# STUDIES IN MATERIALISM.

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## CHAPTER I.

### THE DAWN OF LIFE.

ALL things on this earth may be roughly divided into two classes: things which have motion, and things which have not; in other words, things which are living, and things which are dead. The first constitute the animal and vegetable kingdoms, and the mineral kingdom contains all the inanimate class. Motion and life seem at once to be intimately connected; we recognise the vitality of any living thing, animal or vegetable, by its power of motion; whether from place to place, as in an animal, or in simple changes of form or aspect, as in both animal and vegetable.

Yet we must not confound motion and life. We see motion in even the class of inanimate things. Steam will rise in the air, a stone will fall to the ground; both these are instances of motion, yet even a child scarcely considers them as any sign of life. I propose to myself the project of pondering how far life and motion may be assumed to be indeed one and the same element, though they may differ in degree as much or more than a man differs from a jelly-fish. It will be necessary first to think what phases of motion are readily perceptible to our senses, and then to follow up that chain till we approach forms of motion almost as little to be rendered account of to our senses as is the ultimate mystery, life itself. We may at any rate prove that there is a path advancing step by step into the unknown; we may even go along some part of the road, and we may form a just notion as to where that road will ultimately lead us.

I have already instanced the simplest form of motion with which we are acquainted—the falling of a stone or other body towards the earth. This action or motion is so general or, as it were, natural, that countless generations of men had witnessed it and it did not even occur to them to think of rendering a reason for it. Some of the old Greek philosophers gave a feeble consideration to the matter, but did

not or could not follow the question out; and there it rested till an English philosopher, Isaac Newton, had the remembrance of their difficulties brought to his mind by observing an apple fall from a tree, and set himself to think why the apple should fall to the earth, and whether that motion was in the apple or in the earth. The result of long thought and calculation on his part was the ascertained truth that every substance in the universe is attracted, or drawn towards, or seeks to approach every other substance; and that it will so approach if there be not forces acting in other directions to prevent it. This attraction is called the force of gravitation, or weight-force; and it is so called because it is greater in proportion to the weight and density of the body exercising that attraction.

It is this same force that accounts for the second form of motion that I mentioned—the rising of steam through the air; for the particles of steam are lighter in proportion to their size or bulk than the particles of the air; the particles of the air are, therefore, more forcibly attracted to the earth, and squeeze out of place or force away the steam higher up into the air, *i.e.*, farther away from the earth.

If instead of air we take water for an example, we shall see the same series of motions repeated, for a piece of iron will sink or *drop* through the water, because iron is heavier or denser, bulk for bulk, than water; and a bubble of air or a piece of cork will rise through water (just as steam does through the air) because both air and cork are lighter or less dense, bulk for bulk, than water. And now, if instead of water we take mercury, which is also a fluid, we shall find that a piece of gold will sink in it, but a piece of iron will float in it; and this again for the same reason, because gold is denser than mercury, and iron is not so dense as mercury.

Here we may learn two things: firstly, that some solids may be less dense than other fluids; and, secondly, that density is after all but a comparative and conditional term, and is proportional to the medium or *atmosphere* in which the action takes place, for both iron and gold will sink in water, or drop through the air, yet only one of them will sink in mercury.

We all know that what is called an empty bucket, that is, a bucket full of air, is not so heavy as a bucket full of water, and that this again is not so heavy as a lump of iron the same size, and this lump of iron will not be so heavy as a

bucket full of mercury, nor this again so heavy as a similar mass of gold.

Now the real meaning of the weight or heaviness of all these is simply the greater or less force with which they are attracted towards the earth; that force being in exact proportion to their density as compared with their bulk. For the earth is the great mass towards which all substances on the earth are attracted, and as far as earthly things are considered we may call it the centre of gravitation. It is our greatest and heaviest mass, and hence all earthly things progress or fall towards it when not prevented by other forces or obstacles. It is true that what we call celestial objects have also an attraction for each other and the earth, and for all things on the earth; but *distance* is also an element in the calculation of gravitation, and the earth is so much *nearer* that a stone let go at the distance of 1000 or 100,000 feet above the earth is attracted more powerfully by the earth which is near than by the sun which is so far off, though the sun is 1,300,000 times larger than the earth, and its attraction proportionately great.

And the planets and our earth and the sun would all rush together but for their motion in their orbits—a circular motion which they have that counterbalances this attraction or motion of gravitation and keeps them hovering at a distance. What is the secret or cause of this circular or orbital motion may be discovered by another Newton, but it will certainly be found to be but a phase of this universal force of gravitation.

Indeed all motions and conditions seem to be but phases or consequences of phases of this universal law. Next in order to gravitation as generally defined, we might place what is called the attraction of cohesion—an attraction that does not seem quite so dependent on density, and that might be defined as the greater attraction that substances of the same nature have for each other under favourable circumstances than for substances of a dissimilar nature. It is this attraction that causes the homogeneousness or consistency of t metals, or stone, or wood, &c. This attraction gives as its evidence the two qualities known as hardness and tenacity. It may be exemplified by the cutting of a piece of wood or lead with a steel knife, whereas a piece of steel could not be cut with a wooden or leaden knife. The mechanical explanation of this fact is that the particles of steel have a greater attraction of cohesion for each other

than have the particles of wood or lead; the particles of wood or lead may be easily separated, but the particles of steel are separable with difficulty.

This attraction of cohesion may seem to be but a passive or defensive attraction, while gravitation is an active or offensive power; yet the seemingly passive force of cohesion is always really in action, for it must not be forgotten that it is this force which at every instant holds bodies together in resistance to the active force of gravitation which might otherwise cause an indiscriminate mingling of their atoms with those of all the other bodies composing the mass of the earth. And some phases of this form of attraction are palpably active, for under this head may be classed the force of chemical affinity, and the force which produces and guides crystallization.

The force, chemical affinity, bears a very close resemblance to the attraction of cohesion, and may be roughly defined as the attraction which the particles of one clearly defined chemical element or substance have for another of those elements. At present these elements are known to have certain affinities or combining powers with each other, and these attractions or affinities vary in each case, so that an element will leave one with which it is already combined to join another for which it has a greater affinity, and will again leave that, if one for which it has a still greater affinity be presented to it.

And now we come to the force of crystallization, and must give our earnest attention to this force; for we get here the first glimpse of a force or motion that in some of its actions closely resembles life. For we have here introduced defined growth towards a defined form. Crystals are of varying sizes and shapes according to their substance, the same substance generally following fixed and certain rules as to form. The growth of crystals is sometimes so rapid or vivid that with some substances, and a strong magnifying glass, the crystals may be seen forming themselves. In some instances this action of growth might well be mistaken for some part of the action that is seen in vegetable life. On ancient flint implements accretions of iron and manganese have been found which bear more than a casual resemblance to various cryptogamous plants, mosses, lichens, and algæ or seaweed. An example familiar to us all is that of the moss-like appearance of a frozen window-pane, the "moss" being simply water in a state of crystallization.

This last example brings us face to face with another series of forces or attractions; the force by which bodies may be brought to, and held in, any one of the three conditions: the solid, the fluid, and the gaseous—in a word, how water may exist as ice, water, or steam, each of the three conditions giving powers of combination, or altered force, which would not be possible in any other condition. As far as we know, all elements are capable of these conditions under given circumstances, and there is, as just said, a considerable intrinsic difference in the conditions. Fluids seem only compressible with intense force, while solids have a considerable and gases an excessive amount of compressibility. Fluids and solids, again, have the attraction of cohesion, so that solids retain their form, and fluids their equilibrium; yet in gases the force of cohesion seems to be almost, if not altogether, absent. A pound of any solid substance, or a pint of any fluid, would retain their simple appearance in a vacuum; but it would seem that the same measure of gas would permeate and fill up (though in a rarefied or attenuated form) any vacuum however great.

Now, each of these conditions is distinctly defined and separate, and the change from one to another seems to be effected by some form of the most living force we have yet spoken of—heat. And as we consider this force of heat we find it to be as universal as gravitation, every substance having specific, or intrinsic, or self-contained heat, just as it has specific or self-contained weight. And specific heat varies in different bodies just in a similar manner to what specific weight or gravity does. And just as we may not perceive the weight of a body till some displacement occurs which allows the force of gravitation to come into perceptible action, so specific heat may only become manifest or perceptible when certain changes are brought about in the condition of the substance containing it. When heat is thus manifest or active, it does to the evidence of our senses change some substances from the solid into the fluid state, and from that again into the gaseous state, and a deprivation of heat will act in just the reverse direction.

