in every respect.

We can naturally only pass judgment on the sensations which we ourselves experience. However, anatomy informs us of the presence in the bodies of many animals of other senses than those we are familiar with. Thus fishes and other lower aquatic vertebrates have peculiar sensilla in the skin which are in connection with special sense nerves. On the right and left sides of the fish's body there is a long canal, branching into a number of smaller canals at the head. In this "mucus canal" there are nerves with numerous branches, the terminations of which are connected with peculiar nerve-aggregates. This extensive epidermic sense-organ probably serves for the perception of changes in the pressure, or in other properties, of the water. Some groups are distinguished by the possession of other peculiar sensilla, the meaning of which is still unknown to us.

But it is already clear from the above facts that our human sense-activity is limited, not only in quantity, but in quality also. We can thus only perceive with our senses, especially with the eye and the sense of touch, a part of the qualities of the objects in our environment. And even
this partial perception is incomplete, in the sense that our organs are imperfect, and our sensory nerves, acting as interpreters, communicate to the brain only a translation of the impressions received.

However, this acknowledged imperfection of our senses should not prevent us from recognizing their instruments, and especially the eye, to be organs of the highest type, together with the thought organs in the brain, they are nature's most valuable gift to man. Very truly does Albrecht Rau say: “All science is sensitive knowledge in the ultimate analysis, it does not deny, but interprets, the data of the senses. The senses are our first and best friends. Long before the mind is developed, the senses tell man what he must do and avoid. He who makes a general disavowal of the senses in order to meet their dangers acts as thoughtlessly and as foolishly as the man who plucks out his eyes because they once fell on shameful things, or the man who cuts off his hand lest at any time it should reach out to the goods of his neighbour.” Hence, Kierkegaard, is quite right in calling all philosophies, religions, and systems which oppose the principle of sense action not only erroneous, but really pernicious. Without the senses there is no knowledge—“Nihil est in intellectu, quod non fuerit in sensu,” as Locke said. Twenty years ago I pointed out, in my chapter “On the Origin and Development of the Sense Organs,” the great science of Darwinism in giving us a profounder knowledge and a juster appreciation of the senses.

The thirst for knowledge of the educated thinker is not contented with the defective acquaintance with the external world which is obtained through our imperfect sense organs. He endeavours to build up the sense impressions, which they have brought him, into valuable knowledge. He transforms them into specific sense perceptions in the sense centres of the cortex of the brain, and combines them into presentations, by association, in the thought centres. Finally, by a further concatenation of the groups of presentations he attains to connected knowledge. But this knowledge remains defective and unsatisfactory until the imagination supplements the inadequate power of combination of the intelligence, and, by the association of stored-up images, unites the isolated elements into a connected whole. Thus are produced new general presentative images, and these suffice to interpret the facts perceived and satisfy “reason’s feeling of causality.”

The presentations which fill up the gaps in our knowledge, or take its place, may be called, in a broad sense, “faith.” That is what happens continually in daily life. When we are not sure about a thing we say, I believe it. In this sense we are compelled to make use of Faith even in science itself, we conjecture or assume that a certain relation exists between two phenomena, though we do not know it for certain. If it is a question of a cause, we form a hypothesis, though in science only such hypotheses are admitted as lie within the sphere of human cognizance, and do not contradict known facts. Such hypotheses are, for instance, in physics the theory of the vibratory movement of ether; in chemistry the hypothesis of atoms and their affinity, in biology the theory of the molecular structure of living protoplasm, and so forth.

The explanation of a great number of connected phenomena by the assumption of a common cause is called a theory. Both in theory and hypothesis “faith” (in the scientific sense) is indispensable, for here is the imagination that fills up the gaps left by the intelligence in our knowledge of the connection of things. A theory, therefore, must always be regarded only as an approximation to the truth, it must be understood that it may be replaced in time by another and better grounded theory. But, in spite of this admitted uncertainty, theory is indispensable for all true science. It elucidates facts by postulating a cause for them. The man who renounces a theory altogether, and seeks to construct a pure science with certain facts alone (as often happens with wrong headed representatives of our “exact sciences”), must give up the hope of any knowledge of causes, and, consequently, of the satisfaction of reason’s demand for causality.

The theory of gravitation in astronomy (Newton), the nebular theory in cosmogony (Kant and Laplace), the principle of energy in physics (Meyer and Helmholtz), the atomic theory in chemistry (Dalton), the vibratory theory in optics (Huyghens), the cellular theory in histology (Schleiden and Schwann), and the theory of descent in biology (Lamarck and Darwin), are all important theories of the first rank, they explain a whole world of natural phenomena by the assumption of a common cause for all the several facts of their respective provinces, and by showing that all the
phenomena thereof are inter-connected and controlled by laws which issue from this common cause. Yet the cause itself may remain obscure in character, or be merely a "provisional hypothesis." The "force of gravity" in the theory of gravitation and in cosmogony, "energy" itself in its relation to matter, the "ether" of optics and electricity, the "atom" of the chemist, the living "protoplasm" of histology, the "heredity" of the evolutionist—these and similar conceptions of other great theories may be regarded by a sceptical philosophy as "mere hypotheses" and the outcome of scientific "faith," yet they are indispensable for us, until they are replaced by better hypotheses.

The dogmas which are used for the explanation of phenomena in the various religions, and which go by the name of "faith" (in the narrower sense), are of a very different character from the forms of scientific faith we have enumerated. The two types, however—the "natural faith of science" and the "supernatural" faith of religion— are not inadmissibly confounded, so that we must point out their fundamental difference. Religious faith always means belief in a miracle, and as such is in hopeless contradiction with the natural faith of reason. In opposition to reason it postulates supernatural agencies, and therefore may be justly called superstition. The essential difference of this superstition from rational faith lies in the fact that it assumes supernatural forces and phenomena, which are unknown and inadmissible to science, and which are the outcome of illusion and fancy; moreover, superstition contradicts the well known laws of nature, and is therefore irrational.

Owing to the great progress of ethnology during the century, we have learned a vast quantity of different kinds and practices of superstition, as they still survive in uncivilised races. When they are compared with each other and with the mythological notions of earlier ages, a manifold analogy is discovered, frequently a common origin, and eventually one simple source for them all. This is found in the "demand of causality in reason," in the search for an explanation of obscure phenomena by the discovery of a cause. That applies particularly to such phenomena as threaten us with danger and excite fear, like thunder and lightning, earthquakes, eclipses, etc. The demand for a causal explanation of such phenomena is found in uncivilised races of the lowest grade, transmitted from their primate ancestors by heredity. It is even found in many other vertebrates. When a dog barks at the full moon, or at a ringing bell, of which it sees the hammer moving, or at a flag that flutters in the breeze, it expresses not only fear, but also the mysterious impulse to learn the cause of the obscure phenomenon. The crude beginnings of religion among primitive races spring partly from this hereditary superstition of their primate ancestors, and partly from the worship of ancestors, from various emotional impulses, and from habits which have become traditional.

The religious notions of modern civilised peoples, which they esteem so highly, profess to be on a much higher level than the "crude superstition" of the savage; we are told of the great advance which civilisation has made in sweeping it aside. That is a great mistake. Impartial comparison and analysis show that they only differ in that special "form of faith" and the outer shell of their creed. In the clear light of reason the refined faith of the most liberal eclesiastical religion—is as much as it contradicts the known and inadmissible laws of nature—is no less irrational a superstition than the crude spirit-faith of primitive fetishism on which it looks down with proud disdain.

And if, from this impartial standpoint, we take a critical glance at the kinds of faith that prevail to day in civilised countries, we find them everywhere saturated with traditional superstition. The Christian belief in creation, the immortality, the Immaculate Conception, the Redemption, the Resurrection and Ascension of Christ, and so forth, is just as purely imaginative as the belief in the various dogmas of the Mohammedan, Moslem, Buddhist, and Brahmanic religions, and is just as incapable of reconciliation with a rational knowledge of nature. Each of these religions is for the sincere believer an indisputable truth, and each regards the other as heresy and damnable error. The more confidently a particular sect considers itself "the only ark of salvation," and the more ardently this conviction is cherished, the more jealously does it contend against all other sects and give rise to the fearful religious wars that form the saddest pages in the book of history. And all the time the unprejudiced "critique of pure reason" teaches us that all these different forms of faith are equally false and irrational, mere creatures of poetic fancy and uncritical tradition. Rational science must reject...
them all alike as the outcome of superstition.

The incautious injury which irrational superstition has done to credulous humanity is conspicuously revealed in the ceaseless conflict of confessions of faith. Of all the wars which nations have waged against each other with fire and sword, the religious wars have been the bloodiest, of all the forms of discord that have shattered the happiness of families and of individuals, those that arise from religious differences are still the most painful. Think of the millions who have lost their lives in Christian persecutions, in the religious conflicts of Islam and of the Reformation, by the Inquisition, and under the charme of witchcraft. Or think of the still greater number of luckless men who through religious differences, have been plunged into family troubles and then lost the esteem of their fellow citizens and their position in the community or have even been compelled to fly from their country. The official confession of faith becomes most precious of all when it is associated with the political aim of modern state and is enforced as religious instruction in our schools. The child's mind is thus early diverted from the pursuit of the truth and irrigated with superstition. Every friend of humanity should do all in his power to promote insecular schools as one of the most valuable institutions of the modern state.

The great value which is, nonetheles, still very widely attached to religious instruction is not only due to the compulsion of a reactionary state and its dependence on a dominant clericalism but also to the weight of old traditions and emotional cravings of various kinds. One of the strongest of these is the devout reverence which is extended everywhere to sectarian tradition, to the "faith of our fathers." In thousands of stories and poems fidelity to it is extolled as a spiritual treasure and a sacred duty. Yet a little impartial study of the history of faith suffices to show the absurdity of the notion. The dominant evangelical faith of the second half of the nineteenth century is essentially different from that of the first half, and this again from that of the eighteenth century. The faith of the eighteenth century diverges considerably from the "faith of our fathers" of the seventeenth, and still more from that of the sixteenth century. The Reformation, releasing enslaved reason from the tyranny of the popes, is naturally regarded by them as divested heresy, but even the faith of the papacy itself had been completely transformed in the course of a century. And how different is the faith of a Christian from that of his heathen ancestors. Every man with some degree of independent thought feels a more or less personal religion for himself, which is always different from that of his fathers, it depends largely on the general condition of thought in his day. The further we go back in the history of civilization, the more clearly do we find this esteemed "faith of our fathers" to be an indefensible superstition which is undergoing continual transformation.

One of the most remarkable forms of superstition, which still takes a very active part in modern life is spiritualism. It is a surprising and lamentable fact that millions of educated people are still dominated by this diabolical superstition. Even distinguished scientists are entangled in it. A number of spiritualist mediums spread the faith far and wide and our "superior circles" do not scruple to hold meetings in which "spirits" appear, "talking" with messages from the beyond and so on. It is a frequent boast of mediums that eminent men of science defend their superstition. In Germany, A. Zolliker and Heinrich are quoted as instances in England, Wallace and Crookes. The irresistible circumstance that physiologists and biologists of such distinction have been led astray by spiritualism is accounted for, partly by their excess of imputation and defect of critical faculty, and partly by the powerful influence of dogmas which a religious education impressed on the brain in early youth. Moreover it was precisely through the famous S. S. at Jepson, in which the physiologists Zolliker, Lehmann and Wilhelm Weber were imposed on by the clever American conjurer, that the fraud of the latter was afterward fully exposed. He was discovered to be a common impostor. In other cases too, where the alleged marvels of spiritualism have been thoroughly investigated, they have been traced to a more or less clever deception. The mediums, generally of the weaker sex, have been found to be either snuff-swindlers or nervous persons of abnormal mentality. Their supposed gift of telepathy or "projection of the mind" (a distance of thought without material medium) has no more existence than the "voices" or the "signs" of spirits, etc. The vivid pictures which Carl du Prel, of Munich, and other mediums give of their phenomena must be regarded as the outcome of a lively
imagination, together with a lack of critical power and a knowledge of physiology.

The majority of religions have, in spite of their great differences, one common feature, which is, at the same time, one of their strongest supports in many quarters. They declare that they can elucidate the problem of existence, the solution of which is beyond the natural power of reason, by the supernatural way of revelation from that they derive the authority of the doxologies, which, in the guise of divine laws, control morality and the practical conduct of life. "Divine inspirations of this kind form the basis of many myths and legends, the human origin of which is perfectly clear. It is true that the God who reveals himself does not always appear in human shape, but in thunder and lightning, storm and earthquake, fire, bush or mountain, cloud. But the revelation which he is supposed to bring to the credulous children of men is always anthropomorphic in melody the form of communication of ideas or commands which are formulated and expressed precisely as is done in the normal act of the human brain and language. In the old and Egyptian religions, in the mythologies of Greece and Rome in the Old and the New Testaments, the gods did talk and act just as men do. The revelations, in which they are supposed to reveal, for us the secrets of existence and the solution of the great problem of the relations of the human mind. The truth which the credulous discover in them is a human invention, the childish faith in the true revelation is mere superstition.

The true revelation—that is the true source of rational knowledge—is to be sought in nature, and not amongst the idols which forms the most valuable part of human culture is derived exclusively from the experience required in a searching study of nature, and from the rational conclusions which it is reached by the just associations of these empirical presentations. Every intelligent man with normal brain and senses finds this true revelation in nature on impartial study, and thus frees himself from the superstition with which the 'revelations' of religion had burdened him.

CHAPTER XVII

SCIENCE AND CHRISTIANITY

Increasing opposition between modern science and Christian theology. The old and the new faith. The battle of natural science against the attacks of Christian superstition, especially against Catholicism. Four periods in the evolution of Christianity: (1) Primitive Christianity (first three centuries). The four canonical Gospels. The epistles of St. Paul. (2) The papacy (ultramontane Christianity). (3) The transition to modernism in the Middle Ages. (4) The battle of science against superstition and religion. (a) Infallibility (b) The Papacy. (c) The Immaculate Conception.

One of the most distinctive features of the eighteenth century is the increasing vehemence of the opposition between science and Christianity that is both natural and inevitable. In the same proportion in which the victorious progress of modern science has surpassed all the scientific achievements of earlier ages has the untruthfulness been proved of those mystical views which would subordinate reason under the yoke of an illusory revelation, and the Christian religion belongs to that group. The more solidly modern astronomy, physics, and chemistry have established the supreme dominion of inflexible natural laws in the universe at large, and modern botany, zoology, and anthropology have proved the validity of those laws in the entire kingdom of organic nature, so much the more strenuously must the Christian religion, in association with dualistic metaphysics, strive to deny the application of these natural laws in the province of the so-called "spiritual life" that is, in one section of the physiology of the brain.

No one has more clearly, boldly, and unmistakably cut through this open and unmistakable opposition between the modern scientific and the outworn Christian view than David Friedrich Strauss, the greatest theologian of the nineteenth century. His last work, The Old Earth and the New, is a magnificent expression of the honest conviction of all educated people of the present day who understand the unavoidable conflict between the discredited, dominent doctrines of Christianity.
and the illuminating, rational revelation of modern science—all those who have the courage to defend the right of reason against the pretensions of superstition, and who are sensible of the philosophic dem and for a unified system of thought, Strauss, as an honourable and courageous free thinker, has expounded far better than I could the principal points of difference between "the old and the new faith. The absolute irreconcilability of the opponents and the inevitability of their struggle ("for life or death") have been ably presented on the philosophic side by F. Nietzsche in his interesting work on The Self Destruction of Christianity.

When the works of Strauss and I. E. E. have been read, it may seem superfluous for us to devote a special chapter to the subject. Yet we think it useful, and even necessary for our purpose, to cast a critical glance at the historical course of this great struggle, especially seeing that the attacks of the Church militant on science in general, and on the theory of evolution in particular, have become extremely bitter and menacing of late years. Unfortunately, the mental reaction which has lately set in, and the rising flood of reaction in the political, social, and ecclesiastical world, are only too well calculated to give point to those diatribes. If anyone doubts it has only to look over the conduct of Christian synods and of the German Reichstag during the last few years. Quite in harmony are the recent efforts of many secular Governments to get on as good a footing as possible with the "spiritual regiment," their deadly enemy—that is, to submit to its yoke. The two forces find a common aim in the suppression of free thought and free scientific research, for the purpose of thus more easily securing a complete despotism.

Let us first emphatically protest that it is a question for us of the necessary defence of science and reason against the vigorous attacks of the Christian Church and its vast army, not of an unprovoked attack of science on religion. And, in the first place, our defence must be prepared against Romanism or Ultramontanism. This "one ask of salvation," this "Catholic Church destined for all," is not only much larger and more powerful than the other Christian sects, but it has the exceptional advantages of a vast, centralised organisation and an unrivalled political ability. Men of science are often heard to say that the Catholic superstition is no more astute than the other forms of supernatural faith, and that all these insidious institutions are equally inimical to reason and science. As a matter of general theoretical principle the statement may pass, but it is certainly wrong when we look to its practical side. The deliberate and indiscriminate attacks of the ultramontane Church on science, supported by the apathy and ignorance of the masses, are, on account of its powerful organisation, much more severe and dangerous than those of other religions.

In order to appreciate correctly the extreme importance of Christianity in regard to the entire history of civilisation, and particularly its fundamental opposition to reason and science, we must briefly run over the principal stages of its historical evolution. It may be divided into four periods: (1) primitive Christianity (the first three centuries), (2) papal Christianity (twelve centuries, from the fourth to the fifteenth) (3) the Reformation (three centuries, from the sixteenth to the eighteenth), and (4) modern pseudo Christianity.

I—PRIMITIVE CHRISTIANITY

Primitive Christianity embraces the first three centuries. Christ himself, the noble prophet and enthusiast, so full of the love of humanity was far below the level of classical culture; he knew nothing beyond the Jewish traditions. He has left no single line of writing. He had, indeed, no suspicion of the advanced stage to which Greek philosophy and science had progressed five hundred years before.

All that we know of him and of his original teaching is taken from the chief documents of the New Testament—the four gospels and the Pauline epistles. As to the four canonical gospels, we now know that they were selected from a host of contradictory and forged manuscripts of the first three centuries by the 318 bishops who assembled at the Council of Nicea in 325. The entire list of gospels numbered forty; the canonical list contains four. As the contending and mutually abusive bishops could not agree about the choice, they determined to leave the selection to a miracle. They put all the books (according to the Synopsis of Papyrus) together underneath the altar, and prayed that the scriptural books, of hum in origin, might remain there, and the genuine, inspired books might be miraculously placed on the
table of the Lord. And that, says tradition, really occurred! The three synoptic gospels (Matthew, Mark, and Luke—all written after them, not by them, at the beginning of the second century) and the very different fourth gospel (ostensibly "after" John), written about the middle of the second century, leaped on the table, and were thenceforth recognized as the inspired (with their thousand mutual contradictions) foundations of Christian doctrine. If any modern "unbeliever" finds this story of the "leap of the sacred books" incredible, we must remind him that it is just as credible as the table-turning and spirit-rapping that are believed to take place to-day by millions of educated people; and that hundreds of millions of Christians believe just as implicitly in their personal immortality, their "resurrection from the dead," and the Trinity of God—dogmas that contradict pure reason no more and no less than that miraculous bound of the gospel manuscripts.

The most important sources after the gospels are the fourteen separate (and generally forged) epistles of Paul. The genuine Pauline epistles (three in number, according to recent criticism—to the Romans, Galatians, and Corinthians) were written before the canonical gospels, and contain less incredible miraculous matter than they. They are also more concerned than the gospels to adjust themselves with a rational view of the world. Hence the advanced theology of modern times constructs its "ideal Christianity" rather on the base of the Pauline epistles than on the gospels, so that it has been called "Paulinism."

The remarkable personality of Paul, who possessed much more culture and practical sense than Christ, is extremely interesting, from the anthropological point of view, from the fact that the racial origin of the two great religious founders is very much the same. Recent historical investigation teaches that Paul's father was of Greek nationality, and his mother of Jewish. ¹ The half-breeds of these two races, which are so very distant in origin (although they are branches of the same species, the homo mediterraneus), are often distinguished by a happy blending of talents and temperament, as we find in many recent and actual instances. The plastic Oriental imagination and the critical Western reason often admirably combine and complete each other. That is visible in the Pauline teaching, which soon obtained a greater influence than the earliest Christian notions. Hence it is not incorrect to consider Paulinism a new phenomenon, of which the father was the philosophy of the Greeks, and the mother the religion of the Jews. Neo-Platonism is an analogous combination.

As to the real teaching and aims of Christ (and as to many important aspects of his life) the views of conflicting theologians diverge more and more, as historical criticism (Strauss, Feuerbach, Baur, Renan, etc.) puts the accessible facts in their true light, and draws impartial conclusions from them. Two things, certainly, remain beyond dispute—the lofty principle of universal charity and the fundamental maxim of ethics, the "golden rule," that issues therefrom; both, however, existed in theory and in practice centuries before the time of Christ (cf. chap. xix.). For the rest, the Christians of the early centuries were generally pure Communists, sometimes "Social Democrats," who, according to the prevailing theory in Germany to-day, ought to have been exterminated with fire and sword.

H. —PAPAL CHRISTIANITY.

Latin Christianity, variously called Papistry, Romanism, Vaticanism, Ultramontanism, or the Roman Catholic Church, is one of the most remarkable phenomena in the history of civilised man; in spite of the storms that have swept over it, it still exerts a most powerful influence. Of the 500,000,000 Christians who are scattered over the earth the majority—that is, more than 250,000,000—are Roman Catholics. During a period of 1,200 years, from the fourth to the sixteenth century, the Papacy has almost absolutely controlled and tainted the spiritual life of Europe; on the other hand, it has won but little territory from the ancient religions of Asia and Africa. In Asia Buddhism still accounts 500,000,000 followers, the Brahmanic religion more than 100,000,000, and Islam 120,000,000.

It is the despotism of the Papacy that lent its darkest character to the Middle Ages; it meant death to all freedom of mental life, decay to all science, corruption to all morality. From the noble height to which the life of the human mind had attained in classical antiquity, in the centuries before Christ and the first century

¹ As to the Greek paternity of Christ, see p. 114.
after Christ, it soon sank, under the rule of the Papacy, to a level which, in respect of the knowledge of the truth, can only be termed barbarism. It is often protested that other aspects of mental life—poetry and architecture, scholastic learning and patristic philosophy—were richly developed in the Middle Ages. But this activity was in the service of the Church; it did not tend to the cultivation, but to the suppression, of free mental research. The exclusive preparing for an unknown eternity beyond the tomb, the contempt of nature, the withdrawal from the study of it, which are essential elements of Christianity, were urged as a sacred duty by the Roman hierarchy. It was not until the beginning of the sixteenth century that a change for the better came in with the Reformation.

It is impossible for us to describe here the pitiful retrogression of culture and morality during the twelve centuries of the spiritual despotism of Rome. It is very pitifully expressed in a saying of the greatest and ablest of the Hohenzollerns; Frederick the Great condensèd his judgment in the phrase that the study of history led one to think that from Constantine to the date of the Reformation the whole world was insane. L. Büchner has given us an admirable, brief description of this "period of insanity" in his work on Religious and Scientific Systems. The reader who desires a closer acquaintance with the subject would do well to consult the historical works of Ranke, Draper, Kolb, Svoboda, etc. The truthful description of the awful condition of the Christian Middle Ages, which is given by these and other unprejudiced historians, is confirmed by all the reliable sources of investigation, and by the historical monuments which have come down from this saddest period of human history. Educated Catholics, who are sincere truthseekers, cannot be too frequently recommended to study these historical sources for themselves. This is the more necessary as ultramontane literature has still a considerable influence. The old trick of deceiving the faithful by a complete reversal of facts and an invention of miraculous circumstances is still worked by it with great success. We will only mention Lourdes and the "Holy Coat" of Trèves. The ultramontane professor of history at Frankfurt, Johannes Janssen, affords a striking example of the length they will go in distorting historical truth; his much-read works (especially his History of the German People since the Middle Ages) are marred by falsification to an incredible extent. The untruthfulness of these Jesuitical productions is on a level with the credulity and the uncritical judgment of the simple German nation that takes them for gospel.

One of the most interesting of the historical facts which clearly prove the evil of the ultramontane despotism is its vigorous and consistent struggle with science. This was determined on, in principle, from the very beginning of Christianity, inasmuch as faith was set above reason and the blind subjection of the one to the other was preached; that was natural, seeing that our whole life on earth was held to be only a preparation for the legendary life beyond, and thus scientific research was robbed of any real value. The deliberate and successful attack on science began in the early part of the fourth century, particularly after the Council of Nicaea (327), presided over by Constantine—called the "Great" because he raised Christianity to the position of a State religion, and founded Constantinople, though a worthless character, a false-hearted hypocrite, and a murderer. The success of the Papacy in its conflict with independent scientific thought and inquiry is best seen in the distressing condition of science and its literature during the Middle Ages. Not only were the rich literary treasures that classical antiquity had bequeathed to the world destroyed for the most part, or withdrawn from circulation, but the rack and the stake ensured the silence of every heretic—that is, every independent thinker. If he did not keep his thoughts to him, if he had to look forward to being burnt alive, as was the fate of the great monistic philosopher Giordano Bruno, the reformer John Huss, and more than a hundred thousand other "witnesses to the truth." The history of science in the Middle Ages teaches us on every page that independent thought and empirical research were completely buried for twelve sad centuries under the oppression of the omnipotent Papacy.

All that we esteem in true Christianity, in the sense of its founder and of his noblest followers, and that we must endeavour to save from the inevitable wreck of this great world-religion for our "new" monistic religion, lies on its ethical and social planes. The principles of true humanism, the golden rule, the spirit of tolerance, the love of man, in the best and highest sense of the word—all these true graces of Christianity were not, indeed, first discovered and given to the world by that religion, but were successfully developed in the critical period when classical antiquity was hastening to its
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The Papacy, however, has attempted to convert all those virtues into the direct contrary, and still to hang out the sign of the old firm. Instead of Christian charity, it introduced a fanatical hatred of the followers of all other religions, with fire and sword it has pursued, not only the heathen but every Christian sect that dared resist the imposition of a Montane dogma. Tribunals for heretics were erected all over Europe, yielding unnumbered victims, whose tortures seemed only to fill their persecutors, with all their Christian charity, with a peculiar satisfaction. The power of Rome was directed mercilessly for centuries against everything that stood in its way. Under the notorious Torquemada (1451-98), in Spain, more than 5,000 heretics were burnt alive and 90,000 punished with the confiscation of their goods and the most rigorous ecclesiastical fines, in the Netherlands, under the rule of Charles V, at least 50,000 men fell victims to the clerical bloodthirst. And while the heavens were sounded with the cry of the martyrs, the wealth of half the world was pouring into Rome, to which the whole of Christianity paid tribute, and the self-styled representatives of God on earth and their accomplices (not infrequently Atheists themselves) were allowed in precise and vice of every description. "And all these privileges, said the frivolous, sceptical Pope Leo X, "have been secured to us by the fable of Jesus Christ."

Yet, with all the discipline of the Church and the fear of God, the condition of Europe in society was pitiable. Fodidism, self-sufficiency, the abuse of God, and the favor of the monks ruled the land, the poor helots were only too glad to be permitted to raise their miserable huts under the shadow of the castle or the cloister, then secular and spiritual oppressors and exploiters. Even to day we suffer from the aftermath of these awful ages and conditions, in which there was no question of care for science or higher mental culture. Save in rare circumstances and in secret, Ignorance, poverty, and superstition combined with the immoral operation of the law of retribution, which had been introduced in the eleventh century, to consolidate the ever-growing power of the Papacy. It has been calculated that there were more than 10,000,000 victims of fanatical religious hatred during this "Golden Age" of Papal domination, and how many more millions of human victims must be put to the account of celibacy, oral confession, and moral con

struct, the most pernicious and accursed institutions of the Papal despotism! Unbelieving philosophers, who have collected disproofs of the existence of God, have overlooked one of the strongest arguments in that sense— the fact that the Roman "Vicar of Christ" could for twelve centuries perpetrate with impunity the most shameful and horrible deeds "in the name of God."

The history of civilization, which we are so fond of calling the history of the world, enters upon its third period with the Reformation of the Christian Church just as its second period began with the founding of Christianity. With the Reformation begins the new birth of the Reformation, the reawakening of science, which the iron hand of the Christian Papacy had so long suppressed. At the same time the spread of general education had already commenced, owing to the invention of printing, which the middle of the fifteenth century, and towards its close, several great events occurred, especially the discovery of America in 1492, which prepared the way for the "Renaissance" of science in company with that of art. Indeed, certain very important advances were made in the knowledge of nature during the first half of the sixteenth century, which shook the prevalent system to its very foundations. Such were the circumnavigation of the globe by Magellan in 1522, which afforded empirical proof of its roundness, and the founding of the new system of the world by Copernicus in 1513.

Yet the 31st of October in the year 1517, the day on which Martin Luther nailed his ninety-five theses to the wooden door of Wittenberg, the Church must be regarded as the commencement of a new epoch, for on that day was forced the iron door of the prison in which the Papal Church had detained the Reformer for 1,200 years. The merits of the great reformer have been greatly exaggerated, purposely understated. It has been unjustly pointed out that Luther, like all the other reformers, remained in mankind's subjection to the deepest superstition. Thus he was throughout life a supporter of the rigid dogma, of the verbal inspiration of the Bible, of zealously maintained the doctrines of the resurrection, original sin, predestination, justification by faith, etc. He rejected as folly the great discovery of Copernicus, because in the Bible "Joshua bade the sun, not the earth,
stand still.” He utterly failed to appreciate the great political revolutions of his time, especially the profound and just agitation of the peasantry. Worse still was the fanaticism of Calvin, who had the talented Spanish physician, Scipio, burnt alive in 1553, because he rejected the absurd dogma of the Trinity. The fanaticism of the Reformed Church followed only too frequently in the blood-stained footsteps of their Papal enemy, as they did even in our own day. Deeds of unparalleled cruelty followed in the train of the Reformation—the massacre of St. Bartholomew and the persecution of the Huguenots in France, bloody heresychasts in Italy, civil war in England, and the Thirty Years War in Germany. Yet, in spite of those grave blunders, to the sixteenth and seventeenth centuries belongs the honour of once more opening a free path to the thoughtful mind, and delivering reason from the oppressive yoke of the Papacy. Thus only was made possible that great development of different tendencies in critical philosophy and of new paths in science which won for the subsequent eighteenth century the honourable title of “the century of enlightenment.”

IV. THE PSEUDO-CHRISTIANITY OF THE NINETEENTH CENTURY

As the fourth and last stage in the history of Christianity we oppose our nineteenth century to all its predecessors. It is true that the enlightenment of preceding centuries had promoted critical thought in every direction, and the rise of science itself had furnished powerful empirical weapons, yet it seems to us that our progress along both lines has been quite phenomenal during the nineteenth century. It has inaugurated an entirely new period in the history of the human mind characterised by the development of the monistic philosophy of nature. At its very commencement the foundations were laid of a new anthropology (by the comparative anatomy of Cuvier) and a new biology (by the Philosophie Zoologique of Lamarck). The two great French scientists were quickly succeeded by two contemporary German scholars—Baer, the founder of the science of evolution, and Johannes Muller, the founder of comparative morphology and physiology. A pupil of Muller, Theodor Schwann, created the far-reaching cellular theory in 1838, in conjunction with M. Schleiden and Lyell had already traced the evolution of the earth to natural causes, and thus proved the application to our planet of the mechanical cosmology which Kant had sketched with so much insight in 1755. Finally, Robert Mayer and Helmholtz established the principle of energy in 1842—the second, complementary half of the great law of substance, the first half of which (the persistence of matter) had been previously discovered by Lavoisier. Forty years ago Charles Darwin crowned all these profound revelations of the intimate nature of the universe by his new theory of evolution, the greatest natural philosophical achievement of our century.

What is the relation of modern Christianity to this vast and unparalleled progress of science? In the first place, the deep gulf between its two great branches, conservative Protestantism and progressive Protestantism, has naturally widened. The ultimate clergy and we must associate with them the orthodox “evangelical alliance”), had naturally to offer a strenuous opposition to this rapid advance of the enlightened mind, they continued unmoved in their rigid literal belief, demanding the unconditional surrender of reason to dogma. Liberal Protestantism, on the other hand, took refuge in a kind of monistic pantheism and sought a means of reconciling two contradictory principles. It endeavoured to combine the unavoidable recognition of the established laws of nature, and the philosopher conclusions that followed from them, with a purified form of religion, in which scarcely anything remained of the distinctive teaching of faith. There were many attempts at compromise to be found between the two extremes, but the conviction rapidly spread that dogmatic Christianity had lost every foundation, and that only its valuable ethical contents should be saved for the new monistic religion of the twentieth century. As, however, the existing external forms of the dominant Christian religion remained unaltered, and as, in spite of a progressive political development, they are more intimately than ever connected with the practical needs of the State, there has arisen the widespread religious profession in educated spheres which we can only call “Pseudo-Christians”—at the bottom it is a “religion of the worst character. The great dangers which attend this conflict between sincere conviction and the hypocritical profession of modern pseudo Christians are admirably described in Max Nordau’s interesting work on The Conventional Lies of Civilization.
In the midst of this obvious falseness of prevalent pseudo Christianity there is one favourable circumstance for the progress of a rational study of nature, its most powerful and bitterest enemy, the Roman Church, threw off its mask of ostensible concern for higher mental development about the middle of the nineteenth century, and declared a guerre à outrance against independent science. This happened in three important challenges to reason, for the explicitness and absoluteness of which modern science and culture cannot but be grateful to the "Vicar of Christ". (1) In December, 1854, the Pope promulgated the dogma of the immaculate conception of Mary. (2) Ten years afterwards in December, 1864, the Pope published, in his famous encyclical "in absolute condemnation of the whole of modern civilisation and culture", the syllabus that accompanied it the enumerated and unnumbered all the rational theses and philosophical principles which were regarded by modern science as true truths. (3) Finally, six years afterwards—on July 13th, 1870—the militant head of the Church crowned his folly by claiming infallibility for himself and all his predecessors in the Papal crown. This triumph of the Roman curia was communicated to the astonished world five days afterwards, on the very day on which France declared war with Prussia. Two months later the temporal power of the Pope was taken from him in consequence of the war.

These three stupendous acts of the Papacy were such obvious assaults on the reason in the nineteenth century that they gave rise, from the very beginning, to most heated discussion even within orthodox Catholic circles. When the Vatican Council proceeded to define the dogma of infallibility on July 13th, 1870, only three fourths of the bishops declared in its favour, 451 out of 601 assenting, many other bishops, who wished to keep clear of the perilous definition, were absent from the Council. But the "benevolent Pontiff had calculated better than the timid "discreet Catholics." Even this extraordinary dogma was blindly accepted by the credulous and uneducated masses of the faithful.

The whole history of the Papacy, as it is substantiated by a thousand reliable sources and accessible documents, appears to the impartial student as an unrepenitent tissue of lying and deceit, a reckless pursuit of absolute mental despotism and secular power, a frivolous contradiction of all the high moral precepts which true Christianity enunciates—truth and tolerance, truth and chastity, poverty and self-denial. When we judge the long series of Popes, and the Roman princes of the Church, from whom the Pope is chosen, by the standard of pure Christian morality, it is clear that the majority of them were pitiful impostors, many of them utterly worthless and vicious. These well known historical facts, however, do not prevent millions of educated Catholics from admiring the infallibility which the Pope has claimed for himself. They do not prevent the Roman Church from going to Rome, and doing reverence to the Pontiff (their most dangerous enemy), they do not prevent the site of the German people from being entrusted to the hands of the servants and followers of this "pious impostor" in the Reichstag—thanks to the incredible political indolence and credulity of the nation.

The most interesting of the three great events by which the Papacy endeavoured to maintain and strengthen its despotism in the nineteenth century is the publication of the encyclical and the syllabus in December, 1864. In these remarkable documents all independent action was hidden from reason and science, and they were commended to submit implicitly to faith that is, to the decrees of the infallible Pope. The excitement which followed this sublime piece of effrontery in educated and independent circles was in proportion to the stupendous contrivance of the encyclical. Draper has given us an excellent discussion of its educational and political significance in his History of the Conflict between Science and Religion.

The dogma of the immaculate conception seems, perhaps, to be less audacious and significant than the encyclical and the dogma of the infallibility of the Pope. Yet not only the Roman hierarchy, but even some of the orthodox Protestants (such as the Evangelical Alliance of Germany, for instance), attach great importance to this thesis. What is known as the "immaculate oath"—that is, the confirmation of faith by an oath taken on the immaculate conception of Mary—is still regarded by millions of Christians as a sacred obligation. Many believers take the dogma in a twofold application; they think that the mother of Mary was impregnated by the Holy Ghost as well as Mary herself. Comparative and critical theology has recently shown that this myth has no greater claim to originality.
than most of the other stories in the
Christian mythology it has been borrowed
from older religions, especially Buddhism.
Similar myths were widely circulated in
India, Persia, Asia Minor, and Greece
several centuries before the birth of Christ.
Whenever a king's unwedded daughter, or
some other maid of high degree, gave birth
to a child, the father was always pronounced
to be a god, or a demi-god, in the Christian
case it was the Holy Ghost.

The special endowments of mind or body
which often distinguished these "love
children" above ordinary offspring were
thus put to use by the "beauty of the
Distinguished "sons of God" of this kind
were held in high esteem both in antiquity
and during the Middle Ages, while the
moral code of medieval civilization prohited
them with the same taint of punishment.

This apppellation more forcibly to daughters
of God, though the poor maidsens are just
as little to blame for their want of a father.
For the rest everyone who is familiar with
the beautiful mythology of classic antiquity
knows that these sons and daughters of the
Greek and Roman gods were often associated
with the highest ideals of humanity.
Recall the phrases of legitimacy and the
still more numerous illegitimate offspring
of Zeus.

To return to the particular question of the
imputation of the Virgin Mary by the
Holy Ghost as attested to the fact. The
only two evangelists who speak of it,
Matthew and Luke, relate in harmony
that the Virgin in the need of Mary was betrothed
to the carpenter Joseph but became
pregnant without his cooperation and,
indeed, "by the Holy Ghost" As we
have already related the four canonical
gospels which we regard as the only
genuine ones by the Christian Church, and
adopted as the foundation of faith, were
deliberately chosen from a much larger
number of gospels the detailed of which
cannot but differ sometimes or just as
futility is the selection of the four.
The fathers of the Church enumerate from
forty to fifty of these spurious or apocryphal
gospels some of them are written both in
Greek and Latin—for instance, the gospels
of James, of I hom, of Nicolaitans, and so
forth. The details which these apocryphal
gospels give of the life of Christ, especially
with regard to his birth and childhood,
have just as much on the whole just as
little claim to historical validity is the four
canonical gospels.

Now, we find in one of these documents
an historical statement, confirmed,
moreover, in the Book of I eschua, which
probably furnishes the simple and natural
solution of the "world riddle" of the
supernatural conception and birth of Christ.
The author, curiously as it seems, in one
sentence, the remarkable statement which contains
this solution — Josephus, the
Roman officer, to the Jewish legion which
was stationed in Judea, seduced Virgin of Bethlehem,
and was the father of Jesus. Other details
given about Virgin (the Hebrew name for
Mary) are far from being to the credit of
the Virgin of Heaven.

Naturally, these historical details are
carefully avoided by the official theologian,
but they are subtly presented, with the traditional
myth, and left the veil from its mystery in
an simple and natural fashion. It
makes it the more incumbent on impartial
research and pure reason to make a critical
examination of these statements. It must
be admitted that they have much more
title to evidence than all the other statements
about the birth of Christ. When,
under the principles of science, we put
aside the notion of supernatural conception
through an "overstanding of the Most
High," it is a pure myth that only remains
the widely accepted version of modern
Christian theology, that Joseph, the Jewish
 carpenter, was the true father of Christ.
But this illusion is explicitly contradicted by many texts of the gospels.
Christ himself said that he was
the "Son of Man," and he never recognized
his foster father Joseph as his real parent.
Joseph indeed wanted to leave his
brotherhood when he found her pregnant
without his interference. He gave up
this idea when an angel appeared to him in
his sleep and said him that it is expressly
stated in the first chapter of Matthew
(1:20-25), there was no sexual intercourse
between Joseph and Mary until after Jesus
was born.

The statement of the apocryphal gospels,
that the Roman officer Puidas was the
true father of Christ, seems all the more
credible when we make a careful anthropological
study of the personality of Christ. He is
generally regarded as purely Jewish
Yet the characteristics which distinguish
his high and noble personality, and which
give a distinctive impress to his religion,
are certainly not Semitish, they are rather
traits of the higher Asian race, and
especially of its noblest branch, the Hellenes.
Now, the name of Christ's real father,
"Pandora," points unequivocally to a Greek origin; in one manuscript, in fact, it is written "Pandora." Pandora was, according to the Greek mythology, the first woman, born of the earth by Vulcan and adorned with every charm by the gods, who was espoused by Epimetheus, and sent by Zeus to men with the dread "Pandora-box," containing every evil, in punishment for the stealing of divine fire from heaven by Prometheus.

And it is interesting to see the different reception that the love-story of Miriam has met with at the hands of the four great Christian nations of civilized Europe. The stern morality of the Teutonic races entirely repudiates it; the righteous German and the prudish Briton prefer to believe blindly in the impossible thesis of a conception "by the Holy Ghost." It is well known that this strenuous and carefully paraded prudery of the higher classes (especially in England) is by no means reflected in the true condition of sexual morality in high quarters. The revelations which the Pall Mall Gazette, for instance, made on the subject twelve years ago vividly recalled the condition of Babylon.

The Romantic races, which ridicule this prudery and take sexual relations less seriously, find Mary's Romance attractive enough; the special cult which "Our Lady" enjoys in France and Italy is often associated with this love-story with curious naivety. Thus, for example, Paul de Regla (Dr. Desjardins), author of Jesus of Nazareth considered from a Scientific, Historical, and Social Standpoint (1894), finds precisely in the illegitimate birth of Christ a special "title to the halo that irradiates his noble form."

It seemed to me necessary to enter fully into this important question of the origin of Christ in the sense of impartial historical science, because the Church militant itself lays great emphasis on it, and because it regards the miraculous structure which has been founded on it as one of its strongest weapons against modern thought. The high ethical value of pure primitive Christianity and the ennobling influence of this "religion of love" on the history of civilization are quite independent of those mythical dogmas. The so-called "revelations," on which these myths are based are incompatible with the finest results of modern science.

CHAPTER XVIII.

OUR MONISTIC RELIGION


Many distinguished scientists and philosophers of the day, who share our monistic views, consider that religion is generally played out. Their meaning is that the clear insight into the evolution of the world which the great scientific progress of the nineteenth century has afforded us will satisfy, not only the causal feeling of our reason, but even our highest emotional cravings. This view is correct in the sense that the two ideas, religion and science, would indeed blend into one if we had a perfectly clear and consecutive system of monism. However, there are but a few resolute thinkers who attain to this most pure and lofty conception of Spinoza and Goethe. Most of the educated people of our time (as distinct from the uncultured masses) remain in the conviction that religion is a separate branch of our mental life, independent of science and not less valuable and indispensable.

If we adopt this view, we can find a means of reconciling the two great and apparently quite distinct branches in the idea I put forward in "Monism, as a connecting-link between religion and science" in 1892. In the preface to this Confession of Faith of a Man of Science I expressed myself in the following words with regard to its double object: "In the first place, I must give expression to the rational system which is logically forced upon us by the recent progress of science; it dwells in the intimate thoughts of nearly every impartial and thoughtful scientist, though few have the courage or the disposition to avow it. In the second place, I would make of it a connecting-link between religion and science, and thus do away with the antithesis which has been needlessly main-
tained between these two branches of the highest activity of the human mind. The ethical craving of our emotion is satisfied by monism no less than by the logical demand for causality on the part of reason.”

The remarkable interest which the discourse enkindled is a proof that in this monistic profession of faith I expressed the feeling not only of many scientists, but of a large number of cultured men and women of very different circles. Not only was I rewarded by hundreds of sympathetic letters, but by a wide circulation of the printed address, of which six editions were required within six months. I had the more reason to be content with this unexpected success, as this “confession of faith” was originally merely an occasion in speech which I delivered unexpectedly on October 9th, 1862, at Altenburg, during the jubilee of the Scientific Society of Lower Saxony. Naturally there was the usual demonstration on the other side. I was fiercely attacked, not only by the ultra-montane press, the sworn defenders of superstition, but also by the “liberal” controversialists of evangelical Christianity, who profess to defend both scientific truth and purified faith. In the seven years that have elapsed since then the great struggle between modern science and orthodox Christianity has become more threatening, it has grown more dangerous for science in proportion as Christianity has found support in an increasing mental and political reaction. In some countries the Church has made such progress that the freedom of thought and conscience, which is guaranteed by the laws, is in practice gravely menaced for instance, in Bavaria. The great historic struggle which Díaz has so admirably depicted in his Conflict between Religion and Science is to-day more acute and significant than ever for the last twenty seven years it has been rightly called the “cultur kampf”.

The famous encyclical and syllabus which the militant Pope, Pius IX, sent out into the entire world in 1864 was a declaration of war on the whole of modern science, they demanded the blind submission of reason to the dogma of the infallible Pope. The severity of this crude assault on the highest treasures of civilization is caused by the number of innumerable minds from the slumber of belief. Together with the subsequent pronouncement of the Papal infallibility (1870), the encyclical provoked a deep wave of irritation and an energetic repulse which held out high hopes. In the new German empire, which had attained its indispensible national unity by the heavy sacrifices of the wars of 1866 and 1871, the insolent attacks of the Pope were felt to be particularly offensive. On the one hand, Germany is the cradle of the Reformation and the modern emancipation of reason; on the other hand, it unfortunately has in its 18,000,000 Catholics a vast host of militant believers, who are unsurpassed by any other civilized people in blind obedience to their chief shepherd.

The dangers of such a situation were clearly recognized by the great statesmen who had solved the political “world riddle” of the dismemberment of Germany, and had led us by a marvellous statecraft to the long desired goal of national unity and power. Prince Bismarck began the famous struggle with the Vatican, which is known as the cultur kampf, in 1872, and it was conducted with equal ability and energy by the distinguished Minister of Worship, Kalk, author of the May Laws of 1873. Unfortunately, Bismarck had to desist six years afterwards. Although the cultur kampf was a remarkable judge of men and realistic politician of immense tact, he had underestimated the force of these powerful obstacles. Firstly, the unsurpassed cunning and unscrupulous treachery of the Roman curia, secondly, the corruptive ingratitude and credulity of the uneducated Catholic masses, on which the Papacy built, and thirdly, the power of apathy, the continuance of the irrational, simply because it is in possession. Hence, in 1878, when the holy Leo XIII had ascended the pontifical throne, the fatal “To Canossa” was heard once more. From that time the newly established power of Rome grew in strength, partly through the unscrupulous intrigues and serpentine hands of its slippery Jesuitical politics, partly through the false Church politics of the German Government and the marvellous political incompetence of the German people. We have, therefore, at the close of the nineteenth century to endure the pitiful spectacle of the Catholic “Centre” being the most important section of the Reichstag, and the fate of our humiliated country depending on a Papal party, which does not constitute numerically a third part of the nation.

When the cultur kampf began in 1872, it was justly acclaimed by all independent thinkers as a political renewal of the Reformation, a vigorous attempt to free modern civilization from the yoke of Papal...
despotism. The whole of the Liberal press hailed Bismarck as a “political Luther”—as the great hero, not only of the national unity, but also of the rational emancipation, of Germany. Ten years afterwards, when the Papacy had proved victorious, the same Liberal press changed its colours and denounced the _cultur-kampf_ as a great mistake; and it does the same thing today. The facts show how short is the memory of our journalists, how defective their knowledge of history, and how poor their philosophic education. The so-called “Peace between Church and State” is never more than a suspension of hostilities. The modern Papacy, true to the despotic principles it has followed for the last 1,600 years, is determined to wield sole dominion over the credulous souls of men; it must demand the absolute submission of the cultured State, which, as such, defends the rights of reason and science. True and enduring peace there cannot be until one of the combatants lies powerless on the ground. Either the Church wins, and then farewell to all “free science and free teaching”—then are our universities no better than gaols, and our colleges become cloister schools; or else the modern rational State proves victorious—then, in the twentieth century, human culture, freedom, and prosperity will continue their progressive development until they far surpass even the height of the nineteenth century.

In order to compass these high aims, it is of the first importance that modern science not only shatter the false structures of superstition and sweep their ruins from the path, but that it also erect a new abode for human emotion on the ground it has cleared—a “palace of reason,” in which, under the influence of our new monistic views, we do reverence to the real trinity of the nineteenth century—the trinity of “the true, the good, and the beautiful.” In order to give a tangible shape to the cult of this divine ideal, we must first of all compare our position with the dominant forms of Christianity, and realise the changes that are involved in the substitution of the one for the other. For, in spite of its errors and defects, the Christian religion (in its primitive and purer form) has so high an ethical value, and has entered so deeply into the most important social and political movements of civilised history for the last 1,500 years, that we must appeal as much as possible to its existing institutions in the establishment of our monistic

religion. We do not seek a mighty revolution, but a rational reformation, of our religious life. And just as, 2,000 years ago, the classic poetry of the ancient Greeks incarnated their ideals of virtue in divine shapes, so may we, too, lend the character of noble goddesses to our three rational ideals. We must inquire into the features of the three goddesses of the monist—truth, beauty, and virtue; and we must study their relation to the three corresponding ideals of Christianity which they are to replace.

I.—The preceding inquiries (especially those of the first and third sections) have convinced us that truth unadulterated is only to be found in the temple of the study of nature, and that the only available paths to it are critical observation and reflection—the empirical investigation of facts and the rational study of their efficient causes. In this way we arrive, by means of pure reason, at true science, the highest treasure of civilised man. We must, in accordance with the arguments of our sixteenth chapter, reject what is called “revelation,” the poetry of faith, that affirms the discovery of truth in a supernatural fashion, without the assistance of reason. And since the entire structure of the Judæo-Christian religion, like that of the Mohammedan and the Buddhistic, rests on these so-called revelations, and these mystic fruits of the imagination directly contradict the clear results of empirical research, it is obvious that we shall only attain to a knowledge of the truth by the rational activity of genuine science, not by the poetic imagining of a mystic faith. In this respect it is quite certain that the Christian system must give way to the monistic. The goddess of truth dwells in the temple of nature, in the green woods, on the blue sea, and on the snowy summits of the hills—not in the gloom of the cloister, nor in the narrow prisons of our gaol-like schools, nor in the clouds of incense of the Christian Churches. The paths which lead to the noble divinity of truth and knowledge are the loving study of nature and its laws, the observation of the infinitely great star-world with the aid of the telescope, and the infinitely tiny cell-world with the aid of the microscope—not senseless ceremonies and unthinking prayers, not alms and Peter’s-pence. The rich gifts which the goddess of truth bestows on us are the noble fruits of the tree of knowledge and the inestimable treasure of a clear, unified view of the world—not belief in super-
natural miracles and the illusion of an eternal life.

II—It is otherwise with the divine ideal of eternal goodness. In our search for the truth we have entirely to exclude the "revelation" of the Churches, and devote ourselves solely to the study of nature, but, on the other hand, the idea of the good, which we call virtue, in our monastic religion coincides for the most part with the Christian idea of virtue. We are speaking, naturally, of the primitive and pure Christianity of the first three centuries, as far as we learn its moral teaching from the gospels and the epistles of Paul, it does not apply to the Vatican culture of that pure doctrine which has dominated European civilization, to its infinite prejudice, for 1,200 years. The best part of Christian morality, to which we firmly adhere, is represented by the hummest precepts of charity and tolerance, compassion and assistance. However, these noble commands, which we set down as "Christian" morality (in its best sense), are by no means original discoveries of Christianity; they were derived from earlier religions. The Golden Rule, which sums up these precepts in one sentence, is centuries older than Christianity. In the conduct of life this law of natural morality has been followed just as frequently by non-Christians and atheists as it has been neglected by pious believers. Moreover, Christian ethics was marred by the defect of a narrow insistence on altruism and a demnification of egoism. Our monastic ethics lays equal emphasis on the two, and finds perfect virtue in the just balance of love of self and love of one's neighbour (cf chap xix).

III—But monasticism is the strongest opposition to Christianity on the question of beauty. Primitive Christianity preached the worthlessness of earthly life, regarding it merely as a preparation for an eternal life beyond. Hence it immediately followed that all we find in the life of a man below, all that is beautiful in art and science, in public and in private life, is of no real value. The true Christian must avow his eyes from them; he must think only of a worthy preparation for the life beyond. Contempt of nature, aversion from all its inexhaustible charms, rejection of every kind of fine art, are Christian duties, and are carried out to perfection when a man secludes himself from his fellows, chastises his body, and spends all his time in prayers in the cloister or the hermit's cell.

History teaches us that this ascetical morality could not hold the whole of nature had, as a natural consequence, the very opposite effect to that it intended. Monasteries, the homes of chastity and discipline, soon became dens of the wildest orgies; the sexual commerce of monks and nuns has inspired some of the inspired works of novels, as it is so faithfully depicted in the literature of the Renaissance. The cult of the "beautiful," which was then practised, was in flagrant contradiction with the "abandonment of the world," and the same must be true of the pomp and luxury which soon developed in the immoral private lives of the higher ecclesiastics and in the artistic decoration of Christian churches and monasteries.

It may be objected that our view is refuted by the splendour of Christian art, which, especially in the best days of the Middle Ages, created works of undying beauty. The graceful Gothic cathedrals and Byzantine basilicas, the hundreds of magnificent churches, the thousands of marble statues of saints and martyrs, the millions of fine pictures of saints, of profoundly conceived representations of Christ and the Madonna—all are proofs of the development of a noble art in the Middle Ages, which is unique in its kind. All these splendid monuments of medieval art are untouched in their high artistic value, whatever we say of their mixture of truth and fancy. Yes, but what is all that to do with the pure teaching of Christianity—with that religion of sacrifice that turned scornfully away from all earthly pursuits and glamour, from all material beauty and art, that made light of the life of the family and the love of woman; that urged an exclusive concern as to the immaterial goods of eternal life? The idea of a Christian art is a contradiction in terms—a contradiction in adjecto. The utilitarian princes of the Church who fostered it were candidly aiming at very different ideals, and they completely attained them. In directing the whole interest and activity of the humankind in the Middle Ages to the Christian Church and its distinctive art they were diverting it from nature and from the knowledge of the treasures that were hidden in it, and would have conducted to independent science. Moreover, the daily sight of the huge images of the saints and of the scenes of "sacred history" continually reminded the faithful of the vast collection of myths that the Church had made. The legends themselves were
taught and believed to be true narratives, and the stories of miracles to be records of actual events. It cannot be doubted that in this respect Christian art has exerted an immense influence on general culture, and especially in the strengthening of Christian belief—an influence which still endures throughout the entire civilized world.

The diametrical opposite of this dominant Christian art is the new artistic tendency which has been developed during the present century in connection with science. The remarkable expansion of our knowledge of nature, and the discovery of countless beautiful forms of life which it includes, have awakened quite a new aesthetic sense in our generation, and thus given a new tone to painting and sculpture. Numerous scientific voyages and expeditions for the exploration of unknown lands and seas, put to the credit of the eighteenth and nineteenth centuries, but more especially in the nineteenth, have brought to light an undreamed abundance of new organic forms. The number of new species of animals and plants soon became enormous, and among them (especially among the lower groups that had been neglected before) there were thousands of forms of great beauty and interest, affording an entirely new inspiration for painting, sculpture, architecture, and technical art.

In this respect a new world was revealed by the great advance of microscopic research in the second half of the century, especially by the discovery of the marvellous inhabitants of the deep sea, which were first brought to light by the famous expedition of the Challenger (1872-6). Thousands of graceful and miscellaneous microorganisms, of pretty molluscs and corals, of extraordinary molluscs and corals, suddenly introduced us to a wealth of hidden organisms beyond all imagination, the peculiar beauty and diversity of which far transcend all the creations of the human imagination.

In the fifty large volumes of the account of the Challenger expedition a vast number of these beautiful forms are delineated on 3,000 plates, and there are millions of other lovely organisms described in other great works that are included in the fast-growing literature of zoology and botany of the last ten years. I began on a small scale to select a number of these beautiful forms for more popular description in my Art Forms in Nature (1899).

However, there is now no need for long voyages and costly works to appreciate the beauties of this world. A man need only keep his eyes open and his mind disciplined. Surrounding nature offers us everywhere a marvellous wealth of lovely and interesting objects of all kinds. In every bit of moss and blade of grass, in every beetle and butterfly, we find, when we examine it carefully, beauties which are usually overlooked. Above all, when we examine them with a powerful glass, or, better still, with a good microscope, we find everywhere in nature a new world of inexhaustible charms.

But the nineteenth century has not only opened our eyes to the aesthetic enjoyment of the microscopic world, it has shown us the beauty of the greater objects in nature. Even at its commencement it was the vision to regard the mountains as magnificent but forbidding, and the seas as sublime but dreaded. At its close the majority of educated people—especially they who dwell in the great cities—are delighted to enjoy the glories of the Alps and the crystal splendour of the glacier world for a footnight every year, or to drink in the majesty of the ocean and the lovely scenery of its coasts. All these sources of the kindest enjoyment of nature have only recently been revealed to us in all their splendour, and the remarkable progress we have made in facility and rapidity of conveyance has given even the less wealthy an opportunity of approaching them. All this progress in the aesthetic enjoyment of nature and, proportionately, in the scientific understanding of nature—implies an equal advance in higher mental development, and, consequently, in the direction of our monistic religion.

The opposite character of our natural era to that of the anthropoid centuries that preceded is especially noticeable in the different appreciation and spread of illustrations of the most diverse natural objects. In our own days a lively interest in artistic work of that kind has been developed, which did not exist in earlier ages; it has been supported by the remarkable progress of commerce and technical art which have facilitated a wide popularization of such illustrations. Countless illustrated periodicals convey along with their general information a sense of the inexhaustible beauty of nature in all its departments. In particular, landscape-painting has acquired an importance that surpassed all imagination. In the first half of the century one of our greatest and most erudite scientists, Alexander Humboldt, had pointed out that the development of modern landscape painting
is not only of great importance as an incentive to the study of nature and as a means of geographical description, but that it is to be commended in other respects as a noble educative medium. Since that time the taste for it has considerably increased. It should be the aim of every school to teach the children to enjoy science, not at an early age, and to give them the valuable art of imprinting on the memory by a drawing or water-colour sketch.

The infinite wealth of nature in what is beautiful and sublime offers every man with open eyes and an aesthetic sense an incalculable sum of choice gifts. Still, however valuable and agreeable is the immediate enjoyment of each single gift, its worth is doubled by a knowledge of its meaning and its connection with the rest of nature. When Humboldt gave us the "outline of a physical description of the world" in his magnificent Cosmos forty years ago, and when he combined scientific and aesthetic considerations so happily in his standard Prose of Nature, he justly indicated how closely the higher enjoyment of nature is connected with the "scientific establishment of cosmic laws," and that the conjunction of the two serves to raise human nature to a higher stage of perfection. The astonishment with which we gaze upon the starry heavens and the microscopic life in a drop of water, the awe with which we trace the marvellous working of energy in the motion of matter, the reverence with which we grasp the universal dominion of the law of substance throughout the universe—all these are part of our emotional life, filling under the heading of "natural religion".

This progress of modern times in knowledge of the true and enjoyment of the beautiful expresses, on the one hand, a valuable element of our monistic religion, but is, on the other, in fatal opposition to Christianity. For the human mind is thus made to live on this side of the grave, Christianity would have it ever gaze beyond Monism teaches that we are perishable children of the earth, who, for one or two, or, at the most, three generations, have the good fortune to enjoy the treasures of our planet, to drink of the inexhaustible fountain of its beauty, and to trace out the marvellous play of its forces. Christianity would teach us that the earth is "a vale of tears," in which we have but a brief period to chasten and torment ourselves in order to merit the life of eternal bliss beyond.

While this "beyond" is, and of what joys the glory of this eternal life is compacted, no revelation has ever told us. As long as "heaven" was thought to be the blue vault that hovers over the disk of our planet, and is illumined by the twinkling light of a few thousand stars, the human imagination could picture to itself the ambrosial banquets of the Olympian gods above or the lamen tables of the happy dwellers in Valhalla. But now all these duties and the immortal souls that sat at their tables are "houseless and homeless," as David Strauss has so ably described; for we know from astrophysical science that the immeasurable depths of space are filled with a prosaic ether, and that millions of heavenly bodies, ruled by eternal laws of iron, rush hither and thither in the great ocean, in their endless rhythm of life and death.

The places of devotion, in which men seek the satisfaction of their religious emotions and worship the objects of their reverence, are regarded as sacred "churches." The pagodas of Buddhist Asia, the Greek temples of classical antiquity, the synagogues of Palestine, the mosques of Egypt, the Catholic cathedrals of the south, and the Protestant cathedrals of the north, of Europe—all these "houses of God" serve to raise man above the misery and the prose of daily life, to lift him into the sacred, poetic atmosphere of a higher, ideal world. They attain this end in a thousand different ways, according to the various forms of worship and race. The modern man who "has science and art," and therefore "religion," needs no special church, no narrow, enclosed portion of space. For through the length and breadth of free nature, wherever he turns his gaze, to the whole universe or to any single part of it, he finds, indeed, the grim struggle for life, but by its side are ever "the good, the true, and the beautiful"; his church is commensurate with the whole of glorious nature. Still, there will always be men of special temperament who will desire to have decorated temples or churches as places of devotion to which they may withdraw. Just as the Catholics had to relinquish a number of churches to the Reformation in the sixteenth century, so a still larger number will pass over to "free societies" of monists in the coming years.
CHAPTER XIX.

OUR MONISTIC ETHICS


The practical conduct of life makes a number of definite ethical claims on a man which can only be duly and naturally satisfied when they are in complete harmony with his view of the world. In accordance with this fundamental principle of our monistic philosophy, our whole system of ethics must be rationally connected with the unified conception of the cosmos which we have formed by our advanced knowledge of the laws of nature. Just as the infinite universe is one great whole in the light of our monistic teaching, so the spiritual and moral life of man is a part of this cosmos, and our naturalistic ordering of it must also be monistic. There are not two different, separate worlds—the one physical and material, and the other moral and immaterial.

The great majority of philosophers and theologians still hold the contrary opinion. They affirm, with Kant, that the moral world is quite independent of the physical, and is subject to very different laws; hence, a man's conscience, as the basis of his moral life, must also be quite independent of our scientific knowledge of the world, and must be based rather on his religious faith. On that theory the study of the moral world belongs to practical reason, while that of nature, or of the physical world, is referred to pure or theoretical reason. This unequivocal and conscious dualism of Kant's philosophy was its greatest defect; it has caused, and still causes, incalculable mischief. First of all the "critical Kant" had built up the splendid and marvellous palace of pure reason, and convincingly proved that the three great central dogmas of metaphysics—a personal God, free will, and the immortal soul—had no place whatever in it; and that no rational proof could be found of their reality. Afterwards, however, the "dogmatic Kant" superimposed on this true crystal palace of pure reason the glittering, ideal castle in the air of practical reason, in which three imposing church-naves were designed for the accommodation of those three great mystic divinities. When they had been put out at the front door by rational knowledge they returned by the back door under the guidance of irrational faith.

The cupola of his great cathedral of faith was crowned by Kant with his curious idol, the famous "categorical imperative." According to it, the demand of the universal moral law is unconditional, independent of any regard to actuality or potentiality. It runs: "Act at all times in such wise that the maxim (or the subjective law of thy will) may hold good as a principle or a universal law." On that theory all normal men would have the same sense of duty. Modern anthropology has ruthlessly dissipated that pretty dream; it has shown that conceptions of duty differ even more among uncivilised than among civilised nations. All the actions and customs which we regard as sins or loathsome crimes (theft, fraud, murder, adultery, etc.) are considered by other nations in certain circumstances to be virtues, or even sacred duties.

Although the obvious contradiction of the two forms of reason in Kant's teaching, the fundamental antagonism of pure and practical reason, was recognised and attacked at the very beginning of the century, it is still pretty widely accepted. The modern school of neo-Kantians urges a "return to Kant," so pressingly precisely on account of this agreeable dualism; the Church militant zealously supports it because it fits in admirably with its own mystic faith. But it met with an effective reverse at the hands of modern science in the second half of the nineteenth century, which entirely demolished the theses of the system of practical reason. Monistic cosmology proved, on the basis of the law of substance, that there is no personal God; comparative and genetic psychology showed that there cannot be an immortal soul; and monistic physiology proved the futility of the assumption of "free will." Finally, the science of evolution made it clear that the same eternal iron laws that rule in the inorganic world are valid, too, in the organic and moral world.
But modern science gives not only a negative support to practical philosophy and ethics in demolishing the Kantian dualism, but it renders the positive service of substituting for it the new structure of ethical monism. It shows that the feeling of duty does not rest on an illusory "categorical imperative," but on the solid ground of social instinct, as we find in the case of all social animals. It regards as the highest aim of all morality the re-establishment of a sound harmony between egoism and altruism, between self-love and the love of one's neighbour. It is to the great English philosopher, Herbert Spencer,\(^1\) that we owe the founding of this monistic ethics on a basis of evolution.

Man belongs to the social vertebrates, and has, therefore, like all social animals, two sets of duties: firstly to himself, and secondly to the society to which he belongs. The former are the behoofess of self-love or egoism, the latter of love for one's fellows or altruism. The two sets of precepts are equally just, equally natural, and equally indispensable. If a man desire to have the advantage of living in an organised community, he has to consult not only his own fortune, but also that of the society, and of the "neighbours" who form the society. He must realise that its prosperity is his own prosperity, and that it cannot suffer without his own injury. This fundamental law of society is so simple and so inevitable that one cannot understand how it can be contradicted in theory or in practice; yet that is done to-day, and has been done for thousands of years.

The equal appreciation of these two natural impulses, or the moral equivalence of self-love and love of others, is the chief and the fundamental principle of our morality. Hence the highest aim of all ethics is very simple — it is the re-establishment of "the natural equality of egoism and altruism, of the love of oneself and the love of one's neighbour." The Golden Rule says: "Do unto others as you would that they should do unto you." From this highest precept of Christianity it follows of itself that we have just as sacred duties towards ourselves as we have towards our fellows. I have explained my conception of this principle in my Monism, and laid down three important theses. (1) Both these concurrent impulses are natural laws of equal importance and necessity for the preservation of the family and the society; egoism secures the self-preservation of the individual, altruism that of the species which is made up of the chain of perishable individuals. (2) The social duties which are imposed by the social structure of the associated individuals, and by means of which it secures its preservation, are merely higher evolutionary stages of the social instincts, which we find in all higher social animals (as "habits which have become hereditary"). (3) In the case of civilised man all ethics, theoretical or practical, being "a science of rules," is connected with his view of the world at large, and consequently with his religion.

From the recognition of the fundamental principle of our morality we may immediately deduce its highest precept, that noble command which is often called the Golden Rule of morality, or, briefly, the Golden Rule. Christ repeatedly expressed it in the simple phrase: "Thou shalt love thy neighbour as thyself." Mark adds that "there is no greater commandment than this," and Matthew says: "In these two commandments is the whole law and the prophets." In this greatest and highest commandment our monistic ethics is completely at one with Christianity. We must, however, recall the historical fact that the formulation of this supreme command is not an original merit of Christ, as the majority of Christian theologians affirm and their uncritical supporters blindly accept. The Golden Rule is 500 years older than Christ; it was laid down as the highest moral principle by many Greek and Oriental sages. Pittacus of Mytilene, one of the seven wise men of Greece, said 620 years before Christ: "Do not that to thy neighbour that thou wouldst not suffer from him." Confucius, the great Chinese philosopher, was an ethical and religious founder who rejected the idea of a personal God and of the immortality of the soul, said 500 years B.C.: "Do to every man as thou wouldst have him do to thee; and do not to another what thou wouldst not have him do to thee. This precept only dost thou need; it is the foundation of all other commandments." Aristotle taught, about the middle of the fourth century B.C.: "We must act towards others as we wish others to act towards us." In the same sense, and partly in the same words, the Golden Rule was given by Thales, Isocrates, Aristippus, Séxtus the Pythagorean, and other philo-

\(^1\) Professor Haeckel places Mr. Spencer's works at the head of the bibliography in the German edition. We have omitted these lists, as they are chiefly German. —TRANSL.
sophers of classic antiquity—several centuries before Christ. From this collection it is clear that the Golden Rule had a polyphyletic origin—that is, it was formulated by a number of philosophers at different times and in different places quite independently of each other. Otherwise it must be assumed that Jesus derived it from some other oriental source, from ancient Semitic, Indian, Chinese, or especially Buddhistic traditions, as has been proved in the case of most of the other Christian doctrines.

As the great ethical principle is thus 2,500 years old, and as Christianity itself has put it at the head of its moral teaching as the highest and all-embracing commandment, it follows that our monistic ethics is in complete harmony on this important point, not only with the ethics of the ancient heathens, but also with that of Christianity. Unfortunately this harmony is disturbed by the fact that the gospels and the Pauline epistles contain many other points of moral teaching, which contradict our first and supreme commandment. Christian theologians have fruitlessly striven to explain away these striking and painful contradictions by their ingenious interpretations. We need not enter into that question now, but we must briefly consider those unfortunate aspects of Christian ethics which are incompatible with the better thought of the modern age, and which are distinctly injurious in their practical consequences. Of that character is the contempt which Christianity has shown for self, for the body, for nature, for civilisation, for the family, and for woman.

I.—The supreme mistake of Christian ethics, and one which runs directly counter to the Golden Rule, is its exaggeration of love of one’s neighbour at the expense of self-love. Christianity attacks and despises egoism on principle. Yet that natural impulse is absolutely indispensable in view of self-preservation; indeed, one may say that even altruism, its apparent opposite, is only an enlightened egoism. Nothing great or elevated has ever taken place without egoism, and without the passion that urges us to great sacrifices. It is only the excesses of the impulse that are injurious. One of the Christian precepts that were impressed upon us in our early youth as of great importance, and that are glorified in millions of sermons, is: “Love your enemies, bless them that curse you, do good to them that hate you, and pray for them which despitefully use you and persecute you.” It is a very ideal precept, but as useless in practice as it is unnatural. So it is with the counsel, “If any man will take away thy coat, let him have thy cloak also.” Translated into the terms of modern life, that means: “When some unscrupulous scoundrel has defrauded thee of half thy goods, let him have the other half also.”

Or, again, in the language of modern politics: “When the pious English take from you simple Germans one after another of your new and valuable colonies in Africa, let them have all the rest of your colonies also—or, best of all, give them Germany itself.” And, while we touch on the marvellous world-politics of modern England, we may note in passing its direct contradiction of every precept of Christian charity, which is more frequently on the lips of that great nation than of any other nation in the world. However, the glaring contradiction between the theoretical, ideal, altruistic morality of the human individual and the real, purely selfish morality of the human community, and especially of the civilised Christian state, is a familiar fact. It would be interesting to determine mathematically in what proportion among organised men the altruistic ethical ideal of the individual changes into its contrary, the purely egoistic “real politics” of the state and the nation.

II.—Since the Christian faith takes a wholly dualistic view of the human organism and attributes to the immortal soul only a temporary sojourn in the mortal frame, it very naturally sets a much greater value on the soul than on the body. Hence results that neglect of the care of the body, of training, and of cleanliness, which contrasts the life of the Christian Middle Ages so unfavourably with that of pagan classical antiquity. Christian ethics contains none of those firm commands as to daily ablutions which are theoretically laid down and practically fulfilled in the Mohammedan, Hindoo, and other religions. In many monasteries the ideal of the pious Christian is the man who does not wash and clothe himself properly, who never changes his malodorous gown, and who, instead of regular work, fills up his useless life with mechanical prayers, senseless fasts, and so forth. As a special outgrowth of this contempt of the body we have the disgusting discipline of the flagellants and other ascetics.

III.—One source of countless theoretical errors and practical blemishes, of deplorable crudity and privation, is found in the false
anthropism of Christianity—that is, in the unique position which it gives to man, as the image of God, in opposition to all the rest of nature. In this way it has contributed, not only to an extremely injurious isolation from our glorious mother “nature,” but also to a regrettable contempt of all other organisms. Christianity has no place for that well-known love of animals, that sympathy with the nearly related and friendly mammals (dogs, horses, cattle, etc.), which is urged in the ethical teaching of many of the old religions, especially Buddhism. Who ever has spent much time in the south of Europe must have often witnessed those frightful sufferings of animals which fill us friends of animals with the deepest sympathy and indignation. And when one expositulates with these brutal “Christians” on that cruelty, the only answer is, with a laugh “But the beasts are no Christians.” Unfortunately this gave some support to the error in its birth that man only has a sensitive soul, not the animal.

How much more elevated is on monistic ethics than the Christian in this regard! Darwinism teaches us that we have descended immediately from the primates, and, in a second sense, from a longer series of earlier mammals, and that therefore, they are “our brothers,” physiology informs us that they have the same nerves and sense organs as we, and the same feelings of pleasure and pain. No sympathetic monistic scientist would ever be guilty of that brutal treatment of animals which comes so lightly to the Christian in his anthropomorphic illusion to the “child of the God of love.” Moreover, this Christian contempt of nature on principle deprives man of an abundance of the highest earthly joys, especially of the keen, ennobling enjoyment of nature.

IV. Since, according to Christianity, our planet is a “last of tears,” and our earthly life is valueless and mere preparation for a better life to come, it has succeeded in inducing men to sacrifice all happiness on this side of eternity and make light of all earthly goods. Among these “earthly goods,” in the case of modern civilised man, we must include the countless great and small conveniences of technical science, hygiene, commerce, etc., which have made modern life cheerful and comfortable; we must include all the gratifications of painting, sculpture, music, and poetry, which flourished exceedingly even during the Middle Ages (in spite of its principles) and which we esteem as “ideal pleasures,” we must include all that invaluable progress of science, especially of the study of nature, of which the nineteenth century is justly proud. All these “earthly goods,” that have so high a value in the eyes of the moment, are worthless—to say, injurious—for the most part, according to Christian teaching, the stern code of Christian morals should look just as unfavourably on the pursuit of these pleasures as our humanistic ethics fosters and encourages it. Once more, therefore, Christianity is found to be an enemy to civilisation, and the struggle which modern thought and science are compelled to conduct with it is, in this additional sense, a “cultic leap.”

V. Another of the most deplorable aspects of Christian morality is its belittlement of the life of the family, of that natural living together with our next of kin which is just as necessary in the case of man as in the case of all the higher social animals. The family is justly regarded as the foundation of society, and the healthy life of the family is a necessary condition of the prosperity of the State. Christ, however, was of a very different opinion; with his gaze ever directed “to the beyond,” he thought as lightly of woman and the family as of all other goods of “this life.” Of his inconstant contact with his parents and sisters the Gospels have very little to say, but they are far from representing his relations with his mother to have been so tender and intimate as they are poetically depicted in so many thousands of pictures. He was not united himself “sexually,” the first foundation of the family union, seems to have been regarded by Jesus as a necessary evil. His most enthusiastic apostle, Paul, went still further in the same direction, declaring it to be better not to marry than to marry; “It is good for a man not to touch a woman.” If humanity were to follow this excellent counsel, it would soon be rid of all earthly misery and suffering, it would be killed off by such a “culmic cure” within half a century.

VI. As Christ never knew the love of woman, he had no personal acquaintance with that feminine of man’s true nature that comes only from the intimate life of man with woman. The intimate sexual union, on which the preservation of the human race depends, is just as important on that account as the spiritual penetration of the two sexes, or the mutual complement which they bring to each other in the practical
wants of daily life as well as in the highest
ideal functions of the soul. For man and
woman are two different organisms, equal
in worth, each having its characteristic
virtues and defects. As civilization advanced,
this ideal value of sexual love was more
appreciated, and women held in higher
honour, especially among the Teutonic
races; she is the inspiring source of the
highest achievements of art and poetry.
But Christ was as far from this view as
nearly the whole of antiquity, he shied
the idea that prevailed everywhere in the
East—that woman is subordinate to man,
and intercourse with her is "unnatural.
Long-suffering nature has taken a useful
revenge for this blunder; its sad conse-
quences are written in hot blood in the
history of the papal Middle Ages.
The marvellous hierarchy of the Roman
Church, that never declined any means of
strength; its spiritual despotism, found
an exceptionally powerful instrument in the
manipulation of this "unnatural" idea, and
in the promotion of the ascetic notion that
abstinence from intercourse with women is
a virtue of itself. In the first few centuries
after Christ a number of priests voluntarily
abstained from marriage, and the supposed
value of this celibacy soon rose to such a
degree that it was obligatory. In the
Middle Ages the seduction of women of
good repute and of their daughters by
Catholic priests (the confessional was an
active agency in the business) was a public
scandal; many communities, in order to
prevent such things, pressed for a license of
concubinage to be given to the clergy.
And it was done in many, and sometimes
very romantic, ways. Thus, for instance,
the canon law that the priest's cook
should not be less than forty years old
was very cleverly "explained" in the sense
that the priest might have two cooks, one in
the presbytery, another without, if one was
twenty four and the other eighteen, that
made forty-two together—two years above
the prescribed age. At the Christian coun-
cils, at which heretics were burned alive, the
cardinals and bishops sat down with whole
troops of prostitutes. The private and
public debauchery of the Catholic clergy
was so scandalous and dangerous to the
commonwealth that there was a general
rebellion against it before the time of
Luther, and a loud demand for a "refor-
mation of the Church in head and
members." It is well known that these
immoral relations still continue in Roman
Catholic lands, although more in secret
Formerly, proposals were made from time
to time for the definite abrogation of cel-
bicy, as was done, for instance, in the
chambers of Baden, Bavaria, Hesse,
Saxony, and other lands; but they have,
unfortunately, hitherto proved unavailing.
In the German Reichstag, in which the
ultramontane Centre is now proposing the
most ridiculous measures for the suppres-
sion of sexual immorality, there is now no
party that will urge the abolition of celibacy
in the interest of public morality. The so-
called "Freethought" Party and the utopian
social democracy coquettes with the favour
of the Centre.
The modern state that would lift not
only the material, but the moral, life of
its people to a higher level is entitled to,
indeed bound, to sweep away such unwor-
thy and harmful conditions. The
obligatory celibacy of the Catholic clergy
is as pernicious and immoral as the prac-
tice of annual confession or the sale of
indulgences. All these have nothing what-
ever to do with primitive Christianity. All
these are directly opposed to true Chris-
tian morality. All these are disgraceful
inventions of the Papacy designed for the
sole purpose of strengthening its despotism
over the credulous masses and making
as much material profit as possible out of
them.

The Nemesis of history will sooner or
later exact a terrible account of the Roman
Papacy, and the millions who have been
robbed of their happiness by this degener-
ate religion will help to give it its death-
blow in the coming twentieth century—at
least in (very) truly civilized state. It has
been recently calculated that the number of
men who lost their lives in the Papal per-
suasions of heretics, the Inquisition, the
Christian religious wars, etc., is much more
than 10,000,000. But what is this in com-
parison with the tenfold greater number of
the unfortunate moral victims of the institu-
tions and the priestly domination of the
degenerate Christian Church—with the
unnumbered millions, whose higher mental
life was extinguished, whose conscience
was tortured, whose family life was de-
stroyed, by the Church? We may with
truth apply the words of Goethe, in his
Bride of Corinth—

"Victims fall, nor lambs nor bulls,
But human victims numberless."

In the great cultural Kampf, which must
go on as long as these sad conditions exist,
the first aim must be the absolute separation
of Church and State. There shall be a "free Church in a free State"—that is, every Church shall be free in the practice of its special worship and ceremonies, and in the construction of its fantastic poetry and superstitious dogmas—with the sole condition that they contain no danger to social order or morality. Then there will be equal rights for all. Free societies and monistic religious bodies shall be equally tolerated, and just as free in their movements as Liberal Protestant and orthodox ultramontane congregations. But for all these "faithful" of the most diverse sects religion will have to be a private concern. The State shall supervise them and prevent excesses, but it must neither oppress nor support them. Above all, the state shall not be compelled to contribute to the support and spread of a "faith" which they honestly believe to be a harmful superstition. In the United States such a complete separation of Church and State has long been accomplished, greatly to the satisfaction of all parties. They have also the equally important separation of the Church from the school, that is, undoubtedly, a powerful element in the great advance which science and culture have recently made in America.

It goes without saying that this exclusion of the Church from the school only refers to its sectarian principles, the particular form of belief which each Church has evolved in the course of its life. This sectarian education is a purely private concern, and should be left to parents and tutors, or to such priests or teachers as may have the personal confidence of the parents. Instead of the rejected sectarian instruction, two important branches of education will be introduced—monistic or humanist ethics and comparative religion. During the last thirty years an extensive literature has appeared dealing with the new system of ethics which has been used on the basis of modern science—especially evolutionary science. Comparative religion will be a natural companion to the actual elementary instruction in "biblical history" and in the mythology of Greece and Rome. Both of these will remain in the curriculum. The reason for that is obvious enough, the whole of our painting and sculpture, the chief branches of monistic aesthetics, are intimately blended with the Christian, Greek, and Roman mythologies. These will only be this important difference—that the Christian myths and legends will not be taught as truths, but as poetic fancies,

like the Greek and Roman myths; the high value of the ethical and aesthetic material they contain will not be lessened, but increased, by this means. As regards the Bible, the "book of books" will only be given to the children in carefully selected extracts (a sort of "school Bible"), in this way we shall avoid the besmirching of the child's imagination with the unclean stories and passages which are so numerous in the Old Testament.

Once the modern State has freed itself and its schools from the fetters of the Church, it will be able to devote more attention to the improvement of education. The incalculable value of a good system of education has forced itself more and more upon us as the many aspects of modern civilized life have been enlarged and enriched in the course of the century. But the development of educational methods has by no means kept pace with life in general. The necessity for a comprehensive reform of our schools is making itself felt more and more. On this question, too, a number of valuable works have appeared in the course of the last forty years. We shall restrict ourselves to making a few general observations which we think of special importance.

1 In all education up to the present time man has played the chief part, and especially the grammatical study of his language, the study of nature was entirely neglected.

2 In the school of the future nature will be the chief object of study; man shall learn a correct view of the world he lives in, he will not be made to stand outside and opposed to nature, but be represented as its highest and noblest product.

3 The study of the classical tongues (Latin and Greek), which has hitherto absorbed most of the pupil's time and energy, is indeed valuable, but it will be much restricted, and confined to the mere elements (obligatory for Latin, optional for Greek).

4 In consequence, modern languages must be all the more cultivated in all the higher schools (German, English, and French to be obligatory, Italian optional).

5 Historical instruction must pay more attention to the infernal mental and spiritual life of a nation, and to the development of its civilization, and less to its external history (the vicissitudes of dynasties, wars, and so forth).

6 The elements of evolutionary science must be learned in conjunction with
cosmology, geology must go with geography, and anthropology with biology.

7. The first principles of biology must be familiar to every educated man; the modern training in observation furnishes an attractive introduction to the biological sciences (anthropology, zoology, and botany). A start must be made with descriptive system (in conjunction with etymology or biometry); the elements of anatomy and physiology to be added later on.

8. The first principles of physics and chemistry must also be taught, and their exact establishment with the aid of mathematics.

9. Every pupil must be taught to draw well, and from nature; and, wherever it is possible, the use of water colours. The execution of drawings and of water-colour sketches from nature (of flowers, animals, landscapes, clouds, etc.) not only excites interest in nature and helps memory to enjoy objects, but it gives the pupil his first lesson in seeing correctly and understanding what he has seen.

10. Much more care and time must be devoted than has been done hitherto to corporal exercise, to gymnastics and swimming; but it is especially important to have walks in common every week, and journeys on foot during the holidays. The lesson in observation which pupils obtain in this way is invaluable.

The chief aim of higher education up to the present time, in most countries, has been a preparation for the subsequent profession, and the acquisition of a certain amount of information and direction for civic duties. The school of the twentieth century will have for its main object the formation of independent thought, the clear understanding of the knowledge acquired, and an insight into the natural connection of phenomena. If the modern State gives every citizen a vote, it should also give him the means of developing his reason by a proper education, in order to make a rational use of his vote for the common weal.

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CHAPTER XX

SOLUTION OF THE WORLD-PROBLEMS


At the close of our philosophic study of the riddles of the universe we turn with confidence to the answer to the momentous question, How nearly have we approached to a solution of them? What is the value of the immense progress which the nineteenth century has made in the knowledge of nature? And what prospect does it open out to us for the future, for the further development of our system in the twentieth century? Every unprejudiced thinker who impartially considers the solid progress of our empirical science, and the unity and clearness of our philosophical interpretation of it, will share our view: the nineteenth century has made greater progress in knowledge of the world and in grasp of its nature than all its predecessors; it has solved many great problems that seemed insoluble a hundred years ago; it has opened out to us new provinces of learning, the very existence of which was unsuspected at the beginning of the century. Above all, it has put clearly before our eyes the lofty aim of monistic cosmology, and has pointed out the path which alone will lead us towards it—the way of the exact empirical investigation of facts, and of the critical, genetic study of their causes. The great abstract law of mechanical causality, of which our cosmological law—the law of substance—is but another and a concrete expression, now rules the entire universe, as it does the mind of man; it is the steady, immovable pole-star, whose clear light falls on our path through the dark labyrinth of the countless separate phenomena. To see the truth of this more clearly, let us cast a brief glance at the astonishing progress which the chief branches of science have made in this remarkable period.

I.—PROGRESS OF ASTRONOMY.

The study of the heavens is the oldest, the study of man the youngest, of the sciences. With regard to himself and the character of his being man only obtained a
clear knowledge in the second half of the present century, with regard to the starry heavens, the motions of the planets, and so on, he had acquired astonishing information 4,500 years ago. The ancient Chinese, Hindus, Egyptians, and Chaldeans in the distant East knew more of the science of the spheres than the majority of educated Christians did in the West 4,000 years after them. An eclipse of the sun was astronomically observed in China in the year 2697 b.c., and the plane of the ecliptic was determined by means of a gnomon 1,100 years B.C., while Christ himself had no knowledge whatever of astronomy—indeed, he looked upon heaven and earth, nature and man, from the very narrowest geo-centric and anthropocentric point of view. The greatest advance of astronomy is generally, and rightly, said to be the founding of the heliocentric system of Copernicus, whose famous work, De Revolutionibus Orbium Celestium, of itself caused a profound revolution in the minds of thoughtful men. In overthrowing the Ptolemaic system he destroyed the foundation of the Christian theory, which regarded the earth as the centre of the universe and man as the god like ruler of the earth. It was natural, therefore, that the Christian clergy, with the Pope at its head, should enter upon a fierce struggle with the invaluable discovery of Copernicus. Yet it soon cleared a path for itself, when Kepler and Galileo grounded it on their true “mechanics of the heavens,” and Newton gave it a solid foundation by his theory of gravitation (1686).

A further great advance, comprehending the entire universe, was the application of the idea of evolution to astronomy. It was done by the youthful Kant in 1755, in his famous general natural history and theory of the heavens he undertook the discussion, not only of the “constitution,” but also of the “mechanical origin” of the whole world-structure on Newtonian principles. The splendid Systeme du Monde of Laplace, who had independently come to the same conclusions as Kant on the world problem, gave so him a basis to this new Mecanique Celestie in 1796 that it looked as if nothing entirely new of equal importance was left to be discovered in the nineteenth century. Yet here again it had the honour of opening out entirely new paths and infinitely enlarging our outlook on the universe. The invention of photography and photometry, and especially of spectrum analysis (in 1860 by Bunsen and Kirchoff), introduced physics and chemistry into astronomy and led to cosmological conclusions of the utmost importance. It was now made perfectly clear that matter is the same throughout the universe, and that its physical and chemical properties in the most distant stars do not differ from those of the earth under our feet.

The monistic conviction, which we thus arrived at, of the physical and chemical unity of the entire cosmos is certainly one of the most valuable general truths which we owe to physics, the new branch of astronomy which is honorably associated with the name of Friedrich Zollner. Not less important is the clear knowledge we have obtained that the same laws of mechanical development which we have on the earth rule throughout the infinite universe. A vast, all-embracing metamorphosis goes on continuously in all parts of the universe, just as it is found in the geological history of the earth, it can be traced in the evolution of its living inhabitants as surely as in the history of peoples or in the life of each human individual. In one part of space we perceive, with the aid of our best telescopes, vast nebulae of glowing, infinitely attenuated gas, we see them the embryos of heavenly bodies, billions of miles away, in the first stage of their development. In some of these stellar embryos the chemical elements do not seem to be differentiated yet, but still to be buried in the homogeneous primordial matter (prothyl) at an enormous temperature (calculated to run into millions of degrees). It is possible that the original basic “substance” (vind. p 81) is not yet divided into ponderable and imponderable matter. In other parts of space we find stars that have cooled down into glowing fluid, and yet others that are cold and rigid, we can tell their stage of evolution approximately by their colour. We find stars that are surrounded with rings and moons like Saturn, and we recognize in the luminous ring of the nebula the embryo of a new moon, which has detached itself from the mother planet, just as the planet was released from the sun.

Many of the stars, the light of which has taken thousands of years to reach us, are certainly suns like our own mother-sun, and are gilt about with planets and moons, just as in our own solar system. We are justified in supposing that thousands of these planets are in a similar stage of development to that of our earth—that is, they have arrived at a period when the
temperature of the surface lies between the freezing and boiling point of water, and so permits the existence of water in its liquid condition. That makes it possible that carbon has entered into the same complex combinations on those planets as it has done on our earth, and that from its nitrogenous compounds protoplasm has been evolved—that wonderful substance which alone, as far as our knowledge goes, is the possessor of organic life. The monera (for instance, chromacea and bacteria), which consist only of this primitive protoplasm, and which arise by spontaneous generation from these inorganic nitrogenates, may thus have entered upon the same course of evolution on many other planets as on our own, first of all, living cells of the simplest character would be formed from their homogeneous protoplasmic body by the separation of an inner nucleus from the outer cell-body (cytosome). Further, the analogy that we find in the life of all cells—whether plasmodomous plant-cells or plasmaphagous animal-cells—justifies the inference that the further course of organic evolution on these other planets has been analogous to that of our own earth—always, of course, given the same limits of temperature which permit water in a liquid form. In the glowing liquid bodies of the stars, where water can only exist in the form of steam, and on the cold extinct suns, where it can only be in the shape of ice, such organic life as we know is impossible.

The similarity of phylology, or the analogy of organic evolution, which we may thus assume in many stars which are at the same stage of biogenetic development, naturally opens out a wide field of brilliant speculation to the constructive imagination. A favourite subject for such speculation has long been the question whether there are men, or living beings like ourselves, perhaps much more highly developed, in other planets? Among the many works which have sought to answer the question, those of Camille Flammarion, the Parisian astronomer, have recently been extremely popular; they are equally distinguished by exuberant imagination and brilliant style, and by a deplorable lack of critical judgment and biological knowledge. We may condense in the following theses the present condition of our knowledge on the subject:

I.—It is very probable that a similar biogenetic process to that of our own earth is taking place on some of the other planets of our solar system (Mars and Venus), and on many planets of other solar systems; first simple monera are formed by spontaneous generation, and from these arise unicellular protists (first plasmodomous primitive plants, and then plasmaphagous primitive animals).

II.—It is very probable that from these unicellular protists arise, in the further course of evolution, first of all, cell-communities (cœnobial), and subsequently tissue-forming plants and animals (metaphyta and metazoal).

III.—It is also very probable that thallophyta (algæ and fungi) were the first to appear in the plant-kingdom, then diaphyta (mosses and ferns), finally anthophyta (gymnosperm and angiosperm flowering plants).

IV.—It is equally probable that the biogenetic process took a similar course in the animal kingdom—that from the blastocells (cataclacta) first gastrulae were formed, and from these lower animal forms (coelentera) higher organisms (cœlomaria) were afterwards evolved.

V.—On the other hand, it is very questionable whether the different stems of these higher animals (and those of the higher plants as well) run through the same course of development on other planets as on our earth.

VI.—In particular, it is wholly uncertain whether there are vertebrates on other planets, and whether, in the course of their phylectic development, taking millions of years, mammals are formed as on earth, reaching their highest point in the formation of man; in such an event, millions of changes would have to be just the same in both cases.

VII.—It is much more probable, on the contrary, that other planets have produced other types of the higher plants and animals, which are unknown on our earth; perhaps from some higher animal stem, which is superior to the vertebrate in formation, higher beings have arisen who far transcend us earthly men in intelligence.

VIII.—The possibility of our ever entering into direct communication with such inhabitants of other planets seems to be excluded by the immense distance of our earth from the other heavenly bodies, and the absence of the requisite atmosphere in the intervening space, which contains only ether.

But while many of the stars are probably in a similar stage of biogenetic development to that of our earth (for the last 100,000,000 years at least), others have advanced far
beyond this stage, and, in their planetary old age, are hastening towards their end—the same end that inevitably awaits our own globe. The radiation of heat into space gradually lowers the temperature until all the water is turned into ice; that is the end of all organic life. The substance of the rotating mass contracts more and more; the rapidity of its motion gradually falls off. The orbits of the planets and of their moons grow narrower. At length the moons fall upon the planets, and the planets are drawn into the sun that gave them birth. The collision again produces an enormous quantity of heat. The pulverised mass of the colliding bodies is distributed freely through infinite space, and the eternal drama of sun-birth begins afresh.

The sublime picture which modern astrophysics thus unveils before the mind’s eye shows us an eternal birth and death of countless heavenly bodies, a periodic change from one to the other of the different cosmogonic conditions, which we observe side by side in the universe. While the embryo of a new world is being formed from a nebula in one corner of the vast stage of the universe, another has already condensed into a rotating sphere of liquid fire in some far distant spot; a third has already cast off rings at its equator, which round themselves into planets; a fourth has become a vast sun whose planets have formed a secondary retinue of moons, and so on. And between them are floating about in space myriads of smaller bodies, meteorites, or shooting-stars, which cross and re-cross the paths of the planets, apparently like lawless vagabonds, and of which a great number fall on to the planets every day. Thus there is a continuous but slow change in the velocities and the orbits of the revolving spheres. The frozen moons fall on to the planets, the planets on to their suns. Two distant suns, perhaps already stark and cold, rush together with inconceivable force and melt away into nebulous clouds. And such prodigious heat is generated by the collision that the nebula is once more raised to incandescence, and the old drama begins again. Yet in this “perpetual motion” the infinite substance of the universe, the sum-total of its matter and energy, remains eternally unchanged, and we have an eternal repetition in infinite time of the periodic dance of the worlds, the metamorphosis of the cosmos that ever returns to its starting-point. Over all rules the law of substance.

II.—PROGRESS OF GEOLOGY.

The earth and its origin were much later than the heavens in becoming the object of scientific investigation. The numerous ancient and modern cosmogenies do, indeed, profess to give us as good an insight into the origin of the earth as into that of the heavens; but the mythological raiment, in which all alike are clothed, betrays their origin in poetic fancy. Among the countless legends of creation which we find in the history of religions and of thought there is one that soon took precedence of all the rest—the Mosaic story of creation as told in the first book of the Hexateuch. It did not exist in its present form until long after the death of Moses (probably not until 800 years afterwards); but its sources are much older, and are to be found for the most part in Assyrian, Babylonian, and Hindoo legends. This Hebrew legend of creation obtained its great influence through its adoption into the Christian faith and its consecration as the “Word of God.” Greek philosophers had already, five hundred years before Christ, explained the natural origin of the earth in the same way as that of other cosmic bodies. Xenophanes of Colophon had even recognised the true character of the fossils which were afterwards to prove of such moment; the great painter, Leonardo da Vinci, of the fifteenth century, also explained the fossils as the petrified remains of animals which had lived in earlier periods of the earth’s history. But the authority of the Bible, especially the myth of the deluge, prevented any further progress in this direction, and ensured the triumph of the Mosaic legend until about the middle of the last century. It survives even at the present day among orthodox theologians. However, in the second half of the eighteenth century scientific inquiry into the structure of the crust of the earth set to work independently of the Mosaic story, and it soon led to certain conclusions as to the origin of the earth. The founder of geology, Werner of Freiberg, thought that all the rocks were formed in water, while Voigt and Hutton (1788) rightly contended that only the stratified, fossil-bearing rocks had had an aquatic origin, and that the volcanic or plutonic mountain ranges had been formed by the cooling down of molten matter.

The heated conflict of these “Neptunian” and “Plutonic” schools was still going on during the first three decades of the present.
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century; it was only settled when Karl Hoff (1822) established the principle of "actualism," and Sir Charles Lyell applied it with signal success to the entire natural evolution of the earth. The Principles of Geology of Lyell (1830) secured the full recognition of the supremely important theory of continuity in the formation of the earth's crust, as opposed to the catastrophic theory of Cuvier. Paleontology, which had been founded by Cuvier's work on fossil bones (1812), was of the greatest service to geology; by the middle of the present century it had advanced so far that the chief periods in the history of the earth and its inhabitants could be established. The comparatively thin crust of the earth was now recognized with certainty to be the hard surface formed by the cooling of an incandescent fluid planet, which still continues its slow, unbroken course of refrigeration and condensation. The crumpling of the stiffened crust, the reaction of the molten nery contents on the cool surface, and especially the unceasing geological action of water, are the natural causes which are duly at work in the secular formation of the crust of the earth and its mountains.

To the brilliant progress of modern geology we owe three extremely important results of universal import. In the first place, it has extended from the story of man all question of miracle, all question of supernatural agencies, in the building of the mountains and the shaping of the continents. In the second place, our idea of the length of the vast period of time which has been absorbed in their formation has been considerably enlarged. We now know that the huge mountains of the Palæozoic, Mesozoic, and Cenozoic formations have taken not thousands, but millions of years in their growth. In the third place we now know that all the countless fossils that we find in those formations are not "sports of nature," as was believed 150 years ago, but the petrified remains of organisms that lived in earlier periods of the earth's history, and arose by gradual transformation from a long series of ancestors.

III — PROGRESS OF PHYSICS AND CHEMISTRY

The many important discoveries which

* Cf. The Natural History of Creation, chapa. 6, vi., xv, and xvi.

these fundamental sciences have made during the nineteenth century are so well known, and their practical application in every branch of modern life is so obvious, that we need not discuss them in detail here. In particular, the application of steam and electricity has given to our nineteenth-century its characteristic "machinestamp." But the colossal progress of inorganic and organic chemistry is not less important. All branches of modern civilisation—medicine and technology, industry and agriculture, mining and forestry, land and water transport—have been so much improved in the course of the century, especially in the second half, that our ancestors of the eighteenth century would find themselves in a new world, could they return but more valuable and important still is the great theoretical expansion of our knowledge of nature, which we owe to the establishment of the law of substance. One Lavosier (1789) had established the law of the persistence of matter; and Dalton (1808) had founded his new atomic theory with its assistance, a way was open to modern chemistry along which it has advanced with rapidity and success beyond all anticipation. The same must be said of physics in respect of the law of the conservation of energy. Its discovery by Robert Mayer (1842) and Hermann Helmholtz (1847) inaugurated for this science also a new epoch of the most fruitful development, for it puts physics in a position to grasp the universal unity of the forces of nature and the eternal play of natural processes, in which one force may be converted into another at any moment.

IV—PROGRESS OF BIOLOGY

The great discoveries which astronomy and geology have made during the nineteenth century, and which are of extreme importance to our whole system, are, nevertheless, far surpassed by those of biology. Indeed, we may say that the great part of the many branches which this comprehensive science of organic life has recently produced have seen the light in the course of the present century. As we saw in the first section, during the century all branches of anatomy and physiology, botany and zoology, oncoology and phylogeny, have been so marvelously enriched by countless discoveries that the present condition of biological science is immeasurably superior to its condition a hundred years ago. That applies first of
all quantitatively to the colossal growth of our positive information in all those provinces and their several parts. But it applies with even greater force inductively to the deepening of our comprehension of biological phenomena, and our knowledge of their efficient causes. In this Charles Darwin (1859) takes the palm of victory; by his theory of selection he has solved the great problem of "organic creation," of the natural origin of the countless forms of life by gradual transformation. It is true that Lamarck had recognised fifty years earlier that the mode of this transformation lay in the reciprocal action of heredity and adaptation. However, Lamarck was hindered by his ignorance of the principle of selection, and of that deeper insight into the true nature of organisation which was only rendered possible after the founding of the theory of evolution and the cellular theory. When we collated the results of these and other disciplines, and found the key to their harmonious interpretation in the ancestral development of living beings, we succeeded in establishing the monistic biology, the principles of which I have endeavoured to lay down securely in my "General Morphology.

V.—PROGRESS OF ANTHROPOLOGY

In a certain sense, the true science of man, rational anthropology, takes precedence of every other science. The saying of the ancient sage, "Man, know thyself," and other famous maxims, "Man is the measure of all things," have been accepted and applied from all time. And yet this science—taking it in its widest sense—has languished longer than all other sciences in the fetters of tradition and superstition. We saw in the first section how slowly and how late the science of the human organism was developed. One of its chief branches—embryology—was not firmly established until 1828 (by Baer), and another of equal importance—the cellular theory—until 1838 (by Schwann). It was even later stil, when the answer was given to the "question of all questions," the great riddle of the origin of man. Although Lamarck had pointed out the only path to a correct solution of it in 1809, and had affirmed the descent of man from the ape, it fell to Darwin to establish the affirmation securely fifty years afterwards, and to Huxley to collect the most important proofs of it in 1863, in his "Man's Place in Nature." I have myself made the first attempt in my "Anthropogenesis" (1874) to present in their historical connection the entire series of ancestors through which our race has been slowly evolved from the animal kingdom in the course of many millions of years.

CONCLUSION.

The number of world-riddles has been continually diminishing in the course of the nineteenth century through the aforesaid progress of a true knowledge of nature. Only one comprehensive riddle of the universe now remains—the problem of substance. What is the real character of this mighty world-wonder that the realistic scientist calls Nature or the Universe, the idealist philosopher calls Substance or the Cosmos, the pious believer calls Creator or God? Can we affirm today that the marvellous progress of modern cosmology has solved this "problem of substance," or at least that it has brought us nearer to the solution?

The answer to this final question naturally varies considerably according to the standpoint of the philosophic inquirer and his acquaintance with the real world. We grant at once that the innermost character of nature is just as little understood by us as it was by Anaximander and Empedocles 2,500 years ago, by Spinoza and Newton 200 years ago, and by Kant and Goethe 100 years ago. We must even grant that this essence of substance becomes more mysterious and enigmatic the deeper we penetrate into the knowledge of its attributes, matter and energy, and the more thoroughly we study its countless phenomenal forms and their evolution. We do not know the "thing in itself" that lies behind these knowable phenomena. But why trouble about this enigmatic "thing in itself" when we have no means of investigating it, when we do not even clearly know whether it exists or not? Let us, then, leave the fruitless brooding over this ideal phantasm to the "pure metaphysician," and let us instead, as "real physicists," rejoice in the immense progress which has been actually made by our monistic philosophy of nature.

Towering above all the achievements and discoveries of the century we have the great, comprehensive "law of substance," the fundamental law of the constancy of matter and force. The fact that substance is everywhere subject to eternal movement and transformation gives it the character.
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also of the universal law of evolution. As this supreme law has been firmly established, and all others are subordinate to it, we arrive at a conviction of the universal unity of nature and the eternal validity of its laws. From the gloomy problems of substance we have evolved the clear law of substance. The monism of the cosmos which we establish thereon proclaims the absolute dominion of the "great eternal iron laws" throughout the universe. It thus shatters, at the same time, the three central dogmas of the dualistic philosophy—the personality of God, the immortality of the soul, and the freedom of the will.

Many of us certainly view with sharp regret, or even with a profound sorrow, the death of the gods that were so much to our parents and ancestors. We must console ourselves in the words of the poet:

"The times are changed, old systems fall,
And new life o'er their ruins dwells.

The older view of idealistic dualism is breaking up with all its mystic and anthropistic dogmas, but upon the vast field of ruins rises, majestic and brilliant, the new sun of our realistic monism, which reveals to us the wonderful temple of nature in all its beauty. In the sincere cult of "the true, the good, and the beautiful, which is the heart of our new monistic religion, we find ample compensation for the anthropistic ideals of "God, freedom, and immortality which we have lost.

Throughout this discussion of the riddle of the universe I have clearly defined my consistent monistic position and its opposition to the still prevalent dualistic theory. In this I am supported by the current of nearly all modern scientists who have the courage to accept a rounded philosophical system. I must, however, take leave of my readers without pointing out in a conclusive way that this strenuous opposition may, indeed, even be converted into a friendly harmony. In a thoroughly logical mind, applying the highest principles with equal force in the entire field of the cosmos—in both organic and inorganic nature—the antithetical positions of theism and pantheism, vitalism and mechanism, approach until they touch each other. Unfortunately, consecutive thought is a rare phenomenon in nature. The great majority of philosophers are content to grasp with the right hand the pure knowledge that is built on experience, but they will not part with the mystic faith based on revelation, to which they cling with the left. The best type of this contradictory dualism is the conflict of pure and practical reason in the critical philosophy of the most famous of modern thinkers, Immanuel Kant.

On the other hand, the number is always small of the thinkers who will boldly reject dualism and embrace pure monism. That is equally true of consistent idealists and theists, and of logical realists and pantheists. However, the reconciliation of these apparent antitheses, and, consequently, the advance towards the solution of the fundamental riddle of the universe, is brought nearer to us every year in the ever-increasing growth of our knowledge of nature. We may, therefore, express a hope that the twentieth century will complete the task of resolving the antitheses, and, by the construction of a system of pure monism, spread far and wide the long-desired unity of world conception. Germany's greatest thinker and poet, whose 150th anniversary will soon be upon us—Wolfgang Goethe—gave this "philosophy of unity," a perfect poetic expression, at the very beginning of the century, in his immortal poems, Faust, Prometheus, and God and the World—

"By eternal laws
Of iron rule,
Must all fulfill
The cycle of
Their destiny."