ORGANIC PHILOSOPHY.

VOL. III.—OUTLINES OF BIOLOGY.

BODY, SOUL, MIND, SPIRIT.

BY

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PREFACE.

THE outlines of Organic Philosophy will form a series of five volumes like the present, each one dealing with a distinct subject, though all belong to one general plan, namely—the laws of order seen in the co-operative association of the different cells and tissues, organs and systems of the human body. The first volume is an outline of EPICOSMOLOGY (the three kingdoms of nature on our globe, *epi-cosmos)*; the second is a general view of ONTOLOGY (Eternal Forces, Laws, and Principles); the third is an outline of SYSTEMATIC BIOLOGY (Body, Soul, Mind, and Spirit); the fourth will be an outline of SYSTEMATIC SOCIOLOGY; the fifth a Treatise on DIALEGMATICS, or Biological Methods, in parallel with Mathematics, as a science of Method.

Each subject being complete in itself, there is little inconvenience in publishing the volumes at intervals of several years, required for the special elaboration of each one. Three volumes have now appeared, namely,

Vol. I. Epicosmology, 8vo., cloth, 400 pages, 10s.
Vol. II. Ontology, 8vo., cloth, 470 pages, 10s.
Vol. III. Biology, 8vo., cloth, 560 pages, 10s.

CONTENTS.—VOL. III.

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The following are a brief summary of the contents of the First and Second Volumes of Organic Philosophy, namely:—

VOL. I.—EPICOSMOLOGY.

Introduction.—Man's true place in nature. Outlines of organic philosophy. Outlines of epicosmology. Animal, vegetal, and mineral kingdoms of nature. Vertebrate organic unity. Molluscan organic unity. Articulata, Radiata. Phanerogamic plants. Cryptogamic plants. Atmospheric, pluvial, oceanic, reliquial, geospheric, and elemental realms. Conclusion, on biological method and organic unity of nature.

VOL. II.—ONTOLOGY.

Prelude. All forces are immaterial and indestructible. All laws eternal and immutable. PART I. INVESTIGATION OF PRINCIPLES. The unity of science. Methodological sciences. Cosmological or astronomical sciences. Ontological sciences. Transcendental philosophy. Perfective philosophy. Evolutive philosophy. Organic philosophy. PART II. DISCUSSION OF PRINCIPLES.—Evolutive facts and theories. The origin of species. Systematic classification. Physical philosophy. Bacon's philosophy. Spiritual philosophy. Theosophies and theologies. Bœhmen, Charles Fourier, Swedenborg. Nothing definitely known of cosmogony or world creation.

OUTLINES OF BIOLOGY.

GENERAL INTRODUCTION.

THAT which is eternal in the soul underlies all transitory modes and conditions of experience, and therefore experiential biology is quite distinct from ontological biology, with which it is closely allied, and to which it is always subordinate. While seeming to agree exclusively with Locke and the so-called "sensationist" school of psychology, as far as experiential data are involved, we are not unmindful of the other aspect of the question. Our present theme is nevertheless mainly that of experiential life. By this we mean the experience of the immortal spirit in the mortal body, and in the world. While the body is being formed in the womb, the experience of the spirit is *preconscious:* after birth, it is *unconscious* in all the main functions of digestion, circulation, nutrition, and secretion: *subconscious* in respiration and in some other reflex actions, such as winking the eyelids, and performing certain acts automatically, without being always conscious of such acts, although quite conscious of them when attention is excited: it is fully *conscious* of experience in the outward frame of the body and the senses, and in these only; so that experience means something more than consciousness.

The body is a complex unit composed of various tissues, organs, and systems, more or less similar to the vital organism of a plant, which has no instinct properly so-called: the soul of an animal is a complex unit, composed of various faculties, corresponding with the physiological organs of the body; the same may be said of the affections; and above these we have in man, a fourth kind of principle, called Reason, which forms a ratiocinative category quite distinct from the instinctual, the affectional, and the physiological economy of an animal.

From this point of view it is evident;—

First,—That all the *atoms* of the body are derived from external matter, by various modes of *absorption*; the physical organism is built up gradually *in utero*, and maintained through life by means of a "latent *association*" of these atoms, to form tissues, organs, and systems, which, from being a very feeble unit at birth, becomes strong and beautiful in adult life. *Latent* association of *atoms* in nutrition is contrasted with *patent* association in digestion, as perceptible with imperceptible modes of action in the animal economy. We see the food we eat, and the modes in which it is mixed with saliva in the mouth before it is swallowed, and we can trace its course from the digestive canal into the blood where it circulates in all the organs, but we cannot see the processes by which it is absorbed into the cells and tissues of each organ, by *nutrition* or "latent association" of atoms. Latent forces exist in matter, such as wood, which, by being burned, gives out heat. *Latent* heat-force had been stored up in the wood, by the physiological association of atoms in a growing tree.

Secondly,—In parallel with this process of formation and development of the mortal body, it is evident that all the *ideas* of the experiential soul are derived from the impinging influences of the external world, exciting conscious and unconscious *sensations* and ideas before and after birth; but a *latent* and more or less unconscious *association* of these ideas builds up gradually the general and special faculties of an instinctual intellect, by incessant nutrition or assimilation, as an experiential organism of psychological factors and functions, which from being feeble at birth become marvellously strong in adult life, especially in the higher animals, and in some races of mankind.

Thirdly,—The *affections* of the spirit are derived from experience of the external world of animated beings, by means of pleasurable or unpleasurable *emotions.* The affectional passions of man or woman are gradually formed by means of latent and more or less conscious or unconscious *association* of such emotions after birth; the moral nature being very feeble in infancy, though often strongly and beautifully developed in adult life. And as the body feeds on matter to acquire strength, so the spirit feeds on emotional experience to gain spiritual force as a unit of society.

Fourthly,—The *cognitions* of the human mind are derived from perceptional experience of *invariable laws,* which govern the mutable phenomena of external nature, in all the known depths of the universe, and the rational organism of the experiential mind is built up gradually by means of the latent *association* of such cognitions of scientific laws, to form the faculties of Reason, as distinct from experiential intellect or instinct in mankind. The faculties of human reason are extremely feeble in young children, and are more or less undeveloped in many grown up people, but they sometimes become strong in adult life, where

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innate vocation and favourable conditions of education have combined to bring about a fortunate result. And this may be said of all the muscles and nerves of the body; all the affections of the spirit; all the faculties of intellect, as well as of the faculties of pure reason and scientific understanding.

The intellect of man is much akin to that of animals, but no animal, however gifted, could understand the laws of any branch of science. Noological human reason, therefore, is distinct from psychological human intellect, as much as psychological sensations and ideas in animals are distinct from physiological absorptions and nutrition in plants. The vegetable kingdom is quite distinct from the animal kingdom, and psychological faculties are not more distinct from the physiological organs of the animal, than the scientific faculties of reason are distinct from the subordinate knowing faculties of instinct in mankind. These distinctions are not new, since Aristotle in the first Book of his "Treatise on Politics," chap. iii., says, "*Mind* rules *instinct* as the soul rules the body." He shows that vegetable life is inferior to animal life, and animal to human.

This superior endowment of reason in humanity does not prevent a wide range of diversity in the physical and mental peculiarities of indigenous races inhabiting different climes and regions of the globe.

The food of mankind differs in polar, temperate, and torrid zones; and the complexions, forms, and features of the races vary with the climate and the nature of the food. The general characteristics of animate and inanimate nature are modified in different latitudes, and hence the experiential sensations and ideas of individuals and races differ, as well as the languages in which ideas and sensations are expressed. The sentiments and passions of human races are more or less various in different societies and classes of the same community; but the laws of nature are the same in all known parts of the creation, and hence the science and the reason of mankind are ONE and the same in principle, however various in degree, however little or however much developed in any of the races of humanity or classes of society.

DIVERSITY IN UNITY.—We distinguish four aspects of vital unity in man, as we might observe four aspects of elemental unity in a plate of gold. Thus;—1st, from a barological view of its specific gravity; 2nd, from a thermological view of its specific heat; 3rd, from an electrological view of its specific powers of electromagnetic conduction; 4th, from a photological view of its specific colour or modes of transmitting and reflecting rays of light.

Gold is supposed to be an absolutely simple element which cannot be decomposed by any of the known methods of chemical analysis, and yet the four sciences which deal with the correlative and convertible modes of motion or of tension, commonly called weight, heat, light, and electricity, are classed as if these modes of motion belonged to different kinds of indestructible forces in nature.

It will be understood then that in our analysis of human nature, we distinguish four so-called *kinds* of organism or *vital forces*, as *modal aspects* of inherent unity, without implying any possible disintegration in reality, just as in the analysis of physical elements we note four so-called *kinds of forces* or general *modes of motion*, without implying any possible destruction of the unity of inorganic force. And just as we form distinct branches of physical science to explain the cardinal factors, modes, and laws of motion of the one indestructible energy of physical force, so we define four branches of biological science to explain the cardinal factors, modes and laws of life and organization in the one immortal unity of volitional spirit in mankind.

ELEMENTAL UNITY.—In the unity of physical nature we recognize :—

1. Magnetism....... (Electrological science of physics and chemics.)
2. Weight.......... (Barological science of physics and chemics.)
3. Temperature..... (Thermological science of physics and chemics.)
4. Light or Colour. (Photological science of physics and chemics.)

BIOLOGICAL UNITY.—In the unity of animated nature we also recognize :—

1. Body.... (Physiological science of nutrition and strength.)
2. Spirit... (Pneumatological science of affection and desires.)
3. Soul..... (Psychological science of sensation and intellect.)
4. Mind.... (Noological science of cognition and understanding.)

The body is thus defined *technically*, as a synthetic integrality; and so of the spirit, of the soul, and of the mind, as distinct modalities of life in every individual, male or female.

We use the word *vital force* in contrast with *physical force*, although the one is a determinative principle of *Will* rather than a *Force*, properly so-called : for, without the conditions of motor force in the blood, the Mind or Will cannot move the physical organism.

In this parallel of simple elements and biological units, we must not forget that metals and metaloids have not the same specific gravities, nor powers of conduction ; nor do they all melt or evaporate at the same degrees of temperature ; nor reflect the same rays of light or colour. Human beings are equally diverse in their modes and degrees of specific force and idiosyncrasies in physiological, psychological, pneumatological, and noological habits and temperaments. This will be an important branch of study in sociology, which need only be noticed briefly in the present volume. We must also note, however, that complexity of structure does not imply disunity—an organic cell contains atoms of different kinds, hydrogen, oxygen, nitrogen, carbon, sulphur, phosphorus, &c., and is still a functional unit; the human body contains many different organs and systems, and is nevertheless a physiological unit.

Body, soul, mind, and spirit are a complex social unit or individuality, as definitely as an atom of gold; the whole human race is a finite collective unit of creation; the globe with all its realms an individual cosmic unit. All degrees of diversity and complexity, then, from a simple atom, infinitely small, to the whole of nature, infinitely great, are contained within the limits of absolute unity.

All *kinds* of "immaterial *force*" and "*modes* of motion," are used as correlative forms of expression and correspondency throughout the following pages: that is to say, body, soul, mind, and spirit are analysed as distinct organisms and *kinds* of force, associated in concentric unity, rather than as four general and inconvertible modes of action in *one* individual unit of life and organization. When this artificial or methodical view is understood, there will be no misunderstanding of analytical definitions and distinctions, which *seem* to contradict absolute views of synthetical unity and inseparability.

CORRELATIONS AND CONVERTIBILITY OF LIFE AND FORCE.—What is the difference between effective modes of motion and determinative principles of action? Between the inorganic and organic realms of nature? Between the correlations of *convertible* modes of motion, and the correlations of *inconvertible* vital forces with convertible physical forces?

Great stress is laid by some philosophers on the correlation and convertibility of physical forces as a probable indication of like convertibility of vital forces, but we have no experience of any such possibility. We cannot convert a plant into an animal, nor an animal into a man, although a sensitive plant may seem to feel, and an animal may seem to reason, in some slight degree. What the Creator may do with all kinds of force, we cannot say, but man can only read the Book of Nature as he finds it.

We see in perennial operation two categories of indestructible energy (physical and biological), and four distinct modes of motion in each; and we are induced to ask what laws or principles of stability govern the mutable coexistence and persistent correlations of these modes of motion in the universe? Could all modes of life and motion be successively or simultaneously converted into any one alone of these definite kinds to the annihilation of all the rest? Could heat alone swallow up all the others? or weight alone? or light? or electricity? or vegetation? or animality? or humanity? What would a world of matter be alone? or a world of mind alone? Is it worth while to dwell on such questions when we have the world as it is, to investigate, in order to acquire a science of its indestructible forces, laws and principles, and more especially the laws and principles of life?

We shall analyse the four cardinal modes of human vitality as if they were identified with four distinct kinds of organism, each category of faculties and functions being as complete as that of the complex organs and systems of the body with which they correspond in every particular. As weight belongs to all the particles of gold, so temperature, colour, and conduction belong to all the particles: and just as physiological factors and functions belong to every part of the physical organism, so emotional passions and desires, instinctual sensations and ideas, mental perceptions and cognitions belong to the whole framework of human nature.

DEFINITIONS.—We use the word *soul* to represent the mysterious *principle* of thought in exactly the same hypothetical sense as physicists use the word *light* to represent the mysterious *principle* of illumination; and we speak of the laws of life just as we speak of the laws of light, these laws being equally definite in governing the phenomena of motion and mutation in the vibrations of an invisible ether, and in the emotions of an invisible spirit. Physics and metaphysics are equally positive in dealing with the laws of natural and spiritual phenomena, or the states of tension and modes of motion of unknown essences; and when the so-called "positive philosophers" sneer at the metaphysicians as dreamers who deal with imaginary principles or essences of life, which cannot be handled; we retort upon them the same argument, for they also deal with immaterial atoms of an imaginary ether or essence of light which is purely hypothetical. And yet the physical science of optics is admitted to be a positive science of the laws of optical phenomena, while the metaphysical science of psychology is not regarded as a positive science of the laws of mental phenomena, because it is sometimes misallied with speculations of no value.

Both the physical and the metaphysical sciences commence with a limited knowledge of facts and much imaginary speculation, before they obtain rigorous methods and legitimate inductions; and although physical sciences have made more progress in this age than metaphysical, it is silly to suppose that the laws of life are not as positive as those of light, and as easily discovered in the phenomena of one order as in those of another. The "essences" of light and life are equally mysterious, while the phenomena of light and life are manifest, and the laws which govern them invariable. Many branches of physical science are nevertheless still imperfect, as well as those of biological science, and patient investigation is necessary to advance in all directions. Meanwhile both physical and metaphysical students are obliged to speak of *ether* as the hypothetical substance of light, and of the *soul* as the hypothetical principle of thought, and neither can dispense with the use of these words. As ether and light pervade solid matter and pass through it, so spirit may pervade ether and matter, and, for ought we know, pass through them. Laws govern matter and motion, life and thought, eternally; in all states of co-existence and sequence; in all degrees of extension and intensity; or science would be impossible. This being admitted of necessity, we postulate from what we know already, that—

First,—All physical *forces* and phenomena may be measured by mathematical method or physical science.

Second,—All vital *principles* and phenomena may be measured by dialegmatical method or biological science. Methodological, cosmological, and ontological sciences are the measure of all things, physical and mental, as far as measurable by human understanding.

We may form a parallel of physical and vital phenomena as the data of science, thus—

Physical Phenomena.	1. States of tension—Statics. 2. Modes of motion—Dynamics. 3. Degrees of impress—Magnets.
Vital Phenomena	1. States of consciousness—Religion. 2. Modes of thought—Biology. 3. Degrees of impress—Psychologization.

When one magnet gives its *impress* to a dozen other pieces of metal it imparts force without losing force! this is not conversion! When one man communicates ideas to another, or a number of others, he does not lose ideas.

Physical phenomena have been successfully dealt with by physical and mathematical science. We shall deal with vital phenomena in the following pages.

What is spirit? What is matter? Spirit is said to be "immaterial," and atoms of matter are said to be "mathematical centres of force without dimensions." Spirit and matter then are both defined as immaterial substances or essences which can only be known by their states of tension or modes of motion. Through phenomenal modes of motion all principles, laws, and forces are amenable to human forms of thought, by scientific analysis and synthesis in all degrees of limitation and extension, from the finite to the infinite.

Love is a spiritual mode of affection or emotion in finite or infinite degrees of extension; in individual and collective beings.

Wisdom, or reason, is a mental mode of motion in finite or infinite degrees of extension; in individual and collective beings.

Sensation is an instinctual or intellectual mode of motion or ideation, in finite or infinite degrees of extension; in individual and collective beings.

Force is a physical mode of motion or tension in finite or infinite degrees of extension; in individual or collective beings; plants, animals, and men; cosmic bodies and sidereal systems.

All these modes of motion and tension occur within finite and infinite conditions of time, space, form, and substance (visible or invisible); since finite limits in all cases, are parts of infinite extension. And, therefore, the idea of infinite chaos "without form and void," is an irrational idea. All science consists of rational modes of thought with regard to the permanent principles and regulative laws of nature, and these are known by modes of motion and degrees of force in all the depths of life, in all degrees of extension, from the indestructible atom to the complex individual organism, from the finite limits of physical, instinctual, mental and moral nature in mankind, to the eternal spirit of love and wisdom, creation and destruction, in the unfathomable universe.

Infinite chaos would be infinite destruction, an irrational mode of thought. Infinite order involves co-existent evolutions and dissolutions to balance each other in perpetual harmony; and this is a rational idea. Finite life is a continuous change with alternations of states and modes of motion. Infinite life must be a continuous change with alternations of states and modes of motion, from eternity to eternity. The ontological and the experiential (the noumenal and the phenomenal) become thus one and the same, in an absolute point of view or form of thought. We are, nevertheless, obliged to distinguish eternal laws and principles from transitory phenomena, with distinct modes of motion in elemental atoms and biological units. Diversity in unity is easily recognised and understood by analytical parallels of order and degrees in kinds of energy and modes of motion.

METHODICAL PARALLELS AND ANALOGIES.—Poets in all ages have discerned analogies between physical and moral nature, and have made great use of similes and metaphors, but biological science has not hitherto recognized sufficiently the parallels and analogies of psychological and physiological phenomena. We may now, however, form concentric parallels between body, soul, mind, and spirit, in every faculty and function. For instance, the nutritive wants of body, soul, mind, and spirit, are not identical, but they are analogous forms of yearning, or hunger and thirst for physical nutriment, spiritual nutriment, instinctual nutriment, and mental nutriment. Again, man breathes physical air, pure and wholesome, or impure and unwholesome; a moral atmosphere, pure and virtuous, or immoral and depraved; an instinctual atmosphere of beauty and refinement, or of coarseness and rudeness; a mental atmosphere of truth and science, or of error and prejudice. Such parallels will be duly noticed in our analysis.

But what have parallels and analogies to do with science? Light, heat, magnetism, and gravitation are distinct modes of motion, and the laws which govern them, being mathematically similar, render the physical sciences alike and parallel. Mental, instinctual, spiritual, and physiological phenomena are distinct modes of motion in organic realms, and the laws which govern them, being similar with regard to number, order, weight (or combination), and measure (or proportion), render the biological sciences alike and parallel.

Synoptic tables will be given as verbal diagrams of organic *numbers* in each organism and realm, with symbols of organic factors and functions to denote the natural *order* of arrangement in systems and series of organs; while explanations will be given of progressive degrees of *association* of atoms in cells, cells in tissues, tissues in organs; these in groups of organs, which form an apparatus, or series of groups; three or four of which form a distinct system in one bilateral half of the body, which includes seven of these double systems, with five satellitic senses or sub-systems in connection with the seven; and the same distinctions of number, order, weight and measure, will be found in the analyses of body, soul, mind and spirit; of individual organisms, collective organisms, epicosmic realms, and cosmic worlds.

Problems of biology involve physiological, psychological, noological and pneumatological phenomena in the *natural* world, the *lymbic* world, and the *spiritual* world of existence; we cannot have a comprehensive view of these phenomena, unless we embrace the whole round of life in all its various states and conditions of alternating activity and rest, consciousness and unconsciousness, forgetfulness and reminiscence, sensibility and insensibility, sleep and wakefulness, dream and trance, health and disease, sanity and insanity, objective and subjective excitements, normal experiences and illusory sensations.

The immortal spirit of man must have one distinct set of conditions and experiences in the unseen ethereal world; another set of conditions and experiences in the natural world; and yet another and still different set of experiences and conditions in the lymbic worlds of incarnation, decarnation, and partial or temporary isolation of the permanent "spiritual body" from the transitory physical body. Before we analyse the facts which warrant these distinctions it is well to have a definite outline of the limits of the problems to be solved, and then we can judge of the agreement or the disagreement which may arise between the facts of experience and the rational limits of theoretical postulates.

In physical and physiological biology we analyse phenomenal or experiential life, and its conditions, as modes of motion and associations of atoms, tissues and organs; in instinctual and psychological biology we analyse phenomenal or experiential life, with its conditions as modes of thought, and the association of sensations or ideas, opinions, and faculties; in mental and noological biology we analyse a rational, experiential organism and reasoning faculties, with their conditions as modes of abstraction, calculation, and ratiocination, or the association of definite laws, relations, and principles of science in the human mind; in spiritual and sociological biology, we analyse an experiential conscience with moral conditions, as modes of spiritual emotion, and association of feelings, passions, and desires in the innermost depths of the spirit of man. Thus *physiological* modes of motion and association reveal to us the *qualities* of invisible organic forces and faculties; *psychological* modes of motion and association reveal the *qualities* of invisible thinking forces and faculties; *noological* modes of motion and association reveal the *qualities* of invisible reasoning forces and faculties; *sociological* modes of motion and associated feelings reveal the *qualities* of invisible loving forces and faculties in human nature.

THE SPIRITUAL BODY.—When the spirit leaves the body at death, organic forces disappear, and therefore physiological and psychological modes of feeling and motion cease together, leaving the matter of the corpse to the sole action of physical forces in chemical dissolution. The "spiritual body," then, is the real body, as an organic physiological principle of vitality.

But what of the indivisible unity of man, as a biological unit, in parallel with a simple element of matter? How can the body and the mind belong to the same indestructible unit, if the immortal spirit can be separated from the mortal body?

Alloys of various kinds may be fused with gold, and separated again by heat or chemical modes of action; and thin plates of the alloy would be as uniformly consistent in physical modes of motion, heat, weight, colour and conduction, as thin plates of pure gold. So of the spiritual body blended with the natural, they can easily be separated, more rapidly than they were united, not perhaps exactly like the fusion of metals, or as water mixed with lime, but as intimately as ether permeates gases, liquids and solids in living and growing plants, suspending its modes of action while trees hibernate, and quitting them altogether when they wither and die.

There are many facts, which show that the spiritual body is distinct from the natural, and can be more or less completely isolated from it during life, not only in cases of cataleptic disease, or trance, but in a state of perfect health. For instance, we can think and articulate words and sentences containing vowels and consonants, without opening the lips, or moving a single fibre of the tongue, although we feel the motions of these special organs of the spiritual body, as distinctly as if the material lips and tongue were moved. There may be molecular motion in the nerves, however, without mechanical motion in the organs of speech.

It would seem also that the principle of physiological vitality is as distinct from the psychological principle of sensibility in animal organisms, as in plants; since all sensibility may be lost in the living body, as in cases of cataleptic trance, and anæsthetic insanity, in which state insane patients often mutilate their bodies horribly, without feeling any pain, and the wounds heal rapidly without surgical dressing, just as the wounds of a tree would heal. Many such cases are recorded by medical men who have had the care of insane patients.

These phenomena force upon our attention the problems of experiential life, not only in the natural world, but in the uterine world of embryonic incarnation and metamorphic evolution; in the lymbic world of decarnation, and resurrection in the celestial world of ethereal existence.

Many people doubt of the genuineness of the phenomena of "spiritism" (communications received from departed spirits), but those who have carefully witnessed and examined them cannot reasonably deny the facts which they have seen, nor the importance of such facts in an age of scepticism like the present. We have witnessed the phenomena ourselves, or we should not vouch for them.

Some persons who profess to believe already in the immortality of the soul, but fear "satanic agency" may be the cause of spiritual manifestations, evade the duty of examining for themselves before they form a judgment, by exclaiming in mental darkness, "*cui bono*," supposing such phenomena to be real?

To this we may reply, that many people have been consoled by a belief in life after death which they could not realise before. And besides this, more rational ideas of a future state are given by some spirits than those which are generally taught by theologians of various sects and doctrines. For instance, in a London weekly journal of spiritualism (the *Medium*) for April 28th, 1871, we find the following answers given by a spirit through an entranced medium: Question—"What is meant by spiritual freedom or liberty?" Answer—"The inhabitants of the spirit-world, like "those of earth, have the power to use the means at "their disposal for carrying out their desires, malicious "or otherwise, but all are responsible for the results of "their actions, be they of a beneficent or malignant "nature. Thus freedom of all kinds should always be "made subservient to reason and goodness."

"In reply to a question respecting the existence of "evil in the spirit-world, it was stated that the action "of evil there was pretty much the same as on earth. "A person ignorant of spiritual conditions necessarily "made mistakes and errors, which must produce false "theories and discomfort to himself and others. Before "such an individual attained to light sufficient to rectify "his ideas and conduct, he might be said to exist in a "sphere of evil."

"In answer to a question, the spirit stated that "children who were full-grown and born alive were "immortal, but that in cases where the fœtus died "before maturity the child had no spiritual existence. "A visitor stated that he had heard of parents receiving "messages from the spirits of children that had never "been born. The spirit replied that such was contrary "to his experience."

These are very interesting questions, and as spirits do not agree upon them, we may infer that their experience and knowledge are not equal in spirit-land any more than on earth. The souls of human embryos which never come to life in this world, and the souls of animals after separation from the mortal body, may never come to conscious life in the spirit-world, but we cannot doubt of their existence in the hands of the Creator, to be dealt with in such manner as Eternal Wisdom may deem fit; such obliterations of conscious memory may possibly be what is meant by "spiritual death" in the texts of Scripture. But, enough of this, which leads only to vain speculations: and yet we must suppose that all mysterious words in Scripture are meant to be finally understood or they would not have been written; and we are naturally curious to understand in what sense such enigmatical phenomena are possible in any world. How can we imagine the reality of certain facts related in the Word, such, for instance, as Christ walking on the water; and the body of a person being carried through the air to a distance; or loaves and fishes being multiplied by miracles! Without some evidence of similar facts we should find it difficult to credit such extraordinary statements; but modern spiritualism gives us some reliable experience of analogous phenomena; such as mediums being floated in the air, and thus sustained by invisible power; tables even, being raised and balanced in the air, by some kind of lifting power balancing the power of gravitation; flowers and fruits being brought fresh and ripe from a distance, and placed on the table in a room where no such objects were known to be a minute or an hour before; sea shells brought dripping with sea water to a house many miles away from any shore, and not only carried bodily throught the air, without any visible agency, but brought into a room with the doors and windows firmly closed; so that the solid bodies must have come through the walls, or doors or windows thus closed, or by openings of doors or windows unperceived by the occupiers of the room. How can we conceive either of these modes of motion to be possible, from any evidence we have of physical and mechanical modes of motion in the common experience of life? or should we deny the possibility of such phenomena, on the plea of non-acquaintance with the invisible modes of motion?

MECHANICAL AND PHYSICAL MOTION.—What do we know of physical and mechanical modes of motion? degrees of velocity? and mutable states of matter? not to mention the relations of spirits to "imponderable forces" in the flesh, or out of the flesh? Things may be moved with such velocity that the motion is invisible. An incandescent point of metal may be moved so rapidly in a circle as to form a visible ring of fire, although the real point is invisible in any one place. Doors and windows might possibly be opened and closed so rapidly and noiselessly as not to be seen or heard by those present during the operation, for it is known that mechanical vibrations, which transcend certain degrees of velocity, become inaudible to the human ear. Some phenomena of this kind, however, are testified by credible witnesses, which render such an interpretation insufficient. A watch, for instance, being taken from its place invisibly and placed behind the metal back of a stove without disturbing the fittings. It must have gone through the metal plate, or the wall behind. How can we conceive it possible from anything we know of physical and mechanical modes of motion?

We know that solid bodies can pass easily through air and vapour, as well as through water, without being injured or deformed: that solid bodies can be melted into liquid states by heat, and even resolved into vapour by certain processes; not very rapidly by human agency, but still quickly: we can therefore conceive the possibility of all kinds of substance, metal, wood, or stone, assuming any of these solid, liquid, or fluid forms, just as water becomes either solid ice, or invisible vapour, by easy and familiar modes of motion and mutation. We have only to suppose, therefore, that spirits can use some form of electricity or magnetism so rapidly and mutably as to render solid bodies liquid or fluid for an instant, without change of place, to allow solid bodies to pass through them, as through vapour, and so quickly as not to allow mechanical disturbance while the physical mutations and reconstitutions are being made. It is much easier to conceive this possible velocity in physical modes of motion and mutation, than to disbelieve the evidence of men and women in the perfect enjoyment of all their senses and their reason, who affirm the truth of facts which they have seen and felt, and know to be real, however strange they may seem, and apparently inexplicable.

This digression is not exactly foreign to questions of biology, but it has taken us away from the "spiritual body" and its relations with the natural frame.

The natural body is formed by the association of atoms of matter, not only after birth, by the process of nutrition and exchange, but also in the mother's womb, by the processes of metamorphic evolution. The association of atoms, then, is not the only factor of organic life, after the body has been formed in utero, nor while it is being so formed: there is a formative principle of life and organization, anterior and superior to the association of atoms in cells, tissues, and organs, which principle determines the forms and proportions that organs and systems shall assume by the association of atoms. This principle is the indestructible ontological entity, which pre-exists and aggregates atoms of matter *preconsciously* in the uterine limbo of incarnation, *unconsciously* in the nutritional associations of atoms after birth and during natural life; leaves the mortal body at death, to enter upon a new career of experiential life in what may be called the spiritual limbo of decarnation, on its way to a higher world of experiential existence, in the celestial sphere of what is supposed to be blissful perfection.

We mention this to show that the *association of atoms* in the body (preconsciously in utero, and unconsciously after birth) does not account for the differences of form and proportion in vegetable and animal organisms; in different classes of the same organic realm (such as fishes, reptiles, birds, and mammals); nor does the unconscious association of sensations and ideas alone, account for the differences of instinct in animals of different species, or in mankind. Experiential biology dwells almost exclusively upon the association of atoms and ideas, to form the organs and the faculties of body and mind, but always in subordination to Pre-existent Principles of being, which determine the modes and degrees of organic unity, in all such associations of atoms and ideas: not only in different races and vocations of mankind, but in every type of animal and vegetable organism.

TERMINOLOGY.—Ancient and modern philosophers differ widely in their distinctions of the faculties and functions of the human mind, and also in their use of words. The general terms of Aristotle differ from those of Anaxagoras in naming the same faculties, and modern writers differ from each other as widely as the Ancients. Sir William Hamilton distinguishes Intellect from Reason by giving his view of the meanings of Greek, Latin, and German distinctions, thus,—

Intellect, Intelligence (νους, Mens, Intellectus, Verstand.)
REASON, (λογος, Ratio, Vernunft.)

This is not exactly the sense in which Anaxagoras defined the words φρην, sensuous intelligence, νους, reason, and θυμος, impulsive nature.

Aristotle uses the word *Entelechia*, to distinguish the organic soul of plants from the instinctual soul or *psyché* of animals. The same word Entelechia, also denotes the physiological "soul," as distinct from the psychological instinct of animals.

In the "History of the Inductive Sciences," Dr. Whewell says, "John Scott, of Erigena, may be looked upon "as the reviver of the New Platonism of the tenth cen- "tury. Towards the end of the eleventh, Peter Damien "reproduced some Neoplatonic ideas. Godefroy, also, "the censor of St. Victor, has left a treatise, entitled, "*Microcosmos;* this is founded on a mystical analogy, "often, afterwards, again brought forward, between "Man and the Universe. Philosophers and Theolo- "gians, says the writer, agree in considering Man as a "little world; and as the world is composed of four "elements, man is endowed with four Faculties: the "SENSES, the IMAGINATION, REASON, and UNDER- "STANDING.

"Bernard de Chartres in his *Megacosmos* and *Micro- "cosmos* took up the same notion. HUGO, ABBOT OF

"St. Victor, is said to have been the first of the "scholastic writers who made *Psychology* his special "study. He says the faculties of the mind are, the "*Senses*, the *Imagination*, the *Reason*, the *Memory*, the "*Understanding*, and the *Intelligence*."

Sir Henry Holland observes, that, "it is in passing "from the region of facts to that of laws, that man "takes his peculiar position in the scale of created "beings; and, here also, that the *intellect* of one "man stretches furthest beyond that of another." The word intellect is thus used to denote the highest powers of reason.

We need only show that technical definitions have hitherto been neither uniform nor satisfactory, and words in common use are often applied indifferently to "spirit, soul, mind, intellect, and reason."

According to our analysis:—

The Body is a complete physiological aspect of synthetic unity;

The Soul is a complete psychological aspect of synthetic unity;

The Spirit is a complete pneumatological aspect of synthetic unity;

The Mind is a complete noological aspect of synthetic unity.

In analyzing each one of these parallel aspects of vital unity, we must show how words in common use are defined and limited in technical meanings, thus,—

1. Physiological sensibility, or *sensitivity*.
2. Instinctual sensibility, feeling, or *sensation*.
3. Moral sensibility, feeling, or *emotion*.
4. Mental sensibility, rational sense, or *understanding*.

Here the words feeling, sensibility, and sense, as general terms, sufficiently accurate for literary use, become technically *sensitivity, sensation, emotion, understanding,* when applied to the passive aspects of biological experience; and just as we say a *sensitive plant,* we can apply the word sensitive to the irritability of muscular tissue in the animal body, in contradistinction from the words sensation and sensibility, applied to the feelings of the instinctual soul.

There are *physiological* modes of sensitivity and vitality, "irritability and contractility," selective absorption (or volition ?), secretion, nutrition in all the tissues, which constitute a sort of physiological memory? or an accumulation of latent forces, in the organic soul of a plant or an animal; (the *entelechia* of Aristotle.)

There are *sociological* modes of feeling or emotion, selective conscience or volition, sympathetic affections, and associations of emotions, in all the faculties of the moral organism which constitute a sort of spiritual memory, or an accumulation of latent forces of morality and sociability.

There are *psychological* modes of sensation, and experience, vocational selection or volition, thought, knowledge, and practical judgment, or common sense, which constitute a sort of instinctual memory, or an accumulation of latent forces of intelligence.

There are *noological* modes of understanding, and theoretical modes of reason or science, and mental yearnings for a science of the laws of nature, selective volitions of investigation, and latent associations of cognitions which constitute a sort of rational memory, or accumulation of the scientific principles of reason.

To be guided exclusively by feelings excited either by internal or external conditions of life, is the peculiar characteristic of animal instinct, whereas reason enables man to calculate the consequences of blind obedience to such impulses; to resist them if necessary, and to moderate them in accordance with moral and social requirements. Practical intellect alone may do this to some extent, in both animals and man, but still practical cunning and strategy alone will not enable animals to understand the laws of science; and thence it is we draw a distinct line between Intellectual and Rational faculties and functions in the human Mind.

The usual Greek names for body, soul, mind, and spirit, are *soma*, *psyché*, *nous*, and *pneuma*, from which we derive the words, *somatological*, *psychological*, *noological*, and *pneumatological*, commonly expressed by the words corporeal, instinctual, mental, and spiritual.

Anatomical and physiological views of the *body* and its functions are easily distinguished by current words and phrases, while the anatomical and physiological factors and functions of the *spirit*, the *soul*, and the *mind* are not popularly known, nor even familiar to psychologists, some of whom, in modern times, have denied the existence of mental faculties, and described psychological modes of action as attributes of the brain and nervous centres. We need not discuss this view, but give a series of definitions as we understand them; thus:—

Body—Physical.	*Soma*—Somatological.
Spirit—Spiritual.	*Pneuma*—Pneumatological.
Soul—Instinctual.	*Psyche*—Psychological.
Mind—Mental.	*Nous*—Noological.

Somatological is synonymous with physiological, which is a more familiar word, and so far preferable. In other parallels we may place quadruple Biological faculties and functions, thus:—

Bodily organs and functions, or modes of action.
Spiritual passions and functions, or modes of action.
Instinctual faculties and functions, or modes of action.
Mental faculties and functions, or modes of action.

CHOICE OF WORDS.—The choice of words is governed by a sense of fitness, by persons who have no definite rules of selection, just as people hum tunes, without a knowledge of the modes and keys in which they were composed. It is well, however, to have some rules of choice in accordance with the special point of view, from which we describe ideas and give names to faculties and functions, with relation to internal and external conditions of existence.

Life, Instinct, Reason and Conscience, are words applicable to body, soul, mind, and spirit; use, beauty, truth, and goodness are equally appropriate; industry, art, science and religion, are correlatives; and so are the words economics, æsthetics, philosophy, and theosophy; nature, fate, necessity, and deity; will, understanding, and memory; love, wisdom, and knowledge; morality, rationality, and cunning; are also quite distinct, and easily placed in parallels, as the same notes on different scales of a keyboard. Approximative terms need not be deemed technically accurate, still they give an idea of a methodical arrangement, in which each word would indicate at once the point of view, from which dominant characteristics were observed.

Moral and political sciences have hitherto been deemed beyond the pale of mathematical certainty in parallel with Physics and Mechanics, but there is no valid reason, why this should for ever be so. Vital forces are under the control of invariable laws as much as physical forces, and the data of Biological sciences are as definite as those of other sciences. Dialegmatic rules and methods are as positive as mathematical rules and methods, when duly understood, and this we hope we shall be able to prove in a special treatise on Methodics.

The words *logos* and *ontologos* are applicable to eternal principles of wisdom, truth and reason; latent vital forces, and modes of tension are sufficiently stable in evolutive progressions to enable us by organic methods, to establish Biological and sociological sciences on a solid foundation of eternal laws and principles.

By latent forces and modes of motion in organic nature, we mean static and dynamic forces; not automatic modes of motion, in contrast with autocratic. The organs of the body and the faculties of the soul are statical embodiments of latent forces, in which automatic, or unconscious, and voluntary conscious modes of motion are equally dynamic factors of physiological and psychological functions.

We make this observation here, because the phrase "latent association of ideas" is commonly used by psychologists to denote unconscious modes of sensation and reflection in the human mind, analogous to automatic modes of action in the heart and lungs, the kidneys and the liver, the stomach and intestines, the ovaries and mammal glands, which modes of action are quite distinct from those of nutrition by which organic forces are stored up or rendered latent in the organs themselves, to be afterwards expended in both voluntary and involuntary modes of motion.

We have thus four general aspects of vital unity in human nature, namely, body, soul, mind, and spirit; with four subordinate views of each division, which will be analysed in BOOKS of Physical Biology, Instinctual Biology, Mental Biology, and Spiritual Biology; each containing four *Parts* (anatomical, physiological, embryological, and genealogical); four parallel views of biological phenomena, and four secondary aspects of each general view.

We may also note here that by "spiritual body" we mean ethereal substance, such as that which fills "empty space" and permeates solid bodies.

BOOK I.

THE BODY.

OUTLINES OF PHYSICAL BIOLOGY.

[A systematic analysis of structure and functions, which are common to plants, animals, and man.]

HAVING distinguished four general modes of action, as primary analytical aspects of Biological unity in human nature, we have now to analyse the physical organism, in four secondary aspects; namely, those of Anatomy, Physiology, Embryology, and Genealogy; but this analysis will differ in some respects from practical anatomy and physiology, which *describe* the organs and their functions, but do not notice the laws of order which rule in the economy; whereas these are the factors of life and organization with which taxonomic method is most deeply interested. We must take for granted, therefore, that the reader is already acquainted with descriptive anatomy and physiology as explained in the standard works of practical science, and that he wishes to know something of the laws of order, which are manifest in the human body.

PART I.—SYSTEMATIC ANATOMY.

Are there definite laws of association in any of the variously constituted bodies of the animal, the vegetable, and the mineral kingdoms? What is the organic system of nature? Has she a system which may be analysed and systematized instead of being imagined and arbitrarily described by the human mind?

What are the main systems of the body, and how are they connected to form one complex unit? What is the number of organs and systems? What is the order of arrangement? The skin, the muscles, the bones and the nerves are distinct systems in the external frame, and connected with these are three other systems, namely, the generative, the digestive, and the vascular. The first four are commonly called *relational*, and the other three, *organic*. There are thus two classes of mechanism, one containing four different systems, and the other three; being seven in all. *Seven* is then a leading number with regard to the constituent parts of the body, but there are certain tissues and secretions which connect the systems together in one individual organism. These have common connective uses as constituent parts of every organ, and cannot be placed as an eighth separate system. We must denote them by a neutral symbol which is not a numeral.

In subdividing each of the systems and the connective tissues, we find three secondary series, with a fourth hyper-series of articular apparatus. In connection with the organic systems there are special organs of sense, and two of the relational systems are also enriched by organs of sense. We class them as *satellites* to the five systems with which they are connected, and designate them by symbols which are not to be confounded with the primary numerals. How is this to be done in a general scale of systems? We should probably be much embarrassed with this question if we had not an example of such an order of things in the musical octave, in which seven diatonic notes are complemented by five half tones in the chromatic scale.

This curious coincidence might easily betray us into notions of imaginary parallels between the laws of number in organic nature and those of octaves in the musical scale, and thence into the Pythagorean hypothesis of the harmonies of the spheres.

It is nevertheless incumbent on us to notice this coincidence of constituent numbers and arrangement, showing that the main systems of the body are exactly seven, to which are attached *five* satellites, the organs of special senses. There can be no doubt of this fact, and we will examine the theory of it presently.

We have then *seven* general systems, *five* secondary groups of organs, and a neutral connective class of tissues to describe, as distinct parts of the human body; and as the number seven gives us the first complete view of all the systems (other tissues and organs being merely complementary), we designate them by definite symbols, either the capital letters of the alphabet, A, B, C, D, E, F, G, for the seven systems, with italics for the five senses, or by the following scale of Roman and Arabian numerals: I—1, II—2, III, IV, V—5, VI—6, VII—7; this gives us a means of notation for the systems and senses, but not for the connective tissues and secretions; besides which we have to notice the surrounding elements and forces of nature from which the body obtains nourishment, and by which it is controlled in all its operations. For these complemental factors of organization we must have four distinct symbols, in parallel with the twelve above. The last letters of the alphabet will serve our purpose, and, therefore, we use them to complete the scale. Other symbols will be necessary for the secondary sub-divisions of these factors.

In forming a natural scale in parallel with an octave of musical notes, we proceed from the skin inwards and count upwards from the numeral I at the bottom to VII at the top, with the connective symbols above, as in the following synoptic table of the order and number of systems, satellites, and connective adjuncts. What are the connective factors of a musical octave which correspond with those of an organic scale as here described? The atmosphere is necessary to convey sounds; an instrument is indispensable, a musician and an audience are pre-supposed as connective factors of musical sounds.

SYSTEMS AND ADJUNCTS OF THE HUMAN BODY.

Z. Connective conditions.
Y. Connective ingesta.
X. Connective secretions.
W. Connective tissues.
VII. VASCULAR SYSTEM.
7. *Vascular organs of sense.*
VI. Digestive system.
6. *Digestive organs of sense.*
V. Generative system.
5. *Genetic organs of sense.*
IV. NERVOUS SYSTEM.
III. Osseous system.
2. *Organs of vibratory sense.*
II. Muscular system.
1. *Organs of radiatory sense.*
I. Cutaneous system.

This table gives a first general view of the number of distinct systems in the body, together with their *concentric order* of arrangement from the most external to the most internal positions of the organs; but primary numbers and concentric order are not the only characteristics of complex organic unity. There exists a secondary order of distinction in each system and sub-system, with secondary numbers of correlated apparatuses. Each special apparatus contains a series of organs, and each series several groups. Is there any common law of order, number and distinction, in these secondary subdivisions? Each system contains three distinct series of organs, with a fourth connective hyper-series, which links them together, in unity. Each separate series again, contains four definite groups, and various contrasted orders of arrangement are observed in these complex groups.

Special apparatuses occupy distinct positions, one being relatively *central*, one *medial*, and one *extremital*, in the relational systems, while their relative positions are *upper*, *middle*, and *lower*, in the organic systems. Definite symbols represent these relative positions, and the groups of each series may be designated by the same signs. The letters of the alphabet will serve our purpose here again, as symbols of notation, and taking the letter O to represent a central group, the letter U a medial, or an upper group, and the same letter upside down, thus ∩, to represent an inverted, or a lower, group ; we shall have definite signs representing the secondary distinctions of number and arrangement which are common to all the systems. We want a special sign, however, to denote the articular apparatus of each system, for which we may take the letter H, and thus we have H, U, O, ∩, as representatives of secondary groups and series in each primary system of the organism.

The following table will display all the relative distinctions of order and relationship in the general systems of the animal economy.

NUMBER AND ORDER OF SYSTEMS AND SERIES OF ORGANS.

Connective Systems.	Z External Conditions.	H. *Solar conditions.*
		U. Planetary conditions.
		∩. Social conditions.
		O. Hereditary conditions.
	Y Internal Conditions.	H. *Impregnata and infesta.*
		U. Investa—clothing, &c.
		∩. Ingesta—air, water, food.
		O. Blood—chyle, lymph, &c.

Connective Systems.	X Connective Secretions.	H. *Parturitions—exuviæ, &c.* U. Excretions—urine, milk, &c. Ω. Secretions—fat, marrow, &c. O. Lubrications—serum, synovia, &c.
	W Connective Tissues.	H. *Placenta, &c.—Caducal tissues.* U. Glandular tissues. Ω. Adipous tissues. O. Areolar serous tissues, &c.
Organic Systems.	VII. Vascular System.	H. *Umbilical blood vessels, &c.* U. Respiratory air vessels. O. Circulatory blood vessels. Ω. Urinatory water vessels.
	7. Vascular Senses.	H. *Capillary vessels.* U. Nose. O. Lymphatic vessels. Ω. Urethra.
	VI. Digestive System.	H. *Fœtal yolk-bag.* U. Stomach. O. Small intestines. Ω. Large bowels.
	6. Digestive Senses.	H. *Digestive gland ducts.* U. Mouth and æsophagus. O. Duodenum. Ω. Anus and rectum.
	V. Generative System.	H. *Wolffian bodies of fœtus (?).* U. Ovaries. O. Uterus. Ω. Mammæ.
	5. Genetic Senses Erectile.	H. *Marsupium Protective (?).* U. Oviducts. O. Vagina. Ω. Nipples.
Relational Systems.	IV. Nervous System.	H. *Ganglionic vesicular—sensor motor.* U. Relational nerves, sensor motor. [motor. Ω. Medial nerves of sense organs, sensor O. Organic sympathetic nerves, sensor motor
	III. Osseous System.	H. *Articular hyper series.* U. Limb series of bones. Ω. Costofacial series of bones. O. Craniovertebral series of bones.
	2. Vibratory Senses of Motion	H. *Exoskeletal fascia of muscles and sense of* U. Ears, organs of hearing—sense. [*motion.* Ω. Glottis, organs of speech—vocal sense. O. Osseomuscular tendons—muscular sense [of equilibrium.

Relational Systems.	II. Muscular System.	*Cutimotor series of muscles.*
		Limb series of muscles.
		Costofacial series of muscles.
		Craniovertebral series of muscles.
	1. Radiatory Senses of Security.	H. *Mucous membranes, sense of ease.*
		U. Eyes—organs, sense of sight.
		∩. Palmar papillæ—sense of touch.
		O. Cuticle, hair, nails, &c., sense of temperature.
	I. Cutaneous System.	H. *Fœtal amnion and chorion—umbilical skin.*
		U. Skin of limbs.
		∩. Frontal skin.
		O. Dorsal skin.

The general factors of this table are easily recognised, and need only a few words of explanation.

CONNECTIVE CONDITIONS.—The physical forces, which sustain life in the body, are constantly exhausted by exertion, and renewed by means of food derived from the external realms of nature; and when these supplies fail, physical life is very soon extinct. We therefore class the realms of nature, which supply the necessary food, as *supernal conditions,* without which the vital forces rapidly cease to act. With plentiful supplies of nutriment, the body may perish from cold alone, or otherwise suffer from defective solar conditions; and hence we recognise a climatic order of *supernal conditions.* There is also an order of *supernal forces,* acting *on* and *in* the body from the time of conception to the time of birth; and there are what we term uterine supplies of physical and organic forces in the mammalian class of vertebrata. The matter of the egg and the heat of the bird, sitting on her eggs to hatch them, supply the physical means necessary for the formation of the chick, while the organic and instinctual forces are at work in transforming these complex homogeneous elements into the flesh and blood, bones and nerves, of the animal organism. How the organising vital energies get into the egg, or whence they are derived, we need not here inquire; but without them the egg would remain a mass of unorganised matter, and no chick be hatched; hence hereditary conditions are entitled to the rank of *supernal connective forces.* Gestative or incubational supplies of force are of two orders, physical and hyperphysical, like those which are embodied in the organism throughout life. Instinctual forces co-operate with physical forces, such as *heat, molecular cohesion, chemical affinity,* &c., in embryological and physiological phenomena. The purely physical forces of organic life are greater in the higher animals than they are in man; and this is one proof that physical and hyperphysical conditions are neither identical in kind, nor convertible in modes of action; for an elephant has much more physical power than a man, while a mouse has very much less; and neither of them has proportional degrees of mental or of moral power compared with those of man.

These considerations show that the life of every creature depends upon external forces and conditions, for its very existence in this world, not only after it is born, but from the very moment of its first conception in the womb, or its germination in the egg, until the end of its earthly career. The hyperphysical vital forces come from unknown sources, external to the egg in which the chick is hatched; but the physical forces are derived from solar heat and planetary matter drawn from the external world. Hereditary, social, planetary, and solar conditions of existence, then, are indispensable external factors of physical life and organisation.

The main difference between our descriptive analysis and those of ordinary manuals of anatomy, relates to the vascular system, in which we place the air vessels, the blood vessels, and the water vessels (whose sole functions relate to the aëration, the circulation and the depuration of the blood) together as parts of one system, while practical anatomists couple the urinatory with a portion of the generative apparatus, as parts of a "genito-urinal" system. This slight confusion between descriptive and regional anatomy has no practical inconvenience for surgeons, but it is nevertheless an oversight in methodical distinction.

As the practical aims of one kindred branch of science differ from those of another, such as the special purposes of anatomy from those of physiology, so practical methods of analysis and classification may differ from each other for convenient facilities of exposition and delimitation. Thus regional anatomy and physiology are indispensable for surgery; while general anatomy and physiology are indispensable for Medical science; and something more than both are indispensable for Philosophical organic science. What is it, then, which the latter requires more than the former? The laws of *number*, *order*, and *association*, in the structure and the functions of a living organism. Descriptive anatomy may be satisfied with arbitrary modes of grouping and enumerating organs; regional anatomy, with local and vicinal modes of distinction alone; while systematic anatomy can tolerate nothing arbitrary, because its chief aim is to discover the *natural order* of arrangement, and the *exact number* of parts in a living organism. An arbitrary system may be more or less convenient for practical purposes, but we want to *discover* the mathematical system, or definite plan of structure, according to which the Creator has organised his creatures.

It is not for surgical and medical purposes, that we analyse the human body in the present instance, but for Biological, and sociological, and dialegmatical or purely methodical purposes. Literary men and very learned mathematicians, not perceiving the importance of order, number and association clearly defined in the human body, have put forth objections; and to these we deem it necessary to reply.

OBJECTIONS.—In reviewing the first volume, a critic who dispraised the book in the Athenæum Journal, said that "the greatest vagary in the method was that of "adopting music as a type of natural order and arrange- "ment, since no two races or nations of humanity were "yet agreed as to what was or was not the true gamut "of notes or diapason of tone."

To this kind of criticism we reply, first, that we do not take music as a *controlling* standard of method; we merely borrow a *suggestion* from it, when we come to a difficulty with regard to the method of denoting secondary adjuncts in connection with primary systems; and that, whatever may be the doubts, difficulties, and imperfections of musical art and science — after the luminous explanations of Helmholtz—there can be no doubt or difficulty with regard to the natural limitations and distinctions of the organs of the body; or, if there be, it is a question of anatomical science, apart from music. Although the discoveries of Helmholtz with regard to the true tests of diatonic notes in the scale, have set to rest the question of various gamuts amongst the ancients and of *tempered* modifications of the natural harmonies in such modern instruments as the pianoforte; we are well aware of the delusive applications of supposed musical analogies to many subjects by ancient and modern thinkers, and therefore we never look for any such imaginary parallels. The human body is our type of natural order, and we look for parallels of contrast or identity in every other complex organism.

Literary men are not the only incompetent critics and reviewers of scientific works in public journals. Men of special science are sometimes equally incompetent to judge beyond the limits of their own speciality, and equally prejudiced, at first sight, against anything new or strange to them.

Soon after publishing the second volume, we met a friend who observed that the volume had been seen. We asked for his opinion on its merits and defects, knowing him to rank with the greatest mathematicians, and to be incapable of any unworthy feeling. He said he could not regard the human body as a type of the organic laws of order in creation, and therefore he could not accept inferences drawn from such a theory. He deemed all views untrustworthy based on any such hypothesis, and therefore it would be loss of time to study them. "Who knows," said he, "but that beings may exist with "twenty arms in the planet Jupiter, instead of only "two, as on the planet Earth? And then what be-"comes of your type of order in nature, the terrestrial "human body?" Who knows, indeed? Who cares? Certainly not our learned friend, for he is too busy with problems of mathematical science to give any prolonged attention to those of any other. He is a very busy man with no time to spare, and therefore we did not insist on refuting his argument. If he were convinced of the truth of our views, he would not study them; for he does not doubt of the truths of chemical and physical science, but he would not devote his time to them. We may observe, however, for the sake of argument, that if there be such unknown creatures in the planet Jupiter, it cannot in the least affect us. We can only trust to nature as we find it, for the data of all human science. And again, from a mathematical point of view, twenty arms instead of two, could only affect one factor of the organic problem, and that a very secondary one. Some of the lower types have even more than twenty arms or tentacles, and this subordinate complexity makes no essential difference to the principle of organic unity of structure in animal and vegetable organisms. The fractional varieties of an organic integer of any kind have the same relative value as the fractions of any other kind of integer in mathematical equations.

We should be very sorry to urge our learned friend to devote any of his valuable time to the study of organic philosophy, but we may remind him that his motive for not doing so may be very rational and good, while his arguments against the views in question are utterly fallacious. We thank him none the less for his candid opinion, because it is useful to us, as students of biology, showing us that mental alimentary constitutions and vocations are as various amongst men, as physical alimentary constitutions amongst animals, some being herbivorous, mainly, while others in the same climate and conditions are carnivorous, granivorous, frugivorous, or omnivorous. We may also observe to the Professor that whatever form the creatures of the planet Jupiter may have, and whatever powers may be possessed by superhuman beings in nature, nothing can ever be conceived by the human mind in any but a human form of thought; and therefore man is necessarily the measure of all things, human and divine.

We would ask those who object to theories and systems of law and order in nature and in science, what ideas they hold in lieu of methodical arrangement? Do they imagine there are no laws of order and associative unity in creation? or that it is utterly useless to seek for such, if they exist? Is there no avian form of structure towards which the transitory forms of a chick in the egg tend in the metamorphic processes of embryogenesis? no human type of organism towards which the fœtus in the womb tends in the metamorphic processes of uterine evolution? no ideal of organic unity and science in creation towards the discovery of which the human mind tends in the mental investigation of nature and her laws? And if there be organic laws of life and organisation in the realms of nature, where are they more elaborately manifest than in the human body and the human mind? Constituent number and distributive order are easily detected, but what are the main characteristics of association in the organism, analogous to those of weight or attraction and cohesion, revolution and rotation in the solar system?

ASSOCIATIONS.—We recognise four kinds of forces in the soul, and these concentric modes of living energy form a universal association with the organism of the body. Coordinate unity is then the first and most important factor of this class. In this fourfold coordination, the body forms one complete synthetic unity; the soul, another; the mind, a third; and the spirit a fourth.

In the body itself, the areolar connective tissue forms a universal interstitial alliance with all the other tissues. *Federal* associations are bilateral, bipolar, bifrontal, and arthroidal. The whole body is composed of two bilateral halves, united where they meet on the median line of the axis, and for the most part symmetrical on each side of the frame. They are symmetrical as integral parts, but not in their respective frontal and dorsal aspects, nor in their bipolarity, as upper and lower limbs, chest and abdomen, head and pelvis. Besides the omniversal communion of soul and body, the *universal* alliance of connective tissues, and the *federal* union of bilateral halves, we find distinct modes of *association* between the relational, the organic, and the connective mechanisms; between the nervous and the vascular systems, with all the other systems; between the vascular and the digestive systems, the muscular and the osseous systems; between some of the great systems and their satellites; between the different apparatuses which belong to the same system, such for instance as the respiratory, the circulatory, and the urinatory members of the vascular system; and between organs which are locally allied in mutual relationship, as the genito-urinal alliance; the eyes and the nose in mutual connection of organ and function through the lachrymal duct; the mouth and nose in the pharynx; the ears with the pharynx, by means of the eustachian tube.

We have thus *omniversal* association of soul with every part of the body; *universal* alliance between organs and connective tissues; *federal* alliance of bilateral halves and segments in arthroidal connection, symmetry and contrast; *involutive* association of the relational and the organic mechanisms with the connective tissues in every part; *co-operative* association between the osseous and the muscular systems, bound closely to each other, for a common purpose of locomotion; between the digestive and the vascular systems united in action for the common purpose of nutrition and depuration; *conjugative association* and community of purpose between the general and the ancillary apparatuses of each general system, such as the ovaries, the uterus, and the mammæ of the generative system with its ancillary satellites; the nose and the urethra, the capillary vessels and lymphatics of the vascular system; sight and temperature, touch and systemic sensation are ancillary to the cutaneous system; the vibratory senses (ears and glottis) are ancillary to the motor system of bones and muscles; and there is *vicinal* alliance and mutuality between the eyes and nose, the mouth and nose, the glottis and the larynx, the ears and the pharynx.

It is quite unnecessary to describe the organs and the systems of the body, which are already well explained by texts and plates in manuals of descriptive anatomy; but as such manuals have been written for practical purposes only, the organs are not classed in series with a view to their organic relations of number and distribution, we will analyse the osseous system from this point of view, as an example of philosophical analysis contrasted with mere practical anatomy; for, although method is not our special object of investigation here, it is the *means* by which we demonstrate facts.

The osseous system contains the following series of bones and articulations, and each series contains subordinate groups :—

Osseous System.	H. Articular hyper series of cartilages. U. Limb series of bones. ∩. Costofacial series of bones. O. Cranio-vertebral series of bones.

In the cranio-vertebral series of bones we have the following groups :—

Cranio-vertebral Series.	H. Codal vertebræ; 4 in man. U. Cranio-sacral vertebræ—3 + 5 = 8 (?) ∩. Cervico-lumbar vertebræ—7 + 5 = 12. O. Dorsal vertebræ—4 + 8 = 12.
Costofacial Series.	H. Costofacial articulars. U. Cranio-sacral ribs (facial bones). ∩. Cervico-lumbar ribs (obliterate)? O. Dorsal ribs—7 + 5 pairs.
Limb Series.	H. Hands and feet. U. Forearms and legs. ∩. Arms and thighs. O. Shoulder and hip-bones.
Arthroidal Hyper Series.	H. Extra articular ossicles. U. Limb cartilages. ∩. Costofacial cartilages. O. Cranio-vertebral cartilages.

The periosteum and the ligaments of bones belong to a general class of connective tissues.

In the vascular system we find a parallel order of series and groups :—

Vascular System.	H. Umbilical apparatus—series of organs.
	U. Respiratory apparatus—series of organs.
	O. Circulatory apparatus—series of organs.
	∩. Urinatory apparatus—series of organs.

These are subdivided into natural groups, as follows :—

Circulatory Apparatus.	H. Heart or central connective.
	U. Pulmonic arteries and veins.
	∩. Portal system of arteries and veins.
	O. Systemic arteries and veins.
Respiratory Apparatus.	H. Larynx.
	U. Trachea.
	∩. Bronchial tubes.
	O. Pulmonary vesicles.
Urinatory Apparatus.	H. Bladder.
	U. Ureters.
	∩. Fundibuli.
	O. Kidneys.
Umbilical Apparatus.	H. Maternal placental sinuses.
	U. Fœtal placental vessels.
	∩. Umbilical chord—funis.
	O. Internal fœtal vessels (obliterate).

The vascular satellites also form a parallel order of series, although some of these are comparatively simple or rudimental.

Vascular Satellites.	H. Capillary vessels, hyper series.
	U. Nose, simple series.
	O. Lymphatic vessels, complex series.
	∩. Urethra, rudimental series.

The capillary vessels inosculate with all the organs of the body.

The nose consists of an external, a medial, and an internal apparatus.

The urethra and prostatic ducts form a rudimental series.

The lymphatics form a systemic series containing several distinct groups and ramifications of chyliferous and lymphatic vessels.

The lymphatic vessels are subsidiary to the general circulation, and co-operate with the portal veins in selecting and absorbing chyle and lymph, just as the nose is subsidiary in detecting the quality of air and gas; the capillaries in the functions of exchange; and the urethra in the discretionary uses of retention and emission.

The peripheral extremities of nerves are connected with all the organs as much as the capillary vessels, but the distributive order of arrangement is different in the central and medial parts. The heart is in the centre of the vascular system, and large blood vessels ramify in double systems of tubing, to carry blood from the heart to all the organs, and back from these again to the centre. There are several systems of circulation—namely, single lymphatic, double systematic, double pulmonary, and complex abdominal, but all these have their general centre in the heart. There are distinct secondary systems of neural currents, sympathetic, spinal, and cerebro-spinal, adapted to the organic, the mixed, the relational, and the connective mechanisms, but all have their general centre in the cerebro-spinal mass. Both the nervous and the vascular systems are peripherally connected with all the organs and closely allied with each other in their functions, which are physical and physiological in the blood vessels; physical and psychological in the nerves. All the organs are sustained by the circulation and renewal of the blood, while sensor and motor currents of neuro-magnetic force, or molecular motions sustain intimate relations between the soul and the body in every part, and more especially in nervous centres.

Circulating Currents of Neuro-magnetic Telegraphy.—Sensor and motor nerves are extremely fine telegraphic wires, more or less arranged in bundles or chords, which connect the central system of ganglionic substance with all the organs, just as London may be connected by metallic wires with all the towns and villages of the United Kingdom, not to mention foreign countries. There are three main aspects of the nervous system :--1°, nervous centres; 2°, peripheral extremities of nerves in all the organs; and 3°, nerve cords which carry sensor currents from the organs to the nervous centres, and motor currents back from these to the peripheral extremities. These factors of neural currents are distinct from each other, and still more distinct from the organs and systems with which they are in constant communication. The whole body being in relation with the nervous centres and with the soul, which acts upon it through the medium of the nerves, we may regard the whole organism in its general form and features as a more complete exponent of the soul itself than the cranium alone, which is only a part of the osseous system; an important part, no doubt, containing the encephalon, but still only a part, and not as definitely legible as the whole external frame, head, body, and limbs. To know what the nervous centres are, and to what extent they are correspondential with the outward frame, we have only to note the general type, habits and peculiarities of the latter, as far as physical and physiological activities are concerned, and from these discern the psychological faculties and functions which are closely allied with them, in all the higher classes, orders, families, species, and varieties of organism.

The cutaneous system has its definite and multiple relations with special and general nervous centres; the muscular and the osseous systems have separate and multiple relations with nervous centres; each of the organic systems and their satellites have distinct sensor and motor relations with nervous centres. The organs of sight and hearing, taste and smell, have definite currents of sensor and motor neurility to and from special and general nervous centres. The soul receives sensations from every minute cell and organ in the body, and these sensations are received by neural currents or molecular motions in the nerves reverberating in nervous centres, where they excite thought or psychological reaction without physical response, or return a current of motor stimulus from the nervous centres to peripheral organs or minute parts of an organ.

Conscious centres of sensor and motor currents are located mainly in the brain, *subconscious* or "reflex" centres of sensor and motor currents are located in the medulla oblongata and the cerebellum (?); *unconscious* centres of sensor and motor currents are located mainly in the spinal cord and the ganglia of the sympathetic nervous system, connected with the spinal cord; and all these centres are bound together, so as to excite conscious *systemic* sensations in the brain, when they become disagreeable or painful in the general economy. Just as private houses and small villages may correspond with each other by special telegraphic wires, without telegraphing to the government in London, so they may send messages to large towns, such as Manchester, Liverpool, Bristol, or Glasgow, singly or collectively, and directly or indirectly to the great centre in London. In like manner, minute cells and organs may form sensor and motor currents with their own special centres; with their immediate neighbours, with more important secondary centres, or with the central brain itself, the chief of the hierarchal chain of ganglionic centres of sensor and motor telegraphic communication between the soul and the body; between the soul and all that surrounds it in the universe.

It would carry us beyond the limits of a systematic outline to analyse the details of every system and series of organs, but enough has been done to give a general view of the organic laws of number, order, weight, and measure in the human body. By *weight* we mean barological laws of associative unity; and by *measure*, relative proportions in the organs thus associated in community of life and organisation. The number of systems and satellites, with their anatomical order of arrangement, are much the same in all organic realms and types, but the order of arrangement and the relative proportions of constituent parts are various in different realms, classes, orders, and species. Depths of vitality differ in vegetable, animal, and human nature; orders of arrangement differ also; and diversities of form are not less obvious in animals of the mammalian class. The relative proportions of head, body, and limbs, are different in whales and elephants, bears and buffaloes, lions and horses, badgers and kangaroos, bats and monkeys, not to mention minor shades of difference between tall men and short, stout and slim, male and female, infants and adults. Nervous centres and peripheral forms of the external frame differ in all these types, and instincts differ in correspondence with these diversities of physical form and structure. The main object of systematic anatomy is a definite outline of the organic laws of order in the human body, as a type of unity in the human soul and in all the realms of nature.

PART II.—SYSTEMATIC PHYSIOLOGY.

THE biological characteristics of the body, as an instrument of social industry, involve the facts of common physiology, but as philosophical anatomy differs from practical anatomy in its aims and methods, so systematic biology differs from descriptive physiology in definite purpose and methodical analysis. We need not dwell minutely on the phenomena of nutrition and secretion to obtain a general view of biological functions in the physical and industrial relations of mankind to the external world.

With this end in view we must track the organs and systems of the body through their distinctive characteristics in four aspects—namely, inborn or congenital pecularities; evolutive phases of change from infancy to maturity and declining age; the physiological functions of each special organ and apparatus in a system; physical and industrial relations of each system to the surrounding conditions of individual and social life. The relational, the organic, and the connective mechanisms, must each be dealt with from these points of view, and we begin with the first.

Biological Characteristics of the External Frame.

Slightly marked distinctions between one human frame and another may often be more easily discerned by comparing more strongly marked differences in animals, and, therefore, we shall compare the glaring contrasts which characterise fishes, reptiles, birds, and mammals, with much less obvious distinctions between one human being and another.

The human body is one of the types of organic form in the animal kingdom. While differing from other types it has many points of positive resemblance to some animals, especially to monkeys. As the head of the creation on our planet, man is a constituent part of the organic realms; and as a part of that collective unity, he has numerous relations of form and function with every other part of that co-ordinate creation, in which we see the forms and forces of individual organisms adapted with consummate fitness to the uses they subserve in the general economy. From this point of view we may note that external vocations are related to internal and external conformations. The small cat preys upon small birds and quadrupeds; the lion, powerful and large, preys upon the strong and bulky tribes of animals. The dray horse is large and heavy, to accumulate much strength with slowness; the Arab steed, compact and slight, to carry light weights swiftly. And so it is with men. One organism is large and slow and strong; another quick and slight and small; and all the intermediate degrees denote their corresponding adaptations to industrial pursuits and operations.

This comparison applies to men and animals as individual types, but not as social beings. A lion is much larger and much stronger than a cat, whose instinct is of the same nature, while a man of military instinct, equal to command and organise an army, is perhaps less bulky than a common soldier. Napoleon, though physically strong and energetic, was inferior in stature to the individuals selected for drum-majors in his legions. And yet Napoleon was the lion, and his face and form revealed it, while the larger bodied men of his armies were of inferior rank as military heroes.

The form and stature of the body indicate, nevertheless, the kind of physical activity and industry for which it is best adapted, and a minute knowledge of the relative proportions of the organism would show the natural aptitudes of every individual for particular kinds of bodily and mental labour. By *relative propro-tions* we mean large or small chests, large or small hips, large or small heads or faces, arms or legs, hands or feet, compared with other portions of the same body. In animals these features are more strongly marked. The elephant has a short neck and a long back; the giraffe, a long neck and a short back; the lion, a large head and powerful limbs; the antelope, slight limbs and a relatively small head.

Some men have long necks, and others short; some are long in the back, and others short; some have comparatively strong short limbs, while others have them long and lanky. These proportions vary greatly in different types of build and structure, and exaggerations are as far from beauty in one portion of the organism as another. Small bodies with long limbs are weak; large bodies with short limbs are strong; but neither of these types is beautiful. All are fit, however, for industrial uses, and though "appearances may be sometimes deceptive," the type, when duly studied, shows the natural vocation of the individual. Homely forms are generally rich in practical utility, while fair proportions are sometimes more remarkable for physical than moral beauty.

MORPHOLOGICAL CHARACTERISTICS.

Congenital Forms and Features. — Each individual is born with the form peculiar to its race, and this special form belongs to a more general type of animal or vegetable organism. Vertebrate, articulate, molluscan, and radiate types contain each four classes of modified forms, which in the vertebrate realm are known as fishes, reptiles, birds, and mammals. Man belongs to a definite order of the mammalian class, and the human species contains at present several distinct races, such as the European, the red American Indian, the Mongolian, the dark Tropical races of Asia, and the African negro of the torrid zone; and in each of these races (Aryan, Turanian, African, American) numerous varieties of physical form and stature may be easily discerned; some being well adapted for an active and laborious life, others for more delicate artistic occupations; others again for sedentary scientific labours and investigations; and special temperaments are usually combined with each of these varieties of type and structure, to suit them respectively to their special avocations.

These diversities of form and feature are strongly marked in the lower animals. The hereditary features of a lion differ from those of a tiger; an elephant is not mistaken for a rhinoceros; the features of a horse differ from those of an ass; and all these leading characteristics are hereditary in the species, although one horse differs from another widely in peculiar physiognomy; one cow from another; one man from another. The negro has an unmistakable caste of features, and so have the Chinese races, the Red Indians, and the Indo-Europeans.

We can easily discern what vocational fitness difference of race denotes in domestic animals, and still more easily in wild animals. Lions and tigers have different castes of form and feature from dogs and wolves, and these again from cows and sheep. Besides great differences of facial aspect, these animals are differently armed, some with teeth and claws, others with hoofs and horns, and where a physiognomist is familiar with his subject the head of a dog, is enough to show the character of the whole body; the head of a lion or a tiger, a horse or a cow, will also indicate the nature of the animal.

Individual physiognomy is not so markedly different in races of one species of animal, as the contrast between one species and another, but there are nevertheless great differences of feature between one individual and another of the same age, sex and species, animal or human.

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EVOLUTIVE CHANGES.—The face of an infant is easily distinguished from that of a youth; this again from that of mature age; and both from the shrinking features of senility. The face is very small and short in infancy, larger and fuller in youth, still more developed in maturity, and again shortened by the loss of teeth in extreme age. Whence we are impressed with something of an infantine character in a full-grown man or woman with a small or very short face, and something of a mature character in a youth with a very strong face.

FUNCTIONS OF PROTECTIVE ORGANS.—The teeth and claws, hoofs and horns of animals, are aggressive or defensive instruments, while those of thick hides and armour plates are mainly for protection against outward danger. The abundant dark pigment of the cuticle and hair protects the negro against the scorching rays of heat in the torrid zone, and seems to be unnecessary in temperate and frigid latitudes, where pigments of lighter colour and in less quantity suffice. The hair of animals is useful for protection against cold, the feathers of birds are necessary both as clothing and as means of flight; and are as often moulted and renewed as necessity requires. Feathers serve to balance the body flying in the air, and running on the ground. All these characteristic features are adapted to the external condition of light, heat, electricity, and gravitation, or buoyancy in air, in water, or on land; the eyes for conditions of light; the palmar surfaces of touch for conditions of electricity; the hair, cuticle and pigment of the skin for conditions of temperature; the feathers of birds and the hoofs of animals for the conditions of gravitation, during motion. They are also adapted to the special aptitudes of different types of organism for self-protection, and preservation, attack, and defence; reproduction and perpetuation, in their relations to external resources and internal wants.

Bats fly as well as birds, but still feathers seem to be preeminently suited for flight, and for protecting the body from cold; all the characteristic features of the head, the body, and the limbs indicate special uses, with preordained or casual fitness for such uses. The physiognomies of human beings also indicate characteristic aptitudes if we could learn to read and understand them.

The radiatory modes of action in sight, touch, temperature, and *systemic* sensation (the sense of internal comfort or discomfort) correspond to the external conditions of light, electricity, heat and gravitation, in every type of organism, whatever be the medium in which it is predestined to live and move, and have its being. The forms and features of fishes are adapted to live and move in water; those of birds, in air and upon land; while certain species of amphibious mammalian animals, such as whales and dolphins, seals and walruses, are modified in form and feature to live and move in water, while constrained to breathe the air in pulmonary respiration, much as other mammalian species, which live and move on land. The forms and features of bats again are strangely modified mammalian types adapted to fly in the air like birds, and seek their food as insectivorous animals. All kinds of alimentary constitution are found in fishes, reptiles, birds, and mammals, living in such different media as air and water; amphibious animals being able to live in water, while they breathe the air as other pulmonary respirators, show that the external form and features of an animal are adapted mainly to the conveniences of motion in the medium to which it is confined as a natural sphere of life and motion, alimentation, and reproduction.

The eyes and the optic nerves are especially adapted to the sense of *sight*, being easily affected by the influence of light: palmar papillae and the nerves of *touch* are easily affected by the influence of specific weight or roughness in different bodies. The papillæ and the nerves of *temperature* in the external skin are easily affected by the influence of heat or cold, and react upon the "pores" of the skin; these "pores" being composed of glandular follicles, accompanied by contractile tissue, form "goose skin," by the influence of cold. The peripheral nerves of the mucous membranes are easily affected by the influence of *magnetism*, molecular *cohesion* and chemical *affinity*, or atomic exchanges in the *nutrition* of the organs. Disturbances of nutrition are accompanied by feelings of hunger and thirst; inflammation or violent pain; strainings of the tissues derange molecular cohesions and give pain; sudden risings and sinkings of the body cause feelings of nausea in the stomach and intestines, as in sea sickness, when the peripheral nerves of the mucous membranes are most sensitive to the disturbing influence of perturbed nutrition.

In his Physiology of Common Life (page 32), Mr. G. H. Lewes proposes the name of *systemic* sensation for all kinds of feeling arising from physical comfort or discomfort, such as feelings of vigour and buoyancy, weakness and lassitude, repletion or want, hunger and thirst, which are not connected with any of the special senses, but seem to be felt most keenly in some parts of the internal surfaces connected with the functions of digestion and nutrition.

Just as the special senses of sight, touch, and temperature are connected with the *eyes*, the *palms*, and the *cuticle* of the external skin, these general sensations of comfort and discomfort seem to be intimately connected with the peripheral nerves of the alimentary tract.

The sense of sight is influenced by light, the most far-reaching known mode of cosmic radiation, or centrifugal motion; the sense of temperature is influenced by heat, a less far-reaching mode of cosmic radiation: the sense of touch on the palmar surfaces of the hands and feet is influenced by specific weight or gravitation, the most far-coming influence of *cosmic attraction*, or centripetal motion; a force which causes the body to cling to the earth by gravitation. The soles of the feet are endowed with a special sense of weight and equilibrium of the body, with or without a load, in walking, running or leaping motion. The hands are endowed with the same sense for judging of the relative specific weights of heavy or light substances, as well as of even or uneven surfaces. All these modes of sensation are allied with a muscular sense of motion, as well as with other general sensations, and especially with what has been called the *systemic sense* of ease or discomfort in the *magnetic attractions* of atoms in physiological nutrition; the least far-coming influence of cosmical attraction, since atoms must be very near each other to be influenced by chemical or magnetic modes of attraction or centripetal motion. The magnetic currents of the globe itself seem to be limited mainly to the body of the planet, although the influence of the sun and the moon are supposed to be more or less connected with magnetic storms, and other terrestrial phenomena, just as the nutritional health and hypnotic states of animals and plants are influenced by the action of the sun and moon, day and night, on different latitudes of the earth, and at different seasons of the year.

The most special organs of sense are thus adapted to the most general modes of centrifugal motion; the eyes to light, the cuticle and general covering to heat or temperature; the palmar surfaces to the most general mode of centripetal motion, and the systemic sense of ease or discomfort to the minutest modes of magneto-chemical attraction, or association.

Relational Media or Spheres of Action.—Air and water are the two great spheres of earthly life for all organic types of form, though some animals and plants are more or less amphibious, while others are exclusively aquatic or aërien. Whatever be our views with regard to the "origin of species," it is difficult to conceive that chance alone caused water to become distinct from air, and both again from land in the first turmoil of chaotic elements; and not less puzzling to imagine that organic cells once formed by chance in water or on land, under the influence of like contemporary general conditions, at once diverged in various directions of evolution and development, in both the ocean and the atmosphere, (not only with regard to internal structure and external form, but also with regard to alimentary modes of sustentation and pursuit of food,) by natural selection. It is more germane to human reason, to suppose that all creative evolutions and adaptations have occurred according to a preconceived plan of organic unity, with harmonic correlation of parts, in adaptation to definite ends and uses; each organism having a foreseen destiny in the general evolution and development of life and organisation, progress and perfectibility on the surface of the globe.

However this may be, the external forms of all organic types are modified in adaptation to the external medium inhabited, while the internal structure of the organism, whatever be the medium in which it lives, is modified in adaptation to the requirements of various sorts of alimentary constitution. Fishes, reptiles, birds, and mammals are mainly adapted in external form to the facilities of motion in a special medium, although carnivorous, insectivorous, herbivorous, and omnivorous feeders are found in each class of Vertebrata, not to mention other realms and classes of organic form and life, such as Articulata, Mollusca, and Radiata. The relational conditions of existence and the sphere of action, atmospheric, aquatic, or amphibious, have an important influence on the external forms and features of each class. Vertebrate animals of numerous shapes live in water; molluscan animals of various forms, articulate animals of diverse species, radiate animals of innumerable varieties live also in the ocean, while some of their congeners (excepting radiata) live on land, and thence we may infer that the *plan* of structure is not determined by the external medium in which the organism lives, although external forms are modified in each general plan, to suit the conditions of life and motion in the medium, air or water.

ORGANIC UNITY AND COMPLEXITY OF ORGANISM.

CONGENITAL UNITY AND COMPLEXITY.—In each realmic plan of organism, animal or vegetal, there is an organic unity, however simple or complex the parts may be within. The main distinctions of the most complex physiological unit, such as that of man, are similar to those of a more simple type; that is to say, they are relational, organic, mixed, and connective. The relational mechanism of the human body contains four systems, namely the cutaneous, the muscular, the osseous and the nervous; the organic mechanism contains three systems, namely, the generative, the digestive and the vascular: these systems are accompanied by satellites or organs of sensation which form a mixed mechanism pertaining to both organic and relational systems; and all are united by the different tissues of what may be called the connective mechanism—namely areoloserous tissues and secretions, adipous tissues and secretions, glandular tissues and secretions; not to mention embryonic connectives.

These factors and functions of organic unity and complexity occur more or less rudimentally or completely developed in every plan of organic structure, and in every special type of form in each general plan. There is an organic unity of structure in every realm, class, order, family, genus, and species; in every individual organism, however small; and a definite external form in adaptation to external conditions, internal wants, and special ends and uses in the world.

The lease of life and the bulk of the organism are not the same for every species inhabiting the same medium. Some fishes are very small, while others are quite large; some reptiles are minute, while others are enormous; some birds are ponderous like the ostrich in comparison with the tiny humming bird; some mammals are gigantic like the whale or the elephant, while others are as small as the field mouse; the lease of life is also variable and various in different types.

EVOLUTIVE PHASES AND LIMITS OF GROWTH. — The limits of stature are very different in the mouse and in the elephant, while both are subject to metamorphic phases of evolution in utero, and progressive phases of growth and decay after birth. We need not dwell on embryonic phases of formation, or on those of infancy, youth, maturity, and decline in each individual, but the natural limits of size in each species are remarkable characteristics, not easily accounted for by any theory of natural selection. How could a mouse become as large as an elephant, or live as long, and change its rapid successions of numerous litters for the slow gestation of a single fœtus once in many months? External conditions are much the same for mice and elephants, but predetermined ends and use, lease of life and strength of body, seem to be widely different for these two mammalian types of vertebrata.

The evolutive phases of change in form are equally remarkable in every species of vertebrate organism, and more conspicuously strange in some of the articulata; but still the limits of evolution are so definite for every known species in the present conditions of existence, that we cannot readily conceive the possibility of all the different schemes of organic structure and all the different classes, orders, families, genera and species of type in each of these widely different plans, to have been derived originally from one simple vesicle by chance, although we know that even now the prolific germs in ova of all species, are more or less minute and even microscopical. It is not the smallness of germs which is most striking, but the magnitudes and shapes of organisms, so different in degrees and forms of evolution from such minute particles of matter. The transformations are the most mysterious phenomena. Still there seems to be some relation between the lease of life and the complexity, if not the bulk, of the frame, in both individual and collective organisms. Simple cells are daily and hourly generated and destroyed in the tissues of the human body, and thus all the tissues in the organs are renewed in a few weeks or months; so that cells are short-lived elementary units, while organs are long-lived constituent elements.

We know that all forms of psychological life, subject to physicalandphysiological conditions, have some power of natural selection to secure advantage, but can we imagine any change of physical conditions, which would work to transform a vinegar plant into a strawberry plant, the hazel into an oak? or a polype into a snail; a worm into a fish; an eel into a serpent; a sand eel into a water newt; a newt into a mouse; a mouse into a rat; a rat into a capybara; the latter into a pig; a pig into an elephant, or an elephant which delights to plunge and roll about in water, into a whale, which is ten times as large and weighs a hundred thousand pounds? Are we not constrained to think from what we see so definitely fixed and limited in diversity at present, that no possible amount of change in physical condition, in any imaginable length of ages acting on instinctual energies, could work alone and silently such miracles of transformation of form, and increase of size in one direction or in several, while innumerable multitudes of microscopic animalcules remain for ever stationary in their rudimental shapes and sizes, without any sign of future progress; and while other multitudes of higher grade remain not less stationary through successive ages, side by side with forms of different size and rank in every phase of climatic progress and terrestrial evolution? It is much more easy to suppose an intelligent determinative cause acting on given factors and conditions, than to suppose inherent factors transforming themselves in one case and remaining stationary in another case, amidst the same phases of incident conditions.

The spontaneous generation of microscopic animalcules from simple elements would be a sort of miracle; the progressive transformation of animalcules into higher grades of organism, and on different plans of structure, would be a miraculous form of evolution; the creation of distinct germs for each species and their primitive evolution without parents for the higher animals and man, would be a stupendous miracle, compared with all we know of hereditary origin and fostering care; and yet, one of three miracles must be accepted; for it would now be a miracle for any one to form an organic cell of any kind, from inorganic elements; a greater miracle to transform one type of animal or plant into another; and a still more wonderful miracle to create at once a new species of plant or animal. And yet the Creator must have effected one or more of these miracles in the creation of organic cells, species, and realms. Whichever way we turn to penetrate into the mysteries of origin, we are met by some kind of miracle as a commencement of organic life and motion on the face of our globe. We are constrained to give the question up as hopeless, and limit our investigations to the known phenomena of nature in the present state of things. Within these limits we can observe invariable laws of evolution, growth and progress, and these laws are manifest in the successive phases of human life and variation.

The skin is the main representative of the external form, and the physiological functions of the skin determine the nature of the clothing, the armour and the arms of all species of fishes, reptiles, birds and mammals. The form and the features therefore of an animal are intimately connected with the cutaneous system, and its various secretions. In cold alpine or polar climates animals are well clothed with hair or fur, while those inhabiting warm climates are less heavily clothed. All the secretions of the skin are more or less adapted to the external conditions of temperature, even in man, who is less clothed by nature than many other animals.

Physiological Functions of the Skin.—The flexible and elastic skin limits and defines the external form of the whole body, including all the other systems and series of organs. It has also absorptive, secretive, and excretive functions in co-operation with the vascular, the digestive and the generative systems, as well as mechanical functions in co-operation with the muscular, the osseous, and the nervous systems. Perspiration inosculates with the vascular functions of pulmonary respiration and renal secretion; sebaceous unctuation inosculates with the secretions of the mucous membranes of internal systems; the secretion of hair and pigment is manifestly influenced by puberty, and hence inosculates with the functions of the generative system. The secretion of the cuticle, as well as of the hair and the pigment, are greatly influenced by climate, and therefore the secretions of the skin and its external satellites, the organs of sensation, (sight, touch, temperature, and gravitation) have numerous external as well as internal uses and relationships.

PHYSIOLOGICAL UNITY AND COMPLEXITY.—In studying the factors of physiological action and reaction in any type of organism, from the simplest organic cell to the most complex individual body, we have three distinct agencies to examine, namely:—

1st—The world of *incidental* conditions, in which the organism lives and moves, and has its being.

2nd—The *instrumental* "differentiative" organism itself, distinct from these conditions.

3rd—The *respondential* animating principle within the organism.

We call these factors incidental, instrumental, and respondential, to define their respective characteristics in all physiological operations and cooperations.

General and comparative physiology contrast one species of organism with another, without dwelling elaborately on the elementary units of a complex body. Microscopic anatomy and physiology have made rapid progress in the study of cell structure and function within the last few years. Mons. Durand de gros, in his "*Phylosophie physiologique et medicale*" defines and explains very clearly the importance of *organological phy-*

siology in contrast with *histological* and *microscopical physiology*.

The work has not met with due recognition, because Mons. Durand de gros, after defining his principles and the scope of their application somewhat briefly, dilates at great length on the therapeutical importance of "Braidism," "hypnotism," or "psychologisation," as a means of cure equal or "superior in some cases to chemical and physical remedies." This has caused medical men to overlook the real merit of the work, and mistake it for an essay on Mesmerism.

His main position however is this, namely, that the organism is a mere *instrument* of action in all its parts, and that external *incidental* agencies act upon the organs which convey impressions through conductor nerves to nervous centres, in which the *respondential* principle or the soul, reacting from the nervous centres through motor nerves as instruments, effects a work of some kind in the outer world, or in the organism itself.

"Anatomic elements" alone do not give us a mechanical view of organological unity, and functionality, but distinct organs and nerves give a subordinate view of organic unity and vocational speciality. The *eye*, for instance, with its cooperative muscles and nerves gives us a complete view of an *instrumental* organ, mediating between the *incidental* agency of *light* in the external world and the *respondential* agency of *sight* in the sensational soul; and so of other definite peripheral organs, conductor nerves, and central ganglions in the general economy, as vacational means of action and reaction between special *incidental* agencies in the outer world and special *respondential* faculties in the inner soul.

The ear, the mouth, and the nose, as special organs of sensation, hold the same rank as organological units with distinct vocations in the complex organism of individual unity.

Mons. Durand enumerates five distinct functional factors of organological unity, namely:—1st, the vital centre (in the soul); 2nd, ganglionic nervous centres; 3rd, intermediate conductor nerves; 4th, the peripheral *differentiating* organ, (such as the ball of the eye and its appendages, or any other peripheral special organ), and 5th, the *incidental agent*, such as *light* falling on the eye, aërial vibrations or sounds affecting the ear, odoriferous vapours affecting the nose and the sense of smell, sapid dissolutions affecting the tongue and the sense of taste.

From these organological distinctions and definitions Mons. Durand observes that any kind of incidental agency acts upon a special organ adapted to convey sensations to the corresponding faculty of the soul, in which it calls forth a definite response; and that air and water, food and condiments, light and heat, with all their modes of incidence, meet special organs to convey their influence to corresponding faculties of sensation and reaction; by closely observing how, and in what degrees specific incidental forces affect special organs, and how the inner faculties of life react upon these organs in response within the body and without, we may discover specific remedies for all diseases, just as we observe specific action of light and heat in normal proportions or in excess, good or bad qualities of air, food and water, healthful or injurious proportions of good qualities, in all these incidental agencies of physiological and medicinal influence on the system.

Moreover he observes, that physiological actions may be deranged by any of these primary organological factors, *incidental*, *instrumental* and *respondential*; that the soul acts upon the organs of the body as decidedly as external heat and light, air, food, and water, condiment or medicine; and that in certain cases direct psychological action may excite remedial reactions in the organs, as strongly and efficiently as external physical and physiological agencies; grief in the soul may cause the eyes to weep, and fear relax the bowels.

We need not discuss these questions; our present business is to note hierarchal degrees of secondary unity and functionality in the complex organism; and to show that *anatomic elements* or *cells* differ in distinct general tissues; that these again differ in special modes of organological functionality, where difference of structure is hardly recognizable, such for instance as the mammal glands secreting milk, while those of the liver secrete bile; that special *organological units* differ from more general systems in structure, and in function as special *instruments* in a cooperative mechanism; that different *systems* are also distinct units of a complex organism, such as motor muscles, resistant levers (bones,) *limitative* skin, *protective* cuticle, hair, &c. And, moreover, that all these heterological unities are double and bilateral in the whole body or collective *instrument* of mediatory action and reaction between the *incidental* agency of conditions in the external world, and the *respondential* energy of the soul in the internal world. The upper and the lower limbs are double; the eyes and the ears are double; the mouth and the nose with all the other organs of the body situated on the median line of junction are bilateral and double in their original constituent parts.

Organological units form isolated circles of nervous currents in single organs, such as the eye, the ear, and other local mechanisms, but each of these is closely associated with others in groups and series; each complex apparatus of groups being further united in distinct systems, and all the systems in one consensus of concerted action; and circles of nervous currents may either be isolated, or spread from one organ to another, one group to another, one series to another, or one system to another, until the whole body be set in motion from a single point radiating to all the special centres, and peripheries of the associated community.

This organic unity and complexity of an individual organism corresponds, in some degree, to that of a collective organism or society, in which individuals form families and corporations for specific uses and vocations, industrial and commercial, such as masons and carpenters, smiths and cabinet-makers, spinners and weavers, tailors and dress-makers, hatters and milliners, boot-makers and saddlers, millwrights and engineers, tool-makers and watchmakers, in which case individuals are analogous to organic cells, or *anatomical units*, and corporations to *organological units* of society.

Heterological unity and complexity are everywhere discernible in nature, while absolute homogeneity is nowhere to be found in vital organisms.

'*Unica substantia*,' reduced to mathematical centres of force as a foundation of thought, is nevertheless obliged to *imagine* a spontaneous creation of homogeneous atoms and molecules, to proceed thence to the evolution of organic vesicles from inorganic elements of matter; these being transformed by "molecular physics" into cryptogamic plants of all forms; phanerogamic plants and trees of all shapes and sizes; minute animalcules, and animal ova, small zoonites of radiata, mollusca, articulata, and vertebrata; which "zoonites" are united in complex individualities of different species; and these again variously transformed, we come at last to the huge whale in the ocean, and the tiny mouse on land, not to mention all varieties of fishes in the sea, birds in the air, reptiles crawling on the earth, and man himself the latest transformation of some kind, of anthropoid apes, the pre-historic ancestors of different races of mankind.

Aristotle repudiates this mode of speculation (Metaph. I. 3, ch. iv., as quoted by Mervoyer,) where he says, "The origin of nature is necessarily incomprehen- "sible to human reason: for, were it not so, the idea of "principient origination must be subordinate to an idea "still more comprehensive; and this again to another "more comprehensive still, unless it be already incom- "prehensible, and so on, *ad infinitum*." This is evident to many minds, and yet the opposite view has met with welcome in all ages, and immense advantages have resulted from the strife of the contending schools. Without motion water becomes stagnant, and without controversy ideas become stagnant. Mons. Dumas, in his eulogy of Faraday, has very well said, that "*Douter* "*des verités humaines, c'est ouvrir la porte aux décou-* "*vertes; en faire des articles de foi, c'est la fermer.*" "To doubt of the truths of human science, opens the "way to new discoveries; to establish them as articles "of faith, bars the way to progress." Whatever may have been the *modus operandi* of organic evolution, first principles, being eternal, are ever the same, while phenomenal modes of evolution may be ever various. First principles being congeneric with the human mind are not incomprehensible, while the essential nature, the origin and the infinitude of things, can only be known to us by their modes of motion, limitation, and association, in phenomenal evolution. "*Unica substantia*" is not incomprehensible, but it becomes so when reduced to nothing but "immaterial centres of force" without dimensions. The human mind is limited in all directions by infinity, but is quite at home with all that is eternal and indestructible, within and beyond all that is transitory and phenomenal.

We cannot conceive that anything can possibly be new or unknown to eternal omniscience. Creation and destruction can only be with Deity successive modes and phases of metamorphic and amphimundane evolution, for ever reproducing the same worlds and beings as we see them perpetuating generations on earth.

There is in nature, as we find it, a marked correspondency between individual and collective organic unity and complexity. Every organic realm is composed of distinct classes, these again of orders, families, genera, species, and individuals. And individual man is more fundamentally complex than all these realms and classes; for he contains a quadruple depth of organic, emotional, instinctual, and rational forces, in each of which we recognise a hierarchal category of different systems and series, hemial dualities, groups of organs, differing in form and function, co-operating for one general and common destiny and purpose. Angels and archangels may have higher powers of Love and Wisdom, but animals have not, while suns and planets are supposed to be only physical automata.

Relational Aptitudes and Vocations in different Types of Organism.—The type of an animal is co-ordained by nature to the conditions of its existence, and each animal is endowed with a special vocation, in harmony with its internal wants and the external shape of its body. The vocation of a swallow is not that of a sparrow, although both are mainly occupied in seeking food, and reproducing their own species. The swallow clears the air from surplus swarms of flies or midges, and his type of body is adapted to this special use in his activity, which requires velocity of motion. The sparrow has a different form of body and a different mode of motion, for a pre-destined purpose. Carnivorous and herbivorous animals differ from each other widely, both in form and habit. One man differs from another also, more or less, in physical form and industrial fitness. The Creator has evidently pre-ordained the form to the vocation, in all animals, both originally and by evolutive adaptation, and not less obviously, though in finer shades of difference, in mankind.

Some men have special fitness for husbandry, or commerce, or domestic labour; others, for manufacture, architecture, engineering, or mechanics; others, for military life, administrative functions, or the management of business. All men are modified by education and industrial training, and may, to some extent, be taught any trade or calling; but special *aptitudes* and natural *vocations* are the gifts of heaven, and each individual is born into the world more fit for one occupation than another. This, again, becomes a branch of social science, to conduct the training and development of children, in such manner as to give each individual a chance of finding out his natural industrial attractions, while labouring for his own worldly interests and those of the community.

Natural aptitudes are often paralysed for want of education, and many men are forced by arbitrary circumstances to apply themselves to a profession or a business for which they have no strong vocation. And yet most persons find that they have special aptitudes which have been undeveloped, while the training and professional pursuits they have been obliged to follow, were not those of their dominant attractions.

Social order is at fault, and practical science undeveloped in this branch of civilized progression.

The superior aptitude of a feline for the work of slaughter, is denoted most particularly in the form and mechanism of retractile claws. The tiger and the lion are decidedly butchers by trade. Other animals have cutting teeth and powerful canine tearers, with strong claws, though not retractile. The dog can hunt his prey and slaughter it, but not as deftly as the tiger. The feline species are merely butchers in their relational aptitudes, while the canine species are both slaughterers and scavengers, and therefore apparently more useful to men and to society.

The horse is useful as a carrier, the cow as a source of food for man, by its milk and by its flesh.

The eagles, amongst birds, are armed for slaughter; vultures are butchers and scavengers (like hyænas); and dogs (like carrion crows) are more addicted to scavengery than to slaughter.

Monkeys and parrots have peculiar aptitudes for climbing trees to obtain their food; while otters and seals, ducks and divers, are adapted for swimming and diving to earn their living in the water. All animals, in fact, are endowed with characteristic forms and features, habits and dexterities which give them special aptitudes for industrial modes of action in procuring daily food, and warring against enemies.

Animals of the same type are endowed with different kinds of aptitude in their respective modes of action. The smaller felines can climb trees with more dexterity than the larger leonine and pardine species. The cheetah, with unretractile claws, hunts its prey like a dog, while the lion and the tiger, with retractile claws, lie in wait and watch for an opportunity to pounce upon their prey. Falcons hunt by day, owls by night, and the special forms and plumage of these birds are adapted to their respective aptitudes and habits.

Analogous distinctions may be traced in our own species. A strong and stout build of the human body, tall or short, denotes a natural aptitude for powerful muscular efforts in industrial vocations; a medium build of body, tall or short, denotes more fitness for less heavy kinds of work; and a very slight build of body, lanky or compact, denotes more natural aptitude for delicate, light operations, than for heavy toil.

In each of these, again, the natural aptitudes of mind modify the general vocation of the body. A very intelligent man, of either build, will take a directing part, while minds less active discipline the mass of a co-operative gang, whose natural aptitudes are only capable of common work, directed by their leaders. Industrial, artistic, scientific, and social aptitudes, are not only very decided and distinct in different individuals of the human race, but numerous varieties of inborn aptitude are manifest in each of these general vocations. One artist is born a painter, another is born a musician, a third is born a poet, and a fourth an actor. And here again one man is an excellent tragedian, while another is pre-eminent as a comedian. One man is a born philosopher, another is a born mathematician. And so we may trace natural aptitudes for special kinds of work and thought, in all the occupations of society, showing that collective organism in community of life and uses is not a thing of chance in human kind, but a pre-ordained design of Providence, who has created special aptitudes in individuals for different kinds of occupation, in accordance with a natural process of metamorphic evolution from a simple state of rudimental aggregation to a complex order of universal unity and federation in humanity. At present the dotted outlines only of a fœtal organism of these dimensions are dimly visible amongst the nations of the earth, but these are sufficient to indicate at once the nature and the drift of human progress on our globe, in parallel with the uterine evolution of an individual embryo.

Physiognomy alone seems hardly advanced enough to distinguish a poet from an actor or an orator, a musician from a painter, or a born genius from an enthusiastic amateur in any of the arts and sciences, while phrenology claims powers of discrimination and discernment equal to the task of reading inborn character and natural aptitudes in the external forms and features of the cranium, with or without the aid of facial and general physiognomy. Feline and ferocious animals have brachyocephalic heads, whereas pacific tribes of animals are dolichocephalic. These and other cranio-facial features denote special aptitudes and propensities in mankind as well as in animals. It is not the relative size of a cat's head so much as the shape which denotes the feline character of its instincts and proclivities.

MUSCULO-DYNAMIC CHARACTERISTICS.

HEREDITARY MUSCULAR CHARACTERISTICS.—Every animal is born with a special cast of muscularity. The lion is very differently musculated from the ox, being more elastic in its motions, and more powerful in its limbs. The bear is differently musculated from the lion, and has a peculiar gait or ambulatory motion of his own.

Fishes are differently musculated from reptiles; these again from birds; and birds from mammals. Great contrasts of muscularity are easily discerned in different types, while lesser shades of difference in animals of the same species are not at once so obvious. Bull dogs and greyhounds are, nevertheless, strongly contrasted in their muscularity; the one being more remarkable for strength and endurance, the other for swiftness of locomotion. These contrasts are, of course, intimately allied with differences of form and build in the bony skeleton.

Similar contrasts may be observed in the human race; one man is robust, slow, and strong, while another is slim, and swift in the race. Any of these congenital types may be improved by judicious training, but they remain equally contrasted through all degrees of trained improvement. Heavy types of the human species are most common in temperate regions, where generations have for ages been accustomed to exercise the body to procure food and warmth; slighter forms are general in very hot and very frigid latitudes, where races have for ages been subject to the enervating influences of extreme heat or cold. Amongst domestic animals the largest breeds of equine, bovine, and ovine species are found in temperate latitudes, where human society is most developed. Amongst wild animals, the largest, felines and porcines, are found in low warm latitudes; the largest of the ursine types, in high cold regions. Monkeys inhabit warm climates only, while some animals, such as the reindeer, are only found in cold regions. Large and small animals are found together in all parts of the earth, with differences of muscularity and symmetry adapted to various degrees of elasticity and flexibility, as markedly distinct and hereditary as the outward forms. A panther and a kangaroo of equal bulk or weight are very different in muscular strength and symmetry.

EVOLUTIVE PHASES OF MUSCULAR DEVELOPMENT. Degrees of power and agility increase from infancy to maturity, and then decrease with the declining phases of old age. Very great differences occur in some of the lower animals during the successive phases of evolution. The caterpillar and the butterfly are familiar examples, and many others are equally curious and marvellous. The human fœtus goes through almost every known variety of organic form and structure of the vertebral type during metamorphic evolution, but these only affect the body in after life, in so far as congenital imperfections persist after birth, in cases of hare-lip, club-foot, pseudo-hermaphrodism, and other instances of congenital deformity. Some infants are born with the rudiments of limbs, while others are born fully formed, but with insufficient powers of growth and muscular development.

The muscles are completely formed when the child is born, but they are gradually developed in bulk and strength by growth and exercise in youth, receding in bulk and strength, elasticity and flexibility, with declining age. Acrobats and sleight-of-hand jugglers can easily use many of their muscles in all directions, which are stiff and awkward, if not entirely useless, in the generality of untrained men and women. Were it not for the wonderful performances of these artists, we should hardly guess the extent of muscular dexterity of which the human body is capable when duly trained from infancy to manhood.

Functions of the Muscles.—The functions of the muscular system are mainly mechanical, they move the whole frame in various directions of posture and locomotion. For this purpose they are firmly attached to the bones of the endoskeleton and to the dense tissues of the exoskeleton or fascia, and are so placed in groups as to act alternately, or simultaneously, in various directions. They bend the body forwards or backwards, sideways or spirally, and enable it to walk, leap, run, or swim, by alternate action in the bilateral and bifrontal hemialities of the body.

The muscles which move a whole limb at once, as an arm, for instance, are attached to the shoulder, the upper and central parts of the trunk, and have their tendons inserted into the fibrous periosteum of some portion of the humerus; those which move the fore-arm and the hand together are attached to the bone of the arm and have their tendons inserted into the periosteum of the cubitus and the radius; the muscles which move the hand alone, and the fingers are attached mainly to the bones of the forearm, and inserted into the sheaths of the bones they flex or turn, while some of the muscles of the fingers are located in the palm of the hand, and have their tendons inserted into the bones of the phalanges which they move.

The muscles of the lower limbs are grouped together in like order, with such differences as the case requires, preserving the analogy.

Muscles contract to move the bones and alter their relative positions. Those which flex a limb are called the antagonists of those which bring it straight again. The muscles are so placed in connection with the bones in all parts of the external frame, that by acting together and alternately in slow or rapid motion, they move the body and the limbs in all directions.

"Irritability and contractility" are the main characteristics of muscular tissue in all the organs, giving more or less of flexibility and elasticity to the general frame, and this last quality strongly marks the difference between one type of muscularity and another.

It was formerly supposed that motor nerves gave motion to the muscles, but it is now ascertained that they merely carry a current of neuro-magnetic influence, which excites physio-mechanical action in the muscular tissues, somewhat as an electric current communicates a spark to a mass of fulminating powder, which explodes by chemical action thus excited.

The whole body is a machine so contrived as to store up physical energy until it is required for work. Steam engines and electro-magnetic batteries are also force-generating mechanisms with power to conserve a certain amount of energy until it is required; but these machines are much more simple in structure and in modes of action than the body of an animal. Barological, thermological, and electrological physics and chemics are converted into kindred forms of statics and dynamics for industrial uses, in both vital and automatic mechanisms: and although heat is only one form of physical force, convertible with all the other forms, we may call the human body a heat-making machine, analogous to an automatic locomotive, as both mechanisms generate physical energy by chemical modes of action, converting matter from one state into another state; the one by physiological modes of dialytic action, the other by simpler physical and chemical modes of transformation.

RELATIONAL ENERGY AND ELASTICITY.—Training may have much influence in developing agility in man and animals, but some animals, such as monkeys, are born acrobats, while dogs are not, and some men are born acrobats, while others could not be trained to acquire any remarkable amount of physical dexterity. A lion, an ass, and a pig of the same bulk or weight are very different in their respective characteristics of energy and elasticity. The lion is stronger and much more elastic than a pig or an ass of the same weight.

Musculomotorial characteristics of agility and elasticity are as definitely various in different types of organism, as the external features, arms and claws, hoofs and horns, are various in adaptation to peculiar aptitudes for special uses and vocations; and the same may be said of minor shades of contrast in the various organisms of each special type.

The *contractility* of muscles, the *flexibility* of tendons, the *elasticity* of fascia (which envelope muscles as a kind of exoskeleton) in contrast with the *rigidity* of the bony endoskeleton, are subject to mutually reactive states of tension and vibratory motion, in all parts of the body, while a special system of organs of sense inosculate with the muscular and osseous systems in all vibratory movements. The *ears* are organs of vibratory tension or HEARING; the *glottis* is the chief organ of VOCAL tension in speech; the *flexible* tendons, which attach contractile muscles with *rigid* bones, are also vibratory organs of tension which give rise to the "MUSCULAR SENSE" of rhythm in dancing and other measured movements; and this special sense of tensive vibration is more or less concomitant with a general sense of motion in the fascia which envelope muscles, and by slow reactions of elastic tonicity, moderate the sudden changes of shape and position in contractile muscles. This is very distinctly felt in the movements of yawning, or stretching the limbs and the body, after long rest; but it may also be felt in all movements of the external frame in running, walking, swimming, wrestling, or gymnastics.

There are, then, organs of vibratorial tension and sensation in connexion with the motions of the bones and muscles, tendons and cartilages of the frame; namely, an organ of musical vibration; an organ of vocal articulation; a special "muscular sense" of tension and roughness of touch; and a general "muscular sense" of tensive *effort* in locomotion, climbing, or striking: and these vibratory organs may be regarded as satellites of the motorial system, requiring special notice as distinct factors of the organism. As satellites of the cutaneous system there are special organs of sight, touch, temperature, and gravitation; as satellites of the motorial system there are special organs of *hearing, voice, balancing, tension*, and *muscular effort*.

VIBRATORIAL CHARACTERISTICS.

Congenital Modes of Locomotion, Vocalization, &c.—In a general view of these characteristics, it is easy to discern the different modes of locomotion, in fishes, reptiles, birds, and mammals, (not to mention snails, lobsters, sea urchins, and insects,) and on closer observation we see that one species of fish has a different mode of swimming from another; one bird flies differently from another; the frog leaps, while the toad crawls; the snake glides, while the lizard runs; the quadruped walks prone on all fours, while the man stands erect on his lower limbs.

The dog barks, the cat miawls, the sheep bleats, the ox bellows, the lion roars, and the pig grunts. One bird sings, while another only chatters; and singing birds pipe their own peculiar music, according to their race and species.

The alternate motions of the whole frame in locomotion, differ in vertebrate and other types, and even in animals of the same species; the graceful movements of a greyhound contrast with the waddling movements of a bull dog; the quick elastic step of one man, with the slow waddling gait of another.

The rhythmic motions of the heart and lungs differ also greatly in different types, and more or less in individuals of the same race or species. The vibratory modes of voice and speech differ in numerous ways to form the tones of voice, and quick or slow modes of utterance in men and women. One man sings well or dances gracefully, another awkwardly and hoarsely; one man is nimble with his fingers in musical execution, another clumsy and unskilful. Some are born with musical aptitudes and others not, or in a less degree.

We notice inborn characteristics of adaptation to function in the muscular and vibratorial system with its satellites, in parallel with those of the external skin and features of each special type. Although careful training may correct many defects, it is known that some persons are born dull of hearing so as to confound melody with rhythm in music; others are born dull of speech, and hesitate or stammer all through life; others, again, cannot learn to dance or waltz with ease and grace, and some can never learn to swim or vault, run or even walk with upright gait and ease. These are congenital defects, although they may not be hereditary in all cases.

EVOLUTIVE CHARACTERISTICS OF VIBRATORIAL MOTION.—These are manifestly various in youth and age; the infant is weak and supple, the youth is comparatively strong and elastic, the adult more powerful and enduring, the aged man weaker and much less elastic in his movements. The growth and development of strength and elasticity in the muscular system, from infancy to maturity, are very marked, and not less evident is the loss of strength and agility in declining age.

The same may be said of vibratorial characteristics. The child walks, talks, and manipulates differently from the youth, the adolescent differently from the trained adult, and the old man differently from them all.

The vibratory motions of the body are mainly connected with the satellites of the muscular system, namely, the ears, the vocal organs, the tendons of the muscles, and the external fascia or exoskeleton. Respiration and pulsation are organic vibratory motions, which inosculate with those of the external frame, and are also more or less various in different phases of evolution. The pulse and breathing of infants are about twice as rapid as in old age, while they have a medium range in middle age; the pulsations average more than one hundred per minute in infancy, often less than fifty in senility, and about seventy-five in the prime of life. These averages vary in different temperaments, but the regular decline of frequency is common to them all, in a state of health, while fever and disease may interfere at any time with the average ratios of rapidity.

The organs of hearing require good training to be fully developed in musical sensation, melody, and rhythmic regularity: the organs of speech require careful training, to be well developed in vocal flexibility, sonority, articulation and declamation: the flexible tendons of the muscles and articulations require constant exercise to acquire that easy motion which gives grace to the dance, and to the balance of the body in all movements: the fascia and the muscles require constant training, not to cause aches and pains in the limbs from slight unusual exertions and congestions in swimming, running, leaping, and vaulting. Neither music, language, dramatic art, nor a graceful walk and carriage can be acquired without moderate exercise and training of the special organs of vibratory tension and sensation, which are involved in these accomplishments.

Infants can neither hear well nor speak well, nor walk nor dance until they have learned by slow degrees; and many adults cease learning at an early age, remaining in a sort of ill-trained ignorance and awkwardness, and bashfulness or sullenness, like silly, dependent, or troublesome children all their lives.

FUNCTIONAL CHARACTERISTICS OF VIBRATION.—The human body is a locomotive mechanism, and a chemical laboratory, constructed in such wise, that chemical and mechanical actions and reactions shall be mutually beneficial to each other.

Mechanical motions and vibrations are universal in the body, as well as chemical and physical phenomena, and each particular group of organs has its own peculiar vibratory modes of action, which it more or less communicates to all the rest; peristaltic, respiratory, and pulsatory waves of motion simultaneously flow from the internal organs, through the whole frame, night and day; and these are amplified by general shocks and exercises in locomotion and industrial occupations. Vibratory modes of action, therefore, are not simply consecutive, but multifarious and simultaneous in every atom, cell, fibre, tissue, organ, system and hemiality of the body. The influence of these movements on the elaboration of the blood and the nutrition of the organs, is a subject worthy of minute investigation; want of sufficient exercise in the open air is one main cause of feeble health in many of our cities and manufactories, mines and other confined localities. Excessive exercise is just as bad as ill-conditioned sedentary habits, while a due amount of vibratory movement is essential to the healthy functions of the organs. Respiratory, pulsatory, and peristaltic motions concurring with chemical action in the tissues, help to generate a certain amount of heat, and aid in the elaborations of the blood, but not enough to do the work efficiently for any length of time; and that for a good reason, as the heat and electricity induced by the general movements of the body in useful occupations, would be superfluous and injurious, if the visceral motions and vibrations were alone sufficient to mature the blood and expedite nutrition and secretion. Nature has formed the body for industrial occupations as well as for physiological elaborations, and the mechanical movements of the one co-operate with the chemical motions of the other, within predetermined limits and proportions. If both the internal and the external orders of vibratory motion, then, are essential to the healthy degrees of physiological elaboration, neither can be long neglected with impunity, and hence the feeble health of sedentary persons, and the robust health of those who labour moderately in the open air; although the one may live on better diet, and be less exposed to dangerous extremes or sudden changes of weather than the other.

Artificial rockings and movements are given instinctively to infants, to soothe pains, excite pleasurable sensations or induce sleep and rest. Young people are fond of music and dancing, rhythmic movements and sensations; and artificial motions judiciously communicated to the external frame and the internal organs are found to be beneficial in the treatment of some forms of organic and functional disease, such as chronic rheumatism, stiff joints, deviations of the spine, sluggish circulation, secretion and nutrition. These artificial movements form a minor branch of therapeutics, which may be usefully combined with shampooing and moderate applications of the "cold-water-cure" treatment in hot climates and in summer, or with the "Turkish hot air bath" in colder latitudes or seasons of the year; but in these, as in all other cases of therapeutic treatment, judicious supervision is indispensable. All poisonous drugs are dangerous when administered in excess, and violent douches of cold water, shower-baths, and other physical modes of treatment are as dangerous, in cases of debility, as excessive doses of narcotic drugs in organic or functional disease.

Relational Velocity of Motion.—Again, the combinations of strength with velocity, are various in animals and men. The Arab steed and the giant dray horse are highly contrasted in relative endowments, and though apparently unequal in stature and in power, they may be on a par in relative amounts of work; for while the brewer's horse is able to draw a ton weight or more over three miles of level road in an hour, the Arab would be able to take half the load perhaps twice as far in the same time. The giant dray might be able to drag two tons weight three or four miles an hour, but he could not take a hundredweight twelve miles an hour.

There is a relational quality in swiftness equal to that of superior strength with slower motion, and this is just as manifest in human beings as in animals of other species. They are, perhaps, equally useful as industrial qualities in horses, but velocity is mostly associated with artistic vocations in men, and strength with industrial occupations. The man of slight elastic stature may possibly be able to do twice as much work of a light nature in a given time, as the man of heavy build, although he could not lift a heavy weight or endure hard labour to the same extent. Nature evidently distributes her endowments of relative strength and velocity in different species of organism, and in individuals of the same species, with a view to definite uses and vocations in co-operative order and association.

The main relational characteristics of vibration are those of hearing, speech, balancing and walking, in connection with the *uses* of industrial vocations, and the *arts* of music, language, dramatics, and methodics, not to mention the sciences which underlie these arts.

Skeletostatical Characteristics.—The endoskeletal system serves as the chief factor of mechanical support for all the other systems. The hereditary build, the phases of growth, the statical functions, and the relational strength of the body are mainly characterised by the relative proportions of the bony framework of the body.

HEREDITARY BUILD OF BODY.—The general bulk and build of an animal is strongly indicated by the bony skeleton of the adult, every single bone of which is fashioned with the nicest special mouldings in adaptation to the general type of organism; by this accurate conformity of mouldings in each bony part of a skeleton, Cuvier was enabled to determine the family and even the species to which belonged a single fossil bone of the remains of an extinct race. The skeleton of a fish, a reptile, a bird, or a mammal, indicates at once the general form and relative bulk of the individual to which it once belonged. The skeleton of a whale, an elephant, an ox, or a man are easily distinguished from each other, in both general form and relative dimensions. The osseous frame of a giant is easily contrasted with that of a dwarf in any species.

The general characteristics of build are hereditary in all types, but some degrees of difference are found between parents and children with regard to size and physiognomy. Some adults are taller than their parents, others shorter, but it seldom happens that a thickset herculean parent, tall or short, begets children of very slight frame, or vice versa. The general form and build of a man is mostly hereditary, and forms a sort of mean between any great difference in the father and the mother. The main thing to be noticed in this case is, that hereditary height of stature varies more than breadth of build, and is less indicative of real difference of race. Tall, short, and medium heights are quite distinct from slender, stout, and medium breadth, and these characteristics depend mainly on the tall or short, stout or slender build of the bony skeleton.

Great muscular strength is mostly concomitant with large bony structure, while muscular agility accompanies slight skeletal frames; in the human race as in the breeds of animals, these characteristics are more or less hereditary, and may be modified by systematic selection: not, perhaps, as a King of Prussia once attempted to form a race of giants for his army, but by other modes of proceeding for useful ends.

Congenital defects are not uncommon. Sometimes the skeleton is only partially formed on one side of the body, the ribs being only rudimental, and one or both limbs deformed; in other cases the whole skeleton is rickety, and various other defects too numerous to name, are often congenital, if not hereditary.

EVOLUTIVE CHARACTERISTICS OF STATURE.—From birth to adolescence the body grows in stature, and thence to middle age enlarges in corpulence. Good food and training, climate and conditions, have much to do with health and strength, beauty and dexterity; bad food and training, climate and conditions retard the growth, and cause deterioration to a great extent in one generation, and still greater by perpetuation. The bones are slightly formed during fœtal life, loosely connected during infancy, harder and more closely knit together after puberty, completely set and firmly knit between the ages of 25 and 50, less elastic in declining age, enfeebled by loss of mineral substance in extreme old age, when sudden shocks or starts in crossing dangerous thoroughfares, may cause a fracture in the wasted neck of the thighbone, and prove fatal.

The bones of the skull are but loosely connected when the child is born, and some years pass before they are brought in close contact and firmly knit together. The whole skeleton is loosely connected in many parts until the age of 20 or 25, when all the projecting portions (or epiphyses) become firmly adherent to their main centres, and the frame attains its maximum of strength. All bodily training should be given during the period of growth, when almost any amount of flexibility and dexterity may be acquired, whereas ten times the effort and perseverance afterwards, yield less than half the amount of success.

It is much the same with regard to the practical experience and experimental training of the intellect, though not with regard to abstract studies. Children and youths during the plastic period of growth should learn by sight and manual experiment as much as possible, of the natural sciences of chemistry, physics, mechanics, anatomy and physiology, botany and zoology, with elementary notions of mathematics and linguistics, music and history, geography and geology, morals and religion, leaving the more abstruse study of grammar and logic, mathematics and philosophy, metaphysics and theology for adult life, when the body and the rational mind are well developed in force and elasticity. The bones of the body and the opinions of the mind once firmly set together in their final mould, ill or well developed, remain thus set through life. Whatever be the state of growth at 25, is little and with difficulty modified in after life, but naturally becomes more stiff and inelastic with advancing age.

THE FUNCTIONS OF THE SKELETON are mainly mechanical as a framework of support and leverage for the other systems of the body, although, in common with them all, it has functions of nutrition and regeneration to attend to constantly. It is as active in physiological functions as other organic tissues, and as liable to suffer from starvation. According to the experiments of Chossat on different animals subjected to starvation, and compared with others of like weight not having been deprived of food, the percentage of loss in each part of the frame is given as follows:—93 per cent. was lost of the original amount of fat; 52 per cent. of the liver; 42 per cent. of the muscles; 16 per cent. of the bones, and only 2 per cent. of the nerve substance when the animals died of inanition.

These experiments show the final result of waste in different parts, but do not explain the average rate of waste and renewal in each kind of tissue during healthy activity of function. It is known, however, by the experiments of Flourens, that the matter of the bones is entirely renewed in a few months at most; and when a bone is broken, the injury is repaired in about six weeks. "Six weeks," with proper care, is also the known cure for an attack of acute rheumatism; and this would seem to indicate that the renewal of tissue and the repair of injury in the bones and in the muscles follow the same rate of motion and mutation.

RELATIONAL STRENGTH.—Strength and endurance are relational characteristics connected with motional characteristics, but also with the build of the bony framework, as a basis for muscular action and reaction. A powerful body requires a very strong skeleton, and great endurance needs active powers of nutritive reparation in the whole organism.

Slight, well-knit frames are suited to delicate manipulations in both men and women, and as men are generally more strongly built than women, they are more fit for continuous exertion in active or in heavy labours. Strong frames endure fatigue better than privation, while delicate frames endure privations much more easily than prolonged fatigue.

NEURO-DYNAMIC CHARACTERISTICS.

The purely physiological operations of absorption and elaboration, nutrition and secretion, growth and reproduction occur as regularly and completely in a vegetable organism as in the animal economy, and as no important function is attributed to the pith of plants, analogous to that of nerves, we may regard the nervous system in animals and man as a telegraphic apparatus of action and reaction between vegetative and instinctual forces of vitality; and thence infer that its simplicity of structure, and complexity of distribution correspond to various degrees of rank and power in the psycho-dynamical endowments of the organism.

There are no nerves in plants, nor in the lowest forms of zoophyte life, but still there is in both of these forms of vitality, manifest in the closing flower and the shrinking sea-anemone, a something which corresponds to the influences of heat and light, and causes telegraphic conductions analogous to those of sensation and motion in the higher animals. The seeds of plants and the germs of microscopic animalcules may be kept inert for years in dessicated states, and come into active states of evolution as soon as they meet with due conditions of heat and moisture. The principle of life in both animals and plants depends upon external and internal conditions for its outward modes of manifestation, but must *pre-exist* before it can be manifested by phenomenal modes of motion in any world of conditions.

What is the world of conditions in which the immortal principle of life in man lives and moves before it comes into this natural sphere of physical and moral conditions? In this world it assumes a body formed of matter, and sustained in life by physiological modes of action. What were its original form and ethereal modes of action in a previous world of external conditions? It must have had some kind of substantial form, with powers of sensation, and still continue to possess its original form and essence, since the nerves of the physical body merely serve to convey sensation to the inward man and motion to the outward body.

Physiological susceptibility to the influences of heat, light, and moisture, in plants and animalcules without nerves, shows that the real functions of the nervous system are not so markedly physiological as psychological; and hence it is we define neuro-dynamic characteristics mainly as psycho-dynamic degrees of distinction, indicative of external physiological and internal psychological depths of vitality.

SENSOR AND MOTOR NERVES.—Nervous currents form isolated and associated circles of telegraphic stimulation and motion. The cutaneous surfaces of the body (outer coverings and inner linings) are furnished with nerves which conduct impressions of conscious sensation from these peripheral surfaces to the central ganglia of the nervous system, where the received impression excites more active *vascular exchanges* in the vesicular nervous tissues, and a responsive discharge of molecular force in the motor nerves, which go to the motor muscles of the part first affected by sensation, and to other tissues which co-operate with these in a *consensus* of voluntary motorial or involuntary secretional activity. Telegraphic nerves, therefore, run from the *skin* to the ganglionic centres of the nervous system, and from these back mainly to *muscular tissues* in all parts of the body. Some nerves form connections chiefly with internal viscera and the connective tissues of secretion, as a special general system of internal telegraphy, in communication with the relational system of external telegraphy. The cerebro-spinal system of ganglia and nerves unite general cutaneous sensations with general muscular motions; and with the great sympathetic system of nerves and ganglia in connection with the cerebro-spinal system. Automatic or involuntary reflex motions and systemic sensations are the domain of the so-called sympathetic nervous system, while voluntary motions and conscious sensations are under the control of the cerebro-spinal nervous system.

In insects, we find a simple ganglionic chain of nerves, (homologous with the "great sympathetic" chain and ganglia of the higher animals) with only rudimental traces of cephalic ganglia and nerves of special senses; whereas in higher animals cephalic ganglia and nerves are more and more developed in proportion to the physiological and psychological endowments of the species.

It is not the *quantity* of brain which corresponds to *quality* of intellect, for many of the larger animals have more brain matter than a man in absolute weight and bulk of substance. The proportional weight of the brain to that of the whole body is as 1 to 31 in a mouse; 1 to 36 in man; 1 to 100 in an elephant. It is neither the quantity nor the quality of nervous substance we have to deal with, but the various kinds of psychological endowments with which the physical organism is associated in a given type, and especially with the manner in which the nervous system is affected, by different states of mental or moral activity and rest, sleep and wakefulness, hibernation, trance, catalepsy, and somnambulism.

Sensibility and Insensibility.—It is known that sensibility and insensibility in the nerves depends greatly on the gaseous state of the blood. It has also been ascertained by the experiments of Arthur E. Durham (Guy's Hospital Reports. 3rd series, 1861. vol. vi. p. 149,) and by other physiologists, that during natural sleep, the brain, in a state of complete rest (not vividly dreaming), is comparatively bloodless, or anemic, just as other organs of the body, such as the glands for instance, in a state of physiological inaction, are in almost a bloodless state, but rapidly become filled with blood when called into functional activity. The degree of insensibility caused by dreamless natural sleep, then, is a fact concomitant with vascular inactivity of the brain; the nervous substance is not in active relations with the blood; the capillary vessels being almost or quite empty, neither the gaseous nor the liquid elements of blood are actively exchanged with those of the nerve tissue during cerebral inactivity and nervous insensibility. On the other hand numerous experiments show that anæsthetic vapours, such as chloroform and ether, excite the vasomotor nerves into a kind of spasmodic action, which contracts the capillary vessels of the nervous centres so completely that the blood is driven out of them, leaving the brain and the spinal chord in an almost bloodless state, and therefore insensible to irritative stimulations of the peripheral nerves. A very low temperature produces a similar effect on hybernating animals, while due degrees of warmth produce an opposite effect.

Natural sleep, hybernating sleep, and artificial sleep (produced by anæsthetic agents), have this one characteristic in common: namely, the bloodless state of the cerebral nervous centres; and from the deleterious effects produced on the nerves by a previous excess of carbonic acid gas or a narcotic poison in the blood (or the deprivation of a proper quantity of oxygen, all the other elements of the nutrient fluid remaining the same,) we ascertain that it is the relation between oxygen gas and the nervous tissue, which is the main characteristic of sensibility or insensibility in the nervous system during natural sleep. When oxygen is diminished in proportion, or temporarily excluded from communication with the nervous centres, insensibility ensues; conscious relations between the soul and the body are partially suspended; the nerves are there still, but cannot convey sensation to the soul, which has lost a link between its ethereal substance, and the material substance of the nerves; and this connective medium is evidently oxygen, which is the physical link between the ethereal substance of the sensitive soul, and the material substance of the insensible body; and more especially between the sensitive soul and the chief nervous centres: namely, the brain and the spinal chord.

Too much oxygen in the blood becomes rapidly fatal to the life; and too little oxygen is equally, though not so rapidly inimical.

Degrees of toleration between noxious gases and nervous sensibility vary within given limits in different species of animals, and these conditions may be gradually extended by slow degrees in man, but only within narrow lines; and it is an important part of physiological science to ascertain the extent of these natural and artificial limits.

When the capillary vessels of the nervous centres are completely closed (by the influence of anæsthetic vapours, for instance) active poisons introduced into the blood cannot take effect as long as this state continues, but the moment capillary circulation and exchange are re-established in the nervous centres, the poisons act upon the tissues with their wonted virulence. Physiological life depends mainly upon circulation and exchange of nutrient material in the general system, while *sensation* depends mainly upon the capillary circulation of arterial blood in the cerebrospinal nervous centres. The "spiritual body" must be coextensive with the whole organism, but the essential links of conscious union between them are evidently oxygen gas in limited proportions, and physiological exchanges between this gas and the altered fluids of the general economy, but primarily those of the central nervous tissues. Capillary circulation and exchange may be arrested in one part, while they are continuous in every other part of the body, and when that one part happens to be the brain and nervous centres, sentient life is partly or entirely suspended, while vegetative life is only depressed to a certain extent without being arrested. Such is the case in natural sleep, in trance, in coma; and partly so in artificial anæsthesia, mesmeric sleep, and natural somnambulism. In the complete lethargy of "winter-sleep," and in states of syncope the circulations and exchanges seem to be almost completely arrested in every part, and both physiological and psychological life suspended without being entirely extinguished. These degrees of suspension of physiological and psychological life, together or separately, alternately or simultaneously, are deeply interesting biological phenomena, in connection with problems of bicorporeity and amphibiety, which we leave for the present; observing that psycho-physiological centres in the brain and spinal chord, are spontaneously protected by capillary contractions from deleterious substances, while peripheral physiological activity may continue to eliminate the deleterious invader from the organism, so as not to interfere with sentient vitality, when circulation in the nervous centres has been re-established.

"It has been observed by experimental physiologists, "that the anæsthesia of sensitive nerves does not in-"stantaneously affect the motor nerves of the relational "systems, nor even those of the great sympathetic, "although it may sometimes arrest the movements of "the heart."

"Chloroform introduced into the arterial vessels does "not at first affect the nervous centres, since insensibi-"lity commences at the peripheral extremities of the "nerves, and during a certain lapse of time, the trunks "of nerves remain sensitive. When consciousness has "been completely lost and the capillary vessels of the "brain have contracted so as to render the cerebral mass "anemic, still the motor nerves may remain active dur- "ing a certain length of time, after reflex movements "have ceased."—(*Brown-Sequard.*)

This difference of effect on sensor and motor nerves by the same narcotic gas in the arterial blood, and apparently the same degrees of contraction in the capillary vessels of the brain, is not easily explained, since all nervous actions seem to depend finally upon their relations with the blood. It would seem to indicate that sensor and motor roots of nerves in the cerebral ganglia are located at an appreciable distance from each other, or that trunks of nerves contain other threads besides those which have been paralysed in their peripheral (and central?) extremities, which unparalysed nerves have distinct and separate central ganglia.

HEREDITARY NEURO-DYNAMIC COMPLEXITY.—Plants hybernate as well as animals, and circulate their fluids, absorb air and water, secrete gums and juices, without the aid of a nervous system, and therefore we may at once see that all such physiological functions and partial suspensions of function in the animal ecomony are not necessarily dependent upon nervous action and re-action, however much sensation and emotion may be concomitant with physiological disturbances. Such cases show that the perturbations of the soul may influence the functions of organic life, but not that vegetative life depends on conscious psychological control.

The nervous system is developed in parallel with other systems during metamorphic evolution. In the larval caterpillar movements and sensations are in keeping with the general form and the moulting phases of its progress, until it arrives at the torpid phase of chrysalis, in which a final metamorphosis occurs, and the caterpillar is transformed into a butterfly. The morphology of nerves keeps pace with that of the whole frame, and where the instincts of larval insects become manifest in action, before the body has attained its final form, these instincts are in keeping with the wants and movements of the rudimental organism. This shows that the psychogenesis of instinct is concomitant with that of embryogenesis in each phase of evolution.

In the higher animals the body is almost completely formed before the individual is born into the world, and therefore no instinctual modes of embryonic action can be observed, but conscious instinct co-exists with pre-conscious organic forces of vitality in the non-liberated chick, which breaks the shell with the nib of its beak to escape from its embryonic prison : and the hard nib of the beak which serves to break the shell and then falls off as useless, shows evidence of design in the means of evolution.

The final character of instinct and intelligence is prefigured in the type as soon as it is born ; the body and experiential mind grow concurrently in every individual, according to the hereditary complexity of its physiological and psychological endowments.

Congenital depths of vitality differ then most markedly in vegetables, animals and human beings, and more or less between one class of animals and another, of the same general type.

The principle of sensation does not reside in the nerves during life, since it may be isolated from them by artificial means, without either loss of life in the body or of consciousness in the soul.

The nerves are merely a part of the mortal body which may either be in communication with the ethereal body and sensitive soul, or isolated from them without loss of life, or even without temporary suspension of vitality ; still where anæsthesia has not been artificially or naturally produced, the action of the nerves upon the soul, and the re-action of the sensitive principle upon the physiological vitality of the organism, are well known facts, and medical art and science are chiefly based on a correct knowledge of these vital phenomena.

TELEGRAPHIC FUNCTIONS OF THE NERVES.—Nerves are generators and conductors of atomic and molecular motion just as the wires and the battery of an electric telegraph are generators and conductors of atomic and molecular motion; and just as an electric current may cause an explosion of gunpowder, or excite chemical magnetic and mechanical motion in contiguous substances, so a nervous current always induces more active chemical action and may excite muscular irritability, contractility and motion, or glandular secretion in peripheral parts of the body.

The average rate of conduction in the nerves has been estimated to be about thirty-two metres per second, but this rate of velocity varies in different organisms and under variable conditions. It is easy to perceive that the rapidity of volitional conduction in the nerves of a very swift animal compared with those of a very slow animal of the same species is very different. The number of times a race-horse would lift his legs from the ground in a minute compared with the number of times a dray-horse at its utmost speed would lift its legs from the ground in a minute, would give an exact measure of the different ratios of velocity of nervous conduction and muscular contraction in the two animals.

A similar difference occurs between a man who can run very fast and one who cannot; but a still more delicate test has been found necessary for astronomers to calculate degrees of difference between the timing accuracy of one observer compared with that of another, in registering the transitory phenomena of the heavens.

In 1790 the astronomer Maskelyne noted that there was a constant difference between his own timing of sidereal phenomena and that of his assistant Kinnebrock. Since then Bessel also noted that his own timing of the passage of certain stars, was always a little earlier than that of other observers; and sometimes the difference amounted to more than a second of time. The astronomer Wolf has invented a method of detecting the difference between the exact time of occurrence, and the time lost by the observer in noting the event; and this difference is found to be always the same for the same observer, but different in other persons, although it is possible to improve by habit. Mr. Wolf, has been able, it is said, to reduce his "*personal error*" of noting, as it is called, from three-tenths of a second to one-tenth of a second.

Bessel and Faye suppose this delay in noting the exact time of a particular observation to be caused by the time required for an intellectual act to be performed in the brain before it can be transmitted through the nerves, or for the mind to recognise the sensation received through the nerves of sight. The duration of time which elapses between the impression received and the notation of the fact, is called *physiological time*, and it has been found that as a general rule, one-fifth of a second is lost between the reception of a visual impression, and the motion of the hand to signify the same; one-sixth of a second between the reception of an audible impression and the responding motion; and one-seventh of a second between a sensation of touch and a responsive motion of the hand.

Donders made experiments to analyse "*physiological time*" into its elements, by which he found that one-fifteenth of a second was required for the act of thought, the rest being occupied by the conduction of sensation in the nerves of touch, and the responding conduction of motion to the muscles of the hand. One-seventh of a second of time then is occupied in various processes; first, in making the impression or sensation of touch; second, in conducting that impression from the peripheral surface through the centripetal nerve to the central brain; thirdly, in recognising the sensation by the mind, and deciding on a motion of the hand; fourthly, in transmitting the motor conduction from the central brain to the peripheral extremities of the centrifugal nerves; and fifthly in the contractility of the muscles to move the hand. A little more than half the time is occupied by physiological processes, and a little less than half the time by psychological re-action.

This shows very plainly that the sensitive soul and the material nerves are distinct factors of vitality, not identical in substance; and other facts show that while physiological modes of action are incessant in the body, physical modes of action in the nerves are more or less intermittent in correspondence with intermittent modes of action in the mind.

The nerves are contrasted as centripetal and centrifugal conductors of vibratory motion, but we must view them mainly, though not exclusively, with regard to conscious and unconscious neuro-dynamic characteristics. From this point of view, there are relational, organic, mixed and connective systems of action and re-action in the body and the mind, which may be termed *autocratic, automatic, autotelic* and *embryonic;* or conscious, unconscious, sub-conscious and pre-conscious modes of action and sensation in the organism.

The sensor and motor nerves of the "great sympathetic" system in telegraphic communication between the mind and the central series of the vascular, the digestive and the generative systems are called *auto-*

matic or self-acting, because we have no control over them, being quite unconscious of their modes of action in a healthy state, and only become conscious of their molecular motion through a sense of systematic ease or comfort, pain or suffocation, palpitation of the heart, or other exceptional states of disorder. The sensor and motor nerves of the external satellitic organs in connection with the main systems (as the mouth and nose, for instance), are called *reflex* or *autotelic* or sub-conscious, because they act both with and without our being conscious of their healthy modes of action. Respiration continues night and day, without our being habitually conscious of the movements, but the moment our attention is drawn to the fact, we find that we are not only conscious of the movements of inspiration and expiration, but that we can momentarily control the rate of alternating motion. The sensor and motor nerves of the external frame are called *autocratic* because we can control their motion, and are conscious of their modes of action in accordance with the will.

The autocratic nerves communicate between the brain and certain elements of muscular tissues in the body, as telegraph wires between a battery and a powder magazine, in which any single wire or bundle of wires, according to Signor Matteuci's comparison, may at any time explode a special packet, or bundle of packets of explosive matter at the bidding of the will which governs the whole apparatus. And so wonderfully safe and well constructed is the mechanism that no disaster can occur from its predetermined limits of safety in partial or in general working order.

There is another class of sensor and motor nerves which belong to the connective mechanism—namely, to the glandular, the areolar, and the adipous tissues and secretions, but as these are also automatic in their modes of action, we need only mention them as a distinct part of the telegraphic system. Everybody knows that tears flow involuntarily from the eyes under various states of mental emotion.

When the body is a corpse it contains all the nerves as well as all the bones, muscles, skin, heart, lungs, and other organs, which it contained while living. The spirit of the man is not identified with the nervous system, more than with any other portion of the organism. The matter of the body is distinct then from the spirit with which it is associated during life, and from which it is entirely separated after death.

If a tooth, or an eye, or a limb, be separated from the body, the spirit is not diminished by any of these mutilations. It merely loses several parts of an instrument, the whole of which is but a temporary habitation. When a limb is lost the spirit is partially decarnated, but it is not maimed. The nerves of one half the body may be paralysed without loss of life in the spirit. Loss of the use of part of the body by amputation or paralysis does not involve loss of spiritual unity or personality. And yet this unity is so intimate and indivisible, that where the smallest point of a nerve, in any minute organ, is affected painfully, the whole person suffers. "Toothache, earache," a "whitlow" on the finger, a grain of dust in the eye, may cause such pain in one small part of the community as to render life a burden to the whole soul as long as the excruciating pain endures.

It would carry us beyond the limits of a simple outline to dwell on all the recent discoveries of neural physiology and pathology, which can be found in the writings of Dr. Brown Sequard, Claude Bernard, Helmholtz, Donders, and other eminent experimentalists, but a few extracts from the works of Dr. Elliotson and Dr. Ashburner, who have had life-long experience of animal magnetism, or "mesmerism," in connection with disease and cure, both physical and mental, will give us an idea of normal and abnormal modes of action in the brain and nervous system, where they are complete and physically sound in every part, but variously affected by magnetic forces and conditions of amphibiety.

In the first number of the "Zoist," Dr. Elliotson observes that "mesmerism has been dimly known for "thousands of years, but is only now beginning to "assume the character of a science; a science of the "deepest interest, inasmuch as the phenomena of life "transcend those of all inanimate matter, and inasmuch "as the power of mesmerism over the faculties of the "body at large, and especially over the whole brain and "nervous system, is immense, and, therefore, capable "of application to prevent or to remove suffering, and "to cure disease far beyond the means hitherto pos-"sessed by the art of medicine."

We do not know how far Dr. Elliotson may over-estimate the curative powers of "mesmerism" by confounding exceptional cases with general practice; but none can doubt that he was well acquainted with all the common branches of medical art and science, and that he had much practical experience of mesmeric phenomena. Dr. Ashburner has also had much experience of the same kind, and says, "Man is a magnet composed "of many parts with poles and equators. The brain is "the chief magnet; the trunk and the extremities are "separate magnets. *Normal currents* take the normal "course from the brain to the caudal extremities; Mr. "Faraday and Signor Matteuci have established this "fact in the electric phenomena of the gymnotus and "the torpedo. . . . Abnormal currents reverse the "poles and cause pain."

"Sleep is loss of consciousness; we lose conscious-

"ness if we are dead drunk; or by opium, or stunned "by a heavy blow on the forehead; in every case pressure "on the brain or collapse of nerve matter is involved."

"When an animal is deprived of the calvaria the "brain is exposed to view and is seen to expand and "contract. The palm of the hand is applied so as to "press upon the animal's brain, and instantly sleep "supervenes. If the pressure be steadily kept up "anæsthesia is present, the animal is quite unconscious; "remove the pressure, the animal wakes up, conscious-"ness returns. Blood or serum effused on the brain "produces the deep unconscious sleep of apoplexy."

"Coma, sopor, carus, and lethargy, are degrees of "cataphora or morbid sleep, caused by loaded veins on "the brain, by serous effusion, or by other causes of "pressure on that organ."

"Abernethy, in his lectures, stated that Ruysch had "observed in a man, from whose skull he had removed "a piece of bone, and exposed the brain to view, that "when the man slept his brain occupied less space in "the bony vault of the cranium than when he was "awake. In the year 1813, when I was house surgeon "at St. Batholomew's Hospital, I had an opportunity "of observing that during sleep the brain of a boy (from "whose extensively-fractured skull I had occasion to "remove a large piece of bone) occupied considerably "less space than when he was awake."

"In 1831 a case fell under the notice of Dr. Pierquin "at Montpelier, in one of the hospitals. A female, at "the age of twenty-six, had lost a large portion of her "scalp, skull-bone, and dura-mater, in a neglected "attack of lues venerea, a corresponding portion of her "brain was bare and open to inspection. When she "was in a dreamless sleep, her brain was motionless "and lay within the cranium; when her sleep was "restless and agitated by dreams, her brain moved and "protruded above her cranium, forming cerebral hernia; "and when she was awake, and more especially when "engaged in active thought or conversation, the "cerebral hernia was still greater. Nor did the pro- "trusion occur in jerks, alternating with recessions, as "if caused by the impulse of arterial blood. It remained "steady while conversation lasted."

"Light is a magnetising agent which pervades and "invigorates the whole body. The sun is a magnet, "the centre of attraction. The influence of sunlight "in procuring health is known. Those who are pent "up in close dark rooms are subject to a condition "known as etiolization."

"When a healthy man is exhausted by fatigue, the "best means of restoring his lost tone is sound refresh- "ing sleep. Mesmeric sleep, in fact, is only common "sleep, multiplied, as it were, by a factor of larger "power than itself."

"Sleep may be induced in some persons in a very "short time, by passes slowly made with the slightly- "curved open hands of another person, at the distance "of half-an-inch, or an inch, from the crown of the "head downwards along the face and chest to the pit "of the stomach. This may be done either with one "hand or both at the same time or alternately."

Bicorporeity and Dreams.—In another part of his work on "Magnetism and Spiritualism," Dr. Ashburner says, "Human magnetism is controlled by a law which "allows man to dream—when he dreams his soul quits "his body and wanders on its travels. This has been "proved more than a hundred years ago, by a Scotch "tutor, whose name was Andrew Baxter, who wrote an "admirable work on the nature of the human soul, and "the phenomena of dreaming, showing that dreams are "involuntarily intruded upon the soul."—(Edinburgh, 1733.)

We have not seen Baxter's work, but we should infer that the soul does not quit the body in dreams which occur during sleep, in which the brain moves as in the walking state, but rather, if at all, during sleep, when the brain collapses and lies quite still. These questions of bicorporeity and amphibiety are, nevertheless, important problems of physiological and medical science.

Speaking of trance resembling death, Dr. Ashburner says, "In 1818 I was called in to see a patient, Mr. "Leckie. He was feeble and emaciated, and had been "ailing for some time, but not remarkable for any "serious disturbance of the principal functions of the "body. Dr. Southey was called in also, but we could "detect no lesion of any important organ. Our patient "did not really die, but fell asleep in death, as we "thought. The resources of our art did not restore his "pulse; we administered stimulants until our patient "ceased to breathe, while he lay on his back with his "glassy eyes open. Closing his eyes we applied a looking-glass to his face; not the slightest sign of moisture "appeared on the glass. The body was laid out, but it "did not become cold. Three days afterwards I met "our patient walking on the sunny side of Cavendish "Square, looking cadaverous, but strong enough to walk "steadily. Here was really a case of death in sleep. "Three months later he was again attacked in the same "manner, but did not come to life again in this world.

"The conditions of sleep and wakefulness are striking "examples of altered polarities. A large fan, throwing "upward currents of air, will soon waken a person "slumbering in healthy sleep.

"Each tissue of the body has its own organic sensi"bility. The magnetic force which endows it with "sensibility gives it its special characteristics. The "sensitive plant and the Dionea muscipula in vegetable "life, and the zoophite actinea afford examples of sim- "ple instinctive sensibility."

Here the Doctor seems to confound physiological *sensitivity* with psychological *sensibility*. His experience is nevertheless various and interesting.

We may in some measure conceive how mesmeric passes act upon the body, by observing the manner in which the sun magnetises the atmosphere and illuminates it. When the moon is half full we see how vividly one half is illumined, while the other sleeps in darkness. Mesmeric agency may induce sleep as a reaction after great excitement of the nervous system.

The telegraphic functions of the nerves, like those of an ordinary electro-telegraphic apparatus, are simple conduction on the one hand, and peripheral modes of action on the other. The conduction is always the same in either centripetal or centrifugal directions, but the effect at the extreme ends of the wires may vary in accordance with different kinds of apparatus in connection with the wires. As Helmholtz observes, "the "same metallic wires of copper or of iron conduct the "same kind of electrical current, and yet different effects "are produced at different stations, in accordance with "the structure of the terminal apparatus. In one case "a bell is made to ring; in another, a needle is made "to move, as the finger of a watch; or to make an "impression on a surface; or to cause an effect by "means of chemical decomposition. In other cases an "electrical current may be used to explode a mine, and "thus we see that the same causes may produce very "different effects, in accordance with different external "conditions and connexions. And so it is with nerves.

"According to the most careful observations, all ner-

"vous fibres seem to have the same structure, and the "modification to which we give the name of excitation, "is identically the same in all, notwithstanding the "great variety of functions performed by nerves. Some "conduct sensations from external organs to nervous "centres, while others conduct voluntary motor impulses "from the brain to the muscles, causing them to con-"tract so as to move the limbs; others, again, act upon "the muscles of the heart and blood vessels; others "induce glandular secretions, &c. And yet the fibres "of these nerves are all alike; they are cylindrical "threads of microscopical dimensions, transparent as "glass, and all composed of like substance, partly ana-"logous to oil and partly to the white of egg. If some "nerves are thicker than others, that is merely a matter "of secondary importance, with regard to the grouping "of several together, or of strengthening the part, with-"out affecting the variety of their functions. Mons. "E. du Bois Reymond has shown that all nerve fibres "have the same electromotor functions; and in all, the "same excitation may be obtained by the same me-"chanical, electrical, chemical, and calorific changes; "and the propagation of motion shows the same degrees "of rapidity in centripetal and centrifugal conduction, "in sensor and in motor nerves, and the rate of motion "is about one hundred feet per second, producing the "same modifications in their electromotor properties. "All the fibres die also under the same conditions, and "the coagulation of their contents seems only to vary "a little according to the thickness of the nerve. So "that with the exception of their different peripheral "relations with the numerous organs of the body, all "the properties common to one nerve or set of nerves, "are identical in all the others. And, moreover, two "French physiologists, Phélipeaux and Vulpian, after "cutting through the sensor and motor nerves of the "tongue, united the superior half of the sensor nerve "with the inferior (cerebral) half of the motor nerve; and "after the union became complete, the excitation of the "superior half of the sensor nerve, which under normal "conditions would have conveyed sensation to the brain, "now conveyed motion to the muscular fibres of the "tongue." (An indication that the roots of sensor and motor nerves are located separately in the brain.)

"Whence it is evident that diversity of function in "the nerves does not depend upon their internal struc- "ture, but does depend upon the structure of the dif- "ferent organs with which they are connected, and to "which their peripheral ends are respectively adapted."

"While the excitation of nerves terminating in the "muscles or in the glands produce movements and "secretions, the excitations of sensor nerves produce sen- "sation; and these are of different species. The phe- "nomena of the external world affect us very diffe- "rently through the medium of the five senses, in "which we can find no qualitative likeness between a "sensation of light and one of sound, or taste or smell. "Nor does the effect depend upon the nature of the "excitation by pinching, by electrical shock, by caustic "irritation or any other means. The effect depends "not upon the structure of the nerve, nor upon the "means of excitation, but solely and entirely on the "organs of sensation in connection with the nerves."

From this view of isolated circles of neurility we can easily understand that many different kinds of irritation or means of excitation may cause the eyes to see, the ears to hear, the nose to smell, the tongue to taste, and the nerves of touch to feel in dreams, as well as the usual excitants of these five senses in the waking state. If spirits can magnetise the body, and irritate the organs of sensation during sleep or trance, they may cause visions and audible sensations, where no common light or sound exists in the outer world to produce like effects; or the memory itself may recall subjective sensations as vividly as when first produced by objective excitations.

What are the relations of the nervous system with the ethereal body and the sensitive soul in all the different modes of subjective and objective sensation; such as the following:

1. Waking state and objective sensations.
2. Sleeping state and subjective sensations.

1. Natural somnambulism.
2. Mesmeric somnambulism.

1. Braidism or biological hallucination.
2. Maniacal subjective hallucination.

1. Trance (*sleep*) with alternate reminiscence and obliviscence.
2. Ecstasy (*wakeful*) with or without alternate memory.

1. Hybernation during months of suspended animation.
2. Lethargy during months of depressed vitality.

1. Suspended nutrition with periods of conscious vitality, during many months.
2. Delirium, visions, voices, &c.

These states occur, where the blood is healthy, and are therefore quite distinct from the phenomena of narcotic poisoning and artificial anæsthesia.

All persons have experience of the waking state of objective sensations, and the dreaming state of subjective sensations. Most people have seen cases of natural somnambulism, and of mesmeric somnambulism. The phenomena of "Electro-biology" or "Braidism," by which a person while wide awake, may be made to believe he sees and feels, tastes or smells whatever the biologizer may suggest, have been witnessed by thousands in every large city of Europe and America within the last twenty years, and maniacal hallucinations are common in all insane asylums. States of trance and ecstasy are not very uncommon, especially in some countries and races, such as those of India. Hybernation and prolonged lethargy are periodical in some races of animals, such as frogs and toads, bats and marmots, hedgehogs, and bears. In these cases psychological animation seems to be suspended as well as physiological nutrition, but cases are on record, in which persons have lived without food during many months, and still maintained some warmth of the body with occasional consciousness of all that occurs around them.

"The duration of winter-sleep (says Brown Sequard) "does not appear to be in any way connected with the "class to which the animal belongs, for in animals of "the same class, it may be of long as well as of short "duration, continued or interrupted, and though in ani-"mals of the same species it is the same, there is pro-"bably some difference according to age, seeing for "example that Barkow found the winter-sleep of "younger individuals amongst hedgehogs to be shorter "in general than that of older individuals.

"The temperature of the body of hibernating ani-"mals has a tendency to decrease during ordinary daily "or nightly sleep."

"During hibernative sleep the temperature of the "body of the animal is hardly, if at all, higher than "that of the surrounding atmosphere; and the deeper "the torpid sleep, the lower is the temperature of the "animal's body, being greater during the lesser degrees "of torpor, and lowest during the most complete state "of torpor."

"When the cold season is protracted hibernating ani-"mals wake up at the usual time, and if the cold be not "too severe, the animals observed remained awake, but "if the weather continued to be extremely severe, they "again relapsed into a state of lethargy, became stiff "and cold, and at last died."

"During hibernative sleep or lethargy respiration "is very slow and feeble, hardly perceptible, and may be "completely suspended for a time (as in syncope). In "the last case, circulation is not entirely stopped, the "action of the heart, though very feeble, continues without ceasing."

"With regard to the state of the blood (taken from "animals?) during hibernation it has been observed, "that coagulation, and also the separation of the clot "from the serum, take place very slowly, and putrefaction is longer in supervening. In these respects the "blood of the arteries (which is of a dark colour) is more "remarkable than that of the veins, and the blood of "old animals more remarkable than that of young animals (arterial being compared with arterial blood, and "venous with venous), but the opposite is the case, if "we compare the arterial blood of young animals with "the venous blood of old animals."

"Barkow like Marshall Hall found that muscular "irritability continued longer in animals killed, during "the torpid state of hibernation, than when killed during the ordinary waking state: and also the excitability of those parts of the nervous system involved in "the production of reflex or involuntary movements.

"Some animals, whose hibernative sleep is only partial, such as the badger, for instance (and perhaps "the hamster) do not entirely cease taking food, but the "greater number of real hibernators take no food at all, "during their long winter-sleep; and when by chance "they are aroused from torpor by a very warm temperature, they are generally disinclined to eat; the quantity "they take is very small; and even this small quantity, "in some cases, is imperfectly digested. Moreover, "when such a state of artificial waking-up is much prolonged, the animal dies."

"Hibernation is a natural characteristic of animals "essentially different in type of organism, and in relative degrees of development of the nervous system, "not to mention the greatest degrees of diversity of "form and distribution in the vessels of the vascular "system. Nor is there any peculiarity in the blood, "which can account for the periodic torpor of these ani- "mals (of different types, molluscs, reptiles and mam- "mals). Barkow surmises that imperfect respiration is "the principal condition of hibernative lethargy, but it "may be asked, what can be the cause of this imperfect "respiration, but a diminution or suspension of the res- "piratory movements occasioned by a diminution or "suspension of the nervous influence to the respiratory "muscles; this diminution, or suspension of nervous "influence to the respiratory muscles, being the result "of some state of the nervous centres or promoted by "diminution of external temperature."

During the phase of hibernative lethargy, young toads and young hedgehogs do not grow, and the regeneration of lost parts of the body in snails is arrested. Retardation, says Barkow, is the general characteristic of all the functions of the body, organic as well as animal. The fully developed animal passes slowly into winter sleep, and comes forth from it in a state of rejuvenescence. The tame marmot is found to have forgotten his education, and to have become wild again.

Hibernative torpor is not of the nature of asphyxia. Hedgehogs held long under water while in a state of lethargy are asphyxiated, but the animal does not pass at once from a state of lethargy into a state of asphyxia, as from a lesser to a greater degree of the same state, but first awakens, though imperfectly, and endeavours to escape. Again, the asphyxiated animal, on the return of life, does not pass through the state of winter sleep into the waking state, but directly into the latter, and only again falls into the winter lethargy from the waking state. Nor has the hibernative torpor any analogy with the embryonic state of fœtal life *in utero*, seeing that in this state metamorphic evolution is most active, whilst in hibernative lethargy, the activity of development is arrested.

"Hibernative lethargy differs again from common sleep; the most important differences between these two states have reference to the processes of digestion, growth, nutrition, reproduction, the formation of fat, almost all the secretions, circulation, respiration, and the evolution of heat. In common sleep, chymification goes on unchanged, while it is only at the beginning of imperfect lethargy, or during its interruption, that digestion proceeds at all. During the perfect winter-sleep of torpor the stomach is empty. If hibernating animals are surprised by the sudden occurrence while their stomachs are full, and thus overtaken by lethargy too soon, chymification stops at once. Common sleep favours nutrition, growth and reproduction; hibernative lethargy suspends these processes. The common sleep of hibernating animals powerfully promotes the formation and accumulation of fat; during hibernative lethargy their fat is (more or less completely) exhausted."

This interesting description of hypnotic phenomena gives no explanation of suspended degrees of co-operation between soul and body during hibernation. We must try to find at least a physiological if not a psychological explanation. The fat is consumed probably to generate sufficient warmth to keep the almost lifeless organism from perishing of cold, although some cold-blooded hibernating animals (as frogs and snails) may be almost frozen and return to life again, and many hibernating plants support the severest winter cold, and bloom again in spring.

Animal life may be sustained for a long time on comparatively little food, in many cases, with very sluggish respiration ; but where physical activity is continuous and energetic, comparatively large quantities of food must be consumed, with active respiration, circulation, and nutrition, to accumulate as much latent physical force as is required to be converted into *animal heat* and mechanical work or locomotion.

Where there is no physical activity at all, as in the case of trees (subject to motion, however, by violent gusts of wind), *physiological vitality* is sustained during the winter months without any perceptible circulation. During the winter sleep of cold-blooded animals, respiration, circulation, and nutrition are almost, if not quite, as dormant as in hibernating trees. In warm-blooded hibernating animals, such as the marmot, physiological vitality is maintained during a long winter sleep with almost no perceptible signs of respiration. Semi-hibernating animals, such as bears, for instance, in frigid regions, live through the winter in a torpid state, on little or no food, although not entirely unconscious all the time or with intervals of semi-wakefulness. Physiological vitality, therefore, with *little or no physical activity*, in the highest orders of hibernating animal organisms, may be sustained or partially suspended during many months without food of any kind, and almost or quite without any perceptible respiration, circulation or nutrition; and the hysterical or cataleptic temperaments of human beings are somewhat analogous to those of semi-hibernating animals.

In Doctor Carpenter's *Physiology*, (chapter on "Hunger, Thirst, and Starvation,") there is a fact, well authenticated, of a non-hibernating animal, a fat pig, which was buried in its sty for 160 days, under 30 feet of the chalk of Dover cliff, and was dug out alive at the end of that time, but much reduced in weight. In Berard's *Physiology* (French), numerous cases of prolonged abstinence (many months and even several years) in the human species are given as well authenticated by eminent physiologists.

Nutrition and innervation are intimately correlated in the animal economy, but vascular relations with nervous centres may be suspended for a time while continuous elsewhere, so as to maintain vegetative life without consciousness, as in a plant.

Special qualities of blood are required for each tissue, and that which is unfit for one may still not be injurious to another.

Atoms of matter endowed with latent physical forces are associated in organic cells, in exchange for waste matter from which a portion of these latent forces has been discharged as heat or mechanical motion; the tissues absorb from the blood such atoms only as are fit for their special structure, namely, bone matter in the osseous skeleton, and other kinds of substance in each special tissue; whence it follows that latent force exists in atoms and organic cells, and these have several kinds of neutralizing opposites. The properties of *curare* neutralize, paralyze, poison, or destroy the qualities of nerve tissue; those of the *upas-antiar*, and of the *Tanghinia Venenifera* neutralize those of muscular tissue; not improbably somewhat in the same way that oxygen and hydrogen gases neutralize each other's special properties in forming water; or chlorine and soda in forming common salt.

Where the *conductor* forces of nerve tissue have been neutralized by the absorption of such a substance as curare, the action of vital forces upon non-conducting nerves is as powerless as the action of a galvanic battery would be on non-conducting threads of grass or cotton. The same may be said of muscular tissues and their special properties neutralized by special kinds of poison.

The chief fact to be borne in mind is that all the cells and tissues absorb special kinds of atoms from the river of life in the blood, and by associating these atoms, accumulate physical forces, to be expended as occasion may require, in special modes of motion; in conductor nerves, secreting glands, contractile muscles, elastic cartilage, flexible tendons, &c.

Latent forces in the physical organism are in mutuality of relationship with corresponding kinds of spiritual forces in what has been called the "spiritual body;" and as these mutual relations are active or inactive, free or restricted, so the phenomena of life are natural or perverted, excited or depressed, vigorous or exhausted in their modes of manifestation. These again are more or less diversified in different temperaments, especially in hysterical and cataleptic persons, as well as in hibernating animals contrasted with non-hibernating species, and electrical fishes contrasted with non-electric.

"With respect to the torpedo, the gymnotus and the "silurus, (those instinctive electricians as they have been "termed)" says Sir H. Holland, "it is yet wholly un-"certain whether the large nervous ganglia appropriate "to their extraordinary powers, act directly in produc-"ing electricity or only giving energy to the extensive "organs by which it is accumulated and directed. . . . "The nerves supplying these organs have very different "origin in the three species in question; and further "we may note that there is no proportion between the "intensity of the shock and the size of the nerve in "each."

Is it not evident in this case that the special nerve is merely a conductor to liberate electric forces, just as other nerves liberate muscular forces by setting the body in motion? And not only is neural conduction distinct from muscular and electric forces in electric fishes, but every special organ is adapted to incidental modes of motion in the surrounding medium, such as light and sound, which affect the eye and the ear. A blind man cannot see, although he can hear very well; and a deaf man cannot hear, however good his sight may be.

Objective and subjective states of sensation are most easily distinguished in wakeful and in dreaming states of consciousness; but objective *illusions* and subjective *hallucinations* are common enough in the wakeful state, both in healthy and in morbid states of body and of mind. When we are in perfect health, the sun *appears* to move round the earth, because the earth itself moves round. While standing on the deck of a steam-boat moving down the river, the trees on the banks of the stream seem to move, because the steamer is moving and the spectator standing still. Sitting in a railway train before it starts, a passing train seems to be standing still while the still train seems moving on. The mirage of the desert, phantom ships, and cities in the clouds are illusions of like nature, easily explained, and most of the tricks of conjurors are merely tricks of substitution, objective illusions, of the mind deceived by appearances, without due verification.

In morbid states of the system objective illusions are also common. When certain parts of the organs of vision are affected, small flies, dark lines or spots, bright lines, rings, or flames, seem to float before the eyes more or less constantly, because the nerves of vision are affected by morbid states of the eyeball itself, which cause illusive sensations in the brain and mind. When other organs of sense are diseased, delusive sensations of taste or smell may be experienced, however pure and wholesome the air, the water, or the food may be. In transitory states of excitement, by alcoholic fumes in the blood, for instance, a man sees two noses on the face of his neighbour, and the same effect of diplopia may be superinduced by other causes of nervous excitement, such as excessive mental efforts and consequent nervous debility.

When the organs of sense are perfect, the mind of sensitive persons may be impressed with consciousness of special sensations where there are no real objects in view: as in the phenomena of psychologization the psychologizer tells the patient that there is before him an orchard loaded with fruit and induces him to gather some; or puts a roll of paper in his arms, telling him it is a rabbit, and not to hurt it; or gives him water to drink, saying it is port-wine, or vinegar, and induces the taste, in mere imagination or subjective sensation.

Not only delusive sensations but all kinds of ideas and beliefs may be thus superinduced in the mind of the patient. We have seen a case in which an honest glazier was first made to forget his own name, and then to believe that he was "Father Matthew," just returned from America, and that the audience before him had been called together to hear an account of his apostleship; the man actually addressed the audience in a tolerably connected, but of course imaginary, account of his tour in the United States, and the results of his mission. After which he was depsychologized, and became himself again.

Self-psychologization by mental excitement, dwelling on fixed ideas, is a common phenomenon amongst the insane, who fancy themselves kings or queens; or believe that a particular person is actually their son or daughter.

In states of natural somnambulism the spiritual consciousness seems to be in some degree isolated from the natural consciousness (as in a dream), although the body is influenced by the will, and the inner magnetic sense of vision sees external objects while the eyes and ears are closed against common sights and sounds. The same may be said of mesmeric sleep and trance artificially superinduced; and in both cases the patient has no recollection of what has occurred during the hypnotic state. In certain states of trance, spirits are alleged to take possession of the body of the patient and speak through his mouth, in a different voice, and with a totally different expression of countenance from that of the entranced person.

RELATIONAL NEURO-DYNAMIC MODALITY.—The fact of physiological action and reaction taking place without locomotive power in a vegetable organism is evident, with some degrees of apparent sensitivity and consequent motion in such plants as the Venus fly-trap (dionea muscipula) and the sensitive mimosa.

The physiological processes of vitality are continuous in the bodies of animals and man during sleep, and to a small extent during periods of hibernation or of trance, just as chemical and physical action for the generation of steam power in a locomotive can be continued without setting the machine in motion on a railway line.

Plants are almost lifeless in temporary suspension of physiological processes, but they are not dead. Hibernating animals are almost inanimate during the lethargy of winter sleep, but they are not dead. Human beings sometimes appear lifeless during days or even weeks of trance or syncope, and have been buried in that state, and come to life again; and thus the body maintains an almost imperceptible vitality in cases of suspended animation.

What are the relations between the soul and the body in these different states? Why does a man in profound sleep not hear the loudest thunder which so violently shocks the air in which he breathes, and the nerves of his whole body, as well as those of the delicate organ of hearing?

The spirit is not always inert during sleep, as everybody knows from the experience of most vivid dreams, in which one sees and hears, and sometimes tastes and smells, and feels, with or without corresponding effects in the bodily organs. When locomotion or physiological excitements in the body concur with these dreaming psychological sensations and ideas in the mind, as in cases of somnambulism and incubus, we naturally infer that the spirit is present; but when the psychological phenomena are experienced as hallucinations without corresponding effects in the body, the case is different, and we have no reason to deny the rationality of those who affirm that the spirit has an ethereal form within the material organism, and that during the sleep or the trance of the latter, vegetative life can be maintained for a time, while the spirit wanders far away.

It is affirmed by those who consult this kind of experience, and believe in the "bicorporeity" of man, that when the spirit seems to float or fly in the sensations of dream, it really does leave the sleeping body and float away in objective reality, as it seems to think and feel in subjective consciousness. And if the spirit live and move in an ethereal form within the natural body, we may easily conceive that it is a distinct living entity before it forms its physical organs, and while it animates them. We may also observe here that we have seen the living body of a woman at Batavia, a small village near Buffalo, in North America, taken possession of by an invisible spirit, which gave the features a totally different caste of general form and expression, and spoke in the voice of a man, utterly unlike that of the woman possessed, and in a language unknown to all present (with the exception of a few words known to some), the invisible spirit representing itself to have been formerly an Indian inhabitant of that part of the country. Several persons were possessed by different spirits, one after another, on that occasion, and the friend who accompanied us (M. A. Brisbane) being a native of the village, had known the persons so possessed to be also natives of the place; ignorant peasants, who had never travelled far from home, and were totally incapable of speaking naturally, as they were spoken through by the demons or possessing spirits.

Some people, who have never witnessed such cases, doubt the veracity or the judgment of those who have seen the phenomena, and attribute the wonderful stories to imagination or hallucination.

It is clear, however, that nerves are not really sensor or motor powers, they are merely telegraphic wires conducting the molecular motions of innervation from the peripheral organs to the central seat of sensation, and from central to peripheral limits of the system. The nerves of hearing may be powerfully set in vibration during sleep, and no sound is heard, no sense of hearing is awakened in the spirit; and in a state of catalepsy the flesh may be pierced and no pain felt by the patient. In all such cases the nerves carry the impression from the periphery to the centre, but the spirit does not receive the impression, and thence it is unfelt in the mind, though real in the body. At all times it is only some of the relational or animal functions of muscular "contractility" and nervous "innervation," that come within the sphere of mental consciousness; since, innumerable molecular motions and mutations occur in the body of which we are entirely unconscious.

The relational modalities of nerves are of different kinds; that is to say, in certain states of sleep and wakefulness the spirit receives sensations through the nerves, and sometimes apparently without the aid of these nerves during deep sleep, trance, and ecstasy; whence it is believed by some that the spirit in its ethereal form may be habitually present in the body during catalepsy, but not identified with it, or absent during sleep or trance, and in the company of disembodied spirits as long as the body can be physiologically kept alive by the blood already in the system without renewal of material elements from without. The relations of sensibility and insensibility between the body and the spirit are variable, and in some measure independent of the nerves: they are twofold in the nerves, and twofold in the spirit. The nerves may be healthy or paralysed, capable of conveying vibrations or incapable; and the spirit may be present in the body to receive sensations and communicate magneto-molecular motions through the nerves, or it may be isolated so as not to be affected by the vibrations of the nerves. Bicorporeity, in unity or in duality, are distinct modes of relationship between the spirit in its ethereal form and the material organism, in different states of sleep or wakefulness, trance or catalepsy, somnambulism or ecstasy; and according to different degrees of susceptibility to these various states, individuals are said to have different nervous temperaments, sleepy or wakeful, hysterical or somnambulic, cataleptic or epileptic, sensitive or insensitive, excitable or lymphatic, mediumistic or clairvoyant, nervous or bilious, sanguine or melancholic, irritable or placid.

Some of these states occur in healthy bodies, while others are more common in disease; but what are the normal varieties of nervous susceptibility and vital bicorporeity? Mental delirium and hallucination are mostly connected with morbid states of the body, but there are cases of mental insanity where no traces of deterioration can be found in the brain or in the blood, And there are cases of somnambulism without insanity. The life of the material body is hardly more complex in itself than the life of a plant, and therefore all the phenomena attributed to nervous sensibility in man should be traced up to the sensitive soul which animates the organism (bones, muscles, nerves, &c.), being separable from the whole at times, as well as from the nerves of sight and hearing during the deepest sleep. The phenomena of amphibiety are thus easily distinguished in animal life contrasted with vegetable life during normal states of vitality; and the facts of bicorporeity seem to be equally well ascertained in cases of abnormal vitality.

There are many varieties of neuro-dynamic and nutritive *diathesis*, alimentary *constitution*, and vascular *temperaments*, and some confusion in the use of terms so variously applied. Before we can give a definite meaning to words, we must have clear ideas of the facts they represent. What then are the modes in which the spirit and the body act and react upon each other through the instrumentality of the nerves and the blood, or the gaseous vapours of the blood?

SOULS AND BODIES.—As far as we can penetrate into the phenomena of life, immaterial vital forces (soul and mind) are ever connected with so-called immaterial physical forces (heat, light, electricity, and gravitation), and these are connected with some kind of substance in a solid, a liquid, a gaseous, or an ethereal state. Electro-magnetic forces act upon matter in all states, and the same may be said of heat, light, and gravitation, which act not only *upon*, but penetrate *through* solid, liquid, gaseous, and ethereal substances, as we see in the phenomena of planetary attraction through ethereal space, and gravitation in a pneumatic void. When a chick is hatched in an egg, the organic forces co-operate with the natural or the artificial heat of incubation, upon the solid, the liquid, and the gaseous substances of the egg, to transform them into blood and nerves, skin, bone, and flesh, and all through life organic entities co-operate with immaterial physical forces to regenerate the organs and work the bodily machine.

But how can we penetrate into the mysterious relations of motion and mutation between organic and inorganic forces, in connection with all kinds of substance? Vital forces are invisible; physical forces are invisible; ethereal substance and gaseous substance are invisible; the common air and aqueous vapour in some cases are invisible; transparent solid glass is almost invisible, as insects and birds fly against it, without seeing it otherwise than as transparent permeable air.

No one doubts that invisible physical forces are connected with matter in all its forms of invisible gas and ether, as well as in its visible solid and liquid forms; and by practical experience we find, that the human spirit can be rendered insensible to pain, by etherising the blood. Opium, haschish, alcohol, ether, chloroform and other elements of vapour in the blood produce this kind of temporary separation between the inner ethereal and the outer material clothings of the soul; and some persons are much more rapidly alcoholized, than others, according to what may be called differences of nutritive diathesis. It is well known that very powerful alcoholization, etherization, or narcotization will produce an irrevocable separation between the inner spiritual body and the outer physical, by causing death.

Any nerve or set of nerves may be paralysed, either by internal structural alteration, or by external obstructed connection between the central or the peripheral ganglionic substance and the tissues of the organs with which the nerves are associated. Brown-Sequard has proved by experiments that :—

1st—The sense of temperature may be paralysed alone in the nerves.

2nd—The sense of touch may be alone paralysed.

3rd—The sense of titilation may be paralysed alone.

4th—The muscular sense of tension and motorial direction alone.

5th—The sense of pain may be paralysed alone, as in cases of etherization and catalepsy.

Questions of bicorporeïty may seem strange at first, but we shall meet with questions of tricorporeïty in sociology; for besides the material bodies of collective humanity, the social organism gradually forms a quasi nervous system of telegraphic wires for itself in all parts of the habitable globe; a circulatory system of railways, roads and canals; rivers and oceanic routes; a muscular system of locomotive engines and other motive powers, implements and mechanisms; a cutaneous system of tents and palaces; a clothing system of arms, armours, habiliments, &c.; new organs of telescopic and microscopic vision, acoustic and vocal organs of music and speech; an artificial organism of social life, in fact, more powerful by far, than the external physical bodies of the race.

However intimately and inseparably *vital* and *physical* forces may be associated in universal nature, their local modes of manifestation are evidently quite distinct in different realms, and various states of tension and motion in finite bodies. Vegetal, animal, and human degrees of vitality are quite distinct; not only in different realms, but in the human organism. Electricity, gravitation, heat and light are not only distinct modes of simultaneous and successive action in suns and planets, but in simple elemental substances; and the same indestructible elements are subject to alternating states of isolation and association in solid, liquid, gaseous, and ethereal forms, visible or invisible, transparent or opaque. We can have no difficulty therefore in conceiving the human spirit clothed with an ethereal form (a fluidic or "spiritual body") either isolated from, or associated with a mortal body.

VARIOUS RELATIONS BETWEEN SOULS AND BODIES.

Intimate relations between souls and bodies, incarnate and decarnate, are numerous and various in the phenomena of life observed in the experiences of physiology, psychology, magnetism and spiritism, and although erroneous speculations and imperfect observations abound in these, there are sufficient data of a well attested and reliable character to warrant us in using them as facts which cannot be denied.

The human body is a *physiological generator* of physical and mechanical forces, and these are known by their modes of action, which are barological, thermological, electrological, and in a certain manner, photological.

The human soul is a *psychological generator* of vital forces, or modes of motion which are organic, instinctual, mental, and spiritual.

There is an intimate union and communion between these two kinds of force, with numerous degrees of variability in their united and disunited modes of action, in simultaneous and alternating states of activity and rest; physiological phenomena concurrent with psychological variations, show us that mutual actions and reactions of nerves and blood vessels are observable in normal and abnormal psychological and physiological phenomena.

"Blood is the river of life," it has been said, and from the blood physical forces are generated by dialytic processes of absorption, nutrition and secretion. Chemical exchanges, and the *cohesion* of atoms in the tissues are magneto-barological modes of action; the generation of warmth is a thermological mode of action; the conduction of nervous stimulus is an organic electro-magnetic mode of action; and the conduction of light through the transparent lens of the eye is a photological mode of action, not to mention other stimuli producing light by irritating the optic nerves.

Arterial blood circulating in the capillary vessels, is the only blood which subserves the functions of nutrition and secretion to generate physical forces by dialytic modes of action; the blood contained in large arteries and veins, is merely like water in large pipes, to be drawn off as it is wanted, in private houses, or allowed to pass through the larger pipes, without being drawn off at any particular house or neighbourhood. It may be shut off altogether from private houses by their taps, or drawn into cisterns at any moment; and a like process is rendered easy by anastomosis (crossing junctions) of the blood vessels in the body.

From this we see that any special organ, brain or nervous centre, stomach or liver, ovary, uterus, or mammal gland, may be shut off partially or completely from the general circulation, by contraction of the capillary vessels of supply, and may also be instantly supplied abundantly by their dilatation; common observation shows that such local alternations of supply and demand do occur, both normally in periodic fluctuations, and abnormally, in perturbed s tates of functional periodicity.

These fluctuations correspond to the generation of physical forces, and therefore to natural relations between these forces in the body, and psychological faculties in the soul. And thus we bring the question of various relations between souls and bodies into a field of known relations between psychological and physiological phenomena, which field is limited to that of variable states of the blood and of capillary contraction and dilatation, in the nervous centres chiefly, but also in all the organs. Whatever closes capillary vessels or paralyses their distended walls, shuts off nutrition and secretion (or, it may be of secretion only, where sufficient action is allowed for nutrition, as in the case of procreative glands during the period of impuberty,) and to this extent, affects the relations between physical and vital forces, (as we see clearly defined in the relations between soul and body during the phases of impuberty and those of prolific manhood.)

Physical forces are generated in all the dialytic exchanges, but conscious mental activity seems to be mainly connected with the forces accumulated in the relational mechanism of motion and locomotion, sensation and reaction; since the automatic functions of the body are also unconscious modes of action and sensation, in the normal state, although they may become painfully conscious in some states of disease. If capillary contraction in the nervous centres cuts off communication between the conscious forces of the mind and the physical forces of the body (and between these only), we may conceive that vital connection may subsist, where active circulation and exchange continue in the automatic nervous centres of the spinal chord, and in nearly all the organs except the encephalic mass. This connection may be of different degrees between natural unconscious sleep and the complete unconscious torpor of hybernation.

The heart beats constantly and respiration is continuous, while peristaltic motions in the stomach and the bowels are intermittent in alternations of activity and rest. The external frame is more or less active in the wakeful state, and inactive during sleep: (although respiratory movements affect the whole frame day and night). Physiological modes of nutrition and exchange may be more intermittent also in one part of the organism than another. A sort of chemical circulation occurs habitually in the ball of the eye and in some cartilages unprovided with capillary vessels, but we have no facts to show that chemical circulation in organs furnished with capillary vessels is very active during their contraction, or inert congestion. Still there are degrees of difference in all these relations. Capillary circulation in a salivary gland is much more active during the time of secretion, than between the periods of secretional excitement: and nutrition is continuous in the generative glands of children before capillary circulation increases to supply the means of prolific secretion. Between the active degrees of secretion and those of nutrition, then, in glandular organs, there is a great difference in the relative supplies of blood, although both functions may be equally intermittent in alternations of activity and rest. How far imperfect degrees of capillary contraction may lower the generation of physical forces in the brain, and cut off direct communication between the body and the conscious faculties of the mind during natural sleep, we cannot say; but that vascular exchanges in the brain are either completely or very greatly arrested during unconscious states of mind, are well ascertained facts, already noticed, which show a positive relation between the dialytic action in the cerebrum and the conscious activity of the mind.

Physical force is being generated in all the organs during the metamorphic evolution of the fœtus, but no conscious manifestation of the mind accompanies the generation of these forces during uterine gestation. Some degrees of consciousness are nevertheless manifest in caterpillars during successive phases of their metamorphic career.

If the human mind exist at all during this phase of evolution, it exists in a pre-conscious state. This is a puzzling question of psychology, in connection with the problems of ecstasy, trance, somnambulism, dreams, mesmeric magnetism, spiritualism, bicorporeity, mundane and amphimundane existence, incarnation, decarnation, immortality, &c. We have no doubt of such a pre-conscious state of incarnative vitality.

As capillary action is intermittent locally, and generally, so physical energy may be deficient or excessive locally or generally. All diseases are local or general disturbances of physical energy, and all remedial agencies are disturbances of physiological functions with a view to neutralize or counteract disease.

We have barological, thermological, electrological and photological states of tension and motion in organic bodies as well as in mineral substances; and sea-sickness, burns, scalds, freezings, chills, colds, catarrhs, fevers, neuralgias, hysteria, convulsions, epilepsies, catalepsies, deafness, blindness, &c., are the results of organic and functional disturbances in the generation, accumulation, and liberation of these physical forces, and their various states and modes of action. All kinds of aches, pains, debility, and insanity are the results of morbid states of tension and motion in these physical energies, and their relations with the vital forces of the soul; for when the latter are temporarily isolated by etherization or mesmeric influence, physical disturbances in the body are not felt by the mind.

Such a temporary separation of the sensitive soul from communion with the physical forces of the body by artificial agencies is a fact beyond dispute, which leads to the idea of an ethereal form independent of the material frame, and the mutual relations of the two, through the instrumentality of nerves and vessels; capillary circulation and dialytic exchange give us a clue to the possible suspension and resumption of these mutual relations for a time, without absolute separation as at death.

Haschish, ether, chloroform, and other anæsthetic agents may induce this temporary state of separation artificially, and mesmeric influence may induce it also, on very sensitive subjects, who are easily affected by mesmeric passes; so that it is easy to conceive that certain morbid states of innervation and circulation may induce it naturally in cases of hysteria, lethargy, trance, and ecstasy. Similar phenomena, also, occur in spiritual mediumship, as recorded in the pages of the *Medium* (weekly journal) for April 28th, 1871.

"The spirit, through the medium, represented himself to be an Indian come to give us (at a spiritual séance) some information upon the subject of 'The power of spirit over matter,' and to illustrate his theory, he suspended all animation in our friend, first taking away his sight, then his hearing, then his taste, then smell, and lastly feeling: and to convince us that circulation was completely suspended, he asked for sharp-pointed instruments with which to prick him. Some needles being given him, he forced them into his cheeks as we should into a pin-cushion. Our friend did not show any sign of pain, nor did the appertures bleed. We were then invited to pull them out, and when they were taken hold of they fairly lifted up the flesh."

THERMOLOGICAL RELATIONS.—Certain limits of external and internal *temperature* are necessary for communion between physical forces and organic forces in their mutual relations: and these limits differ for different species of animals and for various temperaments of mankind. Cold-blooded animals are restricted within narrower limits of temperature than warm-blooded animals, and amongst the latter, hybernating animals are restricted within narrower limits of temperature than non-hibernating species.

Batrachian limits of vital temperature are fixed a few degrees below the congelation of water, and at 40 degrees of heat on the centigrade scale, hibernating insensibility being induced within a few degrees of these extreme limits, and active vitality being possible only within the limits of 1° and 36°.

According to the experiments of Claude Bernard, frogs become insensible in cold water near the freezing point, and also in warm water near 37° (centigrade) and remain insensible between 37° and 40°, at which point they die; and they also die when exposed to extreme cold, several degrees below the freezing point.

Cold-blooded animals are affected by the temperature of the surrounding medium almost as much as plants, while warm-blooded animals are enabled to maintain an average internal heat in the midst of external variations. The mean temperature of the human body in health is about 37° (centigrade), and this is maintained by the inhabitants of the arctic regions, where mercury is frozen (zero, Fahrenheit), and in the torrid zone where the sun's rays heat the atmosphere like an oven. The blood may rise to 38° or 39°, in intermittent and typhoid fevers, and as high as 40° and 41° in some eruptive and inflammatory fevers, but these degrees become insufferable, and if not relieved by cooling drinks and refrigerative applications soon become fatal to man as well as to the lower animals.

In health the mean temperature of the human body is maintained by natural and artificial means, in the midst of variations of external heat and cold. Evaporation from the perspirations of the skin cool the body in hot climates, seasons, or conditions, while artificial protection is obtained by heating rooms, and clothing the body with warm garments. The seeds of plants germinate, and the eggs of birds are hatched only within definite limits of temperature. Congelation destroys the germinative powers of eggs and seeds, and roasting degrees of heat are equally destructive; although nearly boiling water is compatible with life in some fishes and lower organisms.

Not only organic vitality but inorganic stability is also regulated within definite limits of temperature; water freezes at zero centigrade, and is transformed rapidly into vapour at the boiling point; (and slowly at much lower degrees of temperature:) mercury becomes solid at zero Fahrenheit; assumes a liquid form between certain limits of temperature, and above these limits is converted into vapour. All metals are solid within certain degrees of temperature, above which they become liquid, and here again they have their limits, above which they assume a gaseous form.

Vital forces then co-operate with physical forces within definite limits only, beyond which a partial separation or suspension of mutual relationship supervenes, and a little further extension of these limits causes a fatal separation of the sensitive soul from the mortal body.

MAGNETIC RELATIONS.—When physical sensibility is suspended by natural or by artificial processes, a magnetic or ethéreal kind of sensibility, with or without the co-operation of the physical organs of sensation, supervenes in states of dreaming, sleep, somnambulism, catalepsy, ecstasy, and trance, and along with this subjective supernatural faculty of sense, a special kind of memory, with regard to different kinds of experience, past and present, in this abnormal state of being is revived, and sometimes altogether lost again, as soon as the conscious soul resumes its usual relations with the physical forces of the body.

In dreams we may have *subjective* sensations or illusive feelings of sight, hearing, speech, taste, smell, and touch, which seem to be as real in the body as when we are awake; we also feel as if we were walking or running from one place to another, or even rising from the ground and floating bodily in the air: and sometimes we feel as if we were falling from a height, and the sensation becomes subjectively strong enough to excite alarm and fright, which breaks the spell of sleep and wakes the body up completely, when the soul is pleased to find the fear was an illusion of the mind, under the influence of a subjective sensation. Children and adults sometimes dream they micturate in their sleep when they really do not, but still, they sometimes do really make water in bed while they are asleep and dreaming. These two different results from the same subjective sensation are perhaps not unlike the efforts of speech while we are awake, where, in one case, we utter the words vocally and audibly, and in the other, speak them in the mouth, as it were silently, without giving them utterance. The soul is equally active in both cases, while the bodily organs are motorially active in one case and only tensively active in the other.

These different modes and degrees of tensive and motorial activity in the waking state, are counterparts of the same modes and degrees of physical activity during dreams in sleep, and are in both cases only delusive or incomplete in the tensive modes, being real and complete in the motorial; but when we feel subjectively and tensively as if floating in the air, or falling from a height, or tasting wine, smelling odours, hearing sounds, speaking sentences, or seeing sights, the subjective feelings must be utterly delusive, unless the ethereal be isolated from the material body, acting and feeling separately, while the physical organism lies insensible and motionless asleep, or in a trance; this does not seem likely where such subjective sensations are superinduced by mesmeric influence, or so-called "biologization." Can tensive sensations and subjective feelings of motion be as real during sleep as tensive efforts without motorial action in the waking state? And can these subjective feelings of tension and motion without objective ultimation in the body, be as delusive where the ethereal body seems to float and fall, walk and run, while the material body is asleep and motionless, as when the soul is biologized by mesmeric influence in the waking state? Partial physical isolation of the subjectively sensitive and dreaming ethereal body from the objectively sensitive material body during sleep seems probable, but complete physical separation and wandering away of one from the other in space, (as vapour rises from water to form a distinct cloud in the air above, to descend again as rain into the ocean from which it ascended) seems hardly conceivable on any other grounds than those in which a plant lives without a psychological associate, and may suspend its physiological activity during winter sleep without losing the recuperative potentiality of life; and even these modes of conceiving the possibility of temporary isolation of the ethereal from the material body, do not prove that any such isolation is necessary to account for delusive subjective sensations and feelings, during either the sleeping or the waking states.

Whether the spiritual form can leave the physical, or not, during abnormal states of sleep and trance, it certainly leaves it at the time of death, and manifests its ethereal powers of subjective and objective sensation and speech, bodily motion and physical power to persons in the flesh.

"Photologic Relations.—A well-known family in Boston (Massachusetts) whose names would at once commend belief of anything they might say, often speak to friends of the clairvoyant condition of their daughter during the last week of her life, when they were with her in Italy. She was much wasted by illness, and her nervous system being in a highly sensitive state, she often saw things which others did not see, and heard music which others did not hear. One evening she was thus present at her grandfather's house in Boston. She described the individuals of a party assembled there, even to the details of their dress and proceedings, not unfrequently expressing surprise that they appeared to take no notice of her. Subsequent inquiries proved that her description was true in the minutest particulars." (*Spiritual Magazine*, November, 1869.)

This young lady was in the natural body and three thousand miles away from America, when she spoke to her parents of being present in the spirit with her relations and friends at Boston; whence we must suppose that the ethereal body did not quit the natural body at the time, but that three thousand miles seem comparatively no more distant from the magneto-spiritual sense of vision, than three feet or thirty feet seem to the natural organs of sight. As vibrations of light travel about ninety-two thousand miles per second, while vibration of sound travel little more than one thousand feet (1130), we may conceive ethereal organs of sense to be incomparably more rapid in sensation, and extensive in relation, than material organs of sensation. Not that the eye itself perceives more rapidly when once affected than the ear, but the natural sense of sight is more fully impressed by light from the stars, than the ear by sounds at our antipodes, and the spiritual sense of sight may be readily conceived to be as much superior with regard to impressions from a distance, and through transparent media, as the natural sense of sight is to that of hearing.

The possibility of isolating the spiritual body from the natural more or less completely for a time, without causing death, is proved by many facts, such as paralysis, dreams, trance, and hibernation. In case of night-mare the whole external frame is paralysed for a moment, until fear of danger wakes the sleeper, and re-establishes connection between the ethereal and material organisms; for we remain conscious of having made strenuous efforts to scream for help, or run away from apprehended danger, without being able to speak or move the paralysed external frame, until woke up by violent internal emotion. This proves at least temporary isolation of will-power from physical organs.

BIOLOGICAL CHARACTERISTICS OF ORGANIC SYSTEMS.

Vascular *conformations* and *temperaments* differ greatly in fishes, reptiles, birds and mammals, and minor differences analogous to these are found in human-kind; alimentary *conformations* and *constitutions* differ also widely amongst animals and more or less markedly in man; various modes of *marriage* and domestic life are recognized in different races and religions of the world. A brief review of these characteristics will show the difference between descriptive physiology, and systematic biology.

PROCREATIVE CHARACTERISTICS.

CONGENITAL CONFORMATION OF THE GENERATIVE SYSTEM.—In the higher animals and man, each individual is either male or female, but in some of the lower animals, and in many plants, the two sexes are combined in the same individual. Species are reproduced, in some cases, by what are called asexual individuals, such as the buds and bulbs of plants, or the sprouting processes of polyps. Individual organisms may thus be male or female, bisexual, or asexual progenitors of their species.

The *functions* of the generative system are those of the ovaries and testes, in which the germ cells and sperm cells are first *secreted;* the *fecundation* of the ovum by the marriage of the sexes; the ovulation or *extrusion* of the egg and its final *incubation;* or the *gestation* of the embryo in the womb; the *suckling* or feeding of the young.

The most important share of these functions falls to the female in all cases, and especially in the higher animals and man. Hence in mankind males are endowed with greater strength for productive labour, while females bear the burdens of reproduction.

Evolutive phases of development are very marked in both sexes. In the beginning of embryonic formation there is hardly any perceptible difference between the rudiments of the generative system in males and females, but after a few weeks the difference becomes more evident, and continues to differ more and more until the body is quite formed.

During childhood the generative system hibernates, as it were, in a state of torpid vitality, becoming active at the age of puberty, and continuing so, until the critical age of sterility, which occurs habitually much earlier in females, than in males. There are three main phases of vitality in the generative system, the *impuber*, the *puber*, and the *sterile*, and their relative periods of duration vary in different races, temperaments and climates. Puberty is early in the tropics, and the critical age also. In temperate latitudes puberty occurs in females between the ages of twelve and sixteen; in males between fourteen and eighteen. The critical age of sterility in femals occurs as early as forty in some cases, and as late as fifty or even fifty-five in others; while men are generally viril until sixty, or seventy.

The ovaries are but partially developed before puberty; they shrink and whither rapidly after the age of sterility.

The relational characteristics of prolification are those of *consanguinity*, (parental, filial, fraternal, and collateral). We need not dwell on conjugal unions, beyond observing that marriage between near relations is supposed to be a cause of physical degeneration in the species, while intermarriage with new blood is held to be one great means of improving the race, in both animals and human beings.

The *dispositions* of the sexes with regard to procreation and the care of offspring are various in different species of animals and in different races of mankind. Dogs are *promiscuous* in modes of intercourse between the sexes, and the female alone takes charge of her whelps until they can forage for themselves. Seals are *polygamous* in their modes of reproduction, one male being accompanied by a number of females, which accept him as their common lord, while he jealously beats off all puny rivals. The young ones accompany their dam in the troop of females under the protection and guidance of the sultan progenitor.

Foxes live in pairs, male and female, and are *monogamic*, constant in attachment, sharing equally in the care of the young, and in procuring the means of subsistence.

Many species of birds pair for the season; are faithfully attached to each other; build their nest in common; and while the female hatches her eggs the male brings her food, and, in some cases, sits upon the eggs to keep them at a proper incubative heat, while the female takes exercise for a brief period. When the young brood is hatched the parents are equally active in feeding and protecting them from injury, until they are able to fly abroad and provide for themselves. Whether the same parents pair again, season after season, or form new marriages on each occasion, in some cases, or habitually, is not well ascertained; but certain swallows which have built their nests under the eaves of private dwellings, during one season, have been recognised, in some cases, as the same birds, returning the next season to the old nest, and producing a second brood in the same domestic home.

Many species of birds pair for the breeding season, and then live in flocks during the winter, to pair again the following year, with the same partners or with new ones, as the case may be; and this occurs with birds that migrate during winter, like the swallows, or stay in the same place the year round, as some species do. Some migratory birds pass rapidly from one place to another, and stay nowhere long enough to pair for the season and provide for a brood of young. The cuckoo is a well-known bird of this character. It arrives in the breeding season; the male and female either pair, or meet promiscuously, but the instinct of migration is so strong in them, they cannot stay to build a nest, lay eggs, hatch their young, and bring them up until they can forage for themselves; and knowing this instinctively the female lays her eggs in the nests of other birds, dropping one here and another there, in different nests, mostly in those of small birds such as the "hedge sparrow;" and both the male and female cuckoos fly away to other climes leaving their progeny to the foster care of other birds. The comparatively large egg of the cuckoo is hatched along with their own small eggs by the unconscious dupes of cuckoo strategy, and when the nest becomes too small to hold the relatively large young cuckoo along with the minor brood, he turns round in the nest to find room and ease, and by this movement hustles the smaller occupants over the border, to fall on the earth below and perish, while the foster parents, unable to save their own offspring, find an ever growing appetite in the strange prodigy, and are fully occupied in providing for his wants until he can fly away and provide for himself.

The genetic disposition of the cuckoo, is neither *paternal*, nor *fraternal*, nor *collateral*, or clannish, for they are bred alone in strange homes, wander alone in strange lands, and only seem to meet promiscuously in the breeding season, to comply with natural instincts, and evade parental responsibility by strategy and desertion.

There are, then, congenital *conformations* in different individuals, for the reproduction of the species, and various genetic *dispositions* characteristic of different species, in their respective modes of cohabitation for the perpetuation of their kind. *Promiscuous intercourse*, *ovulative strategy*, and *parental desertion*, are modes of propagation peculiar to one genetic disposition exemplified in such habits as that of the common cuckoo, and possibly of other species. *Polygamy* and its concomitants are characteristic of numerous species; while *monogamy*, connubial fidelity, parental devotion, and domestic cohabitation are genetic modes of action and hereditary disposition, characteristic of numerous species of animals and birds of the highest and most noble types.

All possible varieties of genetic disposition are found in nature, but the lowest types of organism seem to be more or less promiscuous in genetic habits and instincts, while the highest types are monogamic, faithful, and devoted partners and parents. In hive-bees the procreative instincts and dispositions are peculiar, as well as the evolution of the generative system. Queen-bees are the only females which attain to puberty, and as swarms of male bees accompany the queen bee in her nuptial flight, the habits of apian intercourse and domesticity are polyandrous, one female being surrounded by numerous males, in contrast with the polygamous habits of animals where one male is accompanied by numerous females.

Relational modes of cohabitation, domesticity, prolification, and colonization, depend upon genetic dispositions and habits of procreation. Some animals pair for a lifetime and cohabit in the same *home* together, wherever they may be; others pair for a season only, and cohabit in succession with new partners; others, again, never cohabit as connubial associates, but meet promiscuously, and the female alone takes charge of the young. Some species live in communities of herds or flocks in the breeding season, and all the year round either in the same neighbourhood, or in migratory conditions.

Some species swarm and form new colonies at once, in social and domestic communities like the hive-bees; others form flocks of old and young together in the winter season, to seek their food in company, and pair again in the breeding season, like sparrows and many other kinds of birds. Numerous modes of cohabitation, prolification, and colonization are observed in different species of the higher and the lower animals, and similar though less marked varieties of genetic disposition and relational modes of clanship, prolification, emigration, and colonisation, may be observed in different races and families of mankind, in different climes, and in successive ages of the world.

It seems strange that nature should endow animals with such different instincts for the propagation of their species, and the only lessons we can learn from the facts are such as present themselves in the results. The *promiscuous* habits of the canine species show the results of crossing the breed, in deteriorating or improving the races, as the case may be. The *polygamous* habits of many species of animals and birds induce the strongest full-grown males to monopolise the function of fecundation, and thus prevent the younger, older, and feebler males from deteriorating the species by their undue intervention. This may have been one cause of polygamous institutions in the early history of mankind, when none but the powerful and wealthy families could be sure of being always well fed and supplied with the luxuries of home and domestic comfort, while the multitude around them were slaves, ill-fed, ill-clothed, ignorant and dirty in their habits, subject to skin disease and other infirmities resulting from exposure, poverty, and beastliness; not to mention the ravages of periodical famines in such a state of industrial ignorance and apathy.

The necessity of migrating rapidly from place to place seems to be the cause and the excuse of cuckoo strategy in laying their eggs in the nests of other birds, and abandoning their young to the care of foster parents of a weaker species, whose own progeny are sacrificed to these instincts. The same excuse cannot be made for rich families of our own species who leave their children to be suckled and nursed by poor women, who must either starve their own infants to suckle the foster child sufficiently, or injure the health of both infants by half supplies of milk to each, and half supplies of other kinds of food more or less ill suited to the health of sucking babies. There are cases of necessity, however, in human families, where the mother dies in child-bed, or has no milk, or is too feeble to suckle her own child, and some sacrifice compensated by artificial means may be needful in such cases. Promiscuous, polygamous, and foistering habits of propagation may be animal necessities of instincts and conditions, but they cannot be legitimately human, in a civilized community, unless we admit the loose habits of celibacy in both sexes of high and low degree to be excused by necessities of military and naval services (on the one hand, and inability or disinclination to marry and support a family on the other) as inevitable conditions of civilization. Are they indispensable conditions for the present and future welfare of society?

The *evolutive phases* of growth give rise to different modes of association. Boys and girls associate as friends with little heed to difference of sex; young men and women have a constant eye to marriage and cohabitation; old men and women think more of their own families than of strangers. New friendships and alliances are easily formed in early life; not easily in declining age.

Functional modes of action are various, with regard to procreation. In all cases an egg is composed of substances secreted by special glands, the *germinal vesicle* by one kind of tissue, the *yolk* by another, the "*white*" by another, the *membrane*, which contains the whole egg, by another, and the chalk of the *hard shell* covering the soft egg, by another. Thus germinal vesicle, yolk, white, soft-shell membrane, and hard chalk shell form a series of five successive deposits in the egg, irrespective of fecundation.

In the higher animals and man, the germinal vesicle and the yolk are secreted by distinct tissues in the ovaries, while further additions are made by secretions in the oviducts and in the uterus. In the common fowl, the germ and the yolk are secreted in the ovary. The white of the egg is secreted in the first part of the oviduct, the surrounding membrane in the medium portion, and the substance of the hard shell is secreted and deposited on the soft shell in the last portion of the oviduct, where the egg lies ready for expulsion at the proper time.

In the egg of a bird all the matter is stored up at once for the nutrition of the embryo during incubation; in the higher animals and man the case is otherwise. The ovum in both cases is impregnated by the semen of the male before it leaves the ovary, or soon after, and further secretions are added in the oviducts, either to form a large egg, as in the case of birds, to be hatched outside the body, or a small ovum to be deposited in the uterus of the mammalian animal, there to receive new supplies of fluids as it undergoes the process of gestation and embryogenesis, in parallel with the incubation and metamorphic evolution of birds. The functions of secretion are similar in all cases, but those of fecundation, ovulation, incubation, or gestation, lactation or feeding and care of the young are extremely various in fishes, reptiles, birds, and mammals; and in different species of each class. There are geneagenetic, parthenogenetic, and sexogenetic modes of reproduction; the latter being characteristic of the highest types of organism, and the former of the lower animal and vegetal types. Geneagenesis is asexual, as in the case of potatoes reproduced from the bulbous roots, and polyps reproduced by buds or sprouts. Parthenogenetic reproduction is virginal, as in the case of ant-cows (aphides), where some eight or nine generations succeed each other by spontaneous parturitions without sexual connection—in which case it is supposed that one fecundation is sufficient to impregnate a succession of individuals; or that impregnated ova in such cases, may, for a time, have sufficient virtue to be fit for incubation and embryogenesis without the aid of male semen; but only for a time, for at the end of a certain number of generations the individuals assume the perfect male and female types again, and reproduce the species by sexual intercourse.

Birds feed their young by dropping tender food into their bills, while mammalian animals secrete milk in the mammæ and suckle their young until they can eat stronger food.

The marsupial order of mammalia are peculiar in their degrees of gestation in the womb, where the embryo is developed up to a certain point, as in other types, and then expelled from the womb where no placenta can be formed, to continue the gestation to its final term of completeness. In this rudimental state the fœtus is placed in a ventral pouch, which forms a sort of artificial uterus around the nipples, to which the mouths of the young are attached to suck the milk of the mother, as their only means of nourishment. It may be called a mammal gestation, in contrast with the uterine gestation of other species, during the middle period of embryonic evolution. In all mammal species there are three distinct periods of metamorphic evolution—namely, the embryonic or *preplacental*, the fœtal or *placental*, and the *mammalian* or lacteal. The first and second occur in the womb of ordinary mammals, while the third alone is completed at the breast. In marsupial mammals, the first alone takes place in the womb, while the second and third are completed in an external pouch surrounding the nipples.

In the first period of marsupial lactation, while the fœtus is constantly attached to the nipple, the secretion may perhaps differ somewhat from the milk of the second period, when the young one is detached from the nipple, as the secretion of the womb differs from that of the breast in higher species, or as the substance of an egg differs from the animal food of a young bird after it is hatched.

ALIMENTARY CHARACTERISTICS.

Animals live on various kinds of food, and have *alimentary constitutions* in accordance with the *conformations* of the digestive system. Ruminant animals have several stomachs, while non-ruminant species have only one; and this again is variously endued with glandular secretions, in carnivorous, insectivorous, granivorous, herbivorous, and omnivorous animals, with simple stomachs. The races of mankind feed variously in different quarters of the globe, and those inhabiting the same locality have various tastes and constitutions with regard to their respective powers of relishing and digesting food.

Vultures can relish and digest carrion, while hawks and eagles prefer fresh meat; dogs and hyenas have peculiar tastes and digestive powers as scavengers, in contrast with the slaughtering feline tribes. We have, therefore, to notice the congenital conformations and constitutions of animals and man; the alimentary functions of each; the evolutive phases of variation; with their relational haunts and diverse modes of procuring food, according to their tastes and alimentary constitutions.

Omnivorous man consumes all kinds of food, but polar races eat more of animal, than of vegetable substance; tropical races eat more pulse and grain, fruit and vegetables, than flesh; equable proportions of animal and vegetable foods are generally preferred by the inhabitants of temperate latitudes. Animals differ in their alimentary characteristics with regard to the *nature* of the food they relish (animal or vegetable), the *quality* of the food (carrion or fresh killed flesh), and the *quantity* consumed in a given time by temperate omnivorous animals (bears) compared with gluttonous omnivorous animals (pigs); human beings offer us a reflex of all these diversities in minor degrees of contrast.

These varieties of nutritive and digestive powers correspond to differences of functional energy in the whole body, and in the special organs of digestion. The qualities of bile and pancreatic juice differ considerably along with the energy of the liver and the pancreas in different animals and in different individuals of the human species. Where the bile and the pancreatic juice are weak in certain elements, fat cannot be emulsed sufficiently to be easily absorbed, and the person cannot relish fat; where these secretions are adequate in quality and quantity, fat can be relished in large proportions; and so of all other kinds of food; various qualities of saliva, gastric juice, bile, pancreatic and intestinal juices enable us to relish and digest with ease or difficulty certain kinds of food, and experience can alone direct us in the choice best suited to particular constitutions, since chemical science cannot sufficiently detect the differences which exist between one kind of saliva and another, one kind of gastric juice, or bile, or pancreatic juice, and another. Varieties of digestive power are caused by differences of relative quantity, as well as of peculiar qualities in each of these secretions.

The body is a heat-making locomotive, organized and sustained chiefly for the purpose of doing mechanical and physiological work; the food consumed is destined for combustion and the generation of heat, as fast as work is done and fuel is consumed. The difference between a living and an automatic locomotive consists mainly in the fact, that the machine is worn by frictional motion without being repaired by the fuel, whereas the organs of the body are repaired by latent-heat producing processes of nutrition, by which the waste elements of tissue are exchanged for new atoms drawn from the blood, which is at once the fuel and the steam power of the living locomotive; *food* is first digested in the alimentary canal, and then drawn into the blood to renovate the system.

Hunger and thirst indicate the wants of new supplies, and these feelings of discomfort arise from the chemical relations of nutrition.

The *chemical* action of atomic affinities in the tissues when normal, gives a *sense of ease* and comfort, and when disturbed, a sense of want or discomfort. The *molecular* action of cohesion in the tissues gives a *sense of ease* in the normal motions of the body, and a sense of discomfort whenever the motions are too violent or strained; the *gravitative* motions of the body in walking or dancing give a *sense of ease*, when they are natural and rhythmic, and a sense of discomfort, nausea or sickness, when they are unusual or extremely sudden, as in the heavings of a vessel in a rolling sea; or violent risings and fallings of a swing; or the sinking of a floor from under our feet; these uneasy sensations arise first, and chiefly, in the peripheral nerves of the *mucous membranes* of the stomach and intestines, whose duty is to prepare new supplies of nutrient elements for the blood.

I.—CONGENITAL CONFORMATION OF DIGESTIVE SYSTEM.

The alimentary canal and its auxiliary glands differ in conformation or in relative capacity not only in realmic types of organism (radiata, molluscs, articulata and vertebrata,) but in fishes, reptiles, birds, and mammals. In each class, orders and species differ widely from each other in alimentary characteristics. Those orders which come nearest to each other in anatomical details, such as the horse and the pig, differ widely in their physiological peculiarities, the horse being herbivorous mainly, and very temperate, while the pig is omnivorous and gluttonous.

Human beings have a reflex of these various peculiarities of relish, digestion, temperance, as well as in modes of selecting and ingesting food and drink; these varieties are very marked, not only in races inhabiting frigid, temperate, and tropical latitudes, but in families inhabiting the same locality. It would seem, however, that original differences of race had much to do with these varieties of alimentary constitution; for the highland race in Scotland being originally of Eastern extraction, migrating to the north-west, and the lowland race being of Scandinavian extraction, migrating from frigid northern to temperate north-western regions, still manifest difference of origin, while living for centuries near each other in the same country. Not only their physical constitutions, but their mental characteristics are often very different; the Highlanders being more artistic and impulsive, the Lowlanders more rational and thrifty.

The conformation of the digestive system is very different in an herbivorous ruminant, sheep or cow, and a carnivorous dog or leopard, not only in the physiological functions of secretion, but also in the anatomical forms and dimensions of the stomach and the alimentary canal. The stomach is single in carnivorous and omnivorous animals, and in some herbivora, such as the horse and the ass, while it is multiple in ruminants; their whole intestine is more than twice as capacious as that of the carnivorous mammalia. The length of the intestine is short in carnivora, medium in omnivora, and very long in herbivora. Different kinds of teeth accompany these conformations of the stomach and intestines--herbivorous tribes have cutting teeth more or less developed in one or both jaws, with powerful grinding teeth in both the upper and the lower jaw. Carnivorous mammals have cutting and tearing teeth in both jaws. Omnivorous animals have also three different forms of teeth in both jaws, namely, cutting, tearing, and grinding teeth.

Rodents have no canine teeth, and edentata have no incisor teeth. Most animals are more or less omnivorous, although they feed habitually on special kinds of food, and while man is decidedly omnivorous, special kinds of food are more or less consumed in different climates and conditions of existence. Particular constitutions relish certain kinds of food which others cannot tolerate. Eggs are pleasant food to some, and indigestible for others. Crabs and lobsters are easily digested by some stomachs, and not by others. Peculiar kinds of fish or fruit cause nettle rash to follow their ingestion by certain peculiar constitutions, and have no such consequence in others.

Alimentary appetencies are governed by congenital conformations; an herbivorous animal relishes the herbs of the field; a carnivorous animal relishes the flesh on which it feeds; and neither of these types have a natural appetency for the food of the other. If a dog is hungry, he will not relish herbs, however plentifully growing all around him; nor will a hungry cow on barren ground seek for flesh, however numerous small animals may swarm within her reach.

Insectivorous animals have also special tastes in accordance with congenital conformations of the stomach and intestines. Ant-eaters and swallows prey upon insects; each species has a natural appetency for the kinds of food best suited to its alimentary constitution, and this is another proof of the direct adaptations of means to ends in the plan of the creation.

Human beings cannot relish such qualities of food as are unsuited to their digestive capacities. Some persons cannot digest fat (except in very small quantity) or glandular substance of any kind, such as liver; nor crab and sundry other kinds of crustacea, but they can digest peas and some other kinds of pulse with ease, showing that the gastric juice is weak, and that the liver and the pancreas are relatively apathetic in some alimentary constitutions. And this again agrees with a lymphatic vascular temperament suitable to sedentary habits, and more active mental than physical vocation.

Koopman's experiments show that whilst the strongly acid gastric juice of the carnivora is best adapted for the solution of animal albumen, the feebly acid gastric juice of the herbivora is far more efficacious in dissolving vegetable albumen and gluten. Scrofulous patients require a cold dry climate with oily food; tuberculous disease is relieved by a warm dry climate with nutritious farinaceous diet. Cold damp climates require active daily exercise to favour health; hot steamy climates are oppressive in all cases.

The evolutive phases of alimentation are not equally different in all species—herbivorous and carnivorous mammalia feed on milk in the first phase of life, and many granivorous birds feed their unfledged young on insects until they can leave the nest and forage for themselves. The relish for different kinds of food varies (after infancy) with every succeeding phase of life in man. Few children like flesh as much as pulse and milk during the first seven years, until they have shed their first set of teeth; and even then but little meat is necessary until the age of puberty, except in frigid latitudes and altitudes, or in cases of scrofulous diathesis. The *functions* of the digestive system are those of ingestion, trituration, solution, fermentation, emulsion, and egestion. When food is placed in the mouth, three sets of teeth in man cut, tear, grind, and triturate it into mince meat, while three different sets of glands pour saliva into the mouth to make a soft pulpy bolus easy to be swallowed and sent down into the stomach, where it is again turned round and round by a sort of churning motion, as it was in the mouth, and further mixed with several kinds of gastric juice, pepsine, and mucus, which cause it to undergo a certain amount of change or chymication. The chyme thus formed is then passed through the pyloric orifice into the duodenum (or first part of the small intestine, called duodenum, to signify that it is commonly about twelve inches long). A little way from this orifice the hepatic duct enters the duodenum, and usually pours about a pint of bile upon the chyme, and nearly or quite at the same time and place, the pancreatic duct pours its juice upon the chyme as it leaves the stomach on its way to the small intestine. The bile and the pancreatic juice contain each several distinct kinds of fluid, chemically and physiologically different in quality, since they vary in power with regard to the emulsion of animal and vegetable kinds of food; these two compound fluids neutralize to some extent the acidity of the chyme, and change the aliment into a bland kind of emulsion, which is further modified by the secretions of three different kinds of follicular glandulæ located in the walls of the intestines (as the perspiratory and other small glandular follicles are located in the external skin). These intestinal follicles are called the glands of Brunner, Lieberkuhn, and Peyer, the names of the anatomists who discovered them.

The *chyle* absorbed from the intestines is partly composed of new elements derived from the food, and partly of the fluids which have been poured upon it to dissolve it. The whole, or nearly the whole, of the saliva, bile, and intestinal secretions, are drawn from the blood by secretion, mixed with the food in the alimentary canal, and reabsorbed with the chyle into the blood. Not more than one eighth part of the bile is said to be eliminated as excreta, the rest being reabsorbed with the saliva, the gastric, the pancreatic, and the intestinal juices. Some physiologists have estimated that thirty-one pounds of these digestive fluids are drawn from the blood and returned to it every day, while others maintain that not more than twelve or fifteen pounds of these fluids are secreted and reabsorbed daily. Opinions are thus uncertain amongst experimental physiologists, not only with regard to the relative quantities of digestive secretion, but also with regard to the special qualities and uses of each.

Not more than a few pounds of saliva, gastric juice, and bile are poured out from the blood by secretion for one meal, and this repeated several times a day, should not be added as a daily total extracted from the blood, at once. A man eats many hundred-weights of food yearly, not daily.

Digestive Movements.—To effect these various processes of digestion, mechanical motions, glandular secretions, and vascular absorptions are involved. The movements of ingestion and egestion are voluntary, being controlled by the will, while those of the stomach and intestines are involuntary, rhythmic, and vermicular or peristaltic motions, excited by the presence of food in the digestive tube, without conscious action of the will. The movements of the different organs of digestion are more or less intermittent, for though the complete digestion of a full meal requires several hours, and some persons eat three or four meals a day, the night brings rest, and between the intervals of digestive work the peristaltic motions cease. The muscles of the jaws and mouth are often set in motion by speech, so that although eating and drinking are intermittent operations the mouth is not constantly inactive between meals.

Digestive secretions are concurrent with movements in the mouth, the stomach and intestines, and are poured into the parts successively, as these are stimulated by the presence of food. Absorption by the portal veins alone in fishes, reptiles, and birds (which have no lacteal vessels), and by the lacteals as well as by the portal veins in mammalia, returns nearly all the fluids to the blood which had been drawn from it for the process of digestion, although some waste matters are eliminated by secretions in the bowels along with the refuse of digestion.

Alimentary modes of action differ in accordance with different *alimentary constitutions.* Horses feed on many herbs in common with cows, and sheep, and goats, but each of these selects some kinds of herb which are distasteful to the others. The ass can eat food disliked by horses, and each species of ruminant can relish some kinds of food disliked by others. The horse and the goat can digest hemlock which acts as a poison to other herbivorous species.

Eggs and seeds contain all that is necessary for the evolution of the embryo of each species of animal or plant, and milk suffices for the food of the newly-born mammal, but not for the more advanced phases of life; although some races live almost entirely on a few sorts of animal or vegetable food. Still, neither herbivora nor carnivora can thrive on one sort of food alone.

Rabbits fed on one kind of root or herb or grain, soon languish and die; dogs fed on one kind of food alone, die in a few weeks or months; human beings fed on potatoes almost alone, or on bread, with little or no change of diet, become sickly and degenerate, even where the quantity is plentiful and of good quality. As few kinds of food contain all the elements required for the nourishment of the tissues, variety of food is indispensable. Herbivora can live on herbs alone and make good blood and flesh, but the herbs must be of different kinds. Carnivora can live on flesh alone, but that must be of various kinds; not necessarily different kinds of prey, perhaps, but different kinds of juice and tissue in the animal food.

Insectivorous birds and mammals also differ in their respective preferences of food. Some relish the honey and eggs of insects, as well as their flesh; and many animals not strictly insectivorous, have a relish for eggs and honey. Varieties of climate are no doubt quite as necessary for every species of edentata and insectivora, as for carnivora, omnivora, and herbivora.

Carnivorous animals differ widely in their special relishes of food. The feline and the falcon species prefer fresh killed meat to putrid carrion, while hyenas, dogs, and vultures, eat carrion as well as fresh killed meat.

Each class of alimentary constitutions may be naturally subdivided in different kinds of relish, thus:—

Alimentary constitutions.	*Special appetencies.*	
1. Herbivorous.	Horses, Asses, Cows, Goats,	Monkeys, Squirrels, Elephants, Hippopotamuses.
2. Insectivorous.	Anteaters, hedgehogs, Swallows, bats, Moles, marsupials.	
3. Carnivorous.	Feline butchers, Canine scavengers.	
4. Omnivorous.	Porcine omnivora, Ursine omnivora, Human omnivora.	

"The veterinary surgeon, Renault, has observed that the flesh of animals which have died of malignant pustule, the virus of glanders, and some other animal poisons, can be introduced into the stomach of dogs, pigs, and fowls, without propagating the disease; whereas, when such flesh is introduced into the stomach of the goat, the sheep, or the horse, the poisons are not readily absorbed by the mucous membranes. The American poison, *woorara*, and the venom of the serpent, which are fatal in a wound where they come in contact with the blood, are harmless when swallowed in small quantities, because they are not absorbed by the mucous membrane of the stomach and intestines, and carried into the blood, unless they are introduced in very large doses."

Similar differences of susceptibility may be recognised in epidemics: one person is more susceptible than another to the virus of small-pox, or scarlatina, measles, or whooping cough, or cholera morbus, even where age, sex, or general health and surrounding conditions are much the same.

The alimentary constitutions of both animals and plants are adapted by nature to the climates in which they are indigenous. The herbivorous reindeer and the carnivorous Polar bear find food and climate suited to their constitutions in latitudes where many other species of herbivora and carnivora would perish from starvation in the midst of plenty; and these Polar animals would probably soon *die of want* in the midst of abundance in low tropical regions where the lion and antelope find all they want.

The human race lives mainly on the flesh and fat of seals, wild fowl, and fish in Greenland and Kamskatcha, with little or no vegetable diet; while cereals and fruits, with more or less of animal food, form the diet of most families in temperate latitudes. Tropical fruits and rice, with little animal food, sustain the human race in tropical regions; and each kind of vegetable food produced only within certain limits of latitude, is best suited to the health of those who live in the same area. Milk and oatmeal, with animal diet, enable the body to withstand the severity of a cold damp climate, better than any other kind of food, and are much less relished in more genial climes, where they are not indigenous. Rice and tropical fruits, with spare animal diet, are suited to regions where excessive external heat oppress the system, and the best generators of internal heat become very inconvenient. Plantains, dates, cocoa nuts, bread-fruit, yams, sweet potatoes, rice, sago, and arrowroot are tropical productions, suited to the tropical races of mankind; Indian maize, wheat, rye, and potatoes grow in genial latitudes, and suit the inhabitants;

barley, oats, and buckwheat are more indigenous to variable climates, and suitable as food in larger proportions than in other latitudes. For minute details on all these questions consult special works on physiology and diet.

The quality of food varies greatly in different climates; still there are carnivorous Polar bears and seals, with herbivorous reindeer, in Polar regions; carnivorous dogs and eagles, with herbivorous cattle, in temperate regions; carnivorous lions and tigers, side by side with herbivorous antelopes and zebras, in tropical latitudes; and innumerable insectivorous animals along with frugivorous monkeys in the torrid zone.

In each of these regions difference of *quantity*, in proportion to the weight of the body, is not less characteristic of individuals and races, than that of *quality*, both in man and in the lower animals.

Louis Cornaro, the Italian, who wrote an account of his own life and regimen, being out of health, from over indulgence, at the age of forty, resolved to live abstemiously in future, and limited his daily allowance to twelve ounces of solid food and fourteen ounces of light wine, on which he lived for fifty-eight years, having attained the age of ninety-eight when he died. He no doubt led a very quiet life in a genial climate which did not call for any great expense of heat and energy; he does not mention what amount of water he may have taken at times to slake his thirst, but still he lived in health on this comparatively small amount of nutritious food during the latter half of a very prolonged life.

Great activity in all climates requires more food to replenish waste and generate sufficient heat, than sedentary habits and inactive life; more food is necessary to generate internal heat in cold climates than in tropical regions. Warm clothing is a partial protection against cold, but not enough without an extra quantity of food. Liebig says :—

"Our clothing is merely an equivalent for a certain amount of food; the more warmly we are clad the less urgent becomes the appetite for food, because the loss of heat to be supplied by food is diminished. If we were to go naked, like certain savage tribes, or if in hunting and fishing we were exposed to the same degrees of cold as the Samoyedes, we should be able with ease to consume half a calf daily, aud perhaps a dozen tallow candles into the bargain, as warmly clad travellers have related with astonishment of these people. We should then be able to take the same quantity of brandy or train-oil without bad effects, because the carbon and hydrogen of these substances would only suffice to keep up the equilibrium between the external temperature and that of our bodies."

It is not apparently the direct work of nutrition or assimilation which generates heat, but the retrograde metamorphosis or combustion of elements in the work and waste of the tissues, for plants emit no sensible amount of heat except in the flowering season, and the chick in the egg, like the fœtus *in utero*, requires the aid of external warmth to carry on the work of embryonic evolution. The oxygen of the air seems to be required entirely for this work of combustion to generate heat by the waste of the tissues in mechanical motion and chemical mutation; since plants which accumulate latent organic forces by nutrition liberate oxygen from the elements which they absorb. The food required for physiological sustentation is one thing, and that required for the generation of heat and for mechanical work is another; and while *physiological need* of food may be nearly equal in bodies of equal weight, the physical and mechanical *needs* may be four or five times greater in a very active than in a sluggish constitution; in a very cold than in a very hot climate.

The relational modes of procuring food, and the habitual *haunts* of animals run parallel with the natural relish and constitution of the species. Herbivorous animals seek for pasture in planturous or in mountainous localities. Carnivorous animals haunt the places most frequented by the species which they prey upon. Insects live in almost every region of the globe, and animals which prey upon them naturally haunt the places that swarm with the kinds of insects they prefer as food. Works on natural history give interesting details on all these points, and may be read with much advantage.

Certain herbivorous animals, such as goats, red deer, and llamas, haunt cold mountainous regions to browse on the buds and tender shoots of shrubs and heather, while oxen and sheep frequent herbaceous downs and plains; buffaloes revel in hot, vaporous, and low marshy lands, where they can wallow in water up to the eyes to screen themselves from tormenting insects and the scorching rays of the sun. The camel and the dromedary live in sandy plains where herbs and water are very scarce, and their alimentary conformation, as well as their external limbs, are suited to life and motion in the dry and dusty deserts of Asia and Africa.

Carnivorous animals in every latitude haunt places where their food abounds. Prowling scavengers and wily butchers have each their special modes and habits of procuring food. These facts are also well described in natural history, and may be sought for there.

The industrial habits of human families differ also in general modes of procuring food by hunting, fishing, snaring, breeding cattle, cultivating fruits and cereals, as relational modes of supplying the wants of the body.

Evolutive modes of alimentation vary with the phases of development. The embryo imbibes liquid from the walls of the gravid uterus, through the suckers of the chorion, until a placental connection has been formed, and umbilical circulation established, by which means nutriment is absorbed from the sinuses of the maternal placenta, until gestation and metamorphic evolution are complete, and parturition brings the infant into the open world. When the womb has yielded its fruit, and ceases to be called upon for nutriment, the mammal glands become excited and secrete milk to feed the infant during a period sometimes longer than that of gestation. Somewhere about forty weeks is the average for gestation, and fifty or sixty for lactation in the human species; in other mammals uterine gestation and mammal lactation are nearly equal cycles of long or short duration.

Oviparous animals have all the food necessary for the embryo, stored up beforehand in the egg; and where the young are unable to provide for themselves on leaving the shell of the egg in which they have been hatched, the parents provide food for them during the phase of helpless juvenility. Birds feed their young until they are fully fledged and can feed themselves; but many forms of insect life are left to themselves altogether, before and after metamorphic evolution. The eggs are posited by instinct in a suitable place for the larva to find food exactly adapted to its special constitution as soon as it is hatched or partially evolved, and it generally lives on quite a different kind of food as soon as it is fully formed. The caterpillars of different species of butterfly live on the leaves of special kinds of plants until they undergo their final change, and then sip honey from the flowers during the rest of their short lives. In every species there are special adaptations of food to embryonic phases of evolution, as well as to infantine, youthful, mature, and declining phases of existence.

VASCULAR CHARACTERISTICS.

The respiratory, circulatory, and urinatory apparatuses are variously organized in the four classes of vertebrata, and the rapidity or slowness of circulation and exchange are influenced by the general conformation of the vascular system in adaptation to the requirements of nutrition and physical activity in cold and hot seasons or latitudes. The respiratory and perspiratory functions of the skin cooperate with those of the vascular system under all conditions. Physiologists have recognized different temperaments in men and women, under the definitions of sanguine, nervous, bilious, and lymphatic, in which nervous and vascular modes of action are more or less involved with bilious secretion, lymphatic absorption, and placid or irritable temper.

The vascular system is intimately allied with all the others, but mostly with the nervous. The peculiarities of this alliance are somewhat characteristic of *vital diathesis* as distinguished from *vascular temperament* and *alimentary constitution.* Still the words hœmatoneural diathesis would not cover the whole ground, because glandular and adipous modes of action are included in one definition and not in the other. Besides which, plants have peculiar physiological diatheses as well as animals and man.

Conformation of the Vascular System.—Without entering into the details of comparative anatomy we may observe that fishes have hearts with only two cavities and a comparatively simple apparatus of arteries and veins. Reptiles have hearts with three cavities, and a more complex system of arteries and veins. Birds and mammals have four chambers in the heart, with a more complete system of arteries and veins. The activity of nutrition is proportional to that of circulation and respiration in all these types, and hence their temperaments, properly so called, are warm or cold in proportion to these degrees of activity. Mammals and birds have been called warm blooded animals, fishes and reptiles, with a few exceptions, cold blooded; these epithets denoting very active or very languid exchanges of blood in the tissues, with a corresponding generation of much or little heat in the body.

The conformation of the respiratory and circulatory apparatus is different and hereditary in each of these classes of vertebrata, and analogous degrees of minor difference in the human race give us a faint reflex of these characteristics, which are mostly congenital; that is to say, a man is born with a relatively large or small development of chest and lungs, active or slow habit of nutrition, with a corresponding ratio in the generation of physical force in the body as a locomotive machine.

There are no lacteal vessels in the lymphatic systems of fishes, reptiles, and birds, and hence they all differ from mammalians in this part of the vascular conformation; and though the lymphatic system appears to be relatively more developed in cold than in warm blooded vertebrata, it is merely because the arterial and venous systems are relatively much less developed; and therefore lymphatic preponderance denotes vascular sluggishness, and a "lymphatic temperament."

These are diversities of organic form and structure easily perceived, but minor degrees are not so readily discerned. Still there are great differences in this respect between one human being and another of the same age and sex, and whether they be hereditary or not in all cases, they are certainly congenital, in adaptation to inborn vocations.

Certain industrial occupations require much physical activity; artistic vocations are less laborious; scientific cogitations call upon the brain alone for sustained energy, and it is known that hard thinking involves slow breathing and slow circulation, which are natural to some persons. Severe and continuous physical energy requires copious supplies of food to sustain a rapid waste of physical force. Less physical labour implies less rapid waste and renovation; and these marked degrees of difference correspond to special habits and vocations. Rapid waste and renewal of physical force require a sanguineous temperament. Artistic sensibility and delicate manipulations are best suited to a "nervous temperament;" and what is generally indicated by the words "bilious temperament," (apart from irritability of temper,) is a strong active frame with more concentration and perseverance than "the sanguineous" and better suited to the management of business in manufacturing and commercial pursuits, as well as in political and administrative affairs. We may employ the words in common use, then, by limiting their meaning to the vascular characteristics of active or sluggish habits of nutrition, respiration, and circulation in connection with contrasted degrees of physical and mental activity. And whatever be the hereditary temperament of the individual the mental vocation is an inborn endowment, which regulates degrees of vascular activity to suit mental habits. Vascular temperaments, irrespective of mental vocations, may be thus broadly distinguished:—

1.—*Sanguineous temperament;* large chest with quick and strong respiration, circulation, digestion and nutrition.

2.—*Bilious temperament;* medium chest with strong respiration, circulation, digestion, and nutrition.

3.—*Nervous temperament;* moderate chest with moderate respiration, circulation, appetite, and nutrition.

4.—*Lymphatic temperament;* small chest with slow respiration, circulation, and nutrition.

Intermediate degrees of thoracic development and physiological activity exist in connection with shades of difference in the natural vocations of men and women; but we need not dwell at present on minor distinctions of vocation and vascular adaptation.

EVOLUTIVE CHARACTERISTICS OF VASCULAR SYSTEM. —Degrees of activity of nutrition differ in the successive phases of infancy, youth, adolescence, maturity, and declining age of the same person, whatever be the original conformation of his heart and lungs at birth. The pulse of infants ranges generally above a hundred beats per minute, diminishing gradually in youth, adolescence, maturity, and senility, to ninety, eighty, seventy, sixty or fifty pulsations per minute. These general averages admit of numerous exceptions, in various states of health and vigour, debility or disease. Growth is much more rapid in infancy than afterwards, and healthy circulation bears proportional relation to the activity of nutrition, in all phases of existence. A chick in the egg breathes air in a vascular membrane, which is cast off with the abandoned shell. The human fœtus does not breathe in the lungs, but finds in the placenta aërated blood furnished by the parent. The respiratory lungs and the urinatory kidneys are inert, therefore, while the circulatory apparatus is active (and even supplemented), during nine months of uterine existence. Placental annexes to the vascular system of the fœtus are temporary substitutes for lungs and kidneys, (and to some extent for the digestive system in mammalia, though not in the oviparous classes of vertebrata.) The fact of these organs being formed for temporary functions only, during the phase of metamorphic evolution, is another evidence of creative design and foresight.

FUNCTIONS OF THE VASCULAR SYSTEM.—Respiration, absorption, elaboration, circulation, exchange, congestion and secretion, are the main functions of the vascular system. The chyle absorbed from the alimentary canal is mainly composed of digestive secretions derived from the blood and mingled with new supplies of food to be elaborated in the lymphatic and sanguineous glands and poured into the general circulation, along with the waste matter of nutritional exchange. The waste of the tissues exchanged for new blood in the process of nutrition is composed mainly of carbonic acid gas, ammoniacal and other products, the first being thrown off by the lungs in respiration and replaced by oxygen, while other waste products are eliminated by the kidneys, in co-operation with the skin, the liver, and the lower bowels.

All the secretions are drawn from the blood, but all are not eliminations of waste matter; for instance, the eggs of birds, and the milk of mammals. Fat and serum are also equivalents of healthy blood; the secretions of digestive glands serve a useful purpose in the general economy, and are mostly reabsorbed into the blood, before the refuse is got rid of as waste matter. These facts are minutely explained in hand-books of physiology.

Nutrition governs all the functions of absorption, circulation, respiration, and secretion in plants, which have neither heart nor brain, and the same physiological relations of nutrition and reproduction apply to animal as well as vegetable organisms. Physiological vitality is similar in both, but physical activity is very different. Trees are moved to and fro by winds, but have no powers of locomotion, while animals spend considerable force in spontaneous motion and locomotion; some much more than others, and thence they are endowed with vascular and nutritive temperaments, not only in proportion to their bulk and stature, but mainly in proportion with elative degrees of physical activity.

Birds are more active than mammals, and require more food in proportion to their bulk; mammals are more active than reptiles, and require more food; fishes move in a denser medium than air-breathing reptiles, and require less physical force to move with more rapidity. Physiological vitality and physical activity, therefore, are two distinct factors to be considered with regard to vascular functions in a given type of organism.

Nutrition accumulates a certain amount of latent physical forces in the tissues of plants, none of which is spent in the generation of heat for mechanical work, whereas in animals large proportions of the latent forces accumulated by nutrition to sustain physiological vitality, are rapidly spent in the shape of heat and mechanical motion, and must be renewed as fast as they are spent.

It has been ascertained experimentally, by Dr. Edw. Smith, that a man asleep breathes one-third less oxygen per hour than when awake, and a sedentary man breathes less while sitting still, than a bustling man in active motion. The ratios of nutrition and respiration vary then in different temperaments with variable degrees of sleep and wakefulness, bodily rest and activity, irrespective of sedentary mental work.

The following table is not an exact description of vascular ratios, but it is near enough for a *descriptive diagram* of relative proportions, since it is quite within the natural limits of extremes, for adults of the same sex, age, and weight.

Temperaments.	*Food.*	*Motion.*	*Rest.*	*Sleep.*
Sanguineous	4	15 h.	4 h.	5 h.
Bilious	3	12 h.	6 h.	6 h.
Nervous	2	9 h.	8 h.	7 h.
Lymphatic	1	6 h.	10 h.	8 h.

These proportions of physical rest may coincide with mental concentration, or not, as the case may be.

The most active temperament would require four times as much food, for physical activity at the meridian of life, as the most sedentary lymphatic temperament, and the other two would hold intermediate ranks. A hundred degrees of difference might of course be found in each of these primary divisions, not to mention differences of age, sex, health, and disease. The least bodily active may however be the deepest thinker, and physical temperaments are adapted to all vocations.

RELATIONAL CHARACTERISTICS OF THE VASCULAR SYSTEM.—*The conformation* of the vascular system is adapted to its natural *sphere*, latitude, and *medium* of respiration, in fishes and in birds, which breathe in different conditions, and also in animals and in races of mankind who live for ages in damp or dry, equable or variable regions of the atmosphere; many generations are required to succeed each other before a lowland race can be fully acclimatized to a highland home, or a Polar race to a torrid zone.

Nutrition and circulation are accelerated or retarded by external conditions of climate, and to a most remarkable degree, in cases of winter lethargy. To live and breathe in water or in air; to hybernate in winter or not to hybernate, involve different kinds of relational adaptation in the functions of respiration, circulation, and nutrition; and besides these general relations of the vascular system to external conditions, there are numerous and various internal relations of the system to other functions, and more especially digestion.

All secretions are derived from the blood, and some of them are carried out of the body as excreta, but those which serve the purpose of digestion are mostly reabsorbed with the food which they have rendered fit for assimilation; these various relations of the blood to digestion, nutrition, and elimination involve numerous fluctuations of vascular mutation, and modes of motion.

Vascular modes of motion distinguished from their physiological functions, are those of breathing *waves of motion* in respiration, *pulsation* in circulation, *distension* and *contraction* of vessels, *congestion* and *depletion* in cases of secretion and excretion, *endosmose* and *exosmose* in cases of absorption and respiration, nutrition and exchange. All these modes of motion vary in relative degrees of velocity and strength in different temperaments, in variable states of health and disease, and successive phases of growth and declining age.

The structure of the organs is adapted to their special modes of action. Veins and absorbents are more contractile and dilatable than arteries, the bronchial tubes are more elastic than arterial vessels, the bladder is more contractile and distensible than air vessels and blood vessels. The nose is always open in most air-breathing animals, but sometimes closed for a short time in amphibious seals, to prevent water from entering the lungs. The urethra is habitually closed by a sphincter muscle, which enables it to retain water in the bladder for a length of time, and to give it issue as pressing need or discreet opportunity dictate. Contractility is deemed a *vital* property of tissue, (as in the sensitive plant,) in contrast with mere flexibility and elasticity, as *physical* properties of vegetal and animal tissue.

Respiratory motions affect all the organs of the body by a rhythmic wave of impulse like that of advancing and receding tides in the ocean, and pulsatory motions of the heart and blood-vessels add ripples to these waves in every part. The molecular motions of nutrition and secretion are less obvious than pulsation and respiration, but they are quite as real as those of chemical change and physical osmosis in parallel cases of physical and mechanical phenomena.

The peristaltic motions of the digestive system add intermittent impulses to all these vascular modes of action, and the general intermittent motions of the frame in walking or working, cause the muscles and other tissues to change their relative forms and positions, compressing vessels which permeate them, and causing the blood to circulate more rapidly.

Respiration is one main cause of circulation by absorbing oxygen in exchange for carbonic acid gas and vapour, in the capillary vessels of the lungs; *nutrition* is another cause of circulation by exchanging carbonic acid gas for oxygen in the capillary vessels of all the organs. Intermittent *secretion* also accelerates the circulation of blood in the arteries, veins, and capillaries of the glands. In addition to the central action of the heart, pulsating with a mechanical power "equal to thirteen pounds weight," the exchanges of oxygen and carbonic acid in the pulmonic and systemic capillaries, maintain the general circulation of the blood, which, though incessant night and day, varies with different degrees of activity and rest, in the organs. Nutrition and secretion being the main-springs of circulation and exchange, pulsations of the heart and arteries are only secondary agencies.

The average ratios of pulsation in the female throughout life, are said to be from ten to fourteen beats a minute higher than those of the male of the same temperament, in each phase of growth and decline. This average is more various in different temperaments than in different sexes. The following ratios given by some physiologists would only apply to very sanguine temperaments, the bilious being several beats lower, the nervous lower still, and the lymphatic, one-fourth less in the number of beats per minute, during the middle and declining periods of life, besides being generally weaker as well as fewer.

1.—The fœtus in utero	150 to 160
2.—Newly-born infant	130 to 140
3.—During first year	115 to 130
4.—During second year	100 to 115
5.—During third year................	95 to 105
6.—From seven to fourteen	80 to 90
7.—From fourteen to twenty-one	75 to 80
8.—From 21st to 60th year	70 to 75
9.—Old age	75 to 80

Such averages as the above are more or less misleading, since the pulse varies in each individual; morning, noon, and evening; standing, sitting, lying; under mental emotion and quietude; muscular activity and rest; after and before meals; in summer and in winter; not to mention depressed conditions of health or febrile excitement. These variations of rapidity may rise one-fourth higher than the mean, or descend one-fourth lower in ordinary health; and still more in states of disease.

Circulatory modes of action in the vessels are quite distinct from endosmose and exosmose in nutrition, respiration, absorption, and secretion.

Evolutive Phases of Vascular Activity.—In the uterine phase of existence the mammal fœtus lives and thrives without pulmonary respiration; the placental ramifications of umbilical vessels bathe in the blood of the mother somewhat as the branchial vessels of a fish bathe in water; the lungs are quiescent until the child is born, and then suddenly called into respiratory activity by the impression of the external atmosphere upon the nerves of the skin. When the atmospheric influence is insufficient, a slight sprinkling of cold water on the face will call forth respiration in the newborn infant.

In the fœtus arterial and venous blood mingle together in the heart, which is not completely closed by internal partitions until the end of gestation, and hence an infant has a blue appearance when first born.

The sense of smell is less developed in infants than adults, the powers of urinal retention are weaker, the absorption of chyle is more rapid, and the exchange of atoms in the tissues more energetic. An infant grows much faster, in proportion, than a youth of twelve, and minute differential characteristics of vascular degrees and modes of action are observable in each successive phase of growth and declining age.

FUNCTIONAL MODES OF VASCULAR ACTIVITY.—Capillary vessels are the agents of nutritive exchange; lacteals and lymphatics are agents of general absorption; the nose is an organ of detection, admitting or excluding good or bad air; the urethra is an agent of temporary retention and intermittent micturition of the drainage of the blood.

Exchanges of new blood for the waste of the organs occur by *osmosis* through the walls of capillary vessels, and similar exchanges of gas occur by osmosis in the capillary vessels of the lungs. Osmosis and physiological exchange are characteristic modes of action in the vascular system, as well as mechanical contractions and expansions of the heart and arteries, the chest and lungs.

Exosmose alone, with physiological selection, must be the chief mode of action in kidneys, which clear the blood of its waste matter; *endosmose* with physiological selection are characteristic modes of action in lacteal and lymphatic glands and vessels, which absorb, elaborate, and circulate the nutrient elements they pour into the blood.

Mechanical contraction and expansion, physiological exchange, physical osmosis (endosmose and exosmose), physiological elaboration and secretion are characteristic functional modes of action in the vascular system and its satellites, and these are all we need to notice here.

4.—RELATIONAL MODES OF VASCULARITY.—These are very different in organisms of different classes, and somewhat various in animals of the same species. The main peculiarities relate to the medium in which the creature lives and breathes. Some plants and animals live constantly in water, and their vascular modes of action are adapted to that medium of vitality; others are amphibious (living partly in water and partly in air), and hence the vascular modes of action in amphibious plants and animals are adapted to these alternate conditions of existence; others again live and breathe constantly in the atmosphere of high or low latitudes and altitudes, and their vascular modes of action are variously adapted to conditions of temperature and moisture in the surrounding medium.

VITAL TEMPERATURE.—With due supplies of good food, air, and water, the human body maintains an almost uniform temperature of 98 degrees of Fahrenheit in the coldest and warmest latitudes and altitudes, but it is much depressed by sudden changes of external temperature; by insufficient quantities of food and clothing, more especially in arctic zones and frigid altitudes. Plants and invertebrate animals part with heat more rapidly than vertebrate animals, and are more easily affected by extreme degrees of cold in the external medium; fishes and reptiles part with their animal heat more rapidly than mammals; and hibernating mammals more rapidly than other species of mammalia In all varieties of organism, however, the vascular system adapts its modes of action to fluctuations of conditions.

Tides of fluctuation in connection with vascular adaptations, are the most characteristic relational modes of action, and these vary with the intermittent functions of digestion, secretion, and locomotion; not to mention internal anemic and plethoric conditions of the system. Without dwelling on exceptional degrees of vitality and vascular depression, we may note that there is an average quantity of blood in general circulation, and an average quantity of exuded plasma in the organs, and these two quantities are far from being equal in amount. It has been said by some that twelve or fifteen pounds of blood circulate in the vessels of a healthy body, weighing about a hundred and forty pounds; others say about eleven pounds or nine pints. The most careful observations give an average weight to the circulating fluids of one-twelfth or one-thirteenth part of the weight of the whole body, in a healthy subject.

Nutrition and waste balance each other in adults, who neither increase or decrease in weight. The tidal fluctuations of the blood are those of intermittent periods of nutritive absorption and relational secretion. Tides of secretion are drawn from the blood into the filtering alimentary canal, and returned by turbid absorption, two or three times a day, or oftener in some cases, and these tides or fountains carry about one half of the whole amount of blood each time of intermittent flood and ebb; that is to say, twice a day in those who eat two solid meals, and oftener, but less copiously, in those who eat and drink oftener. Six or eight pounds of saliva, gastric juice, bile, pancreatic juice, and "succus entericus" have been calculated as an average quantity of fluid necessary for the digestion of each heavy meal, and this tidal flux is drawn from the circulating blood each time, to be returned to it by absorption with an addition of two or more pounds of solid and liquid food.

These are diurnal tides of flux and reflux in the system; but there are other tidal currents and oscillations in connection with other systems. There is a monthly flux of menstruation in adult women, and an annual or biennial flux of gestation in prolific females. There is an intermittent flux to the muscular system while in action, and an ebb from it in repose; and the same may be said of the nervous system, mentally active or inactive, as well as of any special organ in which periods of vascular congestion intermit with intervals of depletion.

To have a distinct idea of vascular modes of internal and external circulation, we must dwell a little on the structure and the functions of the organs, in relation to the quantities and physiological permutations of the circulating fluids.

There are three kinds of circulation of the blood, and one of lymph and chyle; namely, a complete circle of pulmonary renovative circulation through the heart and lungs; a complete circle of systemic nutritional circulation through the heart and all the organs of the body; a complete circle of *elaborative* circulation through the portal veins and glands; and a complete confluent stream of lymph and chyle circulating from minute capillary roots in nearly all the organs to the elaborative lymphatic glands and confluent ducts which pour their contents into the veins, near the heart. In correspondence with these *internal* factors of circulation, we have the *external* factors of inhalatory and exhalatory exchange or respiration, integrational and disintegrational exchange or nutrition; not to mention the excretions of waste matter and genetic secretions, as relational factors of fluctuating circulation and exchange.

Systemic veins are much more numerous and capacious than systemic arteries, and contain twice as much blood or more. The lymphatic vessels contain a fluctuating amount of lymph and chyle, which may possibly average nearly half as much as the systemic arteries; the pulmonary arteries and veins contain about equal quantities.

It has been observed in some cases that while the arterial blood moved at the rate of one foot in a second, or sixty feet in a minute, the venous blood in the capillary vessels only moved at the rate of one inch per minute, which gives the ratios of velocity as 720 to one. It must be observed, however, that while the heart beats regularly to establish a uniform rate of movement in the arteries, the capillary vessels do not exude and absorb regularly, but act intermittently as the relative degrees of activity and rest in the nutrition and secretions of the different organs, and besides these intermittent degrees of activity and rest in the functions of nutrition and secretion, the capillary vessels ramify suddenly from the blunt terminal ends of the arteries, like a number of minute veins in very large leaves of a tree. And this sudden augmentation of their relative number and capacity acts like the sudden widening and shallowing of a deep river with a rapid current into a wide marshy plain, which slackens the rate of motion in the current, to be increased again as the bed of the river narrows and deepens, as it does in the veins which return the blood to the heart again. It is probable, therefore, that the systemic circulation in the larger veins may be nearly half as rapid as that of the large arteries, while exactly equal in the pulmonary circulation of both arteries, veins, and capillaries.

It has been calculated that the capillary area of expansion is five hundred times greater than the arterial area, and hence we may easily understand that special capillary flux may often be very considerably slower than general arterial circulation.

Glandular *secretions* and the whole system of *absorption* and *nutrition* counterbalance each other in these fluctuating movements of the blood, as *intra* and *extra*-vascular causes of circulation. Nutrition and absorption in the tissues draw new supplies of nutriment from the exuded plasma of the blood, and return their waste to the same plasma; the waste is re-absorbed by lymphatic vessels, and poured back into the blood along with new supplies of aliment absorbed from the digestive system. This movement of absorption and nutrition is counterbalanced by the numerous and various secretions of the glandular tissues, which draw milk and ova from the blood to reproduce the species; perspiration, sebaceous substance, and hair for the purposes of clothing the body and regulating degrees of temperature; digestive secretions for physiological permutations of aliment; and lastly, eliminations of waste matter in the form of carbonic acid gas and vapour, urine, and mucous secretions to mingle with the refuse of digestion.

A general idea of vascular fluctuations may be obtained from a tabular view of intermittent physiological functions, thus:—

Progenetic vascular fluctuations . .	Secretional, Congestional.
Prodigestive vascular fluctuations .	Secretional, Absorptional.
Pulmono-systemic vascular fluctuations	Accelerative, Retardative.

Progenetic secretions and congestions are not only periodical in adults of both sexes, but they are comparatively feeble during periods of growth in childhood, and sterility in after life. Prodigestive secretions and absorptions are active during digestive operations, and inactive between meals. Pulmono-systemic fluctuations of comparative activity and rest, vary with youth, virility, and senility; with summer, winter, spring, and autumn; with day and night; with degrees of moisture and dryness of atmosphere; with degrees of stillness or motion during the waking state, agitation or rest in the sleeping state; but in all these conditions, pulmonic and systemic, or nutritional inhalations of oxygen and exhalations of carbonic acid gas, balance each other in the general economy, except in certain cases of organic or functional disease.

In the exertion of walking three miles an hour, respiration is about twice as active as in the sitting posture; at the tread-wheel, about four times as active; both breathing and circulation being, of course, accelerated by extra exertions.

It has been said that the human body of an adult of average activity and weight, eliminates about three thousand pounds of solid and liquid food every year, and absorbs an equal amount as aliment to supply the waste. Thirty hundred-weight absorbed to renew the constant weight of one hundred and fifty pounds would be equal to complete renewal twenty times; but a large amount of the water absorbed merely passes through the system as an incidental agent of dilution and evaporation. It is not improbable, however, that the whole body is renewed oftener than moultings of the feathers of birds or the fleeces of sheep. Supposing two thirds of the ingested substance to be water, and one third nutrient food, ten hundred-weight would still be more than six times one hundred and fifty pounds, and this leads us to infer that the body is renewed half-a-dozen times a year.

Lymphatic temperaments are generally small eaters, and renew their bodies much less rapidly than large eaters and more active temperaments; one may therefore renew his coil of flesh every month, while another only changes every season. What this may have to do with a long or short lease of life in mankind we do not know, but fishes are said to live very long, and so are birds, the one of slow, the other of most rapid ratios of nutrition and exchange.

BIOLOGICAL CHARACTERISTICS OF CONNECTIVES.

Connective tissues and secretions, internal fluids and external conditions, are elements of organic unity, and their peculiarities determine the organic *impress*, physiological *idiosyncrasy*, general *health*, and nutritional *diathesis* of individuals. In connection with these we must also notice the external *conditions* of life, and the vocational *destiny* of man.

Connective tissues and secretions, being interwoven with all the organs, do not add to the number of distinct systems. The symbols used to designate them denote their community of structural and functional connections with the organs and the systems, represented by *numerals* as constituent parts of one complex integrality; just as the commissariat of an army are necessary adjuncts not classed with soldiers and officers as fighting men.

CONNECTIVE TISSUES.—Special tissues give to each organ, nerve, bone, muscle, its distinctive character, while areolar and *serous membranes* envelope the nervous centres, and all the viscera of the thoracic, the abdominal and the pelvic cavities, as well as the internal surfaces of the walls of these cavities in which the viscera are lodged. *Fibrous tissues* form dense strong envelopes for the muscles and the bones, the brain and the nerves, the heart, the kidneys, and other special organs, along with serous membranes, meninges and sheaths, pericardium, pleura, peritoneum, bursæ mucosæ, fascia, and ligaments.

Some of these tissues are flexible, inelastic, while others are both flexible and elastic; and as one or other of these characteristics prevail, the *physical impress* of the individual is to that extent differentiated from others of the same species.

Claude Bernard distinguishes two classes of tissue, one active and the other passive; but this is merely a conventional distinction, to separate what he calls active cell regeneration and proliferation from mere deposits of mineral substances around them, to form strong passive tissues such as bones and cartilage, tendons and ligaments, sheaths and connective tissue, which he describes as follows:—

"Cellular tissue, as described by Bichat, is a tissue which is interwoven with all the elementary parts of the body, serving at the same time the purposes of an intermediate substance, connecting them together, and separating them from each other. Besides thus forming a protective covering, this tissue serves as a reservoir of interstitial liquids and of fat, filling up vacant spaces, and giving roundness with plumpness to the external forms of the body. It forms a sort of neutral system, then, a sort of functional auxiliary for all the other tissues, and is traversed by the nerves and vessels which establish vital relations between all the parts of the organism. It is very lax and extensible under the skin, and in other regions forms serous membranes and synovial bursæ which allow the organs to slide one upon another. In other places it is more dense and rigid to prevent the organs from being displaced by general motion. Connective tissue is easily infiltrated by air and water, and when thus distended by artificial experiments, it has the appearance of being formed of thin sheets of tissue, but it is really composed of fibrous threads.

"Fibrous tissue is also composed of fibrillous threads like those of connective tissue, but more closely knit together, and much more resistant. This kind of tissue is found in nearly all the organs. It forms the most resistant part of the external skin, and the mucous membranes, the alimentary canal, gland ducts, bladder, arteries, veins, &c.; it unites the muscles to the bones, forms sheaths for the muscles, and connects many parts by its special forms of tendons, ligaments, aponeuroses, articular capsules, &c. Its properties are those of *flexibility* and *elasticity*, but these are unequally combined in different organs according to the needs of one or the other of these properties. The elasticity of fibrous tissues, like that of India-rubber, is a constant but slow force, which protects the organs by resisting sudden motions and changes of position. In some cases it is opposed to the action of large groups of muscles and bones to moderate their sudden motions by absorbing, as it were, the shock to deaden it, as in the case of yellow ligaments of vertebræ and the posterior cervical ligament; in other cases to moderate the movements of a single muscle."

The tendons of muscles connect them with the bony endoskeleton, and with the dense fascia of the exoskeleton, and being flexible and inelastic, serve as tensorial organs of vibration, in rhythmic motions of dancing, and acrobatic performances; not to mention minor efforts of tension in different parts of the body. The ligaments of bones have similar character and function; while mucous bursæ, synovial and serous membranes, being more elastic, serve to facilitate the movements of the parts which they connect, and bring them back to their natural position. Relatively inelastic and elastic tissues are combined in various proportions to serve special uses in different parts, and as these details are given in manuals of descriptive anatomy, we need not dwell on them minutely.

The eye-ball is surrounded by a strong fibrous sheath called the sclerotic membrane, which maintains all the soft parts in their positions; and many other special organs are sheathed in like manner for a like purpose. When any special tissue is injured which cannot be restored, connective tissue is substituted in the breach to reconnect the severed parts. Its functions and relations, therefore, are everywhere connective and articular.

Exuded serum lubricates connective tissues, and facilitates their movements in adaptation to the general movements of the organs.

The quantity of interstitial serum is so regulated in a state of health, that there is only just enough for the purposes of nutritive exchange and mechanical lubrication, but in "dropsical" disease the fluid accumulates in some parts of the body faster than it is carried away by the absorbents; and such forms of disease are sometimes very difficult to cure.

Adipous tissues imbedded in the meshes of areolar tissues secrete fat of various kinds for special uses, both mechanical and physiological. Fat serves mechanically to support the kidneys, firmly fixed against the walls of the spine, and protect them from entanglement with the intestines, during various internal and external movements of the frame. It forms a sort of cushion to deaden shocks of motion, wherever it is placed, and is wisely distributed for this purpose, being most accumulated where most required, and least, where not mechanically necessary.

The growth of fat is more rapid and plentiful in infancy than in youth, and again in middle age than in declining years. It is more abundant in some persons than in others, in accordance with the *idiosyncrasy* of the individuals, irrespective of relative abundance or paucity of food. In some instances excessive obesity is a kind of disease, almost as bad as dropsy, though not so often or so rapidly fatal. Claude Bernard says:

"Fat which is deposited in the interstices of connective tissue serves various purposes. It may protect us from the effects of cold temperature, while it forms a reserve of nutritive substance in case of need, as observed in cases of long abstinence, and hybernation. It is no doubt deposited by a sort of infiltration of plasmatic cellules; and most plentifully, when the elements of fat are most abundant in the blood, to be absorbed into the blood again in case of need, as seen in cases of emaciation from starvation or disease. Fat sometimes accumulates in the subcutaneous interstitial tissues to such an extent as to compress the nerves and vessels of the skin until they become atrophied. The skin loses its sensibility, and absorption almost ceases in the compact masses of accumulated fat."

Glandular tissues cover the surfaces of skin and mucous membrane, which include and limit all the systems. Adipous tissues secrete fat for internal uses of connexion; glandular tissues secrete eggs and milk, saliva, bile, and gastric juice, sweat and urine; they also exhale vapour and carbonic acid gas from the lungs and the skin, not to mention other exhalations and secretions, which are either re-absorbed for special uses, or eliminated as waste matter.

These tissues are as variously constituted as the fluids they secrete, although they all belong to one general class. Elaborative ductless glands belong to the vascular system; the lungs and the kidneys, with the epithelial linings of their mucous membranes, belong to the respiratory and the urinatory apparatuses of the same system; the salivary glands, the liver and the pancreas, together with the follicles and epithelial surface of the mucous ducts and membranes of the alimentary tract, belong to the digestive system. The ovaries and testes, the mammæ and the epithelial surfaces of the ducts and membranes of the generative system form another special category of glandular tissues; while the epidermic cuticle of the external skin, with the follicles which secrete the water and vapour of sensible and insensible perspiration, the unctuous substance of cebaceous lubrication, and the hairs of the head and face, body and limbs, all co-operate with each other and with the glandular functions of the vascular, the digestive, and the generative systems.

The secretions of the generative system perpetuate the species; those of the digestive system dissolve the elements of food in the alimentary canal; those of the vascular system give a definite constitution to the blood derived from alimentary substances, just as the generative glands give a definite constitution to eggs and milk derived from the blood. The lungs purify the gases of the blood by inhaling fresh oxygen and exhaling carbonic acid dissolved in vapour. The sanguineous glands secrete and elaborate blood corpuscles. The kidneys purify the liquids of the blood, by excreting poisonous waste matter dissolved in water. The exhalations and secretions of the skin cooperate with all the other glands, and serve to moderate extremes of temperature affected by violent exercise, or by external changes of the weather.

Glandular tissues line the amnion which contains the fœtus immersed in a volume of liquid to protect it from violent shocks of movement, as it lies in the womb. The quantity of liquid varies from half a pint to a pint or more at the time of parturition.

ORGANIC IMPRESS OF THE BODY.

Congenital integrality or deficiency with the *impress* of beauty or ugliness of form and feature, size and proportion, club-foot, hare-lip, or other congenital deformity, are special characteristics of the body, which may be hereditary or merely accidental. There is a special impress of the race in Negroes, Chinamen, Red Indians, and Europeans. Mulattoes and other half breeds of the human species, and mules or hybrids of the horse and the ass, have also an hereditary *impress* in their forms and features, which distinguish them as individuals.

In addition to the congenital impress and general physiognomy, there is a *social impress* of habit and education in the different classes and professions of mankind. A student is easily distinguished from a farm labourer, an educated gentleman from an ignorant peasant: and even amongst animals domesticated tribes are easily distinguished from wild species, by the natural demeanour resulting from gregarious or solitary instincts, domesticated or wild habits of life.

SECRETIONS OF CONNECTIVE TISSUES.

Serum and *synovia* are interstitial and superficial exudations which lubricate areolar connective tissues and facilitate the movements of the viscera, as well as the mechanical motions of the external frame. Fat and marrow are accumulations of heat producing elements, which serve as mechanical cushions to deaden shocks of motion in the body. The *secretions* of glandular tissues are indispensable to the functions of reproduction, digestion, respiration, circulation, elaboration, not to mention the elimination of waste matter.

The bodily habits and *idiosyncrasy* of individuals are mainly concurrent with peculiar habits of activity or inactivity in these various secretions and interstitial infiltrations. Fat or lean, hairy or glabrous, lithe or stiff, are natural differences of idiosyncrasy in families and races.

Climatic impress is marked in the different colours and complexions of human races which inhabit from time immemorial different regions of the earth. The negro is easily distinguished from the Scandinavian, and Asiatic negroes are easily distinguished from the African, not only by the difference of form but also by shades of colour in the skin. The inhabitants of southern Europe have a climatic complexion which differs from that of the north, even where the hair may be dark or fair in both races.

The *organic impress* of different *ages, sexes,* and states of prolification is easily discernible in individuals of the same race or species. A man is easily distinguished from a woman, a boy from a girl, and generally young animals may be distinguished from old ones, and males from females.

A *pregnant female* is also easily distinguished from one which is not, and the impress of puberty is stamped on both the male and female sexes, in contrast with the impress of infancy and childhood. Sterility is also marked by visible signs in men and women who have passed the meridian of life, and become blanched by age, or otherwise deprived of the bloom of prolification.

BODILY HABITS AND PHYSIOLOGICAL IDIOSYNCRASY.

Hereditary idiosyncrasies are transmitted from parents to their offspring, in each race of mankind, and also of animals. Some animals grow very fat, while others remain always lean, under the same conditions of food and climate. Pachiderms are prone to become fat, while the canine species, in a state of nature, remain generally lank and lean. Human families vary also very much in physical idiosyncrasies. Some are prone to fatness, others not at all; some are very hirsute, others very scantily supplied with hair on both head, body, and limbs. Some are very elastic, and delight in feats of agility; others are inelastic, slow, and heavy in their movements.

These are purely physiological idiosyncrasies, but there are social, proliferal, and astrological or psycho-physiological peculiarities, which are congenital or hereditary in certain species and varieties of animals and human beings.

Social idiosyncrasies, in connection with solitary and gregarious instincts, domesticated and untamed habits of life, have been already noticed.

Climatic habits and idiosyncrasies intimately allied with vital diathesis, are *stationary* or *migratory*, *diurnal*, *nocturnal*, or *crepuscular* in numerous species of animals and plants. Most trees in variable and frigid latitudes, and many animals and insects become completely torpid during the cold season, while others become more or less lethargic and inactive, though not entirely torpid.

Many animals prowl at night and sleep during the day, especially in tropical regions; others are crepuscular, and sleep both day and night. Bats and moths, for instance, are most active after sunset, in the summer season, and bats are entirely torpid during winter. Swallows and many other species of birds migrate from our latitude during winter, and return again in spring. Some plants, also, remain stationary in limited localities, while others spread over immense regions of the earth.

These habits and idiosyncrasies are too well known to need further notice, with regard to animals and plants, but we find a reflex of them in human nature. Some persons rise early and go early to bed; others rise late and are most lively at night; others, again, sleep nearly all day and are awake all night. Some require only four hours' sleep during the twenty-four; others require eight or nine, and cannot do with less. Between these two extremes, the great majority require at least five, or six, or seven hours' sleep at night.

PSYCHO-PHYSIOLOGICAL IDIOSYNCRASY.—Some human beings, again, are still more exceptional with regard to the peculiar idiosyncrasies of sleep. Somnambulists walk in their sleep, or they fall into states of trance during whole days, or even weeks; and instances are on record in which some Indian Faquirs have allowed themselves to be entombed in this dormant state during six weeks, with a promise that they should be disentombed and revived by artificial means at the end of that time. Mesmeric sleep and clairvoyance belong to this category of exceptional diathesis and idiosyncrasy. Numerous very strange phenomena are recorded by those who are familiar with hypnotism in its various forms. We need not repeat what has been already said of bicorporeity and the temporary isolation of the spirit from the vegetative body during states of trance, at which time it is alleged that the spirit may wander far away, while the body is asleep or in a torpid state, and while thus freed from the bodily enthralment, converse with disembodied spirits, or even take possession of another sleeping body and control it, as permanently disembodied spirits are supposed to do in certain cases. All such facts are believed by a few who are familiar with the phenomena of Mesmerism and Spiritism, and utterly disregarded by many who ignore such wonders; but all are aware of "winter-sleep" (without causing death) in certain species of animals, such as hedge-hogs, dormice, bats, moles, and bears; and these peculiar hypnotic states are mostly dependent on astrological conditions of climate and temperature, as well as on psycho-physiological idiosyncrasies.

Proliferal habits and idiosyncrasies are various amongst animals of the same species, and widely various in different species. Some human races are much more prolific than others under equal conditions of food and climate, and the range of difference amongst the lower animals, while varying to some extent with conditions of food and climate, is extremely great in many cases.

It is probable that natural limits and ratios of prolification are inherent, and that artificial conditions merely accelerate or impede the ratio of reproduction within a given time, without altering the limits of multiplication fixed by nature for each species. Slow reproduction and limited numbers seem to be the natural prolific idiosyncrasies of elephants and all the largest types of animal, while rapid proliferation and almost unlimited multiplication seem to be the natural idiosyncrasies of propagation in the smallest species of mammalia, and the lowest types of vertebrata.

Proliferal habits and idiosyncrasies vary in the human species. Some individuals are naturally prone to celibacy, others are constrained by poverty to remain single, while no amount of inconvenience can prevent the majority of mankind from following, at any cost, the impulse of proliferation. Chastity is an easy virtue in some cases, and very difficult in others. Chastity and modesty are natural to some special idiosyncrasies, and salacity to others.

Highly cultivated flowers are often sterile and always less prolific than wild flowers, of the same species: pampered animals are less prolific than those which are moderately fed and trained. Mankind are influenced also in their breeding powers, by extremes of nutritional habit and condition.

It is said that Mulattoes, or half breeds of mankind, are less prolific than pure breeds under like conditions, and the same has been said of animals and plants. Hybrids of proximate species are known to be unable to propagate the hybrid type; they die out altogether, if not crossed back again immediately with one or other of the permanent species from which they were derived.

There is something deeper, however, in these questions than the hereditary transmission of form and feature to the offspring of each race, which may be traced in mixed breeds as well as in distinct races. There seems to be a planetary as well as an hereditary type of form and feature, and the latter, in course of time, returns to the former, as we see in America, where all the different European nations send annual streams of emigrants; and the descendants gradually lose their hereditary features to assume those of the indigenous races of America. This is strongly marked in the descendants of the puritan colonists, who rarely, if ever, married with the natives, and yet nothing is more easy, in many cases, than to distinguish one of their descendants from a European of the same original stock. The descendants of English, Scotch, Irish, French, Swiss, Danes, Swedes, and Germans, lose more or less of their hereditary physiognomy, and acquire that of the American Indians.

Each continent seems to be peopled with peculiar races of plants, animals, and human beings, diversified again in different latitudes of the earth. Asiatic races differ from indigenous American races; these, from Oceanic races, and from various types of Africans and Europeans. In Europe the northern blue-eyed nations differ greatly from the southern dark-eyed races; these again from North Africans, Egyptians, Abyssinians, and Negroes, who differ from South African Hottentots, Bosgissmen, and Sabutos.

Differences between Asiatic races seem less marked than those of Europe and Africa; Mongolians, Chinese, Malays, and Australians, are slightly differentiated in features and complexions, although various in stature. American Indian tribes also vary more in stature than in colour. The islanders of Oceania vary more perhaps in different latitudes than Asiatics or Americans. Oceanic races seem to be the least prolific; American Indians next; Asiatics next; Europeans and Africans being the most prolific races of mankind. Here it would seem that the most gifted races are the most prolific, while in animals and vegetable nature the lowest species are the most prolific. The African Negro may be deemed a very inferior race of mankind, but he has the qualities of mercurial and social juvenility of character contrasted with the apathetic and morose senility of American Indians.

If various races of mankind were first created in different parts of the globe, and persistently return to their primitive homes, whatever race may colonize the land, *hereditary types* must ultimately disappear amongst the descendants of foreign colonizers, and the *indigenous types* re-appear in successive generations. But then, again, as all tribes are susceptible of improvement by culture, each may be modified and perfected in its own character and indigenous home, without being lost in that of any other race.

Physiological health and diathesis are characteristics of nutrition, in connection with conditions of the blood, food, clothing, climate, epidemics, and infestations.

CONGENITAL HEALTH AND DIATHESIS.—Whatever the nature of wholesome food may be, or the quantity of solid and liquid substances ingested, the *blood* remains much the same in its constituent elements—quality and relative quantity. It is governed by the physiological principle of life, as uniformly and unerringly as the tissues and secretions (such as muscle, bone, or skin, fat or serum, milk or ova), and nothing can alter its natural constitution but poison of some kind, which also disorganises the other constituents of the body.

The forces which organise the fœtus in utero, continue to renew fluids, cells, and tissues, after birth and during growth, by physiological processes, much as they did during the period of metamorphic evolution; and these processes are as definite in the healthy elaboration and exchanges of the blood, as they are in the nutrition of distinct tissues.

The formation of healthy or unhealthy blood globules, and organic cells of every kind, depends upon the healthy or unhealthy diathesis of the individual, and the diathesis of children depends upon the parents in whose organisms were secreted the substances of the ova, which formed the germ-food of the embryo.

If the parents were scrofulous, or cancerous, or tuberculous, or gouty, their genetic secretions will poison the fluids of nutrition during the evolution of the fœtus, and the child will be unhealthy all its days.

In a healthy animal or man the blood globules may be poisoned and paralyzed in their functions by carbonic oxide, or the fumes of coke and charcoal, to such an extent that they can neither inhale oxygen nor exhale carbonic acid; and if a very large number of these globules have been thus paralyzed, the animal dies before new globules can be formed to supply the place of the old ones. The experiments of Claude Bernard show that carbonic oxide has much the same effect as prussic acid on the blood: in both cases venous blood becomes scarlet, as if pure oxygen had been inhaled, but the blood corpuscles are incapable of breathing, and otherwise elaborating the serum of the blood.

Microscopic cells in the organs and in the blood, do not live individually as long as the whole body.

> "Every cell in the organism is independent; it is born, grows, reproduces, and it dies, as if it were a single celled plant or animal. The growth and decay of an organ, is like the growth and decay of a nation, or a tree. The individual cells composing an organ grow and perish as the individual men, or the individual leaves grow and perish. . . . Just as the life of a nation or a tree is the sum total of the lives of its individual parts, so is the life of the organism the sum total of the lives of its individual cells."—G. H. LEWES.

The principle of organic unity builds up systems, organs, tissues, and cells, endowing them with special aptitudes, just as a ruling Providence in nature endows individuals and societies with special functions, vocations, and aptitudes in the evolution of human society.

Blood corpuscles differ in function and vocation from the organic cells of solid tissues, although the eggs secreted by the glandular tissues of birds, and the milk secreted by mammals contain all the elements of food for every kind of organ, just as the blood itself does.

The blood is physiologically homogeneous, as an egg is a homogeneous unit composed of the yolk, the white, and the hard shell; but the chemical composition is sufficiently rich in elemental substances to furnish different sorts of food to different sorts of tissue.

In perfect health the red corpuscles are more numerous in sanguineous than in lymphatic temperaments; in carnivorous than in herbivorous animals; in birds than in mammals; in mammals than in reptiles; and very various in fishes. In the same person the red corpuscles are much more numerous in robust health than in a debilitated state of chlorosis or cachexia of any kind.

The red globules contain the same elements as nerve and muscle, more abundantly than fibrine and serum, and are thus supposed to supply readily the elements most rapidly consumed by these active tissues. But this is mere conjecture, as nothing is positively known of the physiological characteristics of elaboration and mutation in the blood and in the tissues. The red corpuscles are not exuded with the plasma of nutrition, and therefore they yield their contents to some extent, and take up carbonic acid in exchange. Chemical and physiological mutations are constantly occurring in the blood, in correspondence with all the processes of nutrition and secretion, absorption and exhalation in the organism.

It has been ascertained, however, that the red globules contain potash and iron more abundantly than the serum, while the latter is more rich in soda. And with regard to organic substances, hematoglobuline is contained in the red globules, while albumen and fibrine are contained in the serum.

Chemical combinations and dissolutions occur in the blood, as well as in physiological transformations. Each organ draws a particular kind of substance from the "river of life," and returns another in exchange. The bones do not feed on exactly the same elements as the muscles; and so of all the other special tissues. Arterial blood is everywhere the same in composition, because it contains the food of all the tissues, while venous blood receives one kind of waste substance from bones, another from muscles, nerves, &c. These are all mixed together as they leave each organ, and are poured into the general stream, to be renewed by fresh elements derived by inhalation from the lungs and by absorption from the alimentary canal.

Venous blood is generally much darker in colour than arterial, but not in all conditions; for in glandular *secretions* in the kidneys, salivary glands, &c., the blood does not change colour in passing from the arteries into the veins. The gases are not modified apparently by these secretions. It is in the lungs that dark blood globules become scarlet by absorbing oxygen gas, and in all the tissues red blood becomes dark by the absorption of carbonic acid in the process of nutritional exchange.

The health of the body may be affected by the wholesome or unwholesome nature of the air, the water, and the food ingested and absorbed; or by the infestations of entozoa in the intestines, or in the blood, or in the tissues; or by vegetable or animal parasites on the external skin. It may also be affected by external temperature, which has the power of facilitating or of entirely arresting the functions of absorption, elaboration, nutrition, and secretion. The blood may be poisoned by bad air, bad water, bad food, recently ingested, or it may never be in a healthy condition, however good the air, the water, and the food may be, where the individual herbivorous, carnivorous and omnivorous animals, and cold blooded as well as warm blooded animals, inhabit frigid regions amidst perpetual snow and ice.

Herbivorous antelopes inhabit tropical regions along with carnivorous leopards and hyenas, insectivorous bats and anteaters, frugivorous bats and monkeys, omnivorous animals and men; and although some of these species may by careful treatment be acclimatized for a time at least, in other latitudes, few can live and thrive healthily in any but their native homes. Anthropoid monkeys die of consumption in Northern Europe long before they attain full growth, and few of the monkey tribes can live to be old in artificially heated rooms, where they are somewhat protected from the extreme vicissitudes of a variable climate. It is also well known that tropical plants cannot bear exposure to a cold, damp atmosphere.

There are different sorts of climatic diathesis, which may be classed in parallel with vascular temperaments, thus:—

Vascular Temperaments.	1. Sanguineous temperaments. 2. Bilious temperaments. 3. Nervous temperaments. 4. Lymphatic temperaments.
Climatic Diathesis.	1. Alpine diatheses. 2. Temperate diatheses. 3. Genial diatheses. 4. Tropical diatheses.

It is well known, that as we proceed from the equator to the poles, certain tribes of animals and plants disappear, giving place successively to new fauna and flora for each latitude; and the same gradation may be observed as we ascend from the sea level to the foot of an alpine mountain, and thence to the snow-clad summit in equatorial and in temperate zones. The same tribes, species and varieties inhabit similar latitudes and altitudes invariably, although certain species accompany man in almost every clime. The animals and plants inhabiting the sea, are also distributed in different zones and depths of water, in accordance with various degrees of temperature and the climatic diatheses of distinct groups of marine animal and vegetable species.

These varieties of climatic diathesis in the fauna and flora of the globe are physiological puzzles which we cannot explain; the facts are evident, while the causes are obscure. There are, however, analogous facts in chemical and physical science equally known and little understood. We are told by chemists, that "if a man "were made of ammonia-sulphate of copper, he would "say that orange rays were warm, and blue ones were "cool, because the latter would pass through him with-"out warming him much. If on the other hand, a man "were made of bichromate of potash, he would say that "the blue rays were warm, and the orange rays cool." In parallel with these phenomena, a whale finds warmth enough in the icy regions of the sea, and sharks are cool enough in tropical latitudes, although both may feed on animal diet, and not be more unlike in chemical constitution, than they are in physiological diathesis.

The same may be said of all varieties of fauna and flora in every latitude and altitude of sea and land.

CONDITIONS, ENDS AND USES OF PHYSICAL ORGANISM.

The egg of a bird is secreted from the blood, to serve as a store of organic matter, afterwards transformed into organic cells, tissues, and organs, by the living principle, which is invisible before it is incarnate in the matter of the egg, and, after being hatched, the chick has left the shell. Uterine supplies of nutriment to mammals are natural conditions of incarnative evolution; but not the only external conditions which are necessary in the process, since a certain range of temperature is also indispensable.

Climatic conditions of vitality are necessary both to the evolution and continuance of life. In what sense a particular range of temperature should be as necessary as a continuous supply of nutriment to the healthy evolution of life we do not know, but the fact is undeniable. Not only heat, but light and electricity seem to be essential conditions of vitality, if not during metamorphic evolution, certainly after the organism is formed and born into the world.

VEGETABLE HEAT AND ELECTRICITY.—The relation of internal temperature in plants to that of the surrounding medium, in water or in air, varies with degrees of physiological activity, and this is most active in the periods of germination and flowering proliferation. It seems to be much the same in animals, for the eggs of birds require more external heat while being hatched, than the birds require when fully developed. The animal heat and electricity of animals are also more developed during periods of active proliferation and incubation, than at any other time of life.

Plants are absorbing machines for storing up latent heat and light by chemical and physiological modes of action, and these forces can be liberated in the forms of radiant heat and light, when the wood is burnt which had been gradually formed by the growth of the tree. We need hardly mention amber as a vegetable gum, remarkable for its electric properties.

ANIMAL HEAT AND ELECTRICITY.—The physical body is an association of atoms, an organic generator of latent forces, manifest as heat, light, electricity, and gravitation; as a machine for doing mechanical work. This is proved abundantly by physiological and mechanical experience. Electrical fishes are remarkable for their special endowments; and nervous currents are supposed to be analogous to electro-magnetic modes of molecular motion and conduction.

Renovative Forces of Vitality.—When once the organism is evolved, by incubation or gestation, and the stores of nutriment supplied by the parents have been exhausted, vitality must be sustained by other supplies of nutriment to renovate the organs which would very soon perish if deprived of these conditions. Climatic and nutritional conditions are indispensable to the organism, therefore, during the whole of its existence, as well as during the period of formation in the womb. These conditions are more or less the same in kind, though differing in degree, for all types of animal or vegetable, high or low, whereas the form and character of the organism differ in each special type. What is the cause of this variety of organic form and size, habits and endowments in plants and animals, where external conditions of existence are nearly or entirely similar? The air, the water, and the food, the climate and its variations are the same for innumerable species of plants and animals (inhabiting the same localities) which animals and plants differ from each other widely in all the characteristics of organic form and function, instinct and vocation, lease of life and special destiny. There is an organic principle of life, which gives to every plant its special form and character; to every animal, its special type and destiny; to every creature, its organic rank in the creation. All types of organism, however, depend upon external conditions for the resources of experiential life, and these conditions may be favourable or unfavourable. Climatic wealth or poverty, nutritional wealth or poverty, genealogical wealth or poverty, artificial wealth or poverty are conditions which affect the life of plants and animals, subject to the influence of mankind, or far removed from human influence.

Nature furnishes conditions of physical abundance in the rudest form, while human industry can multiply organic germs and modify conditions to a very great extent; and all the realms of nature on our planet are submitted to the care of man, whose mission is to cultivate and improve, not only his own nature, but that of the natural kingdoms placed under his dominion.

The conditions of external wealth in human society depend much upon the hereditary origin and vigour of the race, and not less on individual energy and conduct.

Natural wealth in any clime is independent of man; but artificial wealth, and the multiplication of natural resources depend much upon human energy and industry.

The improvement of land by cultivation and drainage, irrigation, and manure, makes it possible to improve and multiply vegetation, which enables us to multiply animals and improve the breeds. The health of animals depends very greatly on the relative advantages of climate and vegetation; both the health and the wealth of mankind depend upon these same conditions, which may be improved to almost any imaginable extent by human ingenuity, invention, civilization, and colonization.

Organizing Principle of Life.—This principle is invisible in essence, but not in form and character, since each type of organism reveals the force and form of the vital principle which constructs and animates it. This principle is called the soul in animals and plants, and might be called the soul in minerals, since one mode of elemental combination under the same general conditions of cosmic motion and mutation forms water, and another mode of elemental combination forms the atmosphere; another forms granites or transition rocks. These mineral forms can be dissolved and their atomic elements combined in other compounds; and so may the atomic elements of plants and animals. And yet the atmosphere, and the ocean under the atmosphere, and the earth under the ocean, continue their respective forms of elemental structure and physical modes of motion from age to age, just as plants and animals continue their respective forms from generation to generation in the midst of these conditions.

There is an organising principle in the globe which maintains the solid crust of the earth, the liquid mass of the ocean, and the fluid mass of the atmosphere in the same distinct forms of elemental structure and physical function, during ages of terrestrial rotation, and revolution round the sun. What this principle may be we do not know, otherwise than that it is a physical organic force, *sui generis:* what the soul of a plant may be we do not know, otherwise than that it is a physiological organic force, *sui generis:* what the soul of an animal may be we do not know, further than that it is a psychological and a physiological force in nature.

The soul of man has all these powers combined, and though we cannot fathom the mystery of its essence, we can observe its modes of motion, and know its wishes and propensities, its vocation, and its destiny on earth.

As an organising principle we can study its modes of action in the evolution of the organs *in utero*, and their incessant renovation during life. Its organic functions are those of formation and renovation; and these resolve themselves into the physiological association of atoms of matter to form organic cells; of cells to form organic tissues; of tissues to form organs; of organs to form systems; and of systems to constitute a unitary or integral organism. These organic modes of motion are manifest in plants as well as in animals and in man.

In embryology we see the processes by which organic atoms are combined into cells and special tissues. We also observe the metamorphic evolution of these tissues to form special organs, and the gradual association of these in systems. In physiology we learn the processes of absorption and elaboration, circulation and exchange, nutrition and secretion, excretion and proliferation, by which means the organism is sustained in a state of constant renovation, with power to perpetuate the species, and determine the birth of offspring to supply the place of individuals removed by death.

Each organism finds the pabulum of life in the surrounding medium in which it lives, as fishes in the sea, and birds in the air; each organic element or cell in the body of an animal or of a plant finds its special pabulum of life in the nutrient fluids which surround it; this has been very well explained by Claude Bernard in his introduction to experimental medicine, from which we may quote the following pages :—

"*Physico-chemical condition of internal medium.*—Life is manifested by the action of external stimuli upon the living tissues which, being irritable, display their vital properties by special modes of reaction. The physiological conditions of life are no other, then, than the special physico-chemical stimuli which excite the living tissues of the organism into action. These stimuli exist in the surrounding atmosphere, or in the medium in which the organism lives and moves; and we know that the general properties of external air pass into the internal organic atmosphere in which we find all the physiological conditions of external air, with an addition of others which are proper to the internal medium. We need only mention the principal physico-chemical conditions of the internal medium; which are, indeed, essential to life in all media.

"*Water* is the first indispensable condition of organic life, as it is to the manifestation of all physico-chemical phenomena. In the external cosmic medium of vitality we find aquatic animals that live in water and aërial animals that live in the atmosphere; but no such distinction can be made with regard to the life of organic elements or cells in living tissues. Immersed in their internal medium of physical conditions, they are aquatic cells in all cases, and every class of organisms; that is to say, they live and breathe in the midst of organic liquids which contain very large quantities of water, the proportion being, in many cases, from ninety to ninety-nine per cent. of the organic liquid; and when this proportional amount of water is much diminished, very serious physiological perturbations are produced. Thus, for instance, by plunging frogs in very dry air, and keeping them in it for some time, and by introducing into their bodies certain substances of high endosmotic power, by which means the quantity of water in the blood is very much diminished, convulsive phenomena ensue, and only cease after the due proportion of water has been returned to the blood. The total abstraction of water from a living body invariably causes death in the higher animals, with delicate microscopic cell structures; although it is well known that complete desiccation only suspends life for a time in microscopic animalcules; since life is restored in them by introducing water, which is indispensable to the manifestation of vital phenomena. Such is the case in reviving the dried bodies of rotifera, tardigrada, and other animalcules; not to mention numerous other cases of animal and vegetable organisms in which life may be suspended by the abstraction of water.

"*Temperature* has considerable influence upon vital phenomena. An increase of warmth renders physico-chemical and physiological phenomena more active; much lowering of temperature diminishes physico-chemical action, and depresses vitality. Variations of temperature in the external cosmic medium constitute the different seasons of the year, which are only characterised, in reality, by corresponding variations in the manifestations of animal and vegetable life on the surface of the globe; and these vital variations only occur because the internal medium, or the organic atmosphere of animals and plants, adjust themselves in equilibrium with the temperature of the external atmosphere. By placing plants in the artificially heated atmosphere of a hot-house, they do not hybernate, and the same occurs with cold-blooded hybernating animals: whereas warm-blooded animals always maintain, as it were, an artificial internal heat in their bodies, by which means they resist the influence of external cold, and do not hybernate. Still as this internal power of generating heat to resist external cold is limited, the power of resistance may be overcome, in certain cases; and warm-blooded animals may also, in given circumstances, either cool themselves or warm themselves, and be over-heated or severely chilled. The superior limits of temperature, compatible with life, are about 75° centigrade, and the inferior limits do not generally descend lower than the degrees of congelation for organic liquids, animal and vegetable; but still these limits are more or less variable. In warm-blooded animals the normal temperature of their internal atmosphere averages from 38° to 40° centigrade, and cannot exceed 45° or 50° above the freezing point of water, nor descend more than 15° or 20° below, without causing serious physiological perturbations, or even death, where changes are too sudden and severe. In hybernating animals the temperature may be gradually lowered further, suspending the manifestations of life by degrees in a state of complete lethargy, which may be continued in some cases a long time, where no variations of external temperature intervene.

"*Air* is necessary for the life of all animal and vegetable organisms; it is found therefore in their interior organic atmospheric medium. The three gases of external air, oxygen, nitrogen, and carbonic acid, are dissolved in the liquids in which organic elements or cells live and breathe like fish in water. The cessation of life by asphyxia is caused by the abstraction of oxygen. There is a constant exchange of these gases between the internal and the external atmosphere of all living bodies, but these exchanges are not the same in animals and in plants, since the latter absorb carbonic acid and liberate oxygen, while the former inhale oxygen and exhale carbonic acid, thus producing opposite effects upon the external atmosphere.

"*Pressure.*—The external pressure of the atmosphere is equal to 15 lbs. on the square inch, and will raise a column of mercury in a tube to the height of 32 inches? In the internal atmosphere of warm-blooded animals, the nutrient liquids circulate under a much higher degree of pressure; but this does not imply that organic elements or the cells of living tissue really support this pressure. These questions are but little understood as yet. It is known, however, that life cannot be supported in greatly rarefied air, because in those conditions, not only the gases of the atmosphere cannot be dissolved in the nutrient liquids, but the gases which were already dissolved in it escape. For instance, when a small animal is placed under an air-pump its lungs become oppressed by the gases which escape from the blood. Articulate animals can bear higher degrees of rarefaction in the air, and some fishes live under a great amount of pressure in deep seas.

"The *chemical composition* of external air is nearly constant, with some variations in the relative amounts of aqueous vapour and electrical conditions. The chemical composition of internal fluids is much more complex, and this complexity increases with that of the organism of the higher animals. The internal medium, as already stated, is always aqueous; containing in a state of solution definite kinds of saline and organic matter, with fixed properties of action and reaction. The lowest organisms have their own internal atmospheres; neither a microscopic animalcule nor a fish are penetrated by the water in which they live; and in the general internal medium of the higher animals, each organic element or microscopic cell has its own special internal medium, which is not penetrated by the liquid element in which it lives: thus the blood globule contains a liquid which differs from that of the liquid serum in which it swims or floats.

" *Organic conditions* are those which correspond to the evolution or to the modification of the vital properties of organic elements or cells. Variations in these conditions induce a certain number of general modifications, the chief features of which require to be noticed here. The manifestations of vital phenomena become more various, delicate, and active, as they rise in the scale of organisation; but, at the same time, they become more and more variously susceptible of perturbation and disease. And hence experimental physiology becomes more and more difficult as the organisms increase in their complexity.

Animal and vegetable species are separated by special conditions, which prevent them from ever being mingled in organic confusion; in this sense that fecundations, graftings, and transfusions cannot transform one species into another. These are very interesting problems, which, I think, may be reduced to a question of difference in the physico-chemical properties of the medium in which vital phenomena occur.

"In the same species of animal, different races present different physiological characteristics, which are very interesting to the experimental physiologist. In different races of dogs and horses I have noticed different degrees of vital properties in the organic elements of certain tissues, more especially in the nervous system. There are in fact peculiarities of physiological idiosyncrasy connected with special variations of histological elements in individuals of the same race. The same individual undergoes changes of this kind in different phases, from infancy to old age. From birth onwards vital phenomena become more intense until the meridian of life, when they gradually decline as age advances.

"Sex and the physiclogical changes of genital organs introduce sometimes profound modifications of vitality, especially in the lower animals. The physiological peculiarities of larvæ differ in some cases altogether from those of the perfect insect, in which genital organs are developed.

"Moulting sometimes causes profound modifications, and physiological experiments give different results in these different states of the organism. Hybernation also introduces great differences in the phenomena of life, especially with regard to physiological experiments on frogs and toads, which give different results in winter and in summer.

"States of active digestion and long fasting, health and debility, bring corresponding modifications in the relative degrees of intensity of vital phenomena, and the powers of resistance to narcotic and other poisons, as well as in the degrees of susceptibility to invasion by virulent or parasitical diseases.

"Habit is also a powerful means of modifying the system, and must be duly considered in the administration of toxic or medical substances."

These descriptions give a general idea of the internal conditions of cell life in the body, corresponding with the external conditions of life for the whole organism, showing that each cell has a life of its own, distinct from that of all others, in the collective society of its fellows, just as each individual animal has a life of its own in the midst of many others of the same species or of a different class. One kind of organic force gives a special physiological character to one kind of tissue, and another to another in the human body; and so it is even with the physical realms of external nature; and while the individual lease of life is very short compared with that of its own collective class or species, still the parallel holds good in all the realms, and in all degrees of life and organization.

The crust of the earth, the ocean, and the atmosphere have a perennial lease of life in their collective mass, although individual portions are incessantly undergoing changes of dissolution and reformation. The vegetable and the animal kingdoms are perennial in their collective mass, although incessantly losing and gaining individual members by proliferation and decay. The organizing physical forces of minerals are a mystery; the organizing physiological forces of plants are a mystery; and the same may be said of animal organic forces. These modes of motion alone in animals, plants, and minerals would never come within the limits of human comprehension, if we had no other means of observing the phenomena of nature; but when we investigate the higher manifestations of mysterious organic forces in the human soul, we have a clue to their essential nature in mental modes of motion and causation, thought and design, invention and creation, organization and perfective evolution: we then perceive that spontaneous organic forces of all kinds are governed by invariable laws, which are the same for all; and that these laws may be discovered in the phenomena of physical, physiological, psychological, and sociological evolution and progression. The laws of order are the same in principle for every kind of motion and mutation; in every world of visible and invisible phenomena; and wherever we discern any of these laws in known spheres of action, we have a key to their principles in unknown spheres of the creation.

The key being found we have still to learn how to place it in the lock; and when it is fairly in the lock, we have still to learn which way to turn it in the grooves. These are questions of investigative method which require penetrative ingenuity to master, as well as concentrative patience and perseverance. There is no royal road to science.

The ends and uses of microscopic diatomaceæ in the ocean are shown by vast accumulations of rocks of "aqueous formation." Minute organisms in countless myriads construct these strata by transforming the matter of igneous and other rocks (disintegrated by the waves and washings of the sea) to serve a manifest purpose, in cooperation with aquatic animals and vegetables of a higher order, depositing their remains, as a substratum of life and growth in future ages, when the beds of the ocean thus improved, shall have been elevated to form new islands and continents, for the development of still higher forms of animal and vegetable life. The history of the appearance and disappearance of many extinct species is thus written by the evolution and periodic oscillations (elevation and depression) of these rocks, and the organic remains which they enfold. Living animals and plants serve to modify the atmosphere and the ocean in physical and physiological mutation, while their organic remains improve the solid crust of the globe. All organic life serves to improve the face of the earth for future generations of mankind, whose mission is to accelerate and improve still further the progressive evolution of the epicosmic realms upon our planet. The ends and uses of the human body are subservient to those of the mind as a ruling factor in cooperation with Deity, in the government of the globe on which humanity is bound to live and to perform predestined uses. As a physical and mechanical instrument, physiologically formed and sustained in life for industrial uses, the human body is a temporary instrument for planetary and humanitary uses, and the dead remains subserve the same general purpose of reliquial genesis and palæontological history as the remains of other animal organisms.

The body of the individual dies, but that of the collective human race is constantly renewed, and therefore (within given limits) never dies, but grows and thrives in numbers and in relative perfectibility of form and feature, dexterity and usefulness, in parallel with the progressive evolution of the human mind; and in this sense it has a certain importance in connection with the spirit, which is ever striving to attain perfection.

RANK AND DESTINY OF MAN.

Whatever views may be entertained with regard to the origin of living creatures, we know that animals and plants come into visible existence and disappear in cycles of alternation, according to definite limits in the lease of life, pre-determined for individuals of each race. Some species of minute organism are limited to a few hours or days or weeks of natural life; others have a lease of months or years. Small types have short leases, while the larger have longer leases. A mouse can only live a few short years and die, when not cut off by accident, whereas an elephant may live a hundred years and more, when all conditions are well suited to prolonged existence.

Man himself is not more privileged in this respect than other species. Where do individuals come from and return to in these alternations? They come from an *ethereal* world of invisible physical conditions, and return to it on leaving this *material* world of visible conditions. All creatures are thus *amphimundane* in phenomenal modes of alternating life, just as some few are *amphibious*, inhabiting water and breathing atmospheric air, during their terrestrial career.

How do we know this? it may be asked; and we answer that positive experience of the life of disembodied human spirits, and their modes of communication with mortals in the flesh, have taught us that the soul lives in an ethereal world after the death of the material frame, and comes from the ethereal sphere when it is born into the natural world.

Visible suns and planets form the *cosmic* universe, and hence we call the invisible world a *hypercosmic* universe; phenomenal existence depends upon physical conditions, invisible to us in the one, visible in the other. Heat, light, electricity, and gravitation, are manifestations of an "*immaterial* force or substance," which only becomes visible and tangible to us by modes of motion which affect our senses.

The hypercosmic origin of man is therefore his descent from an ethereal world of form and life into a material world, by the processes of incarnation, rendered possible by those of procreation.

We know the hereditary origin of each species of animal or plant, and the rank it occupies on our globe. In the human species, hereditary birth and rank are deemed superior to mere progenitive genealogy in a moral and a social point of view. We have, therefore, a *hypercosmological*, a *cosmological*, and a *sociological* aspect of the question of human origin and destiny, rank and conditions of existence.

ORGANIC RANK.—Organic realms rank higher than the inorganic realms of epicosmic nature, because they possess *psychological* and *physiological*, as well as *physical*, depths of spontaneous energy and modes of motion; and human nature ranks higher than animal nature, because it possesses progressive *sociological* as well as determinative psychological spontaneity. The civilized races of humanity rank higher than the uncivilized, and the cultivated classes of civilized society higher than the uncultivated, because their rational and moral faculties are more developed. We say the highly cultivated classes, not the highly born and wealthy, because high birth and highest culture do not always go together, although they have a favourable chance of doing so.

Terrestrial humanity has always been guided hitherto by men of genius, who profess to have been inspired by angels or spirits which belong to celestial humanity, and therefore celestial humanity inhabiting an ethereal world, invisible to common mortals, and being more moral and enlightened than terrestrial humanity, ranks higher in the social hierarchy of creation. These facts being self-evident to the most enlightened minds, need not be here discussed, as we shall have to analyse them more completely when we deal with the principles and problems of sociology.

HUMAN DESTINY—The destiny of man on earth is evidently to organize society; create powerful artificial instruments of art, industry, and science; improve his own state (and that of all the realms of epicosmic nature submitted to his care), as a collective and progressive being, charged with the government and the amelioration of three natural kingdoms. The special destinies of each realm and class of organisms, are seen by the ends and uses they subserve in the general economy of life, while that of the human race, as a collective organism, is the most conspicuous of all.

The human body is a storehouse of latent forces for generating heat to enable the soul to perform mechanical work in a material world of physical conditions, and therefore the special destiny of an individual during his terrestrial career, is subordinate to the ends and uses of the race, as a collective and perennial organism incessantly progressing in its own improvement, and in that of all the realms of nature under its control,—not to mention its cooperation with higher powers in the general progress of all nature. Personal improvement, social improvement, realmic development, cosmical evolution and progress, are evidently more or less connected with the energies and uses, the growth and the destiny of mankind on earth,—not to mention the celestial evolution of humanity in hypercosmic worlds.

Synoptic tables are repulsive to many minds, but they are very useful to serious students. In practical physiology and medicine, the words *constitution*, *temperament*, *diathesis*, and *idiosyncrasy*, are seldom well defined, and often applied more or less indiscriminately to body or to mind. It is of great technical use, therefore, to distinguish *nutritional* diathesis from *alimentary* constitution, and *secretional* idiosyncrasy from *vascular* temperament,—not to mention all the other biological characteristics of the physiological organism enumerated and definitely classed in the following table.

It is easy to remember such distinctions contrasted in parallels thus :—

Alimentary *constitutions.*	1. Herbivorous. 2. Carnivorous. 3. Insectivorous. 4. Omnivorous.
Nutritional *diathesis.*	1. Frigid climatic. 2. Temperate climatic. 3. Genial climatic. 4. Tropical climatic.
Secretional *idiosyncrasy.*	1. Prolific, sterile. 2. Hirsute, glabrous. 3. Fat, lean. 4. Lithe or stiff.
Vascular *temperament.*	1. Lymphatic. 2. Nervous. 3. Bilious. 4. Sanguineous.

Accurate definitions suit rational thinkers.

BIOLOGICAL CHARACTERISTICS OF PHYSIOLOGICAL ORGANISM.

Z. External conditions, origin, and destiny.	R. *Ultramundane origin.* Functional uses and destiny on earth. Evolutive conditions of wealth & life on earth. C. *Hereditary origin* and rank of organisms.
Y. Physical health, vital diathesis.	*Relational infections* & renovations of the blood Functional elaborations of the blood. Evolutive phases of health and sickness. Congenital *health and diathesis.*

X. Physical habits and idiosyncrasy.	*Relational habits* of industry, idleness, &c. Functional uses of secretions, &c. Evolutive phases of secretional activity, &c. Congenital *idiosyncrasy.* (Fat, lean, &c.)
W. Vital impress and integrality.	*Relational impress of prolification, sterility, &c.* Functions of connective tissues. Evolutive impress of age, sex, race, &c. Congenital *beauty or ugliness.*
VII. VASCULAR CHARACTERISTICS.	*Relational vascular fluctuations.* Functions of vascular system. Evolutive vascular permutations. Congenital vascular *conformation.*
7. Vascular modes and degrees of action.	R. *Tidal modes of fluctuation.* F. Modes of respiration circulation urination E. Evolutive modes of change. Congenital degrees of *temperament.*
VI. ALIMENTIVE CHARACTERISTICS.	R. *Alimentary appetencies.* F. Alimentary functions. E. Evolutive phases of alimentation. C. Alimentary *conformation.*
6. Alimentive modes and degrees of action.	*Relational modes of procuring food.* Functional modes of digestion, &c. Evolutive modes of alimentive change. Congenital alimentary *constitution.*
V. GENERATIVE CHARACTERISTICS.	*Relational consanguinities.* Functions of generative system. Evolutive phases of sexual development. Congenital *conformation* of *sexes.*
5. Genetic modes and degrees of action.	*Relational modes of marriage, colonization, &c.* Functional modes of prolification, incubation, [&c. Evolutive modes of familyconnexion, &c. Congenital connubial *dispositions, &c.*
IV. ORGANIC MODALITY AND AMPHIBIETY.	*Relational modalities of amphibiety.* Functional amphibiety of nerves. Evolutive phases of bicorporeity. Congenital *depths of vitality.*
III. STATICAL BUILD AND STRENGTH.	R. *Relative strength of resistance. &c.* F. Functions of skeletal support, &c. E. Evolutive phases of strength, &c. C. Congenital *build of skeleton, &c.*
2. Motorial means and modes of motion.	R. *Relative velocity of motion.* F. Vibratory modes of motion, language, &c. E. Evolutive modes of change, &c. C. Means of *locomotion* (fins, legs, wings.)
II. DYNAMIC ENERGY AND ELASTICITY.	R. *Energy and elasticity* of organism. F. Motorial functions of muscles, &c. E. Phases of growth and decline. C. Symmetry of body and limbs.

1. Organic form and features.	R. *Conditions and sphere of action.* F. Radiatory modes of action. E. Phases of change, moultings, &c. C. Form and features of organism.
I. ORGANIC UNITY AND COMPLEXITY.	*Relational aspect, (vocations and aptitudes.)* Functional aspect of organic unity (skin, &c.) Evolutive aspect of organic unity. Congenital aspect of organic unity.

PART III.—SYSTEMATIC EMBRYOLOGY.

FOR practical purposes, we have surgical, descriptive, comparative, palæontological, pathological, and histological anatomy; and for methodical purposes, taxonomic or philosophical anatomy. In like manner we have descriptive, comparative, palæontological, pathological, histological, experimental physiology, and finally systematic or philosophical biology. The same distinctions apply to embryology.

In systematic anatomy we distinguish three orders of mechanism: *organic, relational,* and *connective,* already described. In systematic physiology we note *four general aspects* of the modes of action and relationship in all the mechanisms and systems: the *congenital,* the *evolutive,* the *functional,* and the *relational.* In systematic embryology we have also four general aspects to notice, namely, the *histogenetic,* the *metamorphic,* the *sociogenetic* or associative, and the *connective* or transitory. In other words, 1st, the genesis of fluids, cells, and tissues of all kinds; 2nd, the metamorphic evolution of all the complex organs formed of these elements; 3rd, the association of organs in groups and series, or apparatuses; these again in systems, mechanisms, and bilateral halves, in fed eral unity and community; and

4th, the connection of the fœtus with the maternal womb, and its connective adjuncts to be separated from the organism at birth.

CHAPTER I.—EMBRYOGENESIS.

All terrestrial life originates in the egg of an animal or the seed of a plant, and the only difference between the microscopic ovule of a mammal and the much larger egg of a bird, is not one of organic structure, but of relative quantities of elemental matter. A sufficient mass of nutrient substance is stored up in the egg of a bird, to serve for the whole period of incubation, while the minute ovule of a mammal finds additional supplies in the womb, as they are wanted in the process of gestation.

These facts were disputed by naturalists, until Van Baer, in 1827, proved their truth by repeated observations and experiments.

The matter of an egg is secreted from the blood by ovarian glands, just as milk is secreted by mammal glands; and the serum of the male is derived from the blood in the same manner. Eggs, milk, and blood, then, are equivalent nutrient substances, and nothing more. Neither the seed of the male nor the egg of the female contains an embryonic form of life, any more than the blood from which they are derived, nor the milk which nourishes an infant.

Evolution is not creation, in the ontological sense of the word. It is merely the incarnation of a pre-existent force and form of life. This is a question to be sifted thoroughly before the philosophy of life can be elucidated in connection with the phenomena of experiential existence.

Conditions of Evolution.—The requisites of incubation, both natural and artificial, are well known, and need hardly be noticed here, while the conditions of gestation call for brief description.

When the fecund ovule of a mammal escapes from the "Graafian vesicle" in the ovary, and falls into the fimbriated funnel mouth of the oviduct, passing into the uterus, it finds the internal surface of the womb in a turgescent state, covered with a thick layer of sero-mucous secretion, which serves as a matrix, for the nutrition and protection of the embryo; and in this matrix, the incipient processes of evolution are commenced.

EVOLUTION OF THE HUMAN EMBRYO.—The first process which occurs in the ovule is that by which the yolk is first divided into halves; these again are each divided and subdivided in geometrical progression, until the whole yolk becomes a mass of granular substance in globules, having the appearance of a mulberry, and hence has been denominated the "mulberry mass."

"An envelope is then formed around each of the minute globules of the yolk, converting it into a vesicle or cell, of which the contained particle is the nucleus. This occurs first to the peripheral portions of the mass, which form on the surface of the yolk a membrane of rudimental tissue, which tissue being thickened by the addition of new cells from the mass becomes what is called the *germinal membrane*, and forms a complete sac, surrounding the liquid yolk. The whole structure of the future embryo originates in its substance within this sac, and hence it has been called the *blastodermic vesicle*. On one portion of this germinal vesicle a number of cells accumulate to constitute what is called the *area germinativa* (a double row of cells in a line), in which all the structures of the permanent organism originate, whilst the germinal membrane itself subdivides into two layers (an inner "mucous" and an outer "serous"), between which is subsequently developed the "vascular" layer. The external layer becomes the integument, the internal forms the alimentary canal, and the middle gives origin to the vascular system."

The blastodermic sac around the surface of the yolk, is the first tissue formed of the cells, derived from the segmentation of the elemental substance, and all other tissues being formed progressively in the same manner, the initiative process of cell formation and tissue structure are simple, and easily understood; but the metamorphic processes not only form cells and threads of cells, weaving them into tissues, but they fold these tissues into sacs and complex organs of different forms, with a view to their ultimate association into groups and series of co-operative systems. Individual organs are connected in series, to form a special apparatus, and several of these form a system. Nature goes to work in building up the organism, according to a preconceived pattern, just as man builds houses and machines by simple and successive operations, according to a preconceived plan or architectural design. As M. Claude Bernard observes:—

"In the experimental investigation of histogenesis and embryogenesis, we might justify the words of Goethe, who compares nature to a great artist. Nature, in fact, does seem to proceed in the same manner as the artist in the manifestation of the creative ideas of their respective works. In the evolution of a living organism, we first behold a simple outline of the creature which appears before any definite form of organisation. The outward shapes of the body and the organs are first indicated in connection with the envelopes or scaffoldings which are to serve as temporary organs of protection and nutrition during fœtal life. No tissue is distinctly formed; the whole mass consists of embryonic or plasmatic cells. In this living mass of cells, however, the ideal design is already traced of an organism invisible to us, but in which the exact shape, structure, position, and function are assigned beforehand to each organ. Where blood vessels, nerves, muscles, or bones, are to be formed, there the plasmatic cells are transformed into blood globules, and special tissues of arteries and veins, nerves, muscles, bones, &c. The body is not formed at once; it is first faintly indicated, then slightly formed in parts, and gradually perfected by successive elementary differentiations and metamorphic transformations, more and more definite and perfect in all details, and finally complete in complex organic unity.

"The organising principle is not only manifest in the beginning of life in the ovum, the embryo, or the fœtus, but continues its work in the adult, by presiding over all the manifestations of vital phenomena. It is that power which carries on the work of nutrition, and incessantly renews the properties of the active cells and passive tissues of the living machine. Organisation is therefore no other than this generative power continued throughout life, becoming feebler by degrees until it disappears altogether at death.

"And thence it is that we include all the phenomena of organisation and nutrition, or of organic creation in the embryo, the fœtus, and the adult, under the denomination of *organotrophic* phenomena, because they are all subject to one and the same law."

COMPARATIVE EMBRYOLOGY.—All animal and vegetable organisms pass through a certain suite of metamorphic processes, from the simple egg or seed to the hereditary type of the species; and the successive forms of embryonic life in vertebrate animals of all classes are so very similar in the incipient stages of evolution, that many naturalists, before the microscope was much in use, believed them to be identical, while it is now shown, by actual observation, that although they are analogous in some respects, they are never really alike. Mr. Coste has adduced abundant examples of parallel phases of embryonic evolution in all classes, and in many different species of animals, not one of which, in any case, can be mistaken for another by an experienced eye. And Mr. Hubert has carried these investigations so far as to show not only that the eggs of one species are never known to give origin to the embryo of a different species, but that, in the eggs of some insects, such as hive-bees, those which are deposited at the first epoch of ovulation by the queen-bee, always give birth to females exclusively, while those of the second epoch always give birth to males.

The working bees, which build the cells, collect the honey and nurse the young, are well formed females, but never attain to puberty, and therefore remain unprolific. This arrest of growth is caused by limited supplies of honey for the larva to feed upon during its embryonic metamorphoses, and is a predetermined result of instinct in the species; for, when a full grown female or queen-bee is required for the hive at any time, the walls between several small cells are broken down to form one larger cell, in which an abundant supply of honey can be stored up to feed the larva of an ordinary female egg, and thus permit the full development of a prolific queen-bee or breeding female. All the drones or male bees arrive at puberty and are capable of procreation.

Where the eggs which are suited to the incarnative evolution of females are not suitable for males of the same species, we have direct proof of predetermined fitness even in the elemental preparations of life; and this is further corroborated by the experience of six thousand years of the last geological period, during which time no case has ever been known of the egg or seed of one species giving origin to the embryo of a different species, although numerous instances are known of different varieties or races proceeding from one common stock, under the influence of different climates, kinds of food, modes of domestication, and crossing of breeds. The microscope shows that every fact and every feature of embryonic life are different in each species, although they seem so much alike in the elemental substance of the egg, and in the early phases of their metamorphic evolution. We may discern a difference of taste in the egg of a duck and that of a pheasant, and more or less between the outward forms and sizes, colourings and maculations of all kinds of eggs; microscopic animalcules are something like the incipient embryos of higher animals, but never quite the same. The embryonic forms of fishes, reptiles, birds, and mammals, belonging to the same general type of vertebrate organisms, are something like each other in the earliest stages of their metamorphic evolution, but the arrested development of any one of them could never be an exact type of another, nor live as an individual organism. Already unlike each other at successive points of progress, where they seem to travel in different grooves on the same general line, they never stop at any of these analogous forms of embryonic life, as a complete living organism. Each type goes some distance beyond the point at which it bore resemblance to lower types at the same stage of progress, and diverges in a different direction to complete its evolution. A fish is much more perfectly developed in its kind than the embryo of any other animal at the pisciform stage; a reptile is also more perfectly developed in its kind than any higher animal at the reptiform point of parallel.

And so strongly are these differences marked in the beautiful "Preparations" of Professor Coste, at the College of France, that it can hardly be said that the human fœtus, in any of its embryonic phases, resembles a microscopic animalcule, a worm, or an insect, a fish or a frog, a bird or a mammalian fœtus of any species, as much as the human body in adult life resembles that of a dog or of a monkey. Sufficiently numerous observations and experiments of the phenomena of comparative embryogenesis, demonstrate beyond the possibility of doubt, that every special type of organism in the present geological period, is predetermined from the beginning to the end of its metamorphic evolution; and that the hereditary preparation of eggs or seeds for every distinct species of animal or plant (and even for the sexes of individuals in some known cases), is a predetermined fact in nature. Conditions change and individual features vary, to form different races by continuous improvements or deteriorations, but no species can mingle its race with that of a different species, so as to give origin to a prolific hybrid, as the source of a new type.

Nor do monstrous births in any case give origin to new species. Even the most extraordinary confusion of the parts in bodies, with two heads and more than two arms and legs, always show that the parts thus joined together in fœtal evolution, belong to individuals of the same species as the parents, and are just as easily recognised as normal embryos of the same race. It is, in fact, rare that such abnormal births can live at all, where they are more complicated than such cases as that of the Siamese twins, whose bodies were linked together by a fleshy ligament somewhere near the waist.

"As soon as evolution has fairly commenced," observes Milne Edwards, "in the embryos of vertebrate, articulate, and radiate types, the groupings of rudimental cells in the ganglionic centres of activity differ in each type of organism, being invariably located on one side only of the internal membrane of the blastoderm in vertebrata (which internal membrane gives origin afterwards to the alimentary tract), and on both sides of the intestinal tube in articulata, while in radiate types lines radiating from a central axis indicate the typical form of the embryo."

General and special differences of form and structure have been detected, not only in the embryos of different species, and the eggs before incubation has commenced, but in the very cells of which each kind of tissue is constituted in the formation of an embryo; as will be seen in the following quotation from the "*Principes generaux d'Histologie*," by M. Ch. Robin, Professor of Minute Anatomy at the "Faculté de Médecine," of Paris.

"Considered in itself, amorphous organised matter has no structure; but the anatomic elements composed of this matter, have a definite structure. A cell of vegetable or of animal tissue, tube, or fibre is an organised body, formed of organised matter. Some of the so-called anatomic elements have only the simplest forms of organised matter; such, for instance, are the homogeneous substances of cartilage, and the capsule of the crystalline lens; the amorphous marrow of the bones, the grey substance of the brain, &c.

"Generally speaking, however, each species of *anatomic element* has a still higher degree of organisation, and also a degree of organic structure peculiar to living bodies, namely, that of being composed of different sorts of organized substance; and these constituent elements of structure differ in form, volume, consistence, solubility, and colour. They differ also in their chemical composition and modes of reaction. Examples of these kinds of difference are found in the walls of a simple cell, the nucleus, the nucleolus, and the granular contents of the cell.

"One of the characteristics of organised substance, then, is that of not being identical in all the parts of an organism which it constitutes. In the interior of each anatomic element (endowed with a special configuration, mode of birth and development, along with its own proper mode of action) each portion in the state of nucleus, of granule, of liquid contents, is formed of an organised substance distinct from the other portions, both in its intrinsic composition and in the modes of molecular connection of its constituent elements.

"All these special characteristics of granulations, corpuscles, &c., which in their elements have a form proper to each, with special colours and modes of reaction, involve details of structure which must be noticed; for each of these individualities, however minute they be, plays a part which differs from that of others, insomuch as it has a different mode of chemical reaction, a different degree of consistence, &c. Each one absorbs the elements of nutrition, and eliminates waste matter, in a manner peculiar to itself in the two-fold function of assimilation and excretion.

"Thus, considered in itself, organic matter has no structure; while the anatomic elements, composed of this matter, have each a given form, distinct and characteristic. With this degree of definite structure in a higher order of organic synthesis, comes into view, in each typical species of *anatomic element*, either some peculiarities of their vegetative properties of life, exclusively, or combined with one or other of the properties of contractility and innervation, which belong to animal life alone.

"It is also demonstrated now, that each species of minute cell, fibre, or tube, differs from other species with regard to the *place* of its birth, and the *time* of its appearance, where a few moments before it had no existence, and also with regard to the mode in which it is formed out of the homogeneous substance from which it is derived.

"Each one is endowed with an individuality of form and structure, which is proper to itself, from the first; that is to say, it is not from one primordial type of cellule, embryonic or otherwise, that other species of anatomic elements, cells, fibres, or tubules are derived by metamorphic processes.

"Thus, in viewing minute anatomic elements in their vital unity of origin, birth, and development, although they have a sort of common origin in organised substance, it is not enough to observe in what manner the vitellus is transformed into a mass of cells by the process of segmentation, but in what manner these cells could be metamorphosed into muscular fibres in one place, elastic fibres in another, cartilage in one case, and nerve tissue in another.

"These and all other permanent anatomic elements succeed temporary embryonic cellules, but do not proceed from them literally in all their substance. Each special type has a proper history with regard to the locality, the epoch, and the mode of its genesis.

"But these permanent anatomic elements at the time of their birth, are not exactly like what they will be in their adult and senile states. After their birth, we must observe them experimentally during their phases of development. In this evolution each one is modified in a particular manner with regard to its *structure*, *form*, and *volume;* each one describes a special curve in its career, if we may use the word.

"It is during these phases of evolution, and when the changes have attained a certain definite degree, that the physiological qualities (animal and vegetative), peculiar to each species of anatomic element, become manifest for the first time in those special functions executed by each individual element. It is thus that *contractility* in muscular fibres, and *innervation* in the cellules and tubes of nervous tissues, only begin to be manifested by their anatomic elements when they have attained a certain degree of development of volume, form, and structure; so that the characteristic properties of their organic structure are acquired by processes of evolution. This is proved by the study of fœtal development, during which period of evolution, nothing can warrant us in supposing that any external influence can intervene suddenly to introduce, at a given moment, this or that peculiar animal endowment into anatomic elements, which previously had no such properties. In no case, either, do we ever see, during this development, any one species of anatomic element assume the characteristic qualities of any other species whatever. Such, for instance, as having commenced with the elastic element, and afterwards assumed those of a muscular fibre, or an element of nerve tissue.

Nor do we ever find a transition from elasticity to contractility, or from contractility to any mode of innervation."

Hence we see that the eggs and the embryos of every species are distinct from the beginning; and also that the very elements of tissue in the organisms derived from eggs are distinct in origin, form, structure, colour, consistency and modes of evolution, no one species of cells or tissue ever being derived from another by metamorphic processes.

CHAPTER II.—HISTOGENESIS.

VEGETAL HISTOLOGY.—More than a hundred thousand species of plants are known, and all derive their substance from a few simple elements, "always the same, though in various proportions."

"The main elements of vegetable substance are *carbon, nitrogen, oxygen, hydrogen;* the supplemental elements are *phosphorus, sulphur, chlorine, silicium, iron, manganese, calcium, magnesium, sodium, potassium.* These elements are not deposited in equal proportions throughout the various organs of a plant. As a general rule the leaves and the succulent parts of plants contain proportionally more of the mineral elements than the woody and coriaceous parts: herbs more than trees, leaves more than bark, and bark more than wood. Wherever evaporation is most active, as in the leaves and exposed surfaces, there accumulates the largest relative proportion of the purely mineral elements. To give a definite idea of these facts, we may state that herbs contain nearly eight per cent. of purely mineral substance: trees less than one per cent. The wood of trees contains 0.55 per cent.; the cambium, 2.65; bark, 7.14; leaves, 14.20; falling leaves, 6.60; evergreen leaves, 2.00; pods of peas, 5.50; peas, themselves, 3.10 per cent.

"Some of these mineral elements are more generally found in one part of a plant than in another. Silicium, chalk, oxydes of iron, sulphates, and chlorides, are more abundant in leaves and stems than in fruits and seeds, in which potash, magnesia, and phosphoric acid are predominant. In the ashes of wheat, for instance, we find the following relative proportions in the different parts of the plant:—

Ashes of Wheat.	In Roots.	In Straw.	In Seeds.	
Phosphoric acid	1.70	2.26	46.00	per cent.
Magnesium	1.97	3.92	13.77	„
Potash	2.87	15.8	32.50	„
Chalk	0.88	3.00	1.19	„

"Similar differences of proportion are found in the ashes of all plants without exception. The proportion of potash rises gradually from the root to the grain; that of phosphoric acid increases suddenly in the seeds. This displays the wonderful prevision and economy of nature. As the young plant is supported almost entirely during the first stages of its growth by the food stored up in the seed from which it springs, this food must supply abundantly all that is required by the germ for embryonic evolution. Just as the egg of a bird contains all the necessary elements of flesh and blood for a chick, during the period of incubation.

"Three of the organic elements, namely, carbon, hydrogen, and oxygen, are fouud in nearly constant proportions in every part of a plant, and in every species of herb or tree, while the proportion of nitrogen is always much greater in fruits and seeds, than in any other organ of a plant. This is accounted for on the same grounds of embryonic provision and necessity.

"In the whole substance of a plant or tree, carbon forms from 40 to 45 per cent. of the total weight; oxygen about as much, while hydrogen averages about 5 or 6 per cent.

"The simple elements which enter into the substance of a plant are found in a gaseous state in the surrounding air, and in a liquid and a solid form upon the earth. The gases are absorbed from the air by the leaves, while the liquid and the solid food is absorbed by the roots. The elements thus obtained are not formed at once into vegetable tissues and organs, but have to pass through intermediary stages of elaboration, by which simple elements are transformed into proximate elements."

The so-called proximate elements or transitional substances of plants, are defined and classed in the following table :—

	Carbohydrates.	*Nitrogenous substances.*
Insoluble in water.	Cellulose	
	Starch	Fibrine.
Partly soluble	Gum adragant	
	Pectine	
	Inuline	Casein.

	Carbohydrates.	*Nitrogenous substances.*
Soluble	Gum arabic	
	Mucilage	
	Grape sugar	
	Cane sugar..................	Albumen.

Animal Histology.—As simple elements are transformed into organic substances by the processes of vegetation, and from these mutable substances the tissues and the organs of a plant are nourished and increased in size, so again the complex substances contained in plants, together with the simple elements of air and water, are transformed into blood by animals, and from the blood thus formed, the tissues and the organs are derived. In both cases, however, we have to distinguish the physiological transformations of nutrient matter from the fixation of this matter in the shape of definite cells, tissues, and organs. Roots, stems, leaves, fruits, and seeds, are formed by modifications of the same substances; the tissues and organs of the animal body are formed by various modifications of the blood, which is itself elaborated from the air and water, food and drink ingested from the surrounding world.

About 70 different simple elements are found in the crust of our globe, but not more than 14 of these enter into the complex elements of plants, and not more than 16 are found in the most complex of animal organisms. These simple elements, however, are variously combined in the gaseous, the liquid, and the solid substances of animal and vegetable matter. Oxygen and nitrogen (being merely dissolved or loosely combined with "hæmatocrystalline" in the globules of blood or blood discs which float in the liquids of organic life) seem to act, as Claude Bernard observes,—

"In the character of simple elements, while such inorganic salts as phosphates, sulphates, and chlorides enter as constituent elements of structure, in complex tissues, just as they were formed in mineral nature before they were admitted into the animal economy. It is not so with other constituents of organic tissues, such as starch and sugar, albumen and fibrine, oil and fat, which are formed by means of animal or vegetable elaborations.

"These are organic elements, but they are not organized living tissues; not 'histological' elements, although necessary preparations for histological organization."

There are four aspects of elemental substance below that of an organic cell of living tissue. These may be classed as follows:—

Inorganic elements.	1. Radical elements (ethereal atoms?) 2. Simple elements (hydrogen, oxygen, &c.)
Organic elements.	3. Proximate elements (starch, gum, &c.) 4. Proliferal elements (eggs, seeds, &c.)

Radical elements are hypothetical definitions of that invisible substance which fills planetary space, and of which it is supposed ethereal bodies are composed.

Simple elements are those which cannot be decomposed by any known powers of chemical analysis, and are found in gaseous, liquid, and solid bodies.

Proximate organic elements, such as starch and sugar, are elaborated from simple inorganic elements by plants and animals, and when thus elaborated become fit for the nutrition of animal and vegetable organisms.

Proliferal organic elements are those which have been so completely elaborated by living plants or animals, as to suffice, under due conditions, for the reproduction of the species: the seeds of plants, and the eggs of animals, are above mere albumen and starch, or "protoplasm." An egg or a seed, however, being merely a latent germ, cannot rank as an active elementary organism, an anatomical element, or cell, of living tissue in a living body, and therefore it is classed with inanimate elements.

ANATOMICAL ELEMENTS.—The anatomical element of a living tissue is an individual organised cell, containing both simple and complex elements of matter—and this cell performs on a small scale, and in a qualified sense, the same operations of organic chemistry in the absorption, circulation, fermentation, precipitation, distillation, and incessant transformation of inorganic and organic substances, as a more complex animal or vegetable body. On this account it has been deemed necessary to define organic cells as *elementary organisms*, which, being associated together in great numbers, form living tissues; which tissues are again variously linked together to form special organs and systems in a complex organism. It is from this point of view that modern physiologists get at the root of physiological action, and experiment upon the different modes of influencing these primary elements and operations of the animal economy, for the benefit of medical science and the health of the community. The modes and degrees in which various substances, under definite conditions, act upon organic cells, and cause these to react upon each other in the tissues, can be determined in many cases by direct or indirect experiment. This affords a satisfactory basis for the development of physiology and physical therapeutics, while it raises them above the sphere of mere empirical observation and speculation.

The characteristics of a special kind of tissue give us at once those of the minute cells of which it is composed, just as the general vocation of an industrial or a scientific corporation of human beings, gives us a clue to that of each individual member. The nerves, the bones, the muscles, and the skin, are mainly composed of special kinds of tissue, although each contains some tissues which are more or less common to all. This is easily understood in descriptive anatomy, but physiologists deem it expedient to class simple tissues according to specific qualities and uses in healthy and morbid modes of action, apart from local combinations and associations in the organs. Serous membranes, for instance, form envelopes for the brain and spinal cord, the heart, the lungs, and nearly all the viscera, besides lining the internal surfaces of the walls of the chest and the abdomen. They are thus connected with other kinds of tissue in each special organ, and may be alone or mainly the seat of inflammation in any part of the body, while other tissues are not essentially involved. It is, therefore, often necessary to determine not only the special seat of disease, but the special tissue which is morbidly affected in any given region. The general anatomy of tissues is thus distinct from the descriptive anatomy of complex organs, and a distinct mode of classification is required, as in the following description by M. Claude Bernard :—

" The histological elements which constitute different tissues of the body may be classed in two main groups, defined as *active* and *passive*, in connection with a third or *neutral* group. The active histological elements, such as nerves, muscles, and glands, cannot act without being associated with other kinds of tissue. To form locomotive and secretive organs and systems, they must be held together by a sort of common bond, formed by what is called areolar connective tissue, and associated with *passive* tissues, such as the more solid, fibrous, elastic, cartilaginous, and osseous tissues. Whence it follows that the physiological function of any complex organ or apparatus in the body will always represent the combined action and reaction or characteristic properties of active and passive elemental tissues, united together by neutral or connective tissues.

"The *cellular* tissue, as defined by Bichat, is intercallated between all the elementary parts of the body, and serves at once as a universal means of connection and of separation. It is not only a sort of protective clothing for each elemental organ, but it serves also as a reservoir for the deposit of interstitial liquids and fat. All intervening spaces between fractional parts are thus more or less filled up, and a certain roundness and plumpness of form is given to the whole. It forms a kind of neutral system, then, a functional auxiliary to every other system, and is traversed in all directions by nerves and vessels, which establish vital relations between all the organs of the body. It is very lax and extensible under the skin, and easily permits of sliding motions amongst the organs. It also forms the *bursæ mucosæ* of joints, and the serous membranes which envelope the internal viscera. Less yielding and lax in other regions, it holds the organs in subjection, and prevents displacements which would be dangerous. It is easily permeated and distended by air or by water (as seen in cases of emphysema of the lungs, and in dropsy of the body or the limbs). Butchers inflate the bodies of slaughtered animals by means of air, to make a show in their shops; and anatomists often infiltrate water between delicate parts to separate them without cutting through fine nerves and vessels.

"The old anatomists considered this connective tissue as that from which all the others are derived, and modern anatomists show that it is really a vestige of the first forms of plastic tissue developed in the fœtus, and persisting after birth, as the bed or substratum in and from which all new organic formations arise.

"When distended by air or water this connective tissue seems to be lamellate, but that is only an appearance, for it is really fibrillate."

These distinctions of active, passive, and neutral tissues are not as definite and accurate as need be. There are, in fact, four kinds of connective tissue to be noticed, and of these some are both active and passive.

Connective tissues.
- H. Primary tissue.
- U. Glandular tissue.
- ∩. Adipous tissue.
- O. Areoloserous tissue.

Glandular tissues are excretive, adipous tissues are secretive, and areoloserous tissues are infiltrative and lubricative. Glandular tissues form epithelial and epidermic cells to protect external surfaces, and they extract certain products from the blood, such as milk and eggs, bile and urine, hair and wool, feathers and scales. Adipous tissues secrete fat and marrow, and thus form interstitial deposits of nutritive substance, which may be reabsorbed when wanted, and which serve meanwhile as cushions between neighbouring organs, to prevent concussion. Areolar tissues serve as links and connected coverings for every minute organ and for every general apparatus.

All these tissues have active, passive, and connective uses, and cannot be accurately defined by any one alone of these denominations, although sufficiently distinguished from other tissues by the word connective.

With these qualifications we accept Claude Bernard's definitions, and proceed with his descriptions :—

"*Fibrous tissue*, he observes, is anatomically constituted, like areolar connective tissue *(tissu cellulaire)* of fibrils, but is more closely and densely knit together, and thence becomes much more resistant. It enters into the contexture of almost all the organs of the body, forming the toughest element of the skin, of the intestinal canal, of excretory ducts and reservoirs, of arteries and veins. It unites muscles to bones, forms an exoskeletal sheath of support for the muscles, and connects different parts of the bony skeleton by the periosteum, the articular ligaments, capsules, &c. The *fibrous* tissue subserves all these uses by its peculiar properties of flexible *resistance* and *elasticity*. These properties, however, are not possessed in equal degrees by every variety of fibrous tissue; (some varieties are more flexible than elastic, as leather bands compared with bands of india-rubber) and though modern physiologists have given some attention to the various qualities of fibrous tissues they have not yet been thoroughly investigated and described from a histological point of view.

"The elasticity of fibrous tissue, like that of caoutchouc, is a force which is slow and continuous in action. It protects the organs by resisting all abrupt and violent motions, from whatever cause or quarter they may proceed. In the living body, the passive and elastic property of fibrous tissue seems to regulate and control the contractile properties of muscular tissue, which are active and instantaneous. In some cases the fibrous elastic tissue, acting in opposition to certain groups of muscles, regulates and moderates the different movements of the bony skeleton, as, for instance, the action of the yellow ligaments in the movements of the vertebral column, and that of the posterior cervical ligament. In other instances, the elastic tissue serves to lessen or deaden the shocks of sudden muscular contraction, in any given organ or set of organs. In the great arteries, the middle coat being formed of yellow elastic tissue serves to moderate the sudden shocks resulting from the violent contractions of the heart. This active force of the heart, instead of being converted into heat by resistance and friction against the walls of an unyielding tube, so as to be lost as an impulsive force, is on the contrary gathered up by the walls of the artery, and returned again to the same work of impulsion by the elasticity of the vessels, to continue the work of circulation. In the small arteries also it is found that elasticity antagonizes the contractility with which these minute vessels are endowed. When the circular muscular fibres of an artery contract, they compress and lessen the calibre of the elastic coat, and when the muscular tissue relaxes, the elastic tissue of the middle coat restores the vessel to its usual calibre.

"In all the muscles we recognize the *active* property of the contractile tissue, and the *passive* property of the elastic tissue which forms the sheath. Whenever a muscle contracts, it not only shortens itself and increases in breadth, but it shortens the elastic sheath or tube which surrounds it, and which offers some resistance, but the amount of active force lost in the fraction of a second which precedes the contraction of the muscle, is caught up by the sheath and restored in the form of elasticity, to concur in the shortening power of the muscle.

"The elasticity of fibrous tissue is a vital property, which is easily lost when nutrition ceases, and death ensues. This fact has been observed by M. Wertheim, and I have noted that muscular elasticity is a vital property, which may be diminished or benumbed by cold, and can be resuscitated by the influence of warmth.

"Fibrous tissue, combined with arthroidal elastic cartilage, forms a mixed kind of passive tissue, which plays an important part in the articulations of the bony skeleton.

Cartilaginous tissue proper forms permanently the skeleton of cartilaginous animals, and transitorily that of animals whose skeleton afterwards becomes osseous. The main properties of cartilaginous and osseous tissues are those of resistance and elasticity. They are passive tissues destined to form the framework of the living machine, as instruments of support and attachment for all the more active organs of vital manifestations. There are animals which have only an outward skeleton enveloping and supporting the internal viscera. Such are the articulate and arthropodic types (insects, spiders, lobsters, &c.). The exoskeletons of arthropods (beetles, &c.) though solid and elastic, are not formed of the same kind of tissue as the cartilaginous and bony endoskeletons of vertebrate animals. They are formed of a chitinous substance, more akin to ligneous tissue, or woody fibre. The *ligneous endoskeletons* of plants, the *chitinous exo* *skeletons* of insects, and the cartilaginous and osseous endoskeletons of vertebrate animals form a gradation of elastic and resistant tissues, unlike each other in structure, and yet analogous in their respective properties and uses. And although these passive tissues have mainly mechanical functions, they are living tissues, subject to organic laws of nutrition and renovation. (By putting saffron in the food of animals, Flourens was enabled to observe the course of nutrition, growth, and renovation in the bones.) These three orders of skeletal structure contain, nevertheless, a large proportion of mineral substance, by which they are preserved for countless ages, as fossil remains, buried in the earth. (We may here observe that vertebrate animals have both an endoskeleton of bone to which the muscles are attached, and an exoskeletal coat of fascia or fibrous tissue, which also give means of attachment and support to muscles and bones.)

"In all the passive tissues of organic structure, such as woody fibre, chitinous elastic tissue, cartilage and bone, animal fibrous tissue, and areolar fibrils of connective tissue, we may observe a family likeness. They seem to be derived from the same kind of primary tissue, which by various degrees of modification and evolution gives birth in each species to others of the same kind.

"PRIMARY TISSUE.—The histological element of cellular tissue is the *plasmatic cell*, the walls of which, instead of being rounded, have a star-like form, giving origin at each angle to exceedingly minute tubular elongations, which communicate with other star-like cells of the same kind, so as to constitute an organic network of hollow threads of cellular tissue. In what is called *mucous* cellular tissue, such as that which is found in the umbilical cord of the fœtus, and in the vitreous substance of the eyes of adults, the interstitial spaces of the cellular network are filled by a sort of mucous hyaline substance; whereas in the true areolar connective tissue these spaces are occupied by a fibrillary substance, which gives the connective network its main characteristic properties. Whether we regard this fibrillary substance as a distinct kind of tissue, or merely as the dried up remains of the hollow threads communicating with each other, one thing is certain, which is, that the plasmatic cellular tissue of hollow threads is in a perpetual state of nutrition, renovation, and proliferation. The plasmatic cell of primary tissue has numerous points of similarity and analogy with the embryonic cell. In both cases the cell has no definite form of wall, for we regard the star-like excrescences as secondary prolongations of the primary cell.

"*Fibrous tissue.*—The histological element of fibrons tissue is not radically different from that of areolar connective tissue. It is always a plasmatic cell, of a starlike shape, with numerous secondary prolongations; a true product of fibrillar secretion, and more or less endowed with elasticity and powers of resistance, according to its particular rank in the scale of elastic tissues. The cellular sheathings and their filaments constitute the *fundamental* substance of fibrous tissues, in which the old plasmatic cells die while new ones are evolved; just as in epidermic tissue where the cuticle is the product of the flattened envelopes of the active cells of the glandulo-mucous membrane incessantly renewed.

"*Cartilaginous tissue.*—In cartilage we have again the plasmatic cell, clothing itself with a secondary kind of sheath in a rounded or a starlike form according to the special kind of cartilage thus formed. Then comes an interstitial secretion, which constitutes the *fundamental* substance and the distinguishing characteristic of cartilage. It is just the same with bone: around the plasmatic cell an osseous corpuscle or sheath, with hollow threads of bony structure, forms the nucleus of an osseous network; and the interstitial spaces of this web are filled with a secretion of chalk substance, which gives to bone its characteristic hardness and powers of resistance. Cartilaginous and bony cells, like those of other tissues, are incessantly being reproduced. It is under the periosteum and in the medullary canal that the active operations of osseous regeneration are observed. Bony tissue is not, as it was formerly supposed to be, a cartilaginous tissue incrusted by calcareous deposits. Bone and cartilage have distinct origins, and modes of evolution.

"To conclude, we may state that all the *passive* tissues of the body are products of extra cellular interstitial secretions, which secretions form a kind of cement to bind together the active elements of the tissue. (The characteristic properties of the secretions or interstitial deposits reveal the characteristic functions of the secreting plasmatic cells in each kind of tissue.) In some cases the secreted products consist of cells in fibrillary substance, flexible, resistant, or elastic, as observed in the areolar connective, the fibrous, the elastic, and the cartilaginous tissues; in others, the walls of the secondary sheathings of plasmatic cells, which constitute the passive tissues of animals or plants, are incrusted with mineral salts, as in the woody, chitinous, and osseous tissues."

From this it is clear that the so called plasmatic cellular tissue is the rudimental type of all the tissues; and that, as in glandular tissues, one species secretes milk, another, eggs, a third, bile, a fourth, saliva, and so on through the whole scale of grandular secretions; so one kind of areolar connective tissue secretes elastic fibre, another cartilage, bone, hair and cuticle, teeth and claws, and so on through the whole range of organs and systems; the nature and function of the active cells being manifested by the secretions, or excretions, or interstitial deposits and incrustations of the tissue. Adipous cells secrete fat and form fatty deposits; glandular cells secrete many different kinds of substance, such as milk and urine, which they eliminate from the blood, to be expelled from the system; glandulo-mucous cells secrete hair, nails, and cuticle, which they deposit as tissues to clothe and protect the body from external danger, or to arm it with claws for aggressive warfare, or for delving and burrowing labour. Areolar connective tissue, here given as the type of all the others, secretes serum from the blood to lubricate the contiguous surfaces of organs and prevent destructive friction. It is thus quite as distinct from other plastic cell tissues, as bone is from cartilage, or tendon, ligament, and fibrous fascia or sheathings, are from other kinds of tissue. Each active cell in all the tissues is no doubt as much like every other plastic cell, as one man is like another in general form and feature, where the industrial vocations are entirely different, as in the case of carpenters and builders, weavers and mechanics, compared with gardeners and farm-labourers, cooks and housemaids, grooms and coachmen, road makers and merchants, magistrates and rulers, soldiers and policemen, nurses and warders, subserving various uses in the general community for the common good of all concerned.

M. Claude Bernard himself confirms this view, when he says that,—

"Although the secretions of the so called passive tissues differ in many respects from the formation of the active tissues, it is easy to perceive that the processes of organic evolution are essentially alike in both cases. We may regard all the tissues and all the liquids of the animal economy as products of the secretions of vital organic cells incessantly occupied in the work of regeneration; the only difference being that the products of secretion are predestined for different uses. In some cases the product of secretion has a semifluid consistence, and is deposited within the intercellular spaces for special uses, such as those of nerves and muscles; these substances fulfil their active vital uses within the cell itself which formed them, whether they retain the form of cells, or assume the form of fibres. In other cases the products of secretion are liquid, become extracellular, and subserve physico-chemical uses as *external secretions* (saliva, &c.) to be afterwards expelled, or as *internal secretions*, to be retained. In other instances, again, the products of secretion form a solid intercellular deposit to be retained *eodem loco* for special physico-mechanical purposes and uses, as in the osseous and cartilaginous tissues already noticed."

The chief *property* of muscular tissue is *contractility;* that of tendon, *flexibility;* the property of nerve fibre is conduction or *neurility.* The *sensitivity* of tissues in the animal economy is analogous to that of the sensitive plant. The physiological *property* of glandular tissue is *secretion* or dialysis; that of adipous tissue is also a special kind of dialysis; and all these *properties* of tissue in the lowest forms of animal life are analogous to corresponding properties of vegetable tissue. Plants live and thrive and propagate their species in various ways, just as animals live and thrive and reproduce their kind. Physiological vitality and sensitivity in animals and plants are quite distinct from sensation and volition, or psycho-sensibility and perception in animals and in man.

Feelings, sensations, emotions, and impressions, are words often used synonymously, and no great inconvenience arises from the custom, but technical definitions require more precision, and should distinguish the feelings and activities of the *sensitive* body of an animal or a plant, from the feelings and emotions of an instinctual soul.

The soul feels more or less consciously in all the nervous centres, and reacts from all upon the corresponding peripheral organs, in cooperation with mere physiological sensitivity and vitality; but as Mr. G. H. Lewis well observes :—" There is a hierarchal order of morphological arrangement in the nervous centres culminating in the brain, which is the highest centre of sensation and volition, controlling the subordinate centres as the commander in chief of an army directs the movements of officers and men under his command; although both officers and men have wills of their own, enabling them to act individually and in groups, without their chief, and in his absence. Hence, not only physiological vitality may continue in the body, when the brain of an animal has been removed, but certain reflex motions, and semi-conscious sensations, and volitions, are observed to occur, as long as life is maintained after the ablation of the cerebrum."

CHAPTER III.—ASSOCIATION OF SYSTEMS AND SERIES.

And now, what are the results of organic processes and metamorphic evolution in the fœtus? First, the formation of anatomic elements or cells to constitute different classes of tissues; secondly, the associations of these tissues into co-operative organs and systems, united in one complex physical organism, as an instrument to be under the control of an incarnate intellect and will. All the factors may be summed up in the following table :—

ASSOCIATIVE UNITY OF ORGANISM.

Connective Principle.	Z.	Ontological soul.
	Y.	Ultramundane pre-existence and resurrection.
	X.	Intramundane incarnation.
	W.	Mundane career of development.
Associative Combination.	VII.	*Concentric* association of organisms.
	7.	*Bilateral* alliances of hemialities.
	VI.	*Involutive* association of mechanisms.
	6.	*Co-operative* alliances of systems.
	V.	*Conjugative* association of series.
	5.	*Contiguous* alliances of organs.

Constituent cells and tissues.	IV.	Telegraphic conductor tissues.
	III.	Statical, resistant tissues.
	2.	Flexible and elastic tissues.
	II.	Motorial or contractile tissues.
	1.	Protective secretions.
	I.	Constituent cells, "anatomic elements."

Constituent cells and tissues have already been explained in the chapter on histology; associative combinations, in anatomy; but a few words are required on the *connective modes of life* before and after natural existence.

It is evident that the matter of the body derived from external nature is organized by a force analogous to that of vegetable form and life, but we do not find mental forces in minerals and plants, and therefore the forces of the human spirit come from an unseen world, through the intermediate lymbo of metamorphic evolution; and when after birth they become manifest in physiological life, we find other kinds of energy to be analysed and understood, forming as it were a spiritual unity, independent of the mortal body, before incarnation, and partially independent of it, for short intervals of time, during states of sleep and trance. The spirit has an ethereal form before it comes into this world, and while it remains in it, and hence *bicorporeity* is a characteristic of terrestrial existence. The spirit in its ethereal form controls the vegetative and chemical operations of the earthly frame, but these forces are partly independent in physiological modes of motion, just as physio-sensitivity in plants and in animals is distinct from psycho-sensitivity in animals and in man.

Sensation and instinct, perception and scientific thought, emotions and volitions belong to the spirit, independently of the mortal body. We have now to analyse, therefore, the instinct, the mind, and the will, as distinct factors of biological unity; but we must first review the characteristics of the physical organism, as an apparatus for generating a continuous average of heat, the necessary force to be applied in mechanical work or bodily activity during the temporary existence of the spirit in this natural world.

It was formerly believed that every particle of matter was renewed in the external frame once in seven years, but experimental science has reduced the years to weeks.

Flourens found that the bones of animals were tinged throughout with red, after putting saffron into their food during the previous month, and that the colour gradually disappeared from the centre of the bones outwards in the course of another month.

It has been observed that six months or more are required to pare away the length of the nail as fast as it grows and is renewed; but this does not affect the question, since the horny substance of a nail or a claw is merely a secretion of eliminated matter, and the ratio of secretions and eliminations differ in local organs. The mammal glands only secrete milk at given times for special purposes, while the glands of the digestive system secrete and reabsorb very large quantities for every meal.

The elements of the blood are renewed daily in large quantities by the air we breathe and the meals we take, while the waste of the system is eliminated in equal quantities or thereabouts, in healthy adult life (though not in childhood), and the heat of the body is generated by the chemical exchanges, which occur in these slow physiological combustions.

When the source of heat becomes exhausted, the working power is lost. The spirit leaves the useless mechanism, and allies itself with other forms of working force which are very numerous in nature, and being convertible with heat, are just as efficient. Light, electricity, and magnetism, chemical affinity, and gravitation are some of the known "immaterial forces," which are convertible with heat, and with which the spirit may ally itself for working purposes, in any world where sensible heat is not the only mode of motion, nor the main source of mechanical force.

Light may be as powerful a source of motive power in celestial space, as heat is in the natural world; and spirits allied to ethereal bodies generating light or magnetism may be as much more active than souls allied to natural bodies generating heat, as the known velocity of light, or gravitation compared with that of heat in any medium. Velocity is known to be a cause of invisibility to us. We cannot see a thing which moves with more than a measurably slow motion; we cannot hear a sound proceeding from vibrations of immense rapidity. Light and magnetism exist apart from sensible heat in the cold Polar regions of the earth, and on the tops of snow-capped mountains.

We can thus easily conceive that a body of invisible ether may combine with the gentle force of heat derived from the blood of the mother in the womb during the metamorphic processes of incarnation. The concentration of the solar rays of light produces intense degrees of heat, by being converged in the focus of a convex lens.

The question seems puzzling at first, just as it seems difficult to understand that the sun does not rise and set, but that the earth itself turns its face towards the sun at morn and from the sun at eve. The apparent motions of the sun are only real motions of the earth, and so the apparent materiality of nature is only a real state or condition of invisible atomic forces. It is well known that matter is composed of atoms, and these are said by the most learned chemists to be composed of "immaterial points of force." It is then the composition and decomposition of atomic forces, which make and unmake visible forms of substance.

Thus the problem of life and immortality becomes a question of immaterial forces and *convertibility* of modes of motion. Are there more kinds of force than one? The chemist cannot convert physical atomic forces into living plants or animals, but he can see no difference between inorganic and organic combinations and mutations. He does not go quite so far as the poet Wordsworth, who told Charles Lamb "he could write like Shakespeare, if he had a mind." The chemist has not ventured to say he could form living beings if he had a mind, but he approaches that point of assumption; and we may certainly admit with him as Charles Lamb admitted with Wordsworth, that "it is only a question of having the mind." As Dubois Raymond in his animal electricity openly avows that he sees no difference between atomic forces actively undergoing changes in a corpse, and the same atomic forces undergoing changes in the living body; and as he includes the whole problem of chemical, physiological, and psychological forces within these atomic limits of spontaneous action and reaction, we may admit that *he sees* no difference; and that is only a question of *insight*. It may be nevertheless true that immaterial spiritual forces unite with immaterial physical forces in both mortal and immortal forms of being.

CHAPTER IV.—UTERINE CONNECTIVES.

When the germs which pass from the ovary into the womb are not fecundated, they have no power to remain attached to the tumid walls, but speedily dissolve in the fluid exudation, and pass away with the menstrual flux of this organic lymph, strongly or slightly tinged with blood.

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When the fecund ovum is safely lodged it speedily enlarges in size and forms a membraneous envelope with numerous villi to imbibe the lymph; and by degrees more perfect envelopes are formed within this earliest chorion to establish intimate connection between the circulatory apparatus of the fœtus and the uterine circulation of the parent. Blood vessels, proceeding from the arteries of the fœtus, and returning from the placenta with blood circulating to all the tissues of the incipient organism, establish a nutrient connection between the parent and the offspring of a more complex order than the first rudimental connection of the minute ovum and its villous chorion with the tumid walls of the uterus.

The maternal placenta is a kind of cellular formation, in which venous sinuses are formed in connection with the distended blood vessels of the uterus on the one hand, and with the ramified capillary extremities of the umbilical vessels of the fœtus, on the other; and by this means the placenta draws nutrient fluid from the blood, for the fœtus in the womb, just as the mammal glands draw milk from the blood, for the infant after it is born. The mammal glands are permanent, however, while the uterine placenta is a temporary organ, which may be as easily formed when necessary as the cuticle of the external skin may be thickened in any part, and as easily detached without injury when no longer useful. The placental organ becomes inactive when the fœtus has completed all the operations of metamorphic evolution, and then the mammal glands become excited to draw nutrient fluids from the blood to continue the process of nutrition in the infant, until its teeth appear, enabling it to masticate a different kind of food, which will gradually render it completely independent of the mother's milk.

The early villous chorion of the embryo is absorbed, and disappears while the amnion has been formed and a placental circulation fully established. When the fœtus is completely formed and born into the world, its organic connectives with the womb become entirely useless, and are separated from the child and from the mother, to be ejected from the womb as an "after-birth," soon after parturition. The fœtus had itself, however, formed these connective organs, and, therefore, we include them in the biological unity of Forces which have formed the body in utero, and continue to regenerate it during its terrestrial lease of life.

The parents are distinct from this vital principle, although they are associated with it intimately as procreative agents of generation.

This leads to the genealogical aspect of the question.

PART IV.—GENEALOGY.

PROBLEMS of genealogy, traced back as far as we can go, are more or less involved with those of creation. It is commonly thought that when a child is conceived in the womb, its spirit is created, to live awhile in this world and die here, to live for ever after in the spiritual world. Immortality does not thus precede natural life. Procreation is deemed one with actual creation. In other words, man and all other creatures were first created some few thousand years ago, and then endowed with power to "increase and multiply," or procreate (and really create) individuals of their own species from generation to generation in all future time.

This hypothesis is only modified a little by those who reject the Book of Genesis, and substitute a theory of natural evolution for that of Divine Creation. How then should we deal with such a problem? Can we rise from the known facts and laws of nature to the unknown, by experimental and rational modes of investigation?

We have great abundance of experience with regard to the genesis and metamorphic evolution, but none of actual creation. We cannot even imagine how nothing could become something by what is termed "creation," but we may conceive that the Divine Mind, which is eternal, can eternally conceive designs of creative evolutions or tranformations of elements and forces, which are eternal in essence, and absolutely indestructible. This view identifies creation with a designing mind in the Creator, and metamorphic evolution in the creature, as a transitory phase of existence, and a necessary form of thought in the experiential human mind.

What then are the known data of evolution in any realm or class of beings? And how far can we identify procreation with creation in such data?

Omne vivum ex ovo is an axiom of natural science. What is an egg, or a seed? It is a homogeneous mass of organic substance "without form and void," of life and organization, before being hatched. Secretion, fecundation, and ovulation are the phenomena of procreation, while incubation is supposed to be the *cause* of creation, or metamorphic evolution in a bird. But this is a very limited view of the question, involved in much more general data, which may enable us to stand on higher grounds of known phenomena to look into the unknown. We have all the realms of nature before us, with the experience of humanity to guide us in the maze of known phenomena and laws of evolution. What, then, is the experience of humanity? Generations follow generations in the history of the race; and at the present time about a thousand millions of human beings have individually but a short lease of life upon the earth. This number is perennially maintained by alternating evolutions of individual existence. A man is nine months in his mother's womb before he sees the light. When born into the world he has an *average* lease of life of 30 years or thereabout; a natural lease of "threescore years and ten;" seldom a hundred years or more. At the end of his short lease he casts off the "mortal coil" to enter on a new career of happiness or misery in the spiritual spheres. There are then always some millions of human beings in the limbic state of metamorphic evolution, some thousand millions or more in the working world, and about one hundred thousand daily leaving this world for another. Thirty years being the average of human life, a thousand millions are renewed once in that period at the rate of thirty-three millions annually; and as three-fourths of a year are required for gestation, about twenty-five millions are in limbo constantly, on their way to birth, in order to keep up the average number of a thousand millions. Where deaths are equal or nearly equal, one hundred thousand are entering the spiritual world every day; and this rate of increase having been maintained for thousands of years, six thousand times thrity-three millions of human beings, or thereabout, would amount to nearly two hundred thousand millions, and probably more, which must somewhat crowd the spiritual world, one would think, if no further emigration should ensue.

It is affirmed by some seers that migrations do occur in the spiritual world; that some spirits go to other planets for a change, while others return to this world by reincarnation; thus forming a perpetual round of existence in the spiritual, the incarnative, and the natural world, not to mention the purgatorial limbo of resurrection on their way back to the spiritual spheres.

This hypothesis separates primitive creation from actual procreation, and even from metamorphic evolution by supposing immortality to precede incarnation as well as follow decarnation. It may be repulsive to many minds, but it is not irrational. It does not leave the human mind to be evolved from matter, but deems it really immortal, and indestructible as a constituent portion of infinite mind and determinative energy.

Such a view is not pantheistic in the vulgar sense of the word, because it does not *confound* the finite with the infinite as "unica substantia" without hierarchal ranks of order and degrees, from the lowest imperfect human to the All Perfect and Divine.

No other theory can so well harmonize infinite with finite being, or eternal existence with temporary evolutions of life and organization. Narrowing the problem does not make it simpler, but renders it insoluble to suit a narrow mind.

Should we not inquire into these mysteries, because some grown-up children are afraid of entering into caverns?

CHAPTER I.—CONDITIONS OF INCARNATION.

We do not know how the first germs of animal and vegetable organisms were generated, but we know how they are reproduced by the animals and plants of our epoch. The seeds of plants are produced by sexual and asexual modes of generation, and the same may be said of the ova of some of the zoophytes, while the higher forms of animals and plants reproduce their eggs and seeds by the intervention of the sexes. Male and female secretions are united by fecundation, and in the case of birds, after the white of the egg and the outward shell are added to the impregnated yolk, the egg is extruded, and placed with others in a nest ready for incubation.

The eggs of birds may be hatched by artificial heat, and the eggs of many fishes and reptiles are habitually hatched by the natural heat of the sun in water or on land. The secretion, impregnation, and ovulation of the egg are the main processes, then, of ovagenesis, which precedes incubation, embryogenesis, and eclosion or parturition.

In the higher animals and in man, the fecund ovum is not extruded from the body of the female parent to undergo the process of incubation, but is deposited as a minute vesicle in the womb, where it finds a turgid layer of nutritive substance already prepared, in which it is embedded, and from which it absorbs new matter to increase its volume as necessity requires. After this process of absorption and increase of size have proceeded to a certain extent, a more definite vascular connection is established between the embryo and its nutritive supply of blood, during the rest of the natural period of gestation, which varies in different animals, as the periods of incubation vary with different species of birds. Small birds hatch their eggs in a few weeks, while larger birds require twice as long or more, in many cases. The smaller animals gestate but a few weeks, while the largest require some months; the dog about two months, the horse about nine, the elephant about a year.

The formation of the egg before ovulation occurs, differs altogether from the metamorphic evolution of the embryo within the substance of the egg, during incubation or gestation. Ovagenesis and embryogenesis are distinct processes of nature, and therefore should not be confounded in a systematic analysis.

Progenesis is the act of progenitors; embryogenesis is the act of the incarnative soul, which forms its own body by associating the atoms of substance prepared in the egg, to form organic cells and fibres, tissues and organs, within the complex unit, in accordance with the progenetic type from which the egg was first derived.

To what extent the offspring may in all cases resemble that of its progenitors, or in some cases be modified by inherent qualities, or by incident conditions, is but little known at present, although numerous facts of variability within given limits are well known to occur, and some of the most eminent naturalists of antiquity have supposed, (and many moderns still suppose) that all the known forms of animal and vegetable organisms may have been gradually "evolved from a few primitive germs or seeds, and possibly from only one," itself derived from "protoplasmic" substance in primæval mud.

Numerous varieties of the human race exist on earth, but they all belong to one species, and are fruitful in marriage with each other. Some philosophers assume different origins for each human race, while others deem difference of habit, food, climate and education during thousands of years to be sufficient to account for all the varieties of colour and complexion, conformation, and intelligence, which are observed in different races of mankind. There are also numerous varieties of race in each species of animals and plants, supposed to be the result of different conditions of life and reproduction for successive generations during long ages of existence. Dogs and horses, pigs and cattle, are easily modified in form and stature, build and colour by crossing the breeds, and modifying the conditions of food and climate, care and training. The same may be said of numerous varieties of plants; but there are definite limits to these modifications of form by means of affiliation and hybridization; which limits are marked by ultimate sterilization, or reproductive impuissance in the offspring of congeneric species, such as those of the horse and the ass for instance, or the hare and the rabbit. Procreative limits forbid heterogenesis in the present phase of natural evolution, and may, for ought we know, have done so from the first; but it is easier for man to conceive the possible evolution of one type from another, by the occurrence of heterogenetic phenomena and cosmic changes of condition, at regular intervals of time, than to imagine the possibility of a man, or any of the higher animals being created at once in their present form, without progenitors to suckle them in infancy, and foster them while young.

We see minute vesicles give birth to all the lowest forms of life, and many of the higher types of animals (such as fishes, reptiles, and birds) proceed from eggs, requiring little or no care from their progenitors after being hatched, while animals which are formed in the womb, and require suckling after birth, originating from a simple ovum like those which are hatched by incubation, seem to be impossible as primitive creations without parents, and therefore may possibly have been derived at first by heterogenesis from oviparous types becoming in some instances viviparous.

The eggs of sharks are hatched within the body. The ova of marsupial mammalia become rudimental embryos in utero, without placental connection, and are then expelled to be received in an external pouch, to complete their metamorphic evolution by lacteal gestation.

Embryonic, placental or fœtal, and lacteal or infantine degrees and modes of gestation are not only successive, but diverse processes in the collective vertebrate realm, and may have been consecutive at long intervals of time, as well as in uninterrupted phases of metamorphic evolution.

There is in actual experience then, a graduated scale of diverse embryonic processes, from which it has been supposed that some fishes might assume the form of serpents, or other reptiles; some reptiles assume the form of birds; some birds the form of bats; some insectivorous bats grow to the size of the frugivorous bats; these again give birth to the galeopithecus, which might give origin by some accident or other to a lemur, and these again multiply and vary as we see them now, until some of them gave origin to monkeys of all grades; some forms of anthropoïd apes at last giving origin to different races of mankind.

This of course is mere hypothesis, with very little to support it, in the known phenomena of variability within procreative limits at the present day; but still it is easier to imagine such a process of evolution from the lowest types of organism up to the highest, by slow degrees of transformation during millions of ages, than to imagine how the Creator could form at once the higher animals and man in adult pairs, without progenitors; or foster them in infancy (supposing them to have proceeded from primordial ova by metamorphic processes as chicks are hatched at the present day) without a mother's breast; and thence it is that the Darwinian idea meets with more ready acceptance in many minds, than the simple question of "Who knows, or can pretend to know, how any of the creatures, which inhabit our planet, first came into natural existence?"

The appearance and disappearance of certain species of animals and plants, as registered in the successive strata of the crust of the globe, seem to favour the idea of heterogenetic evolution, but that is all that can be said for it; nothing positively known to actual experience warrants the assumption of a definite belief on such a question. The mystery is still a mystery, and though no harm can possibly arise from any reasonable supposition, and much good has certainly been done to progressive science by the Darwinian hypothesis in promoting systematic study and investigation, we may safely say we cannot fathom the enigma; we urge inquiry by opposing known facts to speculative theory, that something useful may come out of the clash of thought and the contrasted energies of different modes of observation and ratiocination.

It cannot make any real difference to religious faith and hope, whatever were the modes of generation or evolution by which the Creator brought different species of animals into existence, but it would be highly interesting to discover the real processes of primitive origination; and nothing promotes real investigation so well as opposite modes of speculation. Nor does it matter on which side of the controversy we range ourselves, as long as we work sincerely and vigorously in search of valid evidence to support our favourite ideas of nature and her modes of action. "*Magna est veritas et prevalebat*," but we cannot modestly pretend that she is either on one side or the other of a special controversy, while it is possible and not improbable that she may be equally far from both.

We are told in Genesis that "the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life;" but how He did it is still a mystery, beyond the ken of human understanding; and whichever view we take of primitive creation, it is equally miraculous and different from all known modes of generation. Prehistoric man, like other animals, was made of the dust of the ground, but the breath of spiritual life was not breathed into the nostrils or perceptive faculties of his understanding until God himself, (the God of Revelation speaking to man as angels, or messengers from heaven, speak, in the form of a Divine man,) revealed Himself to Adam, the first terrestrial man raised to a state of spiritual understanding above that of human animality.

GENEALOGICAL MIRACLES.—The spontaneous creation of an organized cell of matter, such as an animal or vegetable vesicle would be a miracle beyond our ken of natural laws; the evolution of one species from another would be a miracle transcending our present knowledge of generative phenomena; the creation of the higher animals and of man without the intervention of earthly parents, cannot be deemed less than miraculous; and therefore whichever view we take of the origin of organic vesicles, of different species of animals and plants, of the creation of mankind, we are always floating in the realms of mystery and miracle.

And yet numerous phenomena of generation by reproductive species of animals and plants give us an idea of various modes and conditions of incarnation, which may ultimately lead to a discovery of the mystery of epicosmic creation or evolution, in connection with alternations of existence in different worlds.

The Eternal.—We should have some clear notion of what we regard as uncreate or indestructible; what we understand by the creation of mutable worlds, and the living finite creatures which inhabit them; what we wish to denote by the words *causation, organization,* and *disorganization,* in the continuous appearance and disappearance of organisms inhabiting created worlds. When a man constructs a locomotive engine, he does not create the materials of which it is composed. He is only a secondary cause in the formation of the engine. There are, then, secondary causes of organization and construction in nature, as well as a primary cause of creation.

We do not know when God created the world we live in, and the creatures which inhabit it, but we may rationally suppose, that when created, they were endowed, as we find them now, with inherent powers of spontaneous motion and mutation, under given conditions, as a means of fulfilling the ends for which they were designed.

Mineral elements and forces manifest inherent properties; vegetable organisms and forces manifest inherent properties; animal organisms and forces manifest inherent qualities; human beings manifest inherent qualities; superhuman finite beings may possess divine attributes; yet none of these can be deemed either almighty in creation, nor utterly devoid of spontaneity of action, under the stimulus of surrounding conditions, in obedience to invariable laws, as we see them manifested in the phenomena of transitory life, which are the data of human experience and science. What do these reveal?

CHAPTER II.—CONDITIONS OF ORGANIC EVOLUTION.

There are *special* modes and conditions for each species of animal or vegetable reproduction; *comparative* modes and conditions of reproduction; such as metagenesis, parthenogenesis, &c.; *teratological* facts and phenomena, in monstrous births, &c.; *palæontological* facts and phenomena, in the apparition of new species, and the extinction of others, in successive geological periods and conditions; *hybrid* modes and conditions of generation, between congeneric species of animals and plants; *artificial* modes and conditions of fecundation, incubation, and lactation; and lastly, we may speak of human modes and conditions of metamorphic and perfective evolution of the species, as a collective being composed of different races and families.

The general conditions of human incarnation involve at once the internal physiological conditions of the parents, and the external, physical, and social conditions in which they propagate the species. And as these are favourable or unfavourable, wild or cultivated, so are the chances of physical health and beauty, or debility and deformity, in the offspring. If generative secretion be defective or diseased in either one of the parents, the nutritional diathesis of the child will be defective; if fecundation be defective in any way, the result will be unfavourable to the offspring; if gestation be defective or disturbed to any great extent, the fœtus will be more or less imperfectly developed; and if lactation be insufficient, or the mother's milk deteriorated, the child will suffer in its evolutive phases of growth and development. And all these procreative functions in human parents are more or less affected by their daily habits and vocations. The children of students and men of science are generally more delicate than those of healthy labouring men and women, and those of artists equally healthy are often more sensitive and nervous than the children of men and women of laborious vocations in the open air. Physical health, however, is only one of the conditions of hereditary influence.

Parents of different races have various habits of life in different conditions, and these give them such typical traits of form and feature, that the offspring always bear strong marks of hereditary structure and complexion. The tropical races and their children, such as the African negroes, are easily distinguished from those of genial climates, such as the dark-eyed Arabs and the Persians; while these, again, are readily distinguished from the blue-eyed races of temperate regions. Polar races and Mongolians have also peculiarities of form and feature which are hereditary in the race, and persistent during all historic ages.

The civilization of any of these races causes considerable modifications in their physical appearance, which become more or less hereditary in the course of ages; so that hunting tribes may be distinguished from pastoral tribes, and these, again, from agricultural clans, while industrial communities are still more marked in hereditary forms and features, modified by civilized habits and conditions transmitted to their offspring.

Not only may a whole industrial and commercial community be readily distinguished from an agricultural clan, a pastoral tribe, or a savage horde, but individuals and families of different classes in the same community may be distinguished from each other by the hereditary influence of different modes of life and social education.

The children of young healthy parents are generally better formed and stronger than those of aged progenitors. Chaste parents also beget chaste offspring, while the contrary often happens to salacious propagators.

Nervous excitements often cause the mother to disturb the process of gestation, and prevent the normal evolution of the fœtus; in such cases the child is born with club-foot, hare-lip, or other very serious congenital deformity with which it is afflicted during life.

CHAPTER III.—SYSTEMATIC GENEALOGY.

Epicosmogenesis.—The mystery of primitive genetic evolution on our globe is beyond the present ken of human science; whichever way we view the problem, it is a miracle we must admit, without being able to explain it by any known laws of nature All natural phenomena, however, are mysterious before we have discovered the laws which govern their generation; and although we cannot penetrate the mystery of epicosmic genesis and evolution in all its depths and complications, we may hope that some of the principles and laws which generate and govern these phenomena may be partially discovered now, and ultimately be revealed to human understanding. At any rate, we may state the problem systematically first, and then see which are the points accessible to actual observation and analysis: thus—

Epicosmogenesis and Evolution.	U. Genesis of inorganic realms. O. Genesis of organic realms. H. Genesis of sociological realms.

How the principal inorganic realms were formed at first in distinct spheres, we cannot discern, but the modes by which the secondary inorganic realms are formed, we see daily repeated before our eyes. How the atmosphere, the ocean, and the hard crust of the earth were originally formed we may guess by means of physical science, but we cannot go beyond conjecture, whereas the pluvial and the reliquial realms present us with the facts of their daily generation and secular evolution.

These phenomena give us a glimpse of inorganic generation and evolution, which does not penetrate far into the mystery. The organic realms will help us a little further, but even here we are only able to observe the phenomena of procreative generation and metamorphic evolution in animal and vegetal species, and their different modes of propagation. The physiological conditions and phenomena of life and genesis are so diversified and multiplied in all these realms, that we have in them a rich store of data for the problem before us; and a methodical view of the question may be found in the synoptical table of biological characteristics; which are hereditary in all the classes, orders, genera, and species of the organic realms.

SOCIOGENESIS.—After becoming familiar with this biological view, and the various modes and conditions of incarnation and evolution, we have still the sociological view to analyse, and this will lead us into deeper knowledge of genetic and metamorphic phenomena, as a key to systematic genealogy. We must defer this work, however, for the present, until we have published a treatise on Sociology; we may nevertheless refer the reader to our volume on Ontology, where the synopsis of the sciences, (methodological, cosmological, and ontological) will point to the necessary relations of one science with another, and one world with another, in the genetic and evolutive relations of the universe. Industrial inventions and progressive evolution will enable humanity to modify and improve the modes of breeding animals, and the conditions of human incarnation; artistic inventions and refinements will enable man to improve the forms of animals and human beings on our globe; scientific discoveries will enable him to modify physiological conditions and improve the race; social, religious, and political developments of human societies will increase human power over the physical conditions of the globe, which he is finally to understand and govern, and thus enable man to fulfil the task allotted to him by his Maker; that is to say, "*To be fruitful and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.*"

Systematic genealogy will then become a science in harmony with other sciences, and meanwhile it will progress as they progress, along with the metamorphic evolution of the human race as a collective being, which is now hardly more advanced in its associative evolution, than the complex organs of an individual fœtus in the second month of its gestation.

Epicosmic genesis and genealogy are thus brought within the limits of phenomenal evolution, and the word Creation, as an ontological definition, must be relegated to the invisible world of causation, anterior and superior to all forms and conditions of phenomenal evolution.

GENETIC EVOLUTION.

Sociogenesis.	Z. Angelogenesis (in celestial world).
	Y. Embryogenesis (lymbonatural incarnation).
	X. Daimonogenesis (lymbospiritual resurrection).
	W. Sociogenesis (in terrestrial world).
Organic Realmogenesis.	VII. Vertebrate ovagenesis, and realmic evolution.
	7. Articulate ovagenesis and realmic evolution.
	VI. Molluscan ovagenesis and realmic evolution.
	6. Radiate ovagenesis and realmic evolution.
	V. Phanerogamic spermogenesis and realmic evolution.
	5. Cryptogamic sporagenesis and realmic evolution.
Inorganic Realmogenesis.	IV. Elementogenesis and realmic evolution.
	III. Crystalogenesis and geospheric evolution.
	2. Reliquogenesis and realmic evolution.
	II. Aquagenesis and oceanic evolution.
	1. Pluviogenesis and realmic evolution.
	I. Aerogenesis and atmospheric evolution.

Inorganic Realmogenesis.—We have no definite idea of the formation of simple elements, although some of these, such as nitrogen for instance, have been thought to consist of still more radical atoms. We have practical knowledge of the manner in which aqueous vapour may be formed by the influence of electricity in determining the chemical combination of oxygen and hydrogen gases to form water, but this practical knowledge, on a very small scale, gives us no adequate conception of the mode by which the whole ocean could be formed of these simple elements in the primitive evolution of our globe. Our knowledge of crystalogenesis on a small scale is more or less definite, but this gives no adequate idea of the primitive formation of the solid crust of the earth. The genesis of vapour in the atmosphere by the influence of the sun's rays is a well-known phenomenon, as also the formation of carbonic acid and other constituents of the pluvial realm; the same may be said of the organic remains and geological strata which constitute the reliquial realm; and thus we have an adequate idea of the generation of two of the inorganic realms.

Organic Realmogenesis.—We know physiologically how the spores and seeds of plants are formed by vegetable organisms, and how the semen and the ova of animals are formed by pareht organisms, but we do not know by what kind of miracle the primitive elements of matter were formed of still more radical atoms; nor how the primitive organic spores and vesicles, or seeds and eggs of vegetable and animal life were formed of simple elements. When once these inorganic or organic elements and vesicles have been formed, we know something of inorganic realmogenesis in the pluvial and reliquial realms, but nothing of the other inorganic realm formation. We know something of individual organic germination and comparative embryogenesis, but nothing definite concerning the original formation of distinct species of animals and plants; nor of the genetic evolution of organic realms, as distinct collective organisms in the co-ordinate unity and complexity of epicosmogenesis. The phenomena of embryogenesis, however, give us very distinct ideas of sociogenesis or the metamorphic evolution of humanity, as a collective being, forming a distinct sociological realm upon our globe: and thus we have a glimpse of realmogenesis in the organic world, as well as in the inorganic. And, moreover, this definite view of the progressive evolution of mankind on earth, suggests at once the idea of a parallel evolution of humanity in heaven; and hence we are enabled to place the associative evolution of angels or human spirits in a higher world, on a line with other data in our synopsis of epicosmic evolution.

Sociogenesis.—What do we know of sociogenesis in a spiritual world, when so little is known of the existence of human souls in a future state? We know very little, but spiritual communications have been made in all historic ages, and are still being made in all nations; and these communications, controlled by the principles of human reason and positive organic science (physiological and psychological), will be available for a science of daimönogenesis and angelogenesis, as much as terrestrial phenomena of life and organisation, evolution and progress are available for embryogenesis and sociogenesis. The latter we shall deal with in a volume on Collective Biology; and by reperusing the general introduction, the reader will refresh his memory with regard to the aim and limits of the present volume.

The four worlds of alternate existence indicated in the synoptic table, will not be equally investigated in our volume on Sociology, but they will require notice in connection with the sociogenetic evolution of humanity on earth, which is thoroughly involved in, and governed by its relations with humanity in heaven: humanity in its passage from an upper to a lower world by incarnation; and humanity in its passage from this world to the world of spirits, after resurrection.

Systematic genealogy is too vast a problem for a cursory glance in one short chapter, and will present itself in other parts of the present volume, but more fully in sociology.

BOOK II.

THE SOUL.

INSTINCTUAL BIOLOGY.

ANIMAL and human instincts are as different from each other as animal bodies are from human bodies. Practical intellect in man is human instinct, in contrast with human reason; and we use the word instinct in technical psychology, to show where the parallel exists between animal and human nature.

The instincts of snails and worms are not equal to those of ants and bees; fishes and reptiles are inferior to birds and mammals, while none of the higher animals equal mankind in cunning, or practical intellect. An elephant, a horse, a dog, have a sort of practical intelligence, which is called instinct, but they have no faculties capable of discovering the laws of nature, or understanding the principles of science. Human reason is not only superior to human intellect, but human instinct is superior to animal instinct, human affection superior to animal affections, and the human body superior to other types of organism.

Plant life, animal life, and human life, are very distinct degrees of life and organisation, which have much in common. It is not always easy to draw definite lines between them; we have recourse to parallels of force and function, to distinguish one degree of the same general principle of life from another in different realms of organism, thus :—

I.

PLANT LIFE AND SELECTIONAL CHARACTERISTICS.

1. Habitative selection and sensitivity.
2. Alimentive selection and sensitivity.
3. Associative selection and sensitivity.
4. Fecundative selection and sensitivity.
5. Temperatural sensitivity and motility.

II.

ANIMAL LIFE AND SELECTIVE CHARACTERISTICS.

1. Habitative selection and sensibility.
2. Alimentive selection and appetency.
3. Associative selection and sympathy.
4. Procreative selection and sensibility.
5. Visual and temperatural sensibility and perceptivity.
6. Vocational instincts and locomotive activity.
7. Migratory instincts and constructive industry.
8. Memory, cunning, strategy, &c.;

III.

HUMAN INSTINCT AND PRACTICAL KNOWLEDGE.

Inventive genius and progressive mortality or conscience.

IV.

HUMAN REASON AND SCIENCE.

There are distinct lines of limitation therefore, between vegetal, animal, and human planes of life and organisation, faculty, function, origin, and destiny.

How shall we distinguish intellect from reason, on any other grounds than those of scientific understanding? Animals have practical intelligence (inferior to that of man, no doubt), but no animal ever understood a science of the laws of nature.

Reason and understanding are immeasurably superior to human intellect and animal instinct. We use the word Instinctual Biology, therefore, in contrast with Rational.

PART I.—SYSTEMATIC ANALYSIS.

CHAPTER I.—INSTINCTS IN PARALLEL WITH ORGANS.

THE faculties of the soul correspond to the organs of the body, but "immaterial forces" are invisible and we have to name them by their modes of manifestation. Heat, light, electricity, and gravitation, are characteristic of invisible forces, the essential nature of which is utterly unknown to man, although we sometimes speak of them as imponderable fluids in motion or vibration. When purely physical forces are manifest, in connection with solid, liquid, or gaseous matter, we find a substratum of substance, and we name atomic elements by their peculiar qualities.

As the body has organs as well as functions, we may conceive that the soul has instinctual faculties as well as thoughts; and these faculties correspond exactly with those of the body which they animate and control. To make this evident, we have only to observe faculties of instinct in different animals corresponding with the special functions of the organs and systems of the body, as seen in the following table :—

SYNOPSIS OF ANIMAL INSTINCTS.

Connective Instincts.	Z. Conditions of Instinct.	H. Solar conditions—climate.
		U. Realmic conditions—air, water, food.
		Ω. Social conditions—flocks and herds.
		O. Hereditary conditions—progenitors.
	Y. Resources of Instinct.	H. Fixed habits.
		U. Skill in action.
		Ω. Recent experience.
		O. Acquired experience.
	X. Results of Instinct.	H. Hereditary arts.
		U. Arts of protection—nests, &c.
		Ω. Arts of amusement.
		O. Arts of avoiding danger.

- **W. Connective Faculties of Instinct.**
  - H. Hereditary instinct.
  - U. Decorative instinct (various moultings).
  - Ω. Playful instinct (monkeys).
  - O. Self-preservative instinct.

Organic Instincts.

- **II. Mnemonic Instincts.**
  - H. Embryonic instinct (chick in shell).
  - U. Inquisitive instinct (deer).
  - O. Recollective memory (dog).
  - Ω. Critical acumen (fox).
- **7. Detective Instincts.**
  - H. Retentive capacity (elephant).
  - U. Detective capacity (fox).
  - O. Receptive memory (parrots).
  - Ω. Emissive instinct (skunk).
- **VI. Alimentive Instincts.**
  - H. Storing instincts (bees).
  - U. Ruminative instincts (cattle).
  - O. Assimilative instincts (carnivor, &c.).
  - Ω. Rejective instincts (poisons).
- **6. Acquisitive Instincts.**
  - H. Procurative instincts (hunt, watch).
  - U. Butchering instincts (tiger).
  - O. Hygienic instincts (lick salt).
  - Ω. Scavengering instincts (dogs).
- **V. Procreative Instincts.**
  - H. Fascinative instincts.
  - U. Confraternal instincts.
  - O. Connubial instincts.
  - Ω. Parental instincts.
- **5. Educative Instincts.**
  - H. Fostering instincts.
  - U. Ovulative instincts.
  - O. Incubative instincts.
  - Ω. Lactative instincts.

Relational Instincts.

- **IV. Telegraphic Instincts.**
  - H. Signals (heron cries).
  - U. Sentinels (herons).
  - Ω. Messengers (ants).
  - O. Senso-motor feelers (insects).
- **III. Working Instincts.**
  - H. Building instincts (birds).
  - U. Burrowing instincts (moles).
  - Ω. Rooting instincts (pigs).
  - O. Carrying instincts (ants).
- **2. Expressional Instincts.**
  - H. Fear, run; safety, walk.
  - U. Singing birds.
  - Ω. Barking dogs.
  - O. Imitation, simulation (parrots).
- **II. Strategical Instincts.**
  - H. Proliferal strategy (hide).
  - U. Aggressive strategy (war).
  - Ω. Snaring strategy (traps).
  - O. Defensive strategy (fortress).

Relational.	1. Protective Instincts.	H. Proliferal protection (homes, nests).
		U. Connubial protection (rivals).
		Ω. Social protection (herds).
		O. Self protection (suspicion).
	I. Habitative Instincts.	H. Inhabitative instinct (air, water, &c.).
		U. Frigid habitat (hibernation).
		Ω. Temperate habitat (migration).
		O. Tropical habitat (umbration).

Instincts are more or less perfect in degree in parallel with animal types of organism; one organic realm is superior to another, one class to another, one order to another, one species to another, and man is vastly superior to all animals in practical knowledge and artistic skill.

TERMINOLOGY.—Phrenologists have adopted a certain number of words to designate faculties and propensities, and made these words popular. We adopt their terms, with such modifications and explanations as may be useful. A new yard-measure, a little longer than the old, is easily admitted and remembered, whereas, the new name of a *mètre* is not easily admitted. In naming faculties of practical intelligence, we are constrained to make the name of a part stand for the whole, in some cases, but this is a common resource in all questions of terminology. The following table is as nearly accurate as we can make it:—

SYNOPSIS OF THE HUMAN INTELLECT.

Connective Faculties.	Z. Psychological Conditions.	H. *Solar conditions of climate.*
		U. Realmic conditions of fauna and flora.
		Ω. Social conditions of class, nationality.
		O. Hereditary conditions of race.
	P. Experiential Resources.	H. *Fixed opinions and prejudices.*
		U. Acquired skill in action.
		Ω. Recent observations.
		O. Acquired knowledge and experience.
	X. Artistic Creations.	H. *Practical inventions.*
		U. Imaginations, art-creations.
		Ω. Witty or humorous fancies.
		O. Manners, language, style.

Organic Faculties of Intellect.	W. Connective Intellect.	H.	*Intuitive, conceptive faculties.*
		U.	Imagination.
		∩.	Playful fancy, wit, and humour.
		O.	Tact, judgment, practical sense.
	VII. MEMORY.	H.	*Innate instinctive memory.*
		U.	Inquisitive curiosity.
		O.	Recollective memory.
		∩.	Critical acumen, rejective memory.
	7. *Sagacity.* (*Mnemonic.*)	H.	*Retentive capacity.*
		U.	Detective sagacity, memory.
		O.	Receptive memory.
		∩.	Emissive discretional memory.
	VI. Reflection. (*Ruminative*)	H.	*Storing instinct, foresight.*
		U.	Digestive rumination of experiences.
		O.	Digestive assimilation of experiences.
		∩.	Rejection of useless notions.
	6. *Observation.* (*Acquisitive*)	H.	*Procurative instinct (destructiveness).*
		U.	Culinary instincts (*taste*).
		O.	Hygienic instincts (*condiments*).
		∩.	Scavengering instincts (*sewers, &c*).
	V. Concentration. (*Cogitative.*)	H.	*Wondering cogitation.*
		U.	Conceptive imagination.
		O.	Elaborative concentration.
		∩.	Perfective cogitation.
	5. *Invention.* (*Constructive.*)	H.	*Fostering instinct* (*combativeness*).
		U.	Designing thought.
		O.	Constructive thought.
		∩.	Adaptative thought.
Relational Faculties of Intellect.	IV. COMPARISON. (*Similitudes.*)	H.	*Of Fitnesses.*
		U.	Of correlations.
		∩.	Of differences.
		O.	Of similitudes.
	III. Causality. (*Antecedents.*)	H.	*Organoleptic antecedents.*
		U.	Centripetal antecedents.
		∩.	Conductor antecedents.
		O.	Centrifugal antecedents.
	2. *Language.* (*Simulation.*)	H.	*Symbolical language (simulative).*
		U.	Musical language (expressive).
		∩.	Verbal language (expressive).
		O.	Dramatic language (simulative).
	II. Eventuality. (*Sequences.*)	H.	*Eventual sequence,* (nest before eggs).
		U.	Aggressive strategy, arms.
		∩.	Snaring strategy, traps and nets.
		O.	Defensive strategy; fortress, armour.
	1. *Perceptives.* (*Discriminative*)	H.	*Texture, solid, liquid, gas* (*magnetic*).
		U.	Colour, form, sight (photic).
		∩.	Weight, density, touch (barologic).
		O.	Heat, cold, temperature (thermal).

I. Individuality. (*Distinctive.*)	H. *Locality, surroundings.*
	U. Individualities.
	∩. Collective flocks, herds, species.
	Ō. Co-ordinate realms, classes, orders.

Discriminative perceptions, *limitative* distinctions or individualizations; *evolutive* mutations, and possible consequences or eventualities; *expressional* sounds, motions, simulations and exclamations; *phenomenal results* or effects of motorial, or mutational influences or causes; *comparison* of like and unlike things and shapes, are natural modes of instinctual activity or thought in the higher animals and in man. Animals *observe* what is near them, *reflect* on things which have hurt them or delighted them, so as to avoid one kind of relationship, and seek for the other; they are more or less *sagacious* in detecting traps or snares, and *remember* well both friends and enemies. They are also more or less inventive and constructive. Bees not only *construct* their hives, but they *invent* new means of restoring parts of the structure, which have been broken down and displaced, or carried away; and even new means of access to the hive, when their usual scaffoldings have been destroyed, and cannot be replaced as before.

These faculties belong to instinct, much more highly developed in one species than in another, and most of all in man.

Connective faculties of intellect belong to the instinctual organism. There is a kind of intuitive judgment in young birds for instance, who build a nest before they lay their eggs, although they had never built a nest before, and in a duckling which runs to the water as soon as it can move, and sees water for the first time. This sort of intuition is common to each species, whatever be the main characteristics of the type. Animals have also a playful fancy, especially when young, and are not without imagination, as we know from dogs dreaming, while they are asleep. There is also a marked display of tact and temper in different animals. A large dog tolerates with contemptuous indifference the snarling of a little cur, and all animals can judge of the friendly or unfriendly feelings of their associates; of the dangerous hostility of deadly enemies, and the harmless nature of pacific tribes. A horse will dread a lion at first sight, and have no fear of a giraffe. The faculties of connective intellect are common to animals and man; though more highly developed in mankind.

Instinctual intellect and common sense, however, depending on sensation, are not reason. A man who believes intuitively that the sun rises and sets, by moving round the earth, judges according to *common sense*, that is to say, according to the appearances of *practical* sensation, where "seeing is believing," but not according to *theoretical* penetration and rational understanding. He perceives the phenomena, and knows the invariable repetition of their occurrence, but he does not know the real truth of the facts, because he has not been able to correct the delusive appearances of sensation by discovering the *causes* of such appearances.

It is important therefore to class instinctual faculties of thought and intellect, sensation and perception, practical knowledge and experience, apart from the mental faculties of reason and understanding, cognition and penetration, theoretical science and demonstration, which will be analysed apart.

Connective intellect and imagination co-operate with all the general faculties of the soul, just as glandular and other connective tissues co-operate with the organs and systems of the body. Excretive glandular secretions in the skin, in the generative organs, in the digestive organs, in the respiratory, circulatory, and urinatory organs, and in special senses, co-operate with the other constituent parts of all these systems; concretive adipous secretions occur in almost every part, as well as serous and synovial secretions. The connective faculties of intellect, namely, imagination, wit and fancy, tact, and common sense co-operate with all the special instincts of the soul. And as glandular secretions are the most important functions of the generative system, so imagination is the most important function of invention, concentration, elaboration, and design.

The word *causality* is used by phrenologists to denote the instinct of looking from effects to proximate causes, or tracing back from effects to causes, while *eventuality* is used to denote following up motion or phenomenal action of any kind, until it eventuates in a given result, and thus the two words denote different aspects of a complex intellectual movement, such as the common action and reaction between the muscles and the bones of the body.

It would be just as natural to reverse these names, and attribute causality to motive power, and eventuality to the result, were it not that "causality" as an intellectual mode of motion is supposed to look backwards from effects in search of causes, while eventuality is supposed to look forward from causes to effects; as in the strategical instincts of the lion-ant, which makes a pit in the sand and looks forward to insects falling into the trap.

This is the most simple and direct mode of dealing with the definition of secondary causes and events, but further researches into causes bring other faculties into play, such for instance as the faculty of *comparison* between a healthy and a palsied limb, which has lost all power of motion, tracing back the cause of palsy in the motor nerves of the affected limb, to internal and external stimulants, which cause molecular vibrations in the nerves of sensation.

Secondary causes and events are so intimately connected in the association of ideas, that there is an "inseparable conjunction" between them in the intellect, just as there is an inseparable connection between the muscles and the bones of the body.

We shall come to the question again, when we contrast the phenomenal causality and eventuality of secondary causes and events, with the noumenal causality of eternal forces, and the phenomenal evolutions of creation; the faculties of practical intellect with those of theoretical reason and understanding.

We use the word "*language*" to denote all kinds of expression, and symbolical notation, not only in words, but in music or song, dramatics or imitative and simulative expression; symbolical notation of any kind in fact, such as telegraph signs or symbols of expression; so that time and tune, or rhythm and melody, belong to the general faculties of language, as well as the facility of speech and the memory of words.

PHRENOLOGY.—We do not know how far the craniological distinctions of phrenologists correspond to distinct faculties in the ganglionic centres of the brain, but we deem their general divisions very nearly accurate. Connective faculties having their ganglionic centres in the coronal region of the brain, organic faculties in the inferior and posterior region of the head, and relational faculties in the forehead. The ganglionic centres of the organs of special sense may be more or less intermingled at the base of the brain, and at the sides, but this question will require careful investigation. The whole of the facial organs and features seem to have their central ganglia at the base of the brain, but external portions of the cranium may neverthelees be modified in form by internal parts of the brain, forcing outwards other parts in the general distribution of ganglionic centres. The cerebellum, the medulla, oblongata, and the spinal cord are also ganglionic centres of importance.

Phrenologists will be better able to observe and classify the external forms and features of the cranium, or the whole head and face, as indications of peculiar characteristics, when they have a more complete knowledge of psychological analysis and synthesis. At present they use the word *temperament* to indicate the general character of an individual, apart from the special peculiarities of form and size in the cranium. Natural vocations for physical enjoyments and industrial pursuits in preference to artistic, or scientific, or social and political aptitudes, will be found more readily in the relatively large proportions of the face and body and limbs, compared with the cranium, than in a vague idea of temperament. The organic, the instinctual, the mental, and the spiritual faculties are concentric, so that the relational factors of body, soul, mind, and spirit, would all be represented craniologically in the front part of the head; the organic factors in the back part; the connective factors in the coronal region; the mixed factors being represented in the base of the brain, and only to be recognized probably in the corresponding peripheral developments of special nerves and organs of sensation. A large body and limbs with great development of the lower jaw, and a small or moderate sized cranium, probably denote a predominance of physical industrial vocations. A large head with a relatively small body, delicate limbs, and moderate sized face, probably denote a predominance of mental and scientific characteristics; moderately equal proportions of head, body, and limbs, may denote artistic characteristics; while equally strong proportions of head, face, body, and limbs, irrespective of volume and stature, may indicate a political, social, or religious predominance of individuality. These are mere suppositions, to be confirmed by careful observation on an extensive scale, without which they can have no positive value. Napoleon I. despised "les ideologues," who dealt with ideas beyond his powers of comprehension. He had a practical instinct, whose dominant faculties were those of eventuality or strategical versatility, at the service of an insatiable ambition and a feline personality.

By *individuality* and *locality* phrenologists denote the power of distinguishing *things* and *places*, from peculiarities of contrast with their *connections* or *surroundings*, and thus of classifying in the mind objects and localities as distinct from one another. In this sense the words seem to be as well chosen as they could be, and we give them a definite meaning to make them useful and accurate for the purpose. Modern psychologists denote the same faculties by the word *contiguity*, as a leading characteristic of the incidence of sensations, by which ideas are connected in the memory.

Names are individual in their original meaning, however general and comprehensive may be the uses to which they are afterwards applied. Black friars and grey friars are adequate denominations of certain orders of monks, although the words friar or frère, black and gray, merely mean brothers who dress in black or gray garments.

CHAPTER II.—CORRESPONDING FACULTIES AND FUNCTIONS.

The forces of the soul correspond exactly with those of the body, and as we find systems and series of organs in the one, so we distinguish faculties and functions in the other. Physiological nutrition accumulates latent physical force in every part, but the generation and expenditure of heat and motion vary with relative degrees of activity in different tissues and systems. The same may be said of psychological accumulations and expenditure of latent forces of thought by functional activity in every faculty of intellect.

INSTINCTUAL MEMORY.—The experiential soul is a latent association of ideas, derived from sensations, but the special faculties and functions of memory are distinguished from psychological nutrition, just as those of the vascular system are from physiological nutrition.

The whole of the organs and systems hang as it were at the peripheral extremities of nerves, which come from ganglionic centres concentrated in a cerebrospinal mass within the cranium and spinal column, and we may easily conceive the soul to be correspondingly represented in these centres of cooperative union. All *sensations* are carried by sensor nerves to these centres, where they are perceived by the soul, and all motor impulses are conveyed from them to peripheral organs, at the bidding of the will, in cooperation with physical motor forces, generated by capillary exchanges of the blood in all the organs. The excitements of thought in nervous centres are closely allied with the expenditure of latent forces, sustained by capillary circulation and exchanges in nerve substance. This will explain why we place memory in parallel with the vascular system of circulation and exchange, connected with nutrition and latent association of atoms, not only in the brain, but in the whole body; for as Mr. Bain has well observed, "When we think in the nervous centres we often speak, with or without utterance, in the peripheral organs of articulation, or move the whole external frame in representative simulation of our thoughts." When a sensation of want of food, or merely of want of friction in a small part of the skin which itches, is felt and noted by the soul, the sensation excites a thought in the psycho-ganglionic centres, which move either the whole body in search of food, or one of the limbs to scratch the itching skin. Action and reaction between soul and body in cooperative union and sensation extend to all parts of the organism, from peripheral organs to psychoneural centres, and from these again to psychoneural peripheral extremities in organs, wherever latent heat force is generated in sufficient degrees to allow of cooperation between soul and body; instinctual and physical, efficient and motor forces.

When capillary circulation and exchanges are obstructed by any kind of accidental derangement in the cerebrospinal centres, physical motor forces are partially extinguished for a time in the parts affected, and physical paralysis of motion or sensation, or motion and sensation, involves both the central and peripheral portions of the body so affected. The will of the person may be active in volition, but the partial suspension of heat generating exchange in those parts, does not permit this local range of cooperation between the will and the cerebral ganglia in question. Sensation alone, or motion alone, or memory alone, may be paralysed in nervous centres; so that loss of memory, loss of sensation, and loss of powers of motion may be either isolatedly or combinedly experienced in the organism, by want of mutual cooperation between physical and psychological forces, in any one ganglionic centre, or in the whole central and peripheral community.

Sir Henry Holland observes that,—

"Disturbance to the memory may arise from too feeble circulation through the brain, as well as from over-excitement, or congestion of blood there. . . . . The powers of recollection and thought become confused or lost, either from violent action or excessive fatigue. No man can think or remember clearly while running rapidly; nor can any one go through a laborious train of reasoning or recollection when the body is exhausted. I have often known the power thus transiently failing from fatigue, or the debility of disease, restored by the stimulus of a moderate quantity of wine; and so suddenly as to show that the want of due excitement to the circulation was the cause of the failure. But, besides this passing effect of momentary exhaustion, there are chronic states of a similar kind where the memory is enfeebled for considerable periods of time without being permanently affected."

Latent associations of ideas, then, in the experiential intellect are exactly parallel in psychological vitality with the latent associations of atoms in the physiological vitality of the body, and the functions of memory are analogous to those of vascular absorption, circulation, and exchanges of blood in all the organs; for if the fingers be deadened by cold we cannot move them deftly, however active thought may be in the brain; however resolute the will. Mr. Herbert Spencer in his "Principles of Psychology," has well described this parallel in the following paragraphs :—

"Under its most general aspect, all mental action whatever is definable as the *continuous differentiation and integration of states of consciousness.*"

"The widest truth disclosed by the inquiries of physiologists is paralleled by the one at which we have just arrived . . . . By the action of oxygen every tissue is being differentiated, and every tissue is integrating the materials supplied by the blood. No function can be performed without the differentiation of the tissue performing it; and no tissue is enabled to perform its function, save by the integration of nutriment . . . . By each new integration, an organ is fitted for being again differentiated; each new differentiation enables the organ again to integrate. And as with psychical life, so with the physical,—the stopping of either process is the stopping of both."

The physiological processes of accumulating latent physical forces by integrative nutrition, and liberating them by disintegrative heat or motion, are exactly analogous to the processes of accumulating latent intellectual powers by integrative associations of states of consciousness, and liberating them by disintegrative thought or excitement; and as physical forces are stored up in working bodily organs, psychical forces are stored up in working intellectual faculties; and hence we wonder that Mr. Herbert Spencer should question this fact, in a previous paragraph of the same chapter, where he says,—

"The various divisions, therefore, which we ordinarily make among our mental operations, and which psychologists have mostly sought to explain and establish as marking out distinct faculties, have merely a superficial truth. They are to be understood as indicating modifications of detail which distinguish phenomena that are essentially similar—modifications which do but mark that fundamental unity of composition possessed by all cognitions whatever."

"The briefest consideration of the many continuous actions of the body at large, suffices to show that they are synchronous—that digestion, circulation, respiration, excretion, secretion, &c., in all their many sub-divisions are going on at one time in mutual dependence. And the briefest introspection serves to make it clear that the actions constituting thought occur, not together, but one after another."

The actions of conscious thought in the soul are thus compared with both conscious and unconscious motions in the body. Conscious motions of the external frame are no doubt successive, although they are simultaneous with unconscious motions in the viscera; and we might just as well deny unconscious modes of motion in the body, as deny unconscious modes of thought in the soul. Popular proverbs say, "second thoughts are best," "sleep on it before you decide," "la nuit porte conseil." What occurs in the mind unconsciously while we sleep?

Notwithstanding the conclusion of the "briefest introspection," a more careful and prolonged observation leads to the idea that functions depend upon faculties, and that without co-ordinate faculties there can be no co-ordinate functions.

The soul animates the whole body, as well as the brain. It feels what is going on in the nutrition of the eye, and every other organ, as well as in the nutrition of the nervous centres; were it not so, pains could not be felt in visceral inflammations and deranged nutrition, as distinctly as aches and troubles in the brain.

All the systems of the body are organised as working faculties in parallel with mutually corresponding faculties of sensation and thought in the instinctual soul. Supposing the soul to be identical with the nervous centres alone, these centres have nerves connecting them with every part of the body: so that there are nervous centres or souls of every system and every organ.

Instinctual memory is in correspondence with the vascular system in all parts. *Instinctual reflection* is in correspondence with the digestive system and its special nerves, central and peripheral; *inventive concentration* in correspondence with the generative system and its special nerves, central and peripheral; *comparison* of concrete phenomena, (in correspondence with the whole nervous system as a special general apparatus in alliance with other systems), has its psychological individuality as much as other systems, with a corresponding physiological individuality. "*Causality*" in correspondence with the osseous system and its special nerves, central and peripheral; "*eventuality*" in correspondence with the muscular system and its special nerves, central and peripheral; "*individuality*" in correspondence with the cutaneous system and its special nerves, central and peripheral. The organs of special sense in connection with these seven systems are also placed in corresponding parallels with instinctual faculties; so that the whole sensational and instinctual soul corresponds to the whole physiological body in analytical distinctions and mutual co-operations. There are preconscious, unconscious, subconscious, and conscious modes of action in the soul as well as in the body, and these modes of motion are both simultaneous, consecutive, and alternative.

As different modes of physical, mechanical, and physiological sensitivity and motion in the peripheral organs are represented in the central ganglia of the nervous system (sight in one centre, hearing in another), so different modes of thought in visual sensation and perception, musical sensation and perception, not to mention other modes of sensation in different organs of the body, are reflected in the central organs of the soul, and thus, different modes and degrees of action and reaction in the psychological organism, correspond in all directions with like modes and degrees of action and reaction in the physiological. These phenomena have been lucidly described, in minute details, by Mr. Alexander Bain, in his elaborate analysis of the "Senses and the Intellect," to which the reader is referred for more ample explanation.

INSTINCTUAL SAGACITY AND CAPACITY.—Each type of animal is endowed with innate capacities of instinctual sagacity, as with hereditary forms of body and powers of growth from birth to full development. The lowest forms of zoophytes, (protozoa, and hydrozoa,) have hardly more appreciable degrees of sensitivity and motility than plants; the lowest forms of mollusca and articulata, but little more. The highest species of the highest class of radiata, such as the holothurida, seem to have little more instinctual sagacity than the lowest worms of the lowest class of articulata. The highest species of the highest class of mollusca, such as the cephalopods, seem to be endowed with considerable degrees of sagacity in watching for their prey and paralyzing them when seized. The highest species of the highest classes of articulata, such as crabs amongst crustacea, spiders amongst aranacea, are endowed with much relative sagacity in hunting their prey or watching for it stealthily. The instinctual sagacity of insects may be nearly as well developed in ants and bees as it is in crabs and spiders; just as in the parallel classes of vertebrata. Eagles seem to be as sagacious as lions; crows and magpies as sagacious as hounds and foxes.

Elephants are sometimes deemed more sagacions than dogs, both in their native wilds and in a domesticated state. Both seem almost to equal savage races of mankind in experiential degrees of instinctual intellect and knowledge, memory and sagacity. They are not equal to monkeys in imitative instincts; but parrots are superior to monkeys in imitating human modes of speech, and many of the inferior animals have simulative instincts and sagacity.

Experiential memory and sagacity are inherent capacities, and much artificial skill and knowledge may be acquired by well-trained animals, as well as by savage races of mankind; but science cannot be acquired or understood by mere instinctual intelligence, neither in animals nor in man. Practical ideas and knowledge are not abstract principles and science.

The special faculties of instinctual memory correspond then to those of the vascular system; and, as nutrition is a *latent association of atoms* in all organs of the body, so the stores of memory are latent associations of sensations and ideas, the evidence of the senses, in all the faculties of the instinctual soul.

An instinctual intellect alone, such as we see it in animals and undeveloped human beings, would never discover that the earth revolved upon its axis in twenty-four hours, and that that was the real cause of the apparent rising and setting of the sun. The illusion of the senses is to them a reality, and the reality would seem to be a theoretical illusion. The simple evidence of the senses causes animals and human beings to judge of concrete phenomena by *intuition* or simple *common sense* and experience, which kind of judgment has often to be rectified by reason and scientific demonstration in seeming contradiction with the evidence of the senses.

IMAGINATION.—Animals have imagination as well as men. Dogs dream in their sleep and imagine they are actively in chase of game. Imaginations in the soul are analogous to secretions in the body, and ideas are drawn from the latent memory in new forms and combinations, just as secretions are drawn from the blood in new forms and combinations. Blood itself is formed partly of new supplies of food derived from the digestive system, partly of lymphatic absorptions of waste matter in all the organs, and partly of digestive or assimilative secretions, returned to the "river of life" in a modified form. The physiology of nutrition and secretion in the body is a type of the psychology of memory and imagination in the soul.

Wit, fancy, and opinion are as much akin to imagination proper, as the secretion of fat is akin to glandular secretions. Humorous men are often fat, but stores of humour and accumulations of fat are not necessarily coincident.

Young animals are playful, but we do not know that they are witty and fanciful in the common acceptation of these words, although wit is certainly "the sport of thinking," as it has been well defined.

Wit is, nevertheless, an instinctual mode of thought, and not a theoretical faculty of reason; an opinion based on imperfect knowledge is not even a doctrine based on imperfect science.

Secretions of fat are mainly useful as rounders of form in the body, beautifying angular shapes, but falling into the opposite excess by oppressive obesity. Wit and fancy are recreative and cheerful, but wearisome, when habitually obtrusive, in general conversation; ignorant opinions, when comformable to common sense, are not offensive, but intolerant prejudices and fanatical opinions maintained against the evidence of common sense and experience, are intolerable nuisances. Religious and political fanaticisms are explosive elements of revolutionary violence, creating storms which may clear the social atmosphere of pestilent stagnations and obstructions, by their destructive energy, but cause much actual damage to the community.

Self-preservation, tact, or judgment is also an instinctual faculty; horses can select and feed with impunity, upon certain herbs which would be injurious to some other herbivorous animals, which instinctively avoid them. Vultures and dogs can live on carrion, and enjoy it, while eagles and leopards require fresh killed meat for food, and would be poisoned by putrid flesh.

Human races select animal foods and fats, in large proportions, for their usual diet in frigid regions: vegetable foods and sweets in tropical regions; and find that these agree best with their health and experience on the evidence of the senses and the feelings in such climates.

Imagination is a faculty of artistic invention, analogous to physiological secretion, while *Intuition* is a faculty of conception, analogous to that of embryological conception; and although fecundation and conception are often confounded, as well as imagination and invention, still, in both cases, the phenomena are very different. To render physiological congress fruitful, there must be incarnative conception to animate the fecund ovum and develope an embryo, or the ovum will be cast out useless; and to render inventive imagination fruitful, there must be ideal inspiration to develope an organic form of thought previously unknown to the terrestrial human intellect. The secretion of bile and other fluids in the digestive organs of a fowl is similar to that of eggs in the ovaries, but the latter alone are fit for incubation to give birth to an organic form.

PART II.—PSYCHOLOGICAL CHARACTERISTICS.

IN systematic physiology we have a complex scale of *congenital, evolutive, functional,* and *relational* aspects; in systematic psychology, we have also to review characteristic phenomena in their fourfold complexity.

INDUSTRIAL INSTINCTS AND VOCATIONS. — Animals are furnished with special organs of sensation, prehension, industry and locomotion, suited to their instincts of industrial activity, adapted not only to different spheres of life in the ocean, or on land, or in the atmosphere, but to special vocations in each of these spheres. The sense of sight is most piercing in eagles to discern their prey at a great distance; the sense of smell in vultures, to scent dead bodies far away. Animals are born with hereditary instincts as well as with hereditary shapes, and do not seem capable of progress in a wild state, although their instincts and their forms of body may be considerably modified by culture and training under the influence of mankind. Human races inherit their physical forms and features from their parents, but not their practical instincts and tastes. The son of a mason may prefer the vocation of a carpenter, or a gardener, a sailor or a soldier, whereas the progeny of insect masons, sailors, soldiers, inherit the vocational instincts of their progenitors through endless generations. Ants, bees, wasps, spiders, and all other species of animals perpetuate the same instinctual habits and vocations from generation to generation. Instinctual vocations seem equally constant, though progressive, in the intellects of individuals of the human race, but not hereditary in families like those of animals. All kinds of industrial instincts and artistic vocations are perpetuated in each generation of humanity, however much the natural vocations of children may differ from those of their parents; and, therefore, instinctual endowments are as perennial in the human race as in the animal kingdom; perhaps as numerous and as various as in all the different realms, classes, orders, families, genera, and species of animality on our globe; nay, much more numerous and various in a certain sense, since many practical arts and instincts unknown to animals, are progressively developed in human society. Instinctual intellect or practical knowledge and skill in mankind is, nevertheless, quite distinct from theoretical science and understanding, as we shall see in another part of this volume.

Instinctual types of practical intellect in mankind are numerous and various in adaptation to the arts of life in the sphere of *industrial crafts,* or in that of *high art*. And as some animals are amphibious, living in the water and breathing common air, so are some types of practical intellect, living in the sphere of industrial activity, endowed with powers of breathing the common atmosphere of high art; such for instance as the sculpture masons of the middle ages (who have left their impress on those wonderful cathedrals). Benvenuto Cellini, and many other modellers and jewellers of artistic genius, connected with industrial pursuits, in all countries and all ages.

The bodily forms of all races of mankind are much alike, though various within given limits, but special endowments of the senses and practical intellects are as various almost as those of the whole animal kingdom, or more various, since they rise into higher spheres of action, and descend perhaps as low into the regions of mere sensuous animality. Some human beings have even the physiognomy of birds or quadrupeds: eagle beaks, or ostrich heads and necks; peacocks or bantam cocks; rabbits or squirrels; bull-dogs or mastiffs; foxes or wolves; pugs or poodles; lions or bulls; horses or goats; pigs or bears; and some have even the physiognomy of fishes or frogs; serpents or lizards; and all these peculiar physiognomies are, no doubt, indications of peculiar instincts and vocations.

Industrial and commercial occupations are various in civilized society, and the practical instincts of mankind are formed in harmony with special *aptitudes and vocations* in a life of practical *uses and inventions*, which vocations will be explained in detail when we treat of sociology, and therefore need only be mentioned here.

The organic unity and complexity of the practical human intellect have been already described in the previous chapter. The *vocations and aptitudes* of individuals are either industrial, or artistic, or mixed, as we have just now said; and the functional modes of *sensation and ideation* vary in modes and in degrees of intensity, according to special endowments. Ideas are derived from sensation and motion, while practical instincts and perceptions direct thought into special channels of vocation, some to one branch of industry mainly, and some to another; some to hunt, and fish, and snare animals; others to cultivate the fields and breed animals; others again to quarry mines and build; others to forge metals and make tools, instruments, ornaments, or mechanisms of various kinds. Some are endowed with special aptitudes for nursing or training children; others have culinary aptitudes, or important domestic vocations.

Though all the higher animals are endowed with the five senses in some degree, they have not all the same kinds of dominant ideas and perceptions derived from these modes of sensation. An eagle and a dove may see and hear, taste and smell, but not in the same degrees, and their dominant perceptions, ideas, and instincts, are very different. The same may be said of the vulture and the owl, the ostrich and the pelican, the wolf and the lamb, the dog and the cat, the seal and the whale. Butchers and bakers, masons and carpenters, smiths and jewellers, are different vocations and human instincts, inherently adapted in individuals to one or other of these callings more than to another. One man is a born hunter or sportsman; butcher or soldier; another is a born cook, brewer, or baker: and so of born poets, painters, musicians, architects, inventors; in a word, of all inherent practical instincts and vocations. And just as a young duckling may be distinguished from a chick as soon as they are hatched and can run about, one to the water and the other to the midden, guided by similar visual sensations with different inherent instincts and perceptions, so young children, as soon as they can run about and see different trades at work, will naturally take part in those crafts most congenial to their inborn instincts. The practical intellect is a "blank" until impressed by visual and other sensations of the external world, but the "blank" is not without a texture with reactive power of its own, which reactive power of perception and ideation takes the duckling to the river and the chick away from water, except as drink. One man is born a Watt, another is an Arkwright, or a Jacquard, or a Stephenson, in practical inventive genius. Another is a Homer, a Virgil, a Shakespeare, a Milton, a Schiller, a Corneille, or a Moliere, in poetic genius; a Raphael, a Titian, a Michael Angelo, in painting or sculpture. Each female of any class, order, family, genera or species of animal, fish, reptile, bird, or mammal, is a *virgin* before marriage; but how different the progenies which are the result of fecundation in each case, just as the inherent or blank senses of each species of new born animal or man are virginal faculties of instinct, but how different the vocations of these instincts when impressed by the organoleptic forces and conditions of existence for each type?

The practical vocations connected with special sensations of *sight*, *touch*, *temperature*, and *gravitation* in mankind, are those of making ornaments and clothing, arms and armour, upholstery and furniture, boats for sailing on the water, carriages to roll on land, and balloons for flying in the air. Subordinate to these are all the crafts of *spinning*, *netting*, *weaving*, and *bleaching* tissues for clothing; *tanning* skins for leather; *felting* fibres of any kind to form tissues; all the arts and crafts, in fact, which are necessary for clothing, upholstery, furniture, arms, armour, coaches, boats, and balloons; not to mention tents and wigwams to protect the family against the inclemencies of weather.

The *fine arts* in connection with these special modes of sensation and delight, use and beauty, are painting and sculpture, engraving, photography, &c., which need only be mentioned to be recognised at once.

STRATEGICAL CUNNING, AND MODES OF ACTION.—Strategical instincts are numerous and various in different species and families. Felines lie in wait and pounce upon their prey; some spiders do the same, while others hunt and chase their prey like hounds and wolves. Some species of dogs also lie in wait to catch their victims by surprise. Some felines, like the cheetah, hunt their prey and overtake it in the chase.

Timid species like the hare and the rabbit, burrow in the ground, or hide in tufts of herbage, to escape from the sight of their natural enemies, and run away with all their speed when once in sight of their pursuers. Horned ruminants generally trust to speed to escape from danger, but use their horns as arms of defence when brought to bay. Horses trust to speed, or use their teeth and their hind-legs, as means of aggression or defence. Elephants use their trunk and tusks, or try to crush their adversaries under the stamp of their feet, or the weight of the body.

All animals and insects have special instincts of strategy for self-preservation in modes of procuring food, for themselves and their offspring, or in defending themselves and their progeny against assaults from rivals or from natural enemies.

Human races have like instincts of strategy and cunning for self-preservation, military organisation, and co-operative modes of action. The policy of an animal, or a herd of animals, depends upon the wants of the brute, and its instinctual modes of attack and defence. The policy of human beings individually, and of classes or nations collectively, depends upon the character of the race, with instinctual cunning, to obtain what they want, or retain what they have already got.

Different degrees of cunning and stupidity run parallel with those of elasticity and want of flexibility in muscular agility. Bears are cunning and skilful amongst animals, although they do not seem so. Horses are docile, tigers indocile; and so it is with men in certain cases, still there is complete accordance between the special characteristics of the body and those of the soul, however much appearances may be deceptive where want of experience and natural discernment fail in detecting the real correspondency.

Skill in arts and crafts of various kinds is power, in the industrial world, just as *knowledge* is power in all spheres of human activity; individuals as well as whole races are born, not only with peculiar industrial and artistic tastes and instincts, but with different degrees of aptitude and skill in the same species of instinct. One painter is a man of genius in conception and in execution, while another is a man of skill or talent without inventive genius; a third is a mere amateur, without either talent or genius; and a fourth may be a man of taste and a collector of works of art, without attempting even to paint a picture or to copy one. The same distinctions may be made in poets and musicians, engineers and mechanics, architects and builders, weavers and clothiers, farmers and commercial men; not to mention other branches of art and industry in civilized communities.

Quickness of sensation and perception is also as various in human beings as different degrees of velocity of motion in animals; and this is so manifest in every calling and profession as not to require further notice.

The general *strength and build* of industrial instincts run exactly parallel with those characteristics of body in animals, and something like a similar parallel between physiological and psychological characteristics may be observed in human beings. An elephant, a bull, a horse, a camel, a lion, a bear, a gorilla, and a man, have very different forms of body, with relative degrees of strength and elasticity; and different degrees of size and build are observed in species belonging to each of these orders of animals and human kind; but as man is a collective type of the whole class of mammalia to which he belongs, so some individuals represent pachydermals, while others represent the bovine, or the ursine, the feline, or the equine types of physical strength and build, as well as of instinctual strength and solidity of character. Every body knows different types of industrial energy and instinct, within his own circle of acquaintance, and can easily perceive to which type of animal each character belongs, so that we need hardly dwell on these pecularities of human instincts and endowments. Cunning as a fox, clumsy as a bear, treacherous as a cat, headlong as a bull, timid as a hare, sharp as a weasel, lazy as a sloth, greedy as a pig, are common epithets which need no explanation.

INSTINCTUAL MODALITIES.—The faculties of sight, and the times of activity and repose are not the same in diurnal, nocturnal, and crepuscular tribes of animals and insects; seasons of fecundation, ovulation, and incubation are not the same in different species inhabiting the same region; and human beings are subject to similar modalities of magnetic states of sensation and excitement, apathy and repose of body and of mind, at certain seasons of the year, or periods of day and night. Some rise and go to bed early, work well in the morning, and are sluggish in the evening; others rise late in the day, and are most active and sprightly in their work at night. The correlations of peculiar magnetisms, sensations, and industrial habits of activity, seem in fact to be almost as various in human races and individuals as in different orders and families of animals; and no amount of artificial training can totally overcome these inborn modalities of sensational impressibility and industrial activity, in parallel with physiological modalities, which seem to be governed in both animals and man by a sort of cosmic magnetism and change of seasons (the data of astrology as a field of speculative theory ?)

Subjective Sensations and Correlations.—The subjective modalities of sensation are very various in relation with different species of objective reality, and such relations may be easily distinguished :—

I. The so-called *internal states* of systemic sensation, absorption and elaboration, nutrition and exchange, secretion and elimination, in the body, affect the nerves of sensation in communication with the mind, in both the waking and the dreaming state.

II. *External nature* affects all the senses in special ways, during the normal state of health in body and in mind. These modes of impression are, however, extremely various under mutable conditions of motion and relation.

Variable external conditions may be classed under two general heads, namely, physical and psychological; both of which may give rise to real sensations and illusory ideas.

1. Physical Illusions.—All sorts of conjuring and slight of hand substitutions may produce semblances of external phenomena which are simulative and delusive, just as the unknown rotations of the earth on its axis impresses the senses with a delusive idea of ascending and descending motion in the sun, instead of rolling motion in the planet.

2. Psychological Illusions.—The human mind is not only impressed by the action of external objects on the senses, but also by mental representations of phenomena in language conveyed from the speaker to the hearer, and these representations may be either true or

only simulative, whence fascination or psychologization may produce more wonderful effects on the senses, and through them on the body and the mind, than even the most natural and normal objective forces and phenomena. Numerous examples of hypnotism are already given in physical biology.

The play of physical light may give various appearances to the same things, and thus produce illusory impressions on the senses and the intellect; and so may the play of mental light give various appearances to the same phenomena, and produce illusory impressions on the conscience and the mind. Great care is necessary to correct the delusive evidence of the senses by verificative methods in all scientific investigations.

Inventive Instincts.—What are the characteristics of inventive genius? Are they not peculiar states of sensibility and magnetism, analogous to the sexes of prolific animals and plants? We do not know the forms of atoms, but some kind of physical magnetism inherent in metals and metalloids causes them to unite and crystalize; we know the general forms of plants and their sexual contrasts in each species, but we do not know what kind of vegetable magnetism causes the pollen to be attracted by the ova of the same species, and no other; nor can we discern the inherent nature of animal magnetisms, peculiar to the sexes of each species; not only special attractions, but decided preferences of one bird for another amongst thousands, in the pairing season; and similar preference of one monogamic mammal for another amongst many; though some species are polygamous, and others more or less promiscuous within the limits of their own species, or their proximate allies.

In human nature we find the same peculiarities of sexual attraction and repulsion with regard to physiological marriage and proliferation, but with this difference, that the sense of smell is most intimately allied with the instinct of fecundation and ovulation in animals and insects, while the sense of *vision* is most impressed in cases of human fascination and conjugation; and this sense seems most in harmony with the intellectual faculty of perception, conception, and invention.

Birds invent their special forms of nest instinctively, but never improve or greatly alter the original shape and structure. Wasps and bees construct their hives instinctively, and when obstructions intervene, they modify some parts to suit localities, but fundamentally the structures are the same. Animals and insects have innate homogenetic faculties of invention. Man alone has progressive heterogenetic faculties of poetical, artistic, and industrial invention; and just as some animals are prolific and others not, so human beings are not only physiologically prolific or unprolific, but psychologically with or without inventive *genius*.

In the characteristics of sex, we find one half of the human population in a state of infancy or impuberty, under fifteen years of age; (the average of human life being thirty) a considerable portion, in a state of declining maturity, beyond the age of reproductive power, and consequently sterile or unprolific; a large number living in state of unprolific celibacy, or equally unprolific promiscuity; so that the real breeders or efficient prolificators of the human race are limited to a relatively small proportion of the whole community. Inventive genius seems, from some cause or other, to be still more limited in numbers, of practically prolific individuals of all ages and sexes, in every generation: and some periods of history are more prolific of new inventions and discoveries than others. There never was an age in which practical inventions and scientific discoveries have been so numerous and important as in the nineteenth century, although religious revelations and poetical inspirations were perhaps more definite and influential some two thousand, four thousand, and six thousand years ago. There seems to be a slow homogenetic process of growth during long periods, and then suddenly occur cataclysmic changes by heterogenetic degrees of new inspirations, religious revelations, practical inventions, and scientific discoveries; not equally in each metamorphic era, but sometimes a religious revelation: at others, new poetical inspirations; practical inventions; or scientific discoveries; and still, more rarely perhaps, at immeasurably long intervals, geological cataclysms and new creations or heterogenetic incarnations.

In the ordinary course of homogenetic incarnations, monsters without brains, or with two heads, or other deformities, are brought into the world to die as soon as born; and so it is with many new inventions of the intellect; but thoroughly new discoveries and inventions, though repulsive to the vulgar mind, are not monsters, which cannot live, but strangers, more or less unwelcome at their advent, destined to live and thrive, and finally supplant inferior types, or rise to higher uses in the world.

If physiological prolification and psychological invention be really parallel and analogous functions in human nature, though not at all identical, we must look for distinct sexes of genius in *suggestive* and *conceptive* faculties; and also for causes of sterility and proliferation in these faculties. Ignorance, or intellectual impuberty; promiscuous wilderings and bewilderings of thought; incipient conceptions and premature abortions; inventive infanticide for want of means to foster new creations of the intellect, and numerous other causes of failure are enough to account, in some measure, for the relative paucity of artistic and industrial creations in civilized and uncivilized communities.

And then, again, as in physiological proliferation we have the perpetuation of the same inferior breeds, and the improvement of such breeds by crossing with superior races of the same species, so in psychological proliferation and invention, we may have the perpetuation of the same forms of invention from generation to generation (as in the hives of bees, the nests of birds, and the huts of human tribes of savages), or new and improved forms of mechanism, by crossing inferior with superior breeds of psychological endowments.

What are the inferior and superior races of instinctual endowments in the human family? Civilized communities are evidently superior to uncivilized, and vast improvements may be realized by the latter from intercourse with the former; but then, how did the civilized communities themselves rise from the inferior savage state to the superior civilized? How were the first savages crossed with a superior race of human beings, when all were equally ignorant and helpless? Was it not that a less ignorant race existed elsewhere, and that the race on earth was psychologically inspired by enlightened brethren of the same human species in heaven, to conceive and bring forth new inventions superior to the unprogressive forms of animal and undeveloped human contrivances? Poets and musicians have always claimed such modes of inspiration.

This is the mode in which we account for progressive human instinct, and practical as well as poetical invention, contrasted with unprogressive animal instinct and ingenuity. We need not discuss the questions of amphimundane mediumship and inspiration from a higher world of human knowledge and experience to this lower world, as that question will be dealt with elsewhere, but we know that human beings in the spiritual world can and do communicate their thoughts to men in this world, and that psychological suggestions and conceptions are just as easy between enlightened and ignorant races of humanity inhabiting different worlds, as between men and women of the same race and language in our own world. Men of inventive genius therefore of the highest order, are those who are inspired by superior fellow-beings in the spiritual world, instead of being inspired by ignorant human beings in the natural world: and thus ignorant humanity on earth is governed and controlled by enlightened humanity in heaven.

Men and women may proliferate, but a living spirit must *animate* the fœtus in the womb. Conceptive and suggestive genius may imagine, but more enlightened spirits must *inspire* new forms of thought. Children may wonder and inquire, guess and suppose, but well informed adults must instruct and educate them.

Genius, however, is not merely a question of psychological inspiration, but of special types of invention in poets, artists, and mechanical or industrial inventors of all descriptions. It is a question of collective biology as well as of individual biology, and will present itself again in sociology.

In physiological procreation, miscarriages are not uncommon; in the psychological realms of practical invention, miscarriages are numerous. Not one in a thousand patents obtained for new inventions ever succeed in practical application; Mr. Alexander Bain observes, ("Senses and the Intellect," *page* 547), that

"Inventive genius requires the quality of mind well known by the name of *judgment*. I have already included a clear perception," he says, "of the end to be served, as essential to a high order of constructive ingenuity, simply because without this, though there may be great profusion of the requisite devices and suggestions towards the required combination, the fitting result is not really arrived at. Judgment is in general more important than fertility (of suggestion) . . . . for, without judgment, the highest exuberance of intellect is only a snare."

Judgment, in our analysis of intellect, corresponds to the serous and areolar connective tissues, and their regulative functions in all parts of the body, so that regulative judgment is not only necessary to the inventive faculties, but to all the faculties of intellect. No amount of health and dexterity in the body would however enable a virgin to conceive without marriage, nor would any amount of common sense alone give inventive genius or conceive new forms of thought, although sound health of body and of mind are favorable to physiological gestation and psychological inspiration.

Inventive imagination may be common to all the human race, in a degree, just as genetic glandular secretions are common to adults of both sexes ; and, still, as comparatively few become fathers and mothers of healthy children that live and prosper, so comparatively few imaginative intellects become the authors of new practical inventions which live and prosper as artificial creations, useful to mankind.

Proliferation is a mundane relation of the sexes, male and female. Incarnation is an amphimundane relation of the two humanities, *celestial* and *terrestrial.* Imagination and expression, conversation and instruction are mundane relations between old and young, learned and unlearned. Inspiration and invention are conscious or unconscious amphimundane relations between higher celestial and lower terrestrial intellects.

All living forms exist in the spiritual world before they descend to the natural world by incarnative and metamorphic evolution. All arts and inventions, laws, and sciences exist in celestial minds before they descend by inspirational elaborative evolution into terrestrial minds. These relations between human beings of different spheres are just as natural as those between different sexes and ages inhabiting the same world; and thus homogenesis and heterogenesis come within the more general limits of social intercourse and progressive evolution.

Innumerable human beings have complete human forms in both the spiritual and the natural worlds, while others are building up their outward bodies, bit by bit, by metamorphic evolution in the womb. Perfectly organized and harmonized humanities, well acquainted with sciences unknown to us (or only in their infancy at present) exist in other planets and solar systems, while our poor ignorant humanity on earth is only in the early rudimental phase of sociogenetic evolution.

ALIMENTARY APPETENCIES AND PROCURATIVE INSTINCTS.—All the instincts of the animal kingdom are united in collective humanity by omnivorous modes of consumption and omnigeneric modes of procuration and production; and not only are the animal instincts thus combined, but they are developed in higher degrees of practical skill or cunning. To distinguish animal from human instincts especially with regard to physiological constitutions and instinctual modes of procuring food, we must form a concentric parallel of physiological, pneumatological, psychological, and noological faculties and functions in mankind, contrasted with inferior though analogous faculties and functions in animal and vegetable nature. Thus,

1. Vegetable or physiological appetencies and constitutions.
2. Animal psychological instincts and endowments.
3. Animal sociological propensities and dispositions.
4. Human noological yearnings and capacities.

Certain plants absorb one sort of elementary food, while others require a different kind of soil and culture; some plants haunt rivers, lakes, marshes, or the ocean, while others prefer dry land with moderate moisture, or very dry air.

The same diversities of physiological constitution are observed in the animal kingdom. Some are carnivorous or insectivorous, herbivorous or granivorous, while others are omnivorous. Some live in the water, others on land, in high or low latitudes, while others again haunt the higher regions of the air.

If such a word may be applied to vegetable organisms, the *instincts* of plants are adapted to their favourite haunts or habitat: that is to say, they only thrive well by nutrition, where the conditions of habitat are suitable. So it is with animals, and even with man himself. But, then, he is endowed with powers of adaptation of a higher order than those of plants and animals. Practical intellect with him is superior to animal instinct; and yet he may obtain much practical *knowledge* from experience, as animals do, without ever attaining to the *science* of any general law of nature.

There must be a sort of nutritive and selective instinct in a plant which absorbs from the soil, the water, and the atmosphere, such elements only as are suitable to its peculiar physiological appetency. There is certainly a nutritive and industrial instinct in animals, which select from surrounding nature such kinds of food as suit their alimentary constitutions, and induce them to procure such food by means appropriate to the ends proposed.

The same alimentary wants and instincts exist in mankind, with numerous other wants of clothing, building, rearing young, &c. Animals are armed by nature with teeth and claws, hoofs and horns, beaks and spurs, coats of mail, mephitic secretions, electrical batteries, &c.,

which protect them from enemies, and enable them to procure food suitable to their constitutions, and to that of their offspring. Man is unarmed by nature, but he is endowed with *practical intellect* and cunning, which enable him to arm himself artificially for all the purposes of self-protection and defence, as well as those of procuring food for himself and his family. Practical intellect in man, is, therefore, a substitute for instinct in animals and plants ; but still industrial and artistic instincts in mankind run parallel with those of animals: and although collective humanity contains and surpasses every kind of animal ingenuity ; still individuals are not endowed with every variety of instinct. Each profession has an intellectual appetency suited to its special wants. It does not seek indifferently all kinds of knowledge and experience, but mainly such as is useful in its special vocation. Practical knowledge is the natural food of the instinctual organism, just as physical substance is the natural food of the body, and each industrial instinct seeks for appropriate kinds of knowledge, as each species of animal seeks for appropriate kinds of food.

Vegetable food is most commonly sought in tropical latitudes, with small proportions of animal food ; a more equally mixed diet in temperate regions, and animal food almost exclusively in frigid climes. Light clothing and open habitations, warm clothing and comfortable dwellings, extra warm clothing and heated caves, correspond to these climates respectively. Human alimentary constitutions and industrial arts are adapted to the wants of the community in all such latitudes, just as the physiological wants and psychological instincts of animals are adapted by nature to their innate wants and surrounding conditions. And hence we find that tropical races of mankind have generally small hands and feet (except in the Alpine heights ?), and vegetarian habits of diet ;

in temperate latitudes, medium proportions of hands and feet, with omnivorous habits of diet; in frigid regions large hands and feet, with carnivorous habits of diet.

The migrations and intermarriages of different races modify these features to some extent, but still they are more or less marked in different races and latitudes.

Not the mortal body only, but the experiential mind of man is subject to the influence of surrounding conditions; and although the body of a Laplander fed on fat and blubber, may resemble that of a Hindoo fed on rice and curry, sugar and water, and the instincts of the two be very similar in general characteristics, still the difference will be very marked in practical aptitudes and modes of activity; quite enough to unfit either for the habits, food, and climate of the other. And the same may be said of the animals and plants of one and the same species in these distant latitudes.

MNEMONIC MODES OF ACTION. — Mnemonic modes of action differ in animals endowed with different instincts of vocation, and so they do in man. Musicians by vocation easily remember sensations and ideas of sound and melody, while painters and sculptors may or may not have such a memory. Each professional vocation has a special kind of memory for facts pertaining to its favourite vocation, and easily forgets other species of sensations and ideas.

The intellect or instinct of an animal is exactly correlative with its bodily form, and is thus easily discerned, but varieties of practical intellect and vocation in mankind, not being easily distinguished by mere varieties of feature and physiognomy, are discerned in their characteristic modes of action; and nothing is so clearly indicative of the special vocational instinct or intellect of a man as the peculiar aptitudes of memory for one species of sensations and ideas, with a concomitant inaptitude for other kinds of sensations and ideas. One man learns more easily by one method, and another by a different method. A practical intellect learns easily by simple experiment, synthetic order of arrangement, and association of ideas. A scientific mind learns more easily and rapidly by multiple coordinations of parallel forces and phenomena laws and principles, involving all kinds of sensations, feelings, and relations. But even here, again, one type of vocational mind differs from another in its aptitudes for learning and remembering abstract laws of science. Sir Henry Holland observes, in his medical notes and reflections, that—

"Special instances are ever before us where the mind, by its constitution, is so unfitted for particular objects of study, that the attempt to force the memory or other faculties upon them, is not merely fruitless, but hazardous in result. In mathematics, this caution is especially needful, there being no single mode of intellectual action in which this natural difference of mind is so strongly marked." We may add, however, that it is not less manifest in dialegmatics (languages, &c.), than in mathematics.

Some have one dominant vocation manifest in early youth which continues throughout life, while others seem to be absorbed by one vocation in childhood, which is completely superceded by another, or by several others, in adult life. It is not safe, therefore, to suppose a child will always be devoted to painting, or music, or any other art or craft, exclusively because he seems absorbed by them in early life. Mozart, and many other prodigies of genius in infancy, however, have never abandoned their first love or disappointed expectations of continuous success.

Instinctual Impress is very marked in both animals and man. Peacocks are vain, turkey-cocks irascible. Fighting cocks are combative and brave; many other species of birds have very marked instinctual characteristics more conspicuous in the males than in the females of the same species. The same differences may be observed in the higher animals. The llama has an exceedingly supercilious air, when its head is thrown backwards at the top of its long neck; the camel has a similar expression, though its neck is always curved, as if in feigned humility. The giraffe has also a supercilious expression of tall dignity, hardly less conceited in its attitudes than the camel and the llama. Bulls and bears are surly; horses are proud; goats have a lascivious stare. Pachydermal animals have a self-willed independent bearing. Felines have a dauntless eye and an aggressive bearing; hyænas have a stealthy, mean and slouching amble; the wolf has a defiant predatory, and the fox a cunning, thieving look, and every other species of animal has a particular impress of instinctual character, if we take the trouble to examine carefully.

In mankind we find all these characteristics of instinctual impress as definitely marked as in the animal kingdom. One man is naturally proud, another vain; one is affable, another surly; one timid, another independent; some are open, others are secretive. Conceit or pride, supercilious or manly bearings, seem to be as natural to human beings of different characters as to animals of different species.

Manners and Fashions vary in different classes, as education and religion vary; but the natural impress of character may always be discerned in individuals of every class, whatever be their education and their manners, their age or their vocation. Within due limits, and when disciplined by education, Vanity desires to please and be admired, and, therefore, seeks to please by kindness and politeness. Pride cannot brook humiliation or rebuke, and, therefore, seeks freedom and independence, not for itself alone, but for all. Cunning is fond of acting in secret and with caution, and may be very good for detecting fraud and roguery. Bravery is good for military vocations, and all natural characteristics of instinctual impress may be turned to uses when properly directed.

A vain man, though naturally prone to be conservative, may be as honest and as honourable as a proud man who is fond of liberty and progress; and so of every other special kind of instinctual impress. However moral or truthful a vain man or woman may be, they are often unbearable to some people, and the same may be said of very proud men and women, even where they are neither haughty nor overbearing. Sympathies and antipathies of this kind are generally quite unconquerable; even where the cause is so very obscure, that the person affected cannot describe it, still the impression remains indelible. No bear is a pleasant companion for a bull; no tiger for an antelope; no wolf for a lamb; no cat for a dog,—although they do sometimes live in peace together in the same house, as goats may live with donkeys, horses, cows, and pigs, in the same field, without quarrelling and without social intercourse.

INSTINCTUAL IDIOSYNCRASIES.—As there are physiological, so there are psychological idiosyncrasies. One man is naturally grave, another gay, of a melancholy cast, or hopeful. Owls are grave and solitary; parrots and rooks are loquacious and sociable; tuneful nightingales are melancholy and retiring; sky-larks, hopeful and aspiring; male birds of the pheasant species are jealous and combative, while those of the duck species are submissive and obsequious; all these varieties of psychological idiosyncrasy are as definitely marked in men and women of different tastes as in animals of different species. National idiosyncrasies are often as distinct as those of individuals. The French are of the pheasant character, in this respect, and have appropriately chosen the *coq Gaulois* as their national symbol. The English and the Dutch are of the anserine turn of instinct, but have not chosen the duck or the goose as their national emblem. "John Bull" is not as galant as the Frenchman, nor as fond of duelling; he is a pacific animal, somewhat surly and independent, generally uxorious and obsequious to his better-half, in all domestic matters. The Irish are more like the French, though generally faithful to their spouses. The Scotch more nearly approach the English and the Scandinavian. Spaniards have a melancholy pride; Italians a supple and intriguing vanity. Northern races are apt to be more frank than affable; Southern races insincere and untruthful, though fair-spoken and polite. Education modifies but does not easily eradicate these instinctual idiosyncrasies.

Some men are naturally witty, others very dull; some are imitative, while others, who are not adepts at imitation, can simulate adroitly. Some are prolific in inventive genius, others unprolific, while many are quite barren of imagination and invention.

Psychological Health and Diathesis.—There is a psychological as well as a physiological diathesis, and just as children inherit the one from their parents, so individuals inherit class prejudices and opinions from their ancestors, and from the society in which they live. Jews remain Jews, Mahomedans imbibe Mahomedan opinions, Roman Catholics their special creeds, Protestants, of every sect, their favourite doctrines; and so of every religion, sect, and class, according to hereditary influence. The progress of positive science may modify to some extent these states of mind, but centuries of progress have had little influence as yet, in engrafting toleration and common sense on the strongly prejudiced minds of religious and political sects and parties. They cannot all be sound in psychological health, but each one thinks himself more healthy in his creed than those who differ from him in opinion. Were it not uncivil, we should be tempted to class exaggerated views of any kind as diseases of the intellect, analogous to gout and rheumatism, scrofula and cancer, phthisis and heart disease, and many of them might be placed in parallel with parasitical diseases, in the outward skin and the internal viscera. These diseases affect the health of the body very much, and psychological infestations of pernicious creeds and prejudices affect the intellect as banefully by injuring common-sense, as parasitical and constitutional diseases injure the health of the body; and just as good food is turned to bad account in the nutrition of a diseased body, so simple truths are turned to bad account in the nutrition of diseased souls. Nothing is more common than to hear all forms of real truth brought forward in support of false doctrines and erroneous opinions, not to mention popular prejudices, and this is done consciously or unconsciously by rhetorical substitutions analogous to tricks of conjuring and sleight-of-hand.

Plenary inspiration is claimed for every word of the Bible, the Koran, the book of Mormon, or other "sacred" volumes. Infallible authority is claimed for the dogmas of every church and every sect. Who can reconcile all these views, or adopt any one of them, without restriction.

All forms of animals and instincts come from the hands of the Creator; the wolf and the lamb, the dog and the cat. All forms of revelation may come from the spiritual world; the Bible and the Koran, the oracles of Greece, and those of Scandinavia; not to be harmonized any more than the wolf and the lamb, but to be superseded in time by higher forms of revelation, as extinct animals give place to higher types of life and organization. The Gospel is a re-incarnation of the Jewish Bible in a better form, as the Bible itself was a re-incarnation of older revelations than itself. There are certain forms of truth in all, but nobler forms in one than in another.

Imperfections of body and mind in the social community are analogous to rudimental states of the fœtus in the womb, before it is completely formed; and as these incipient shapes are gradually altered and improved by metamorphic evolution, so may imperfect laws and doctrines be modified by more enlightened views of truth and justice in the sociogenetic progress of the race.

THE USE AND DESTINY OF INSTINCT.—Practical instincts and vocations are as definite and almost as distinct in human beings as in animals, though not so obviously indicated by external forms and physiognomy; and although children do not inherit from their parents the same tastes and aptitudes, their practical vocations are nevertheless innate.

Instinctual vocations are predestined to special uses in mankind as well as in animals, but the *manner* of their evolution will vary with conditions of society. In savage tribes natural vocations will be shown in rudimental modes of action; more developed in pastoral clans; still more in agricultural and military barbarism; and still more wonderfully in civilized nations, where they have a wider scope. Poets and orators, sculptors and painters, architects and actors, had great scope in ancient Greece, but engineers and mechanicians had comparatively little chance; and although modern civilization may be highly lauded in comparison with ancient, we can hardly guess how lamentably natural tastes of various kinds are still cramped and paralysed for want of circumstance to call forth all the energies of inborn aptitude.

The predestined ends of human instincts and practical vocations are those of *use* and *beauty* in artistic and industrial pursuits; and a man occupied in any other calling than that for which nature intended him, can neither be as useful to himself and to society, as he otherwise would be; nor can he invent forms of beauty as freely and as well. It is a matter of much importance therefore that society should educate children of all classes in useful crafts and arts of general refinement. Schools and colleges, galleries and museums, workshops and public sports, should be accessible to all, and recreative as well as instructive.

PART III.—PSYCHOGENESIS.

CHAPTER I.—PSYCHOGENETIC MODES OF ACTION.

Distinct Kinds of Elements and Sensations.—There are but sixteen kinds of atoms, it is said, in organic fluids and tissues, and all types of organism are formed of these few elemental substances (mainly four: oxygen, hydrogen, nitrogen, carbon). There are but few distinct kinds of sensation and ideas received through the channels of the senses; mainly those of sight, hearing, touch, taste, and smell. These, however (as we have seen in the synoptic outlines of anatomy) are closely allied with secondary organs of sensation, which give us about a dozen kinds of habitually conscious sensations with several others, which only become consciously felt, occasionally, by unpleasant or painful degrees of excitement. Muscles, bones, nerves and skin, hair, teeth, blood, and lymph, are all built up with a few kinds of simple elements, and all the faculties of the experiential intellect (such as memory, imagination, judgment and reflection) are built up of ideas received through a few direct channels of sensation.

GENESIS OF IDEAS.—Ideas are derived from sensations received mainly through the medium of special organs at the peripheral extremities of nerves; sensations are the result of physical and physiological modes of motion, reflected, as it were, and photographed upon the soul. We have already seen what nervous currents are from peripheral surfaces to central ganglia, and back to motor organs. Organoleptic forces impinge upon the organs in which the peripheral ends of sensor nerves are distributed; these carry the impressions to special ganglia, in which sensations are received, and from which reactive currents are sent through motor nerves to such parts of the body as are required to act in response to the sensation; (or through the brain, when thought alone responds to the impression without determining physical reaction). We may give a general view of the main factors of sensation in a tabular form, thus :—

Satellites.	*Organs.*	*Senses.*	*Organoleptics.*
Vascular Satellites.	U. Nose.	SMELL.	Gases.
	O. Absorbents.	(Ease.)	Lymph, &c.
	Ω. Urethra.	*Mictural* sense.	Excretions.
	H. Capillaries.	(Ease.)	Blood.
Alimentary Satellites.	U. Mouth.	TASTE.	Solutions,
	O. Duodenum.	(Ease.)	Aliments.
	Ω. Anus.	*Anal* sense.	Excretions.
	H. Gland ducts.	(Ease.)	Secretions.
Generative Satellites.	U. Oviducts.	(Ease.)	Ovulations.
	O. Vagina.	SEXUAL sense.	Congestions.
	Ω. Nipples.	*Suckling* sense.	Congestions.
	H. Incubatives.	*Fostering* sense.	Parturitions.
Motorial Satellites.	U. Ears.	HEARING.	Sounds.
	Ω. Glottis.	*Voice.*	Effort.
	O. Tendons.	*Weight.*	Resistance.
	H. Fascia.	*Muscular* sense.	Motion.

Satellites.	*Organs.*	*Senses.*	*Organoleptics.*
Cutaneous Satellites.	U. Eyes.	SIGHT.	Photological.
	Ω. Palms.	TOUCH.	Barological.
	O. Cuticle.	*Temperature.*	Thermological.
	H. Mucus membranes.	*Systemic* sense.	Electromagnetic.

Organic *sensations* of hunger and thirst, general *cravings* for special kinds of food or drink, exercise or rest, sleep or wakefulness, instinctual *appetites* for animal or vegetable kinds of food, belong to the general category of feelings in connection with the organs of the body, and the faculties of the soul. There is, however, much more elaborate attention bestowed on the analysis of the five primary senses, than on these organic feelings. Numerous shades and degrees of sensation have been recognized and named, while the various shades and degrees of organic sensation have neither been carefully defined nor named. There is a dearth of words, therefore, in almost all languages, which makes it difficult to describe varieties of feelings. In the sense of sight, we distinguish many shades and degrees of light and colour, dulness or brightness; and also in the sense of hearing, many octaves of sound, bass, barytone, and tenor, loud or faint, musical or unmusical, as well as many different tones (or *timbres*), in the *harmonics* of different substances, glass or metal, wood or stone. Hard and soft, rough and smooth, waxy, pulpy, watery, and many other words denote peculiar sensations of touch; bitter, sweet, sour, nauseous, insipid, and numerous other words denote varieties of taste; and although varieties of smell are not so well defined and named, still some degrees of difference have been noted by reference to the objects which excite peculiar sensations, such as violet, rose, lily, wall-flower, peach-blossom, and others, not to mention the unpleasant smells of various shades, such as those of brimstone, ammonia, asafœtida, and other substances, which emit strongly scented gases or effluvia.

Difference of colours and brightness, in the senses of sight, are distinct from degrees of intensity of light or darkness, as differences of tone are distinct from degrees of loudness or volume in sound. In organic feelings we seem to recognize only degrees of intensity, without noticing or naming varieties of sensation, analogous to those of sound or colour. Such differences do exist, however, in reality, though not so easily distinguishable.

Hunger and thirst are very different varieties of organic sensation, subject to like degrees of weak or strong intensity; thirsts for water, for acid or bitter drinks, are not alike, and most, if not all, the organic feelings, if we could learn to analyse them, and give appropriate names, include numerous shades of variety and degrees of intensity, from slightly pleasant to delightful, or slightly unpleasant to intensely painful.

There are general and special modes of sensitivity in vegetal as well as animal organisms; heat and light have great influence on the latent association of atoms (nutrition) in plants, and more especially on those species which hibernate in winter; the rootlets and the leaves of plants are the special avenues of absorption and respiration, while in animals the alimentary and respiratory senses and systems are the main avenues of admission for solid, liquid, and gaseous elements of food. They have special organs of sensitivity for light and heat, as well as for alimentation and respiration; and these relational organs seem to be more important channels of psychological sensibility to convey sensations to the soul, than the organic senses of taste and smell. All the sensitivities in plants affect the nutrition of the organism, and all the sensibilities of animals affect both the nutrition of the body and the latent association of ideas, but all are not special feeders of the body, as they are of the soul; and here we see at once a wider and a deeper range of vitality in the soul than in the body, although the organs of the one run parallel exactly with the faculties of the other, in animal and human forms of life and organization.

In the table we see five principal senses, namely: smell, taste, hearing, sight, and touch; nine secondary channels of sensation, or feeling, namely: urethral, anal, genital, lacteal, vocal, resistant, motorial, temperatural, and general; the latter being a systemic sense of ease or pain in any part of the body. The organic feelings of functional ease or discomfort are also five in number, or six, if we include the fostering sense of parents for their progeny during and after incubation and parturition. We have thus five categories of sensation, four orders in each class, and numerous varieties or species.

The senses of taste and smell preside mainly over respiratory and alimentary ingestions; the generative senses, over fecundative, ovulative, incubative, and fostering operations; but all the senses subserve physical, mechanical, chemical, and physiological uses in the body, as well as psychological uses in the soul. They converge from peripheral organs, through sensor nerves, to ganglionic centres, where the soul receives sensations as the body receives atoms of substance through special channels of ingestion, absorption, circulation, and exchange, or nutrition. What, then, are the corresponding factors of psychological ingestion, absorption, circulation, and nutrition, or sensation, perception, recollection, and latent memory (or the association of ideas), in the faculties of intellect? emotions in the will? cognitions in the understanding?

The absorbing physiological *sensitivities* of a plant, and the nutritional preferences for one kind of food and climate to another, are analogous to the psychological *sensibilities* and the intellectual preferences of an animal for one kind of pleasure and vocation to another; and also to the *emotions* of the spirit and the volitional preferences of the will for one kind of affection and society to another; and equally analogous to the *cognitions* of the human mind and the rational preferences of the understanding for one kind of science to another. The physical, instinctual, social, and scientific conditions in which human beings are placed, are what are termed external *organoleptic* factors of biology. The sensitivities of the bodily organs; the sensibilities of the intellectual faculties; the emotional susceptibilities of the spiritual organism; the cognitional penetrations of the rational mind, are what may be termed the external *instrumental*, or experiential factors of biology. The special *type* and predetermined characteristics of the body; the hereditary and vocational, or innate, *instinct* of the soul; the volitional *will* of the spirit; the regulative reason of the understanding, are the *determinative* factors of biology, in all cases of physiological selection, psychological vocation, spiritual conduct, and mental application.

In plants there are no nerves to carry impressions from sensitive organs to selective centres of reaction, but in animals and human beings the sensor and the motor nerves act as *telegraphic* or intermediate factors of biology, in addition to the *organoleptic*, *instrumental*, and selective or *determinative* factors. Body, soul, mind, and spirit, must exist in a special form or type of organism before all these factors can be fully manifest, in experiential life, or even in the phases of metamorphic evolution; but while physiologists distinguish embryogenesis from evolutive phases of growth and decline after birth, psychologists confound one with the other in describing the genesis of ideas with instinctual or innate types of intellect and psychological modes of action. They also confound the latent or nutritional associations of sensations and ideas in the faculties of the soul with functional minglings and assimilations of sensations, feelings, and ideas, by the faculties of the soul; which is just as inconsiderate as it would be to confound the digestive processes of assimilation of atoms for elaboration in the blood, with the nutritional exchanges and associations of atoms in the cells and tissues of the organs themselves. It is not, however, what they do, but what they leave undone, which requires notice here, since we refer the reader to their writings for elaborate details of experiential psychology.

CHAPTER II.—THE ASSOCIATION OF IDEAS.

The faculties of intellect are formed and sustained by latent associations of ideas, just as the organs of the body are formed and sustained by the latent associations of atoms. Psychological modes of thought and the utterance of ideas are analogous to physiological modes of secretion, with vibratory motions in the viscera and the external frame; and as each cell, tissue, and organ associates atoms of matter in such wise, that muscular tissues may contract and relax, fibrous tissues vibrate, glandular tissues secrete, the intimate associations of atoms accord with the functions of the tissues formed. Their *functional modes* of motion and disintegration, agree with their nutritive or *structural* modes of motion or latent association.

COMMINGLING OF IDEAS.—The structural association of atoms in cells and tissues differs somewhat from the comminglings of atoms in the blood, not perhaps essentially, but mechanically, and the same may be said of the association of sensations or ideas in the intellect. The physiological processes of digestive assimilation are numerous and various, by which atoms of food are prepared for nutrition and exchange in cells and tissues, and similar processes occur in psychological digestion, to prepare mingled sensations and ideas for the functions of intellectual nutrition and exchange, or latent association in the faculties of thought. The food of the body is first mixed with saliva in the mouth, and if not spit out at once, it is turned by the tongue and triturated by the teeth in the moving lower jaw against the teeth in the fixed upper jaw, until it forms a bolus fit to be swallowed and sent down the gullet into the stomach; where it is further churned about and mixed with gastric juice, until formed into chyme fit for passing through the pyloric orifice into the duodenum, where the acid pulp is mixed with the alkaline secretions of bile and pancreatic juice, on its way to the small intestines, meeting with other glandular secretions from the intestinal follicles, until it becomes fit for absorption by the veins and lacteal vessels, and is poured into the river of life. The food of the intellect undergoes analogous processes of preparation by successive minglings and assimilations with inwardly digestive thoughts, to prepare it for absorption in the memory, or for rejection as mere refuse, unfit for the support of common sense. "Read, mark, learn, and inwardly digest," are proverbial descriptions of this mingling process, distinct from that of the retentive memory and the latent association of ideas, by which the faculties are ultimately strengthened and renewed.

These phenomena have been described by psychologists as associations of ideas by correlations, such as resemblances or differences, contiguity or contrast, coexistence and sequence, which we may compare with the likeness and unlikeness of milk or eggs, flesh or fruit, bread or cheese, wine or beer, tea, coffee, or water, to the constituent elements of saliva, or other secretions derived from the blood for the purposes of physiological digestion, There is certainly a commingling of new food with digestive secretions, by means of likeness and unlikeness, contiguity and separation, but that is not the latent association of nutrition and exchanges in the tissues; nor are the preliminary comminglings of sensations and ideas identical with the latent associations of ideas, opinions, and sentiments, in the psychological constitution of the individual. Felines and falcons live on raw flesh, and have very similar experiences and habits of procuring food; and so have sharks that live in the sea; but, notwithstanding these very strong similitudes of habits and instincts, there are marked differences of form and structure in the bodies and the souls of these animals. The differences are still greater, in some respects, between herbivorous, insectivorous, carnivorous, and omnivorous types of the same realm, or class, of animals, and analogous varieties may be discerned in the vocational habits and instincts of human beings, with their respective modes of seeking and acquiring sensations and ideas for building and sustaining their vocational forms of intellect. A musician has one prevailing habit of collecting sensations and ideas; a poet has another; a painter, a sculptor, an architect, a builder, an engineer, a lawyer, a clergyman, a physician, a farmer, a butcher, a gardener, a cook, a coachman, a merchant, a banker, or a broker, have all like habits of acquiring and comparing sensations and ideas, but they build up very different varieties of intellect by an incessant latent association of ideas, received and cogitated or digested, by like processes of perception, comparison, and reception or rejection.

The processes of psychological nutrition or the latent association of ideas, are also very similar in all kinds of intellect, just as those of physiological nutrition are similar in all types of organism, but the kinds of food they feed upon, and the instincts they develope, are very different in widely various or incompatible instincts and vocations.

We refer the reader to the works of John Locke, James Mill, Herbert Spencer, Alexander Bain, and Mons. Mervoyer, for minute details of the various processes by which sensations and ideas are commingled and assimilated by what are called the "laws of contiguity and contrast, likeness and unlikeness," so as to prepare them for "latent associations" of ideas, to form the different faculties of the experiential intellect. These psychological processes are much more easily remembered, however, in parallel with the physiological processes of digestion and nutrition, to form distinct organs of the body, and sustain their energy through life.

It is easy to follow the minglings of new alimentary substances with saliva, and other digestive secretions to associate them by assimilation with the blood, before they are finally lodged in the organism by nutrition in different kinds of tissue; and so it is with the mingling of new sensations or ideas (as alimentary elements of the mind) with spontaneous imaginations and reflections to prepare them for reception or rejection, and finally for circulation in the memory, and latent association in all the constituent faculties of the soul.

But latent associations of *atoms* are first formed in the body unconsciously by metamorphic processes of evolution in utero, and then continued unconsciously through life, although the minglings and combinations of food with digestive secretions in alimentary processes are consciously performed in the first stages, and unconsciously in the later stages of digestion and absorption. And as with physiological processes of alimentary assimilations, and latent nutritive associations of atoms, so with psychological processes of acquiring and assimilating *sensations*, and the latent associations of ideas in the faculties of the intellect. The early stages of acquisitive processes are consciously performed; the ultimate stages of assimilative and nutritive association occur quite unconsciously. The conscious commingling processes of association by the so-called laws of resemblance and difference, contiguity and contrast, coexistence and sequence, are preliminary stages of assimilation; not the unconscious final stages of the latent assimilative and nutritive associations of ideas: which modes of psychological association can only be conceived in parallel with analogous processes of physiological nutrition. Atoms of matter *cohere* in the tissues of bone or muscle, nerve or skin, by affinities of likeness or unlikeness, fitness or unfitness.

It is not difficult to see that the formation of the organs in embryogenesis, and the functions of the organs during life are distinct aspects of biological phenomena, and a little reflection will show us similar aspects of psychogenesis and functional psychology. A few quotations from two small numbers of Chambers's "Papers for the People" and "Information for the People," the one on "Animal instincts and intelligence," the other on "The human mind," will enable us to note such necessary distinctions. The human mind is thus analytically defined to consist of

"I. Sensations, appetites, and instincts.
II. The intellect.
III. The emotions.
IV. The activities."

"Sensations are divided into two categories:—

ANIMAL SENSATIONS.

1. Sensations of organic life.
2. Sensations of the alimentary canal.
3. Sensations of taste.
4. Sensations of smell.

INTELLECTUAL SENSATIONS.

5. Sensations of touch.
6. Sensations of hearing.
7. Sensations of sight."

These are described at length, and afterwards the *appetites*, of which it is said :—

"The appetites are largely involved in human enjoyment, and are stimuli to human thought and activity. In proportion to their strength, the frequency of their recurrence and their capacity of being gratified is their influence on the general stream of consciousness. *Instincts* belong to the special means of action that each animal possesses for accomplishing its various works and fulfilling the ends of its existence.

"The most strongly marked description of instincts seem to proceed upon an innate knowledge of what is usually learnt by experience alone. This is exemplified in the senses of taste and smell, when they enable us to decide upon what is good for the alimentary canal in the first place, and for the organic system, in the choice and rejection of food. . . . The migrations of birds show the same characteristic of preordained knowledge. . . The elaborate constructiveness of many animals, such as the bee, the beaver, and the nest-building birds, is a still higher stretch of instinctive or preordained power.

"A circle of instinct is usually in succession to a circle of sensation. The muscular feeling that terminates a sensation is the first step in an instinctive circle; and if there be several successive movements, the feeling of the last muscular positiou in one movement is made to stimulate the ganglion, which sets on the second.

"THE INTELLECT.—The products arising from the action of the powers of the intellect upon the sensations, appetites and instincts, or upon the more simple circles of mind, are very numerous and varied, and might be exemplified by all the arts, sciences, and organization of human life, and by what is meant by such terms as understanding, reason, judgment, abstraction, memory, imagination, invention, and the like."

Here we have an enumeration of faculties, which belong to both intellect and reason; and in describing these, the author confounds faculties with functions, and assimilative processes with nutritional or latent associations of sensations and ideas in the faculties of imagination, memory and judgment; individuality, comparison, causality and eventuality. The descriptions of functional modes of action, are nevertheless good, and we quote a few of them. Genesis, exercise, growth, habit, education, training, evolutive phases of bodily development, and vocational dexterity, are all more or less involved, as well as latent nutritional associations, but we need not notice them as we read the general descriptions.

"The first property or law of mind upon which intellect is based, is a property that seems to adhere to the inferior circles, as such, not as one of the laws of intellect proper. It is the law of the permanency, endurance or coherence of sensational states. When a surface of sense is impressed by an object and the influence transmitted to the central ganglion from which the responsive action proceeds outward to the connected muscles, we find that the impression once made continues for some time, more or less, after the object is withdrawn; the circulation of influence perseveres in the absence of what set it on. If the same sensation be repeated, the sensitive surface will take it on more readily, the nerve will convey more alacrity, and the responsive muscles will be found more vigorous and alert in the execution of their function. This is one of nature's laws of the growth and development of our capacities of sensation and instinctive action."

"The laws of intellect proper make a very decided advance beyond this. Instead of simply hardening or confirming the current of each sensation in its own circle, they bind separate sensations to each other and build up complicated masses of sensation and activity, which may not merely be more easily revived by the repetition of the first impression, but which may be revived without employing the original in any shape, so that we may live in a world of the most varied sensation, while none of the objects of sensation act upon us at all, and may be affected by impressions recovered from the repositories of the mind (memory) more powerfully than by any action direct from nature without."

Contiguity.—"The first law of intellect properly so called has been termed by psychologists, '*the law of contiguity*.' Two or more sensations, impressions, actions or states of feeling existing together in close succession, tend to cohere, so that the future occurrence of any one of them is sufficient to restore or revive the others." (As the head of a cat, or a bull, or an elephant, suffice to recall the whole form of the body of any of these types.)

"The impressions of natural objects (which generally excite several senses) are compacted into wholes. Thus many things in nature may affect sight, hearing, touch, taste, and smell, and, it may be, the alimentary and organic feelings in addition; and by repeatedly experiencing these conjoined impressions, we come to form a complex impression or aggregate notion of the entire object."

INDIVIDUALITY.—"Many natural objects, such as the human body, are permanently made up of a great many parts, each requiring separate acts of attention, and yielding separate sensations. The fixings of these altogether in one total impression is the effect of contiguity."

CO-EXISTENCE.—"Besides the conjunction of parts in the same (individual) object, we also find that nature has in many cases coupled distinct objects together by some of those powers of distant influence, which prevail in the world. Thus a warm latitude is coupled with rich vegetation, and a sea-coast with a mild and temperate character of climate. The tides coincide with positions of the moon, and the migrations of birds with the changes of the seasons. These conjunctions are laws or ordinances of nature, and become impressed on the human mind by the association of contiguity."

LOCALITY.—"The accidental juxtapositions that occur around us, or those conjunctions that may happen from any cause, and that continue in virtue of the inertness of matter, impress themselves in the same way. Thus it is that we carry about with us the picture and arrangement of our own homes, and of the localities where we have often been; we associate house with house, and street with street, and have in our minds a connected view of each prospect, large or small, that has been frequently before us. In short, all the fixed arrangements around us, and the local and geographical aggregates with which we have become conversant, become permanently fixed in our conceptions, exactly as they stand in nature."

CAUSALITY AND EVENTUALITY.—"The whole class of regularly recurring successions, including cause and effect, as the most invariable of all successions, are stamped in the mind by the same force."

LANGUAGE.—"The addition of names to objects for the convenience of intercommunication and reference is rendered permanent (in the memory), by the operation of continuity. After a certain number of repetitions of the word moon, while attention is fixed on the object, the two impressions come to cohere, and are thenceforth able mutually to recall each other. The acquisition, both of our mother tongue, and of foreign languages is therefore a consequence of this adhesive force. In like manner the fixing of connected series of words,—that is of narrations, statements, assertions and literary compositions, or what is usually called a 'verbal memory' depends on the same law."

"All the steps of a connected procedure in the arts, professions, and occupations of life are joined together after a proper degree of repetition under this associating principle; and many other examples might be given. The time or the number of repetitions necessary for a full adhesion to take place, depends on the power of adhesiveness peculiar to each individual, and on the freshness and freedom from distraction of the mind at the time, as well as on the impressiveness of the objects. The force of contiguity is most energetic in early life, and seems identified with the vigour of growth of the system. It may be called the law of intellectual growth, since we have called the fixing of sensations and instincts the force of sensational."

Here it is evident that the latent association of ideas in the permanent faculties of the soul is confounded with the assimilative or digestive modes of action in observing and ingesting ideas, and also with the manner of active thought in tracing back causes from their effects in retrocessional order, or forward in events, which follow in successional connection. The faculties of individuality, perception, locality, language, causality and eventuality, as described by phrenologists, are all involved in one or other of these functional modes of action, called the "law of contiguity." We shall find similar confusions in the so-called "law of similarity."

"THE LAW OF SIMILARITY."—(Or the functions of the faculty of comparison.)—Any present impression or state of mind tends to revive previous impressions that resemble it. If we suppose a person to see a ship for the first time, and to examine minutely all the peculiarities of its structure within and without, and to dwell upon them so long, that the aggregate picture of the ship clings together in his head, and can be revived entire, when any part is brought before his view; and if after this he observe at a distance the outward form of a second ship, this by similarity will recall (recollect in memory) the already-formed picture of the first with all its details; and without having the means of fully examining the second, he can transfer to it at once the particulars of the other, and thus supply a knowledge of what is hidden from the eye. As nature has produced many repetitions of the same objects and forms, it is a vast economy of human labour, to be able to know an entire class through a single individual thoroughly studied; and the application of what is known and conceived of one thing to all others like it, is effected through the power we are now considering. When objects are not perfectly identical we have still the advantage of the similarity as far as it goes; and for each new individual, we need only to learn what is its difference from some one previously known, in order to possess a full acquaintance with it. We shall now adduce a few examples of this law."

"1. THE EXTENSION OF OLD SENSATIONS TO NEW OBJECTS.—We have seen that it is a work of time and growth to acquire the engrained sensation or aggregate notion of any one natural object, such as an orange, a tree, a house, a man. The exercise of acquiring the sensation of roundness from an orange, will serve us in acquiring the impression of an apple, or a plum, or a cannon-ball, and for each new case the labour of attention will be needed only for the new circumstances of colour, size, and modifications of the round form. So in the case of hearing; when the ear has been repeatedly exercised in a set of sounds, as in the words of a language, or the notes of an instrument, it falls into or recognizes them again under new combinations, as when repeated by a different voice or instrument."

"2. The word *identification* expresses a large class of the operations of similarity. We identify a portrait with its original, the common features in a family, the sameness in character, in the scenery of a country, or in the aspect of a population, the institutions of different nations, the events of remote ages, the characters of different individuals,—all by the force of this law (or the faculty of comparison?) A high facility in recovering all past impressions that contain anything in common with some present impression is the main foundation of a high intellectual power, capacity, originality, invention, genius. The peculiar species of the capacity will depend on other points of character, but the main force of it resides in the perception of likenesses, and the revival of the past by the force of similarity."

"The identification of like phenomena often demands an intense power of similarity (comparison?) owing to the repulsion of unlike circumstances. Thus, a man that identified the attachment of the moon to the earth with the falling of a stone, will be reckoned through all time to have been a very extraordinary genius; ordinary minds would not have traced anything common in appearances which to the superficial eye are so utterly unlike. The identification of lightning with the spark of an electrical machine is another example of the same uncommon force of intellectual perception. Thus the inductions and generalizations of science are in the main the consequence of great stretches of the power of similarity."

Analogical faculties of reason and understanding are here confounded with the intellectual faculties of comparison, which might cause a dog to bark at the image of a stranger in a looking-glass, but would not enable it to understand the science of optics.

"3. In literary efforts there is abundant scope for tracing the operations of the same power. A great part of the formation and growth of language lies in applying old names and expressions to new objects, in consequence of a felt identity or likeness between the things. Thus the word 'head,' primarily applying to a part of the human frame, has come to be used in reference to innumerable other things quite different, but having all some one feature in common with the human head, as the head of a house; the head of a mob; the 'heads' of a discourse. The great class of expressions, called 'metaphors,' are struck out on the same principle, and are produced most abundantly by the men that possess an intense power of bringing together like in the midst of unlike."

"4. The tracing out of unity, consistency, harmony, and uniformity in a mass of varied things and circumstances, is a direct effort of similarity."

"5. The application of general laws and rules to individual cases, and deductive reasoning in general demands the same effort: it is only in virtue of similarity of subject that a law or rule can be transferred from one case to the other."

"In every high operation of intellect and genius this power is requisite. Contiguity leads to routine and to the arranging of things as they happen to be in nature by juxta-position: similarity breaks through juxta-position, and brings together like objects from all quarters. It is by far the grandest manifestation of the human mind; it enables us to rise to the unity, simplicity, and comprehensiveness of plan that regulates the complicacyof the world's arrangements and movements, and lessens to an unlimited degree the toil attendant on man's situation in the universe."

"The Law of Compound Association, (Memory ?).—Impressions, notions, or thoughts may be recalled (re-collected) more easily by being associated with two or more impressions or objects present to the mind at the time, whether by contiguity or similarity. The two forces of contiguity and similarity (faculties of individuality and comparison ?) express all (?) the powers that nature appears to employ in maintaining the operations of the human intellect, but there are certain peculiar cases of their working that deserve to be specified as separate although dependant laws. A common example is furnished by such a case as our endeavouring to *remember* something said or done on some past occasion, whose other circumstances are distinctly before us. The bond of contiguity not having been strong enough to connect the remembered circumstances with what is sought we fail in the attempt; but should anything cross our minds having some slight resemblance to the matter in question,—perhaps too slight to have revived it of itself,—the faint contiguity joined to the faint similarity, effects the revival of the recollection that we were struggling for. So two contiguities, or two similarities, will always be more powerful than one."

"The Law of Constructive Association.—We have hitherto referred to the revival of past impressions of objects exactly as they were formed by the action of the originals on the senses and intellect; but this does not exhaust the range of the intellect's powers. It is possible to form a picture of what has never been experienced, to all intents and purposes the same as the pictures of actual experience; and the effecting of this is what we denominate 'constructive association.' This faculty enters into all the higher operations of the mind. It is the direct basis of *imagination*, and is requisite in reasoning, abstraction, and in every kind of originality. It represents the highest range and consummation of the human intellect."

These descriptions of intellectual faculties and functions relate to the conscious modes of sensation, observation, and reflection, during experiential life, but they do not explain unconscious modes of ideation, neither in the processes of psycho-digestive assimilations nor those of latent associations in the faculties; still less in those of preconscious existence and metamorphic evolution in the fœtus; they are nevertheless good.

It will be easier to understand the laws of compound associations of ideas in the mind and atoms in the body, by remembering that the soul in all its faculties and functions is a reflex of the organs of the body and their functions, just as the phenomena of light and heat are parallel and analogous modes of motion, as the data of thermological and photological laws of science. The body itself is a reflex of all other types of individual organism, and it is also a type of all collective realms, classes, orders, families, species, and individuals in external nature. The same laws of association rule in all cases of contiguous or separate, like or unlike parts of a complex whole, whether it be an association of elements, cells, and tissues, in a special organ, or of organs in systems and hemalities of the body; and so it is with sensations and ideas of cells and tissues, organs and systems, individuals and families, orders and classes of phenomena. The relations of all things are those of contiguity or separation, likeness or unlikeness, antecedence or sequence, co-existence or succession, incessant or intermittent modes of action, both in the parts of a single body and in those of a whole cosmic world. The soul, therefore, cannot do otherwise than see and feel things as they are associated or disconnected in relation to each other, and to the soul itself, as a sensational reflex of external things. The most convenient way of remembering the phenomena and laws of association in the mind, then, is to observe the phenomena and laws of association in the body:—simple elements in cells, cells in tissues, tissues in organs, organs in groups and series to form special apparatuses, these in double systems, and systems in relational organic and connective mechanisms, which being double form bilateral hemialities in the complex individual organism, male or female; and this physical body is itself associated with a soul which animates it in every part; with a mind which illuminates, and a spirit which elevates it in the ranks of social beings upon earth, and in the heavens. We have the absorbents and the general systems of the body; the senses and the faculties of the intellect; the emotions and the passions of the will; the cognitions and the faculties of the understanding, equally subject to the laws of metamorphic evolution, experiential growth, and final transition from one world of conditions to another.

The imperfections of body, soul, mind, and spirit, in health and disease, as rudimental elements of humanity progressing towards a perfect state, may be compared with the rudimental forms of the fœtus during the successive phases of metamorphic evolution in the womb; at first hardly more developed than a worm; then something like a fish, a bird, a mammal, until it assumes