Chemical action or affinity, which has already been spoken of, is very frequently attended by the evolution or absorption of heat, and for the reason already given, *i.e.*, a disturbance in the molecular conditions of elements which makes manifest their specific heat. Chemical action, indeed, is the main source of the heat with which we are acquainted,

for the heat of the sun itself is but the result of chemical action or combustion in or on the sun.

As with the other forms of force or motion or attraction spoken of, heat is but a comparative condition, and our experience of it on this earth has but a very limited range. We may readily imagine a planet or world where the heat was so great that water was only known in a gaseous state, and their rivers might be of molten metal; or, on the other hand, one so cold that ice might be their usual building material, roofed with sheets of hydrogen, an element that we only know in a gaseous state. And any bodily organism of living creatures would have to be proportionately altered; yet there is nothing repugnant to the idea of a similar condition to mind, or soul, or life, call it what we will, existing under the changed circumstances.

And I think this may be taken as a probable solution of the question whether there is life on other planets or worlds; for wherever there exist the forces that we have knowledge of on this earth, there will life follow as a natural consequence.

I spoke just now of combustion. This word simply means chemical action or combination so intense that heat and light result. And in light we have reached almost the last of the series of forces of which we have yet any clear conception. We have seen by now that the word force is to be used in a somewhat different sense from that generally ascribed to it. It is too generally confounded with "strength" or "motion;" yet we see it may be existing where we have only pictured inactivity, or rest, or death. We may see a soldier standing "at ease." He too is resting, yet the muscles of his legs and back are all in action, or the man would fall to the earth. And in speaking of light as a force it might be thought that I was applying a false word. In giving an instance or two of the *power* of light, we may recognize that it is literally a force.

We know that a plant in comparative darkness will hardly grow, and will at best be but pale and sickly. It is light that gives the green colour to all vegetation, simply because it is the initial force which gives the chemical elements in vegetation the impulse to unite and form healthy green flesh necessary for the plant's full life. Again, light is the force that draws all our photographic pictures. In taking those pictures, where the light falls strongest the chemical salts are destroyed or decomposed; where the light does not fall those salts are left untouched.

It must need force to do this, and light is that force. Light is certainly the initial force of a vast amount of chemical action, and again it seems sometimes to be the *consequence* of chemical action; as with heat, which is in turn the origin or result of such action. Some time we may have knowledge of latent or specific light as well as of specific heat or specific gravity.

As yet we know but little of the vast force involved in light. George Stephenson said that a railway engine was driven by the rays of bottled sunshine contained in the coals that fed the furnace, and there seems no doubt that he was correct. Coal is the buried vegetation of forests of millions of years ago. The sun shone on those trees and on their leaves and branches day by day in their growth, the light and warmth was effective in working the chemical change that formed their vegetable tissue, and when the trees fell, century by century, their dead bodies contained and preserved the results of this action; this absorbed or latent light and heat lay buried in them, is in them when they are mined and dug up, and when they are put into the fire-box of the engine. The fire is lit, and by combustion, the bottled sunbeams, developed into the form of heat, are transmitted to the water in the boiler, this heat turns the water from fluid into the gaseous state of steam; the steam occupies vastly more space than water, and in endeavouring to get room to spread itself to its natural bulk is allowed to force out a piston, this piston moves a crank which turns the wheel on which the engine rests, and the whole engine moves on.

In this brief story we see what permutations or changes may take place in the same force; now it appears to us as light, now as heat, now as chemical action, now as mechanical motion overcoming the attraction of gravitation. Indeed there seems but *one force*, and the changes in it are but changes in that they are more clearly perceived by some one of our imperfect senses than by the others.

I have used the words *initial* force once or twice and shall need to explain this somewhat, for the ultimate purposes of our argument. Initial force, then, is the impulse which once given to matter or force is carried on in the matter or force itself without need for repetition of the original impulse. For instance, the mechanical action involved in the striking of a match is the initial force which gives rise to its combustion, and this combustion may be conveyed to things innumerable without need for any repetition of

mechanical action. With a slight knowledge of chemistry, we may remember where a single drop of sulphuric acid is capable of initializing the same process of combustion.

In some cases the force of crystallization may be initialized in a similar way. A mass of salts may be in a condition ready for crystallization, and continue in that preparatory stage till some tiny initial mechanical impulse, such as even the prick of a needle, is given, when the mass will at once rush into crystals. We all know too that nitro-glycerine may by a slight mechanical force be driven into gas, and possibly a frightful explosion ensue. Any slight amount of one kind of force may, under favourable circumstances, be the initializer of a vastly increased mass of some widely different phase.

And now I will only call attention to one other form of force before endeavouring to show how all these forces, or some combination of them, may have given the initial impulse to the wondrous force of *life*. This last force to which I shall draw attention is *electricity*, a force of whose knowledge we are but yet in the infancy; and a force that seems, even as far as our present knowledge goes, to be capable of a considerable number of phases. This is the force by which, to give a simple example, a man's words may be conveyed almost without lapse of time from one place to another (the electric telegraph); it is also the force that causes the attraction of a magnet for iron.

Whether electricity be the cause of some of the various forms of force already named, or simply a resultant of them, is more than can be said at present: it sometimes appears in the one character and sometimes in the other. It seems in this way to add greater strength to the presumption that all force is but some different and convertible phase of some great and ultimate property:—the very property of *being* or *existing;* for existence and movement or force are inalienable and interchangeable terms. But be electricity what it may, it is already known that all things are subject to its influence, and that it is therefore presumably as universal and great in its results as gravitation itself.

With all this well weighed and considered—bearing in mind the different possibilities of matter in its known conditions of solid, fluid, and gaseous—bearing in mind the powers of chemical combination and the novel substances engendered thereby—bearing in mind the power of definite form and growth of which the force of crystallisation is an

example—bearing in mind that an initial impulse however slight, once communicated, may give rise to a condition so widely differing from itself that the change is to our present powers utterly inexplicable; and that this condition will be perpetuated as long as there is matter favourably situated to be affected by it—bearing in mind all this, I ask if there is anything very inconceivable in the idea that matter *has* been so acted upon by some initial impulse that has given rise to the phase of force which we call *life*, with all its attendant phenomena?

For, after all, *what is life?* Animated beings may be traced down to a type wherein they seem little more than inert masses of matter—masses of gelatinous substance, or of vegetable growth scarce differing from rust—and with little more than the power of growth or assimilation of similar matter to that of their own substance, which they have in common with many substances that we hold to be but minerals with the chemical properties of cohesion and combination.

To such a view as this the continual objection made is: "Yes, but you never show us what *is* the initial force by which inanimate matter is endowed with the property of life." To this I can but say: Can we yet explain *any* initial impulse? And why do you call *any* matter inanimate? Is not chemical action itself a *phase of life*, just as we reasonably presume all these other forces to be but phases of some universal ruling principle? And indeed to me there seems a less distance between the crudest forms of living organisms and simple chemical action, than between those same organisms and intellectual man. This difference and progress I shall make an attempt to follow in my next study, the "Dawn of Humanity." And as to the question of defining or pointing out the initial force which institutes the beginning of life, that initial force is just as easy or as difficult to point out as any other initial force of which I have spoken: we see the results, and it is a simple matter of *comparative* result on which we have arbitrarily made the distinction of calling one phenomenon *animate* action, while we stigmatize the other as *inanimate*.

Yes: the greater our power of observation, the less do we see to be the distinction between life and death, between force and matter; death (*i.e. inanimation*) is but hidden life, matter is but hidden force. Change, or rather motion, is the one constant rule of all things; and as our senses grow,

and fresh capacities or organs of sensibility are developed, we shall grasp at higher and still more intangible phenomena. It is not that Nature's workings are so mysterious, but that our own faculties are so small, our own eyesight so dim. Yet if we will carefully consult and ever strive to improve the faculties we have, and follow out and strengthen in our being the perceptions of justice and truth which Nature everywhere shows us, we *shall* grow to know her better, and to have fuller, stronger sight—we shall be *worthy* to know more of the at present mysterious meaning of life. When we *are* so worthy the knowledge cannot be hidden from us, we may become intelligent co-operators in Nature's work; and with power in our eyes and love in our hearts we shall fulfil the poet's golden prophecy, and become in very deed

> "the crowning race
> Of those that, eye to eye, shall look
> On knowledge; under whose command
> Is earth and earth's, and in their hand
> Is Nature like an open book."

## CHAPTER II.

### THE DAWN OF HUMANITY.

In the previous study, I have presumed or asserted that matter, under certain conditions, may become a living organism, such active life being the sequence of an initial impulse which we may hope eventually to trace and solve. I have further asserted that matter to which such an impulse has been once conveyed, may continue or even increase that impulse under suitable conditions. These assertions cover two of the most advanced theories yet deduced from our knowledge of to-day—viz., Spontaneous Generation, and the Development or Origin of Species. In plain words, the theory of Spontaneous Generation declares that, under certain conditions of matter, life will be initiated and living organisms will be evolved or spontaneously generated; and the theory of Development is that these organisms once evolved will not only have the power of continuing the impulse, *i.e.* of propagating themselves, but also of developing further and higher capabilities under favouring conditions, and thereby of becoming higher organisms—organisms, in fact, such that we could no longer

readily accept the supposition of their being *in that condition* spontaneously generated.

The theory of Spontaneous Generation has as yet but a limited acceptance, owing to the difficulty at present of producing positive argument and irrefutable experiment in its support, and owing, moreover, to its entire antagonism to any biblical or other revelation, or to belief in any supernatural power. But it seems to me that the position may be conclusively proved and justified even by negative argument; and it may be useful so to justify it before going further.

Evidently all primary generation (or initiation of life) must either be spontaneous, or else the act of some creative power foreign to the organism itself. In other words, life is either the natural, innate, and inevitable result of certain conditions of matter, or it is the act of a creator external to the matter. Such a presumed creator is usually styled God, and we may therefore conveniently use this term in the sense specified. Nor shall we in so using the word be doing any wrong to the somewhat numerous class who seem disinclined to accept the theory of spontaneity of life, while yet rejecting the inconsistencies which become every day more palpable in the theory of God and *his* creation of life. For indeed there is no logical halting-place between the two conclusions. Either all phenomena (life included) are attributable to certain natural properties and sequences, or they are due to an extra-natural power, a God.

Let us shift our questioning, then, from matter to its presumed "Creator." Let us inquire into the origin of God. How came he into existence? Did he create himself? If so, we have a notable instance of the spontaneous generation which his believers deny. Had God himself a creator outside himself? If so, we may apply the same questioning as to *his* creator. We only get the elephant and tortoise fable over again.

There is but one resource left, and that is the assertion that God has existed for ever. This is but a begging of the question, for no proof is given of the truth of the assertion; and being unverified and unverifiable, it has not the least tangible claim to assent from our intellect.

The God theory is then placed in this dilemma: that it must either acknowledge spontaneity of life (which renders the God theory itself unnecessary), or take refuge in an unverified assertion utterly beyond the ken of our senses and intellect.

Against such a course of argument as this the constant objection of Theists or supernaturalists is, that there are more things existent than can be brought to the evidence of our senses; but on that perfectly allowable position they base the startling affirmation that therefore *we must not reason about God*, or, at any rate, *must not accept any conclusion of our reason which leads to his rejection!* Yet in all the assertions that they make in support of the God theory, it is to these very senses of ours that they ultimately appeal; they have recourse with confidence to our senses and our reason for acknowledgment of what they call the works of a God, and thereby of a God himself, and yet they deny to our senses and reason any right to evidence of, or faculty to criticise, the hypothetical being whom they expect our reason to recognise!

The words *reason* and *senses* may in this connection be used as of the same meaning, for reason is but the collected and developed experience of our senses. Now, if this reason and these senses may be safely appealed to, and their evidence be received in the case of *results*, materialists hold that the questionings of reason may be and must be extended to *causes*, and that indeed the conclusions of reason are the *only* ones that can validly be accepted by the organism that has given birth to it, and, as it were, delegated to it the care and power of the guidance and government of the organism.

It is to this reason and to these senses that Materialism appeals, for it sees in man's being no evidence of any higher tribunal. Nor need it care to do so, since it also sees in the reason and the senses, and the self-responsibility of man, a faculty of development, of power, and of harmony with nature, far beyond the feeble dreams and dulcet cajoleries of any God theory, ancient or modern.

And Materialism claims for itself and for its evidence a higher character and a greater worth of acceptance than it holds due to any religious or supernatural or ultra-intellectual theory. And this on several grounds. For Materialism appeals to no select few, but to senses and faculties which *all* possess. It does not recognise that any special clique or class of man has received a supernatural revelation of things in which all men have a joint and equal concern. Its evidences are *facts* which have been gathered with care and painstaking by close observers and lovers of nature, not dark *fancies* evolved from the tortured and ascetic brains of

men who have begun their system with the assumption that nature is an abhorrent and unholy thing. Materialism claims the higher character, because it comes into the light and courts the examination and aid of all, not shrouding and hiding itself in impenetrable unintelligibleness, and hurling threats and cursings and thunderings at those who shall dare to deny its infallibility, analyse its inconsistency, or despise its degrading sycophancy and terrorism.

Though I have spoken of Spontaneous Generation as not having been to the consent of all irrefutably proved, it must not be forgotten that there are men who decisively affirm that they have to the evidence of the senses produced organic life where it was previously non-existent. The evidence of Bastian and others is convincing that living organisms are constantly evolved in liquids which have been hermetically sealed in flasks while boiling, or submitted to still greater heat, and carefully preserved from all extraneous influence of the atmosphere.

The arguments used by opponents to explain or contradict these experiments, is what is known as the "germ" theory—an assertion that there are countless seeds of living organisms floating in the air, and ever ready to develop themselves into active life when favourable conditions of matter are presented. It is true that these germs may be invisible in even the most powerful microscope, and so imperceptible as to elude the subtlest chemical test, yet the theory has the convenient property of continuing to refer the initiation of life to some primary act on the part of a creator. It is to such germs, also, that many forms of disease, epidemic or otherwise, are attributed; so that if the theory of the *creation* of germs be correct, it will follow that the appearance of certain new and previously unknown forms of disease, such as diphtheria or rinderpest, is an evidence that the creation was not an act once accomplished and done with, but that the Creator still busies himself from time to time with doubtful benefits to his creatures.

Let it be understood that Materialists do not deny that low organisms may propagate themselves by germs, as well as by other means more clearly visible to our senses. Materialism simply denies any extra-natural creation or origin of these germs, and the materialistic explanation of a new form of parasitic disease would be that certain novel conditions of matter had evolved or developed into a new form some low type of organism, which, once generated, might propagate

itself either by cell-growth or by germs. The Germ theorists would say, that if all the germs or sporules of small-pox, typhoid fever, &c., could once be destroyed, we should never see those diseases more; the Evolutionist says that similar unsanitary conditions to those that now exist where those diseases are rife, would again evolve them.

It must not be forgotten that it would be no refutation of spontaneous generation even if men had not yet succeeded in producing it. It is the action of nature that is in question, rather than man's power, to evoke that action. And certainly, whether by spontaneous generation or otherwise primitive and extremely simple organisms are, under favourable circumstances, everywhere readily and plentifully generated, and in an ascending scale from them we have a series of ever higher developments.

As instances of fairly low (though not the lowest) animal and vegetable organisms, I may take the *amœba* and the *algæ*, previously referred to as "masses of gelatinous substance, or of vegetable growth, scarce differing from rust." The amæba is but a floating speck of jelly that absorbs or covers other floating particles of matter which can afford sustenance to it. It has no defined organs of nutrition, or of any other function; it simply lets the floating particle sink into its jelly-like substance, and then, by a process no more vital than chemical affinity, or even simple attraction of cohesion, it absorbs what there may be in the floating particles analogous to its own substance, and lets the remainder again sink or drop through. Its action seems no more a *living* one than is the action of the isinglass used in "fining" beer. The isinglass that is there introduced falls gradually to the bottom of the cask, enfolding in its own substance, and bearing down with it, every floating speck of turbid matter, and leaving the beer clear. And, undoubtedly, any particle of isinglass or other gelatinous matter that might previously have existed in the floating specks would be absorbed from out them into the homogeneous mass of the isinglass itself. Why this action of the isinglass is to be set down as *mechanical* action, while that of the amæba is to be exalted to the dignity of *living* action, it is not for me to say, since I do not believe in the distinction.

Some forms of the *algæ* are a sort of grey-green mould or rust: they "vegetate exclusively in water or in damp situations; they require no nutriment, but such as is supplied by

water and the air dissolved in it, which they absorb equally by every part of their surface." These are the words of one of the most strenuous advocates of the God theory. Yet if for *algæ* we substitute the word *rust*, how perfect a description we get of the action of moisture or water on iron. And what is the difference between the two actions? As far as I can see, it is simply this, that the *algæ* form a compound of three lements, oxygen, hydrogen, and carbon, while the iron merely absorbs oxygen from the air or water, and so forms a compound of only two elements, oxygen and iron. No one disputes the spontaneous evolution of rust, that is, of a compound of iron and oxygen: strange that men should find it so hard to credit the spontaneous evolution of a compound of carbon, hydrogen, and oxygen!

Two objections may here be raised: firstly, that rust will only appear or propagate itself where there is iron or some other metal to feed it; and, secondly, that the action of algæ, or, at any rate, of other living organisms, is more vivid than that of rust. To the first objection it is a sufficient answer that neither will algæ nor any other organisms appear or propagate themselves where there is not suitable food for them; and to the second, I would reply that I am not asserting an equal *degree* of vital action in both the cases, but simply that both instances are but different degrees of the same natural and *spontaneous* action; the dragging of one stick across another may seem to be action remote enough from that of combustion, yet we know that combustion is but an enhanced form of such action, and is, under given circumstances, educible thereby.

In the lower living organisms, the distinction between animal and vegetable is frequently so confused as to render the organisms incapable of being classified with certainty; some motionless and apparently vegetable growths having other well-defined animal properties, whilst some actively moving organisms are, in other respects, as undoubtedly vegetable. One would almost say, that on the threshold of life the organisms are debating and undecided as to which of the two great channels they will follow. When this choice is made, the same indecision seems extended again somewhat to choice of species; the mass of the primitive organisms being involved in a hazy mist, to which only a very self-confident man could venture to assign defined limits and arbitrary classifications.

In these lower forms of life, the methods of extension or

spreading, or repetition of both animal and vegetable organisms are, as might be presumed, identical; and are visibly effected by either gemmation, or fissure, or both. Gemmation is only another word for budding; buds form on the original organism, which break off and become independent organisms. Fissure means that the original organism, when grown, *splits* into two or more independent organisms. Some of the lowest organisms are asserted to consist of single cells of animated organic matter, and it is, of course, the development of further cells that renders practicable either gemmation or fissure. Yet we may soon find organisms with a considerable accretion of cells not separating from each other, but remaining with the parent organism, and, as it were, helping in the mutual and better development of each; and we then begin to find special groupings of these cells fulfilling certain definite functions in the economy of the organism, becoming, in point of fact, the *organs* for the support and growth and propagation of the organism.

Here, too, we begin to come on clearer distinctions between animal and vegetable; whose main difference has been roughly, but fairly well-defined in the observation that with a vegetable the food is mainly applied to continually increasing its fabric throughout its life, whereas, with the animal, the food is only applied to growth till the adult form is attained, and is then simply used to maintain that condition in efficiency.

We then go on to find special and peculiar formations and growths of cells for various purposes in the *structure* of the organism; so that, eventually, we have cells whose special purpose is to form the tissue or flesh of a plant, while others of different structure form the bark or fruit; and in animals we have cells which form the fibres of the muscle, somewhat different ones forming the bone, and others yet different forming the brain or nerve matter, &c., &c.

This development of different cells and functions is but one form of the variations which are taking place, of which, perhaps, the most important is the adaptation of the organisms themselves to altered circumstances in which they may find it convenient or necessary to live, and the development of varied forms and powers which will render that life more acceptable and enjoyable to them. And it may fairly be said that this variation or development is a fact in which

*all* classes of observers agree, though not all are willing to allow to it the same great ultimate results. It is the reasoning out of such of these results as we have undoubted cognizance of to their possible and logical conclusions, and the acceptance of those conclusions, that constitutes the theory already referred to of development or origin of species.

In the lower forms of organisms this development or variation is, as I have previously intimated, very conspicuous, so that fructification or generation has frequently to be waited for and observed before the organisms can with any certainty be assigned to a definite class. And this question of fructification or generation brings us to one of the most vexed and evaded questions in the whole history of physiology or development—that of *alternate generation*, which will be presently discussed.

For a further phenomenon has manifested itself in the course of these developments—the difference of *sexes ;* and to this I shall need to draw your careful attention, since in his own case man has based on that difference a series of artificial and arbitrary, and therefore unjust, distinctions which have done more than any other act to retard the progress and hinder the happiness of the human race.

We noticed that in the extension or propagation of the lower forms of life, the growth or birth of further cells was followed by a constant budding or splitting off from the parent organism, but that in somewhat higher forms we find cells remaining and allotting themselves to various special functions, and forming special organs for those purposes. As might naturally be supposed, a substitute is at once provided for the superseded actions of gemmation or fissure ; so that among the first definite organs we find those for the extension or propagation of the species, and with such a specialized function we also find, as we might anticipate, a more methodical manner of fulfilling that function. The cells or germs which will form the infant organisms are no longer indiscriminately severed as soon as formed ; but are stored in assigned receptacles to await what shall seem to the organism a fitting time for their evolvement and extrusion. To convey this fitness and impulse for extrusion is the function of a further organ, which in its turn has secreted special cells.

In these two sets of organs and their difference of cells we have the first glimpse of separate male and female functions. To distinguish the two classes of cells, the latter are

usually called *germ* cells, and the former *sperm* cells. The secretion of sperm cells, and their application, in due time, to the germ cells, is the function of the male organs; the secretion of the germ cells, and the care of their development after impregnation, is the female function. For a long time we find both these organs existing in the same creature; and this arrangement is very general throughout vegetable life, from the lowest forms to the very highest. It also extends into some fairly high grades of animal life, the oyster being a notable instance of hermaphroditism, as this union of the two organs in one being is termed.

At first, too, both these functions may be performed within the one being without any extraneous aid; but presently it would seem that a better result is attained by some intermingling of possible slight variations, and we find two individual organisms uniting in a mutual and utterly reciprocatory act of parentage, each being having fulfilled the functions of father, and accepted the responsibilities of mother, to an ensuing progeny. But this intermingling does not seem an inevitable necessity, for there is evidence that many such organisms have the capacity of both self and reciprocal impregnation. Here, too, the strange fact may be noted that in some organisms the co-operation of *three* individuals is necessary to effect the generative act.

The change from gemmation to sexual generation is by no means an invariable or fixed one, for we have here intervening the strange phenomenon of alternate generation just referred to. Various organisms may propagate a progeny by means of sexual organs, and the members of this progeny will be of a totally different type to their parents in nature, appearance, and capabilities, and having no sexual organs, but giving birth to their progeny by the primitive methods of gemmation or fissure; yet this further progeny will be fully developed like the first set of parents, having sexual organs, yet giving birth in turn to organisms that differ in type, and only propagate by gemmation. It is, as it were, an inheritance from grandparent to grandchild, with an intervening generation of an utterly different and inferior organism. In some instances this descent seems to run through three forms of organisms before reverting to the original type.

This phenomenon is affected to be made somewhat light of and readily explained away by the holders of the God theory; apparently because it militates somewhat against

their idea of a creation, and is equally strong evidence in favour of the materialistic theory of development or origin of species. If, as is the case, a *stationary* and, in so far, vegetable-like polyp can give birth to an independent and totally different *swimming* creature (a form of medusa), which lives its life and gives birth again to stationary polyps, it is easy enough to say that the one is but a latent or intervening form of the other; but this does not *explain* the difference, nor destroy the evident fact that some organisms under certain circumstances do evolve an utterly different form of being. It were perhaps to "consider too curiously" to ask the God theorists which of the types was the one originally created, and whence came the other?

It is too much the habit of the God theorists to play fast and loose with *species;* holding, when it suits their purpose, to the idea of the special creation of each individual species, and dropping that idea when the conclusions become at all inconvenient. Yet there are only two possible ways of accounting for species. Either they are the results of the development of accidental or beneficial natural variations; or they must be the result of distinct creative acts. In the first case the materialistic theory of development must be accepted with all its consequent inductions (summarized towards the end of this paper); in the second case all the logical consequences of special creation must be accepted, of which consequences we may readily find an exemplification. It is a definite and accepted fact, for instance, that there are various *species* of entozoa or internal parasites finding a congenial habitat in the flesh and organs of special animals and incapable of existence elsewhere. There are also varied *species* of external parasites which make their dwelling-place on the skin of animals, and live by extracting the grateful juices from within, nor can they exist on other than specified animals. In the case of man, we may instance psoriasis (as the *itch* is technically called), the presence of exceedingly small but irritating animalculæ, without troubling to refer to larger easily remembered insects. With the creation theory, or with the germ theory as propounded by non-evolutionists, we must accept the conclusion that the first man and animals had within and without them all the various types of the parasitic organisms with which their descendants are still troubled.

## II.—THE DAWN OF HUMANITY.

SURELY, none but a fabled God, the dark imagination of an ignorant and uncultured mind, could look upon poor Adam or any other man, afflicted inwardly with tœnia and ascarides, busied externally with the prolific pediculi that enliven the solitude of the primitive savage, and having the monotony of his consequent reflections diversified by the chigo of the West Indies and the guinea-worm of torrid Africa; could look too upon the sheep with a diseased liver, owing to the fasciolæ or "flukes" therein existent; could gaze on the pig evincing more than a suspicion of trichinæ or "measles," and upon the potato for the food of the same pig already bearing the germs of the dreaded "disease," and pronounce such a sample of his creative powers as "very good!"

Let it not be thought that these conclusions are only ludicrous; they are very serious indeed—for Bibliolaters and the germ theorists. Nor let it be said that I am speaking of repulsive things: the man who believes that God made all these things and called them good, must also believe that God made what *repulsiveness* they have; and it is not my fault if the theory of creation is capable of a *reductio ad absurdam.*

To return to the gradations and developments of functions, we find, at the stage at which we had just arrived, individual organisms with only one set of generative organs and functions—those of the male or those of the female respectively; though, again, it does not follow that this is an instant and unvarying result, since we may find forms of the same organisms in which some individuals have only male or female organs or functions, while others have both, powerfully developed. This is even the case in some of the orchids, plants bearing a very high rank in vegetable life. In some species of gregarious insects, as ants or bees, we find a further variation, for there are a very small number with female organs, a larger number with male organs, and a vast majority without any sexual organs at all; yet the grubs, which would otherwise have become non-sexual insects or working bees, can be, in case of need, developed by the other working bees themselves into perfect females or queens.

Difference of sex is, as we all know, the rule in the higher grades of animal life. We find, too, an increasing

importance and responsibility attaching to the female functions. In some cases, as in fishes (which are classed very high in animal life, being *vertebrated*), the functions of both male and female may continue to be as simple or even more simple than in some of the primitive forms already mentioned; for with most fishes no congress of the sexes is needed for the act of generation. The ova of the female are simply extruded in some convenient locality, and the secretion of the male is extruded in the water near by. But with birds, and with the mammalia upwards to man, the maternal function is one of increasing burden and responsibility; no longer limited to the simple formation and extrusion of germs or ova containing, as it were, *latent* life, but now nourishing and cherishing the impregnated cell or cells within their own body or otherwise, till eventually an almost perfectly developed progeny is put forth into the world. In this natural function and adaptability we have a link which stretches through all remaining types of life, in very deed "one touch of nature" that "makes the whole world kin;" for in the system of development that I have roughly sketched we have, in the incident of separation of sex, arrived at or passed through all the phases of living organisms of which we have any knowledge—the lowest organisms as well as articulata, crustaceæ, insects, fishes, reptiles, birds and mammalia—all therein included. At the head of these as intelligent beings may be probably placed the insect the ant, and the mammal *man*.

I cannot attempt to explain in brief words all the evidence that is adduced by materialists in favour of the assertion that MAN has been eventually developed by simple natural laws from lower organisms somewhat such as now surround us. I will only draw attention to two inevitable conclusions: firstly, that if we verify any one instance in an organism of development or adaptation to an altered condition of surroundings, there is no logical bar to such a series of developments as would eventually result in man, and might through him go on to still higher beings; and secondly, that if we concede the spontaneous generation of any one living organism we at once lay a sufficient basis for such a series of developments as is just suggested.

Both these conclusions are antagonistic to and utterly do away with any necessity for recourse to imaginary forces outside the natural properties of matter. And this is, in brief, the essential point of Materialism. In matter, *i.e., in that which*

*is perceptible to our senses*, we find the basis of, and the potentiality for, all of which those senses and their resultant reason can give us any knowledge. We find, for example, in the fact of man's mind or intellect, simply a high instance of this potentiality of matter; mind or intellect being but an empty phrase, without the existence of brain and reason (*i.e.*, experience of the senses) to evolve and contain it. Materialism does not, as is falsely assumed, degrade the vital forces of life and thought to the level of the inert and inanimate conditions usually attributed to matter; on the contrary it elevates ignorantly despised matter to the capabilities and possibilities of the highest existence and most subtle energies; materialism is no adding of death unto death, but a resurrection of all things unto life. It does not hold matter as alien or foreign to spirit, it sees in the one but a capacity or phase of the other; it does not say matter is a vice, it finds no vice resultant anywhere but from the want of knowledge of the laws of matter; it does not look on matter as a foe to virtue and high intelligence, it sees in matter the noble mother of *all* living.

I have wronged my argument somewhat by seeming to assume that an *hypothesis* was necessary for the first of the conclusions given above. But development is already more than a theory, it has established itself in the region of indisputable fact. One of the most recent observations on this point is that concerning the axolotl, a Mexican lizard, furnished with gills, and living only in the water; but which by accidental natural circumstances, or by such circumstances artificially imitated, may be developed into a perfect land salamander (hitherto considered of an entirely different *genus*, which is a greater distinction than a *species*), breathing only by lungs and being incapable of a life in the water; its gills having disappeared together with the tail-fin, dorsal ridge and other especially aquatic adaptations, and corresponding capacities for a life on land having been developed.

Now if the variation from a life only possible in water to one only possible in air,—if such a variation or adaptation or *development* can be brought about during the brief period of existence of one little reptile, who shall dare to assign a limit to the variations and developments that may be evolved in untold myriads of years? This factor of *time* is one of the most difficult to realize and grasp the full import of, since we have but such a tiny experience of it in our own life, or even in all the centuries during which

man has left any written or graven record of his life and acts. Thirty or forty centuries would seem to be the limit of the period during which we have anything like historical record of man, though we may grasp that there were then many and diverse races of men, some of which had attained a high state of civilization. Nor does there seem to be any indubitable change traceable in the actual bodily framework of man during that time. But sufficient explanations of this at once suggest themselves. In the first place, that, as has been already noticed, it is in the lowest and simplest organisms that cardinal changes are most readily evolved, and we may expect in the case of so high an organism as man that many generations may pass away before any distinct and palpable development may have manifested itself; and that indeed *no change would be necessitated in such organs as had, during all that period, been sufficiently adapted to the circumstances;* secondly, that in tracing the record of man through prehistoric times, in such evidence as is afforded us by fossil implements and bones of man himself, we do get irrefutable evidence of development since *that* more distant period; and, lastly, that if we will consider the case of organs or faculties which have *not* been sufficiently adapted to the circumstances, we shall get here, too, distinct and indubitable evidence of development.

Somewhat of such development it will be my effort to trace in the next study—the Progress of Civilization; the development of the faculties by which we have reached from the material into that which has been usually, and, we hold, incorrectly, styled and considered the immaterial. With more highly developed faculties we may find how *all* things are material: *i.e.*, ultimately reducible to the cognizance of the senses; we shall find in materialism the eventual explanation of all that lay outside the ken of duller senses, and was therefore attributed to ultra-intelligible and extra-natural agency; we shall find in materialism the sure basis and touchstone for both the outward and inward conduct of man—all true work, all true science, all true morality being therefrom deducible and provable. Nought of despondency, nought of untrust is there in Materialism, no dark, cold, fanciful *belief*, but simple *knowledge*, full of Nature's warmth and life and light. Not ours

> "to seek
> If any golden harbour be for men
> In seas of Death and sunless gulfs of Doubt,"

for to us Doubt is not sunless, it is the very bright and bracing air in which we grow ever more strong, more humble, more confident,—and we trouble about no poetical fictions as to Death; for we hold that, as far as man is concerned, Death is but the condition of non-existence, and it is manifestly absurd to endow the sheer absence of existence with either charms or terrors.

## III.—THE PROGRESS OF CIVILISATION.

In tracing the progress of man from a simple animal condition to one of high intellectual power or civilisation, two methods of inquiry are available; firstly, such historical record as is afforded by writings and monuments, together with what pre-historic evidence we may gather from fossil bones or implements, or other evidences of man; and, secondly, such knowledge as we may deduce from the conditions and characteristics of existing uncivilised races. To my mind the evidence resultant from the comparison of present existing conditions is less open to difference of opinion than the historic or pre-historic source. It is on this account that I have preferred to exemplify the development theory by reference to now existing types and conditions from the lowest organisms up to man, and by showing a power and action of development in those which *infer* a previous course of development ere reaching their present condition, rather than to base my position more specially on fossil forms and types which indubitably establish such development, according to some observers, whilst others dispute the conclusions thus arrived at. In man, however, with both these sources of inquiry at our command we may adduce evidence of development which it is impossible to controvert, and I think we may further prove that such progressive development has been incessant, and will, under given circumstances, continue to be so.

In considering man and the higher organisms by comparison with the lower and primitive types, we may take the greatest acquired difference as that of sex. And for this diversity of sex the Materialist may find a ready and natural explanation. In the lowest types of life, as we have already seen, the beings have the powers and functions of both sexes (*i.e.*, impregnation and conception) united in one body, and these functions may presently be exercised either independently of another being, or reciprocally with another being.

Now, it is a natural fact, and resultant from obvious reasons, that liability to conception may and does exist before the power of impregnation is existent. For impregnation can only be effected by an animal already arrived at puberty, while the capacity for reception and retention of the sperm cells exists, and may come into operation before the actual capacity for conception, which is also an attribute of puberty.

If, therefore, we presume a double-sexed animal at just this stage of its existence taking part with, or being forced to submit to an older and fully developed animal in what should virtually be a reciprocal act, we shall find as the result that the immature animal will receive and retain sperm cells with which its germ cells will in due time be vivified, while the mature animal will have received no sperm cells from its partner, and its own germ cells will, therefore, remain unimpregnated and unvivified. In plain words the first animal will have found exercise for its female organs alone, and the second for its male organs alone. And, supposing no further intercourse or exercise of the organs to take place, it is evident that the one animal will have fulfilled the function of a mother only, and the other that of a father only. It will also be seen, and I call special attention to this fact, that an animal might be forced or coaxed into the position of maternity before its own impulses or capabilities would have prompted any such responsibility.

Another singular natural feature now comes into play. Where an act is susceptible of repetition, the use of the necessary organ has a tendency to cause an increased ability of that organ; and the disuse of an organ has a corresponding tendency to produce debility or atrophy of that organ. So that in the next acts of intercourse of the two individuals we have presumed, there will be a tendency to the *uni-sexual* function alone being exercised. Taught by experience, too, the older individual may have learnt that by being careful always to select young and scarcely mature individuals it may secure what amount of gratification is afforded by the sexual act, without any resultant burden or incommodity of maternity to itself. It might, in fact, readily act as a *male* being, with the tendency to masculinity continually increasing throughout its life. And some of its progeny would inherit this tendency to be of the male sex only; as also others of the progeny would, from the *mother's* induced habit, have a corresponding tendency to be of the female sex only. With these tendencies once developed into

fixed habits, and they certainly will so develop, the fact of division into separate sexes is accomplished.

Upon the incidents mentioned in the earlier part of the preceding paragraph two others follow almost as corollaries; firstly, that with the idea of the evasion of the incommodity of maternity once conceded, it would need the exercise or development of but a very slight amount of cunning or instinct to lead an experienced mature animal to evade the maternal function when trafficking with even a matured animal of less experience; and, secondly, that in addition to the induced femininity of the younger animal, there would be developed and perpetuated a sort of habit of *juvenility* which might explain the seeming secondariness of development or immatury in some aspects of females generally; and further, the general earlier capacity of parentage on the part of the female than of the male which is now existent.

And I think it may easily be shown that maternity is an incommodity sufficiently great to prompt to its evasion in the manner I have suggested. For in even the lowest organisms the fact of the organism being gravid, or heavy with young, will necessarily restrain its liberty of action or locomotion, and yet will entail on it a necessity for increased action in order to find the extra food for the formation of its coming progeny.

The habit of unisexuality on the part of either male or female, would be further established by the fact that with many of the lower types, both of animals and vegetables, the act of fructification once fulfilled the being dies. Those of my readers who have kept silkworms may have noticed how the male moth will live even for several days, should not a female moth be present, but that the sexual act once accomplished the male forthwith dies. And the fact of the female receiving and retaining the male secretion may be well seen in the female moth who does not begin laying eggs till two or three days afterwards, and who has within her body, in common with many other insects, a special cavity, called the *spermotheca*, for the storing up till time of need of the secretion received from the male. In the ant also, the instant death of the male after the sexual act, and the long-continued impregnation of the female, is a prominent example of this phenomenon.

I instance these things to show that I am not drawing on hypothesis alone, but also on facts and parallels for the theory as to origin of sex. I hope, at least, to have shown

that there may be a perfectly intelligible and natural way of accounting for difference in sex, and of refuting the supernatural fiction that "male and female created he them." It is but one contradiction the more of the fable of creation that primitive and even some advanced forms of animal life are not of divided sex.

Among the evidences that can be adduced in proof of the some time general hermaphroditism of the progenitors of animals that are now of clearly defined sexes, is the fact that the rudiments or *survivals* of the organs and characteristics of either sex are found in animals of the opposite sex; rudiments of specially male organs or characteristics being traceable in every woman, as are likewise rudiments of the female organs in every man. Man, with other male mammals, has nipples, and there are known cases in which a perfectly developed man has given milk in sufficient quantity to suckle a child. It would even seem from recent observations in Germany that this faculty and power may be somewhat readily called into activity. In women, when the specially female functions have lapsed through age, the male characteristics more or less assert themselves; there is a distinct tendency to a more masculine type in feature, voice, &c., and not unfrequently some appearance of hair on the lips or chin. In the domestic fowl, a hen past laying will acquire spurs and comb like the male, and the habit of crowing. Again in the human being, if accidentally or purposely the specially sexual organs are removed, there is an instant and persistent tendency to the development of the *surviving* organs and characteristics of the opposite sex (as though these organs had only been kept in a state of dormancy by the predominances of the previous set); thus male eunuchs are beardless, their muscles less firm in texture, and their breasts grow and soften; and, conversely, in women from whom the ovaries have been removed, the breasts shrink and disappear, and masculinity of voice and bearing supervene.

A still stronger exemplification of this survival of double sexuality remains. As it is in the generative organs that the main departure from the stage of hermaphroditism has been made, so also is it there that we must be prepared to furnish crucial proofs if we would maintain a still existing identity of being in male and female; such an identity, I mean, as should do away with all distinctions other than those really existing in Nature. And it is precisely in those organs

that survival can most clearly be evidenced, most celebrated anatomists and physiologists asserting that precise analogues or rudiments of every portion of the female economy are to be found in the man, and *vice versâ*.

I am calling attention at this length to the present and real identities and differences of male and female, because in the case of the human being the natural difference has been very much over-rated, and, as I have already said, man has based a series of artificial and arbitrary and unjust distinctions on that difference. I wish it to be clearly understood that I am but relating what seems to me a very probable history of the origin of sex. Whether my theory be altogether correct or not, we shall undoubtedly, by searching, eventually find out that division of sex has been as simply and naturally induced as any other phenomenon which was at one time a mystery, but is now clear. Such a mode of natural action as I have suggested would go far to account for all the good and evil of existing civilisation. For the difference of sex is certainly at the very base of civilisation as far as man is concerned: from this difference (as I shall endeavour to show) have arisen all the conditions of social and political life, all the working of men together for mutual and common interests, all the good that has been engendered by reciprocity of action and sharing of benefits, and all the social evil from which the world still groans, and which is but the resultant of selfishness or non-reciprocity.

For I take civilisation to mean the banding of many together to do that which could not be done by one, and the more entirely mutual and reciprocal the benefits received from such union are, the higher and truer is the civilisation. It is the custom to credit man alone with being civilised, but it will be seen that under the definition I have adopted many other animals may be included, some sorts of ants, bees and wasps among insects, while perhaps the beaver is the only other among mammals. It will be seen that intelligence alone does not imply civilisation, for though the elephant, the dog, and other animals have a high degree of intelligence, yet the cases are rare in which they seem to combine for a general good. And when such instances do occur, they seem but temporary and transitory conditions, whereas, in the beaver and the insects named the union is a permanent one, insomuch that fixed habitations are erected for the general welfare of the community. Indeed the word *civis*

means a denizen of a city or State, and in all the animals I have classed as civilised the construction of cities or commonwealths is an essential feature. Yet the art of building alone does not constitute civilisation: birds, squirrels, and sticklebacks build nests, though generally only for temporary purposes; moles dig passages and chambers, spiders make webs, and catapillars spin cocoons.

It is in the fact of community that we find civilisation; it is in what tends to and ensures the general benefit of that community that we find the *good* of civilisation: it is where the personal acts or interests of an individual are selfish, and, therefore, irrelevant or inimical to the general well-being that we have *evil* resultant. I know it is asserted by some sophists that all actions of man spring from a selfish motive, but we need not trouble much about such a definition; it will be sufficient for our purpose to distinguish between the acts in which a man may believe that his own well-being or happiness will be an eventual result of benefitting others, and the acts in which he seeks a personal advantage utterly irrespective of any evil consequences of such acts to others. Few of my readers will hesitate to call the former acts good and unselfish, and the latter selfish and evil.

Now, it would seem that the class of actions confined to self-interest alone had their origin as a natural consequence of the primitive unisexual and self-sufficient condition, and that the wider class of feelings and actions have been the eventual outcome of separation into sex—*i.e.*, of the rendering each individual reciprocally helpful to, and more or less dependent on, the well-being and full life of some other.

For in looking for the primitive origin of man's power of feeling, passion, idea, thought, and reason, we must be ready to recognize and accept beginnings utterly small and infinitesimal as compared with his present powers; we must be prepared to find that the love of a mother for her child had as rudimentary and material an origin as the breast and the milk with which she suckles the babe. As we may already ascribe back the wondrous delicacy of finger of a Benvenuto Cellini or a Michael Angelo to slow development from such power as lies in the vague changes of form of the amœba, so may we look for the birthplace of all the passions that a Shakespeare pourtrays, of all the wisdom with which a Socrates and a Bacon enrich the world, in the cravings of hunger and the sensations of heat and cold on

the unisexual being, and then, with wonderfully increased impetus, in the fresh set of feelings evolved when quest for love was added to the quest for food. For many of the capabilities evolved and developed in either quest would become of avail in the other, the mutual action and reaction giving to the organs an acceleration and extent of development which they might not otherwise have attained.

In speaking of sensations of heat, cold, and hunger in the lowest organisms, no further intellectual action is implied on their part than is involved in the simple chemical, or even mechanical, effects of heat and cold, moisture and dryness; some such action, for instance, as is seen in the *rotifer*, a fairly advanced organism, which, in the absence of moisture, dries up, and will lie, to all intents and purposes, as dead matter, even for years, but will instantly revive and resume full activity with the advent of a few drops of water.

A distinct tendency of animated matter is to accept such conditions as are favourable to animation, the distinguishing power of locomotion being developed and constantly exerted to this end. Nor can it be doubted that constantly recurring experiences of things inimical to the organism's well-being will cause even a mechanical tendency to the avoidance of such evil things, and will develop a *provision from the remembrances of experiences*, which is the stepping-stone to an intellect. We see the pimpernel flower close itself when rain is coming, that its pollen may not be injured by the moisture. Doubtless the mechanical cause of this is that some condition of the atmosphere previous to rain causes a relaxation, and therefore a closing, as in sleep, of the flower. We see men and women, when rain is coming, take an umbrella, that their clothes or their health may not be injured. They are warned by some evidence of their senses: a dark cloud in the sky causes a mechanical relaxation in the retina of their eye analogous to the relaxation of the corolla of the pimpernel, or they see a change in that further mechanical contrivance, the barometer. Why are we to call the carrying of an umbrella an intellectual act, and the closing of a flower a mechanical act? Men only use a further developed set of experiences and remembrances and mechanisms; the base of the action and the resultant are essentially the same, the avoidance of a condition hurtful to the well-being of the organism. Man's intellectual chain may be longer than that of the pimpernel, but the links are forged of the same metal.

The fact is that every experience of an organism is in some way duly registered in the organism, just as truly as every touch of a sculptor's chisel has its effect in the image he produces. One result of this law—a result that will at some time be as clear to our understanding as it is now in many instances to our vision—is that the accretion of experiences produces, as might be expected, some definite change or growth in the organism itself, such change being, in point of fact, *an organ;* and so truly is this the case that it is by examining the organs of any living thing that we arrive at the knowledge of the conditions and experiences of its life. Indeed, we should not greatly err in calling organs *materialized experiences.* In such a way we may not only clearly explain the necessarily slow progress of development, but we may also show the very how and why of its existence.

And so the varied necessities of food and love induced the gradual evolution and development of the organs and faculties of touch, sight, hearing, smell, taste, locomotion, prehension, speech; and from the experiences and remembrances attendant on their continual use arose by similar slow evolution all the powers that we call intelligence, or mind, or soul. For we may find a fully sufficient basis for mind and all its phenomena in such experiences and remembrances, such impressions, inherited or acquired—impressions inherited from countless ages of progenitors as unconsciously, but just as tangibly, as our limbs are inherited—impressions from our own smaller experiences—impressions which we acquire from others by living converse, or by bookly intercourse with the mighty dead.

It is the quest for food and the quest for love that are at the bottom of the two laws so clearly enunciated by Charles Darwin—Sexual Selection and the Survival of the Fittest. It must be borne in mind that this survival of the fittest simply means the survival of the types or animals best capable of living under certain conditions and contingencies; it does not mean the survival of the animals which man might have considered the most fitting denizens of the earth as far as his ideas were concerned. For further consideration as to these two laws, I must refer the reader to the works of the author just mentioned. I simply wish here to note that the quest for food, coincident with the survival of the fittest, and the quest for love, which evolved the principle of sexual selection, opened out two separate and widely varying vistas of impulse and action.

As already estimated, the quest of food involved feelings mainly concerning the *self* of the organism, and affecting only the inward personality of the individual; while from the quest for love, for intercourse and companionship with fellow-beings, have arisen the feelings concerning the larger world outside the individual—the feelings which have their outcome in parental affection, social relations, and civilisation. And in the commingling and interaction of these inward and outer interests we may find the source of all intellectual action. For, indeed, the reaction of these two sets of feelings on each other has been so incessant and so multitudinous that it is difficult, if not impossible, now to classify some of the many varied passions of man according to their original incentive. And the organs naturally bear evidence to this intermingling of causes and events, for the gentle murmuring of words of love is as delicious to the lips and tongue as is the most delicate fruit, and "the warmth of hand in hand" is more tender and delightful than the sunniest glow of summer skies.

In man, as in the male of many other animals, this interchangeability of usage of the organs has been temporarily used to evil ends, for the organs of prehension acquired in the quest for food have been in some instances developed by the quest for love into instruments of outrage; so that, as already said, the young of the opposite sex have continually had enforced on them the function of maternity before their own strength or inclination would have suggested any such burden or responsibility. In looking at the means of prehension used for amatory purposes by male animals generally, it is hard to avoid the conclusion that the maternal office has been a matter of compulsion rather than of equal and voluntary acceptance. In some beetles, the cruel-looking specially-developed organs of prehension are repulsively suggestive of the idea that conquest and not endearment is their purpose, and that it must have been a great repugnance on the part of the female which has necessitated such implements of brute force in the male.

It is true that in the course of time a habit of tolerance, or even of perfect acquiescence, has been acquired by some females, yet the habit is far from universal, and, perhaps, never will be so, so long as the female remains exposed to the capacity of having maternity forced upon her despite her own will, while the male is incapable of having the office of paternity enforced by outrage on him.

In the primitive and savage condition of mankind we have such evidence of the abominable treatment and outrage of the young females as to leave us without wonder that the result has been to make woman of a generally more feeble type than man, and to have induced in her an utterly abnormal and unnatural phenomenon from which men and even female animals are exempt. At the first glance it is pitiful to reflect that man's vaunted superiority over the brute, the greater activity of his brain, and the subtler cunning of his hand have for so long lent themselves to the oppression that has resulted in such pernicious consequences and in the still existent slavery, social and physical, of the female of his own species. The function of child-bearing has been exaggerated to an utterly disproportionate degree in her life; it has been made her almost sole claim to existence. Yet it is not the true purpose of any intellectual organism to live solely to give birth to succeeding organisms; its duty is also to live for its own happiness and well-being. Indeed, in so doing, it will be acting in one of the most certain ways to ensure that faculty and possession of happiness that it aims to secure for its progeny. But up to the present woman has scarcely been treated as an intellectual being. In earlier history her fate was entirely subordinated to the passions of man, nor has our civilization yet sufficiently advanced to leave her to choose her own life, or to develop the powers, the inclinations, or the individuality which lie within her nature; and in our still feeble intellectual powers, in our narrow sympathies, and in our stunted capacities, we men are reaping the natural consequences of our blindness and injustice.

Truly the tale of man's ignorant injustice will be a bitter one when unfolded; yet there is the bright hope and confidence that to know the wrong will be to redress it. And it is by intelligent materialistic research that we can alone assure such knowledge, and by the destruction of all religions and priestcrafts. For a main basis and element in the constitution of these is the subjugation of woman, enunciated in tacit and open assumptions and assertions of her inferiority and secondariness to man, or in hideous and insulting fables proclamatory of her innate baseness, and exculpatory of the condition to which the wrong and selfishness of man has alone reduced her.

Further and very conclusive evidence in favour of development by interaction of these sets of motives and quests is

offered by the nervous system in organised beings. This system comprises the organs of intellect and of action, and divides into two main conditions having these specific functions. In the lowest organisms little evidence of nervous structure is presented beyond disjected filaments, but with organisms of more experiences (and, therefore, development) the nervous system becomes an apparatus of filaments combined with knots or *ganglia*. And with division into sets we have the accession of a cephalic ganglion or brain, at any rate in the more advanced organisms. The minuteness of many intelligent organisms (such as ants, bees, wasps, beetles, &c.) throws greater difficulty in the way of obtaining precise statistics concerning their nervous structure, but in the vertebrata we have greater facilities. That the brain seems to be a special outcome of wider experiences and motives is evidenced by its greater bulk in proportion to

Average Proportion of Weight of Brain to Body:

| | |
|---|---|
| Fishes | 1 to 5568 |
| Reptiles | 1 ,, 1321 |
| Birds | 1 ,, 212 |
| Mammals | 1 ,, 186 |
| Man | 1 ,, 35 |

The spinal system, which we are assuming to be more specially developed by, and connected with, the narrower series of motives implicated in self-preservation alone, offers a similar confirmatory result in its proportion to the amount of brain, as in the ensuing fairly accurate table :—

Proportion of Weight of Brain to Spinal Marrow:

| | |
|---|---|
| Fishes | 1½, or 2 to 1 |
| Reptiles | 2, ,, 2½ ,, 1 |
| Birds | 2½, ,, 3 ,, 1 |
| Mammals | 3, ,, 4 ,, 1 |
| Man | 23, ,, 24 ,, 1 |

This proportion ot brain or mental power to spinal or active power shall be noted with the coincident sexual, parental, and social conditions, as follows :—

Fishes.—In general there is no approach of the sexes, and no indication of parental feeling, except in very rare instances.

Reptiles.—Approach of the sexes, and sometimes (as in the viper) fairly developed parental care.

Birds.—In general a greatly increased degree of parental care, with, in some cases, a steady companionship of two individuals of opposite sex, which may even endure throughout life.

Mammals.—Parental, or rather maternal, care has here evolved a special organ, affording food to the young; the degrees and conditions of parentage, and of sexual affection and companionship, vary greatly. In many birds and mammals a power of affection, outside sexual or parental feeling, has been developed. In animals which have been much cared for by man, and become domesticated, this affection may be so prominent as sometimes to override both the quest for food and sexual or parental affection. Instances are not rare of the dog or the horse who willingly refuses a meal in order to be with his master, or who will leave puppy or colt at the sound of the same dear voice.

Man.—The office and issues of parentage have been extended through simple paternal brute force, with subjugation of wife and child; patriarchism, with attendant slavery; autocracy, with attendant servitude; limited monarchy, with attendant subjection; to Republicanism, with recognition of equality of individual right. And from some phase of these have arisen the vast majority of the existent relations between man and man. These form the subject of the further science of materialism called Sociology, and to that branch of the subject we must leave them, as also the wider discussion of the development of love in man to its grand phases of conjugal love, parental and filial affection, patriotism, and general humanity.

I need only draw attention to one further incident before bringing these papers to a close; the fact that the superiority of man's primitive culture over that of animals is mainly evidenced in three things—agriculture, the use of tools, and the use of fire, each of these having contributed its quota to the development of man's intellect. Agriculture would seem to be an outcome of the habit, common to many animals, of hiding a superfluity of food till a time of need, though there is, of course, a vast distance between the simple hiding of food and the sowing of seeds and the preparing of land for the purpose, yet it is not difficult to imagine that the *accidental* growth of a store of nuts or roots hidden in the ground gave to man the idea of *providing* for food in that manner.

Evidence of the origin of the use of tools is to be found in the habit of some birds in carrying to a height and dropping shell-fish which they have not the strength to break or open; monkeys, too, are known to break cocoa-nuts by dropping them. In these cases the earth itself is used as

a hammer, and the unintentional dropping of a shell or a cocoa-nut offers an easy solution for the origin of the habit, which would readily spread by imitation and inheritance. The next step in the scale of mechanical progress is evidenced in some monkeys, who use a stone as a hammer, or a stick as a lever. Then follows man, with the adaptation of the lever (or handle) to the stone, and the use of sharp-edged stones (knives and axes), and with the advent of fire and the smelting of metals we gradually arrive at the whole series of tools and machines that may be found in an international exhibition.

There seems no glimpse of any approach to the creation of fire in any animal but man, though many animals willingly accept its artificial warmth, and prefer the food that is cooked by its aid. In primitive times the chipping of his flint implements must have afforded man many instances of sparks of fire, and possibly of *undesigned* conflagration, with attendant flame and heat. The observation of this may well have led some thoughtful man to turn the unexpected discovery to profit and to imitate it; and the evolution by friction of a heat similar to that caused by fire might suggest to him or to others the continuance and increase of that friction till flame would be the reward of their curiosity and perseverance. And all this would be the consequence of as clear and simple a train of reasoning as that which led Columbus to discover land to the west of the Atlantic, or James Watt to foresee that the force which could raise the lid of a teakettle could also drive mighty engines.

We do not now dignify either of these men with the title of gods, or suppose that they stole their knowledge from heaven, our times are already too materialistic for that; yet in a preceding age we have the invention of fire attributed to such agency, and the shrewd and patient woman who evolved the primitive art of the culture of corn and fruit figured as a goddess, whose name we still use when speaking of our cereal productions.

Yet, though we no longer dream of referring such inventions or knowledge to supernatural power, though we no longer place faith in fictions of the divinity of the inventors, we, as a majority, present the pitiable spectacle of still accepting such primitive and infantile explanations of all the phenomena that man's intellect has not yet had the perseverance or the opportunity to solve. The inquisitiveness and habit of research evolved in man's natural quests have

led him to continually inquire into the origin and sequence of all the circumstances that he sees around him, and, where want of true knowledge has supervened there have not been wanting those who have offered all sorts of fictitious and baneful explanations. It is the evil of all religions, from that of Confucius to that of Comte, that they are, in the main, a compound of unverified assertions concerning man's physical and social condition, together with a series of self-styled moral aphorisms deduced from such assertions. It is only when the spirit of materialistic inquiry shall be carried into the region of ethics, when every action and idea and sequence of man's intellect and mind shall be accredited solely on the same terms as any other physical fact, that we shall arrive at any true morality, at any assured knowledge of living to the best for ourselves and for each other. Proceeding in this way we shall find that man's intellect will have power to find the solution of all that that intellect can suggest, and to speak of anything further is simply to speak of what is for man non-existent.

It has been my purpose to indicate somewhat of the line and method of thought which may be available in this further research, but each man must be left to travel by himself along that road. Sect and name-following can find no place there; open eyes for Nature's facts, open hearts for Nature's love, these will be our unerring guides to the ever-increasing knowledge, the ever-growing happiness, the ever-higher potentiality of life, and love, and humanity. Farewell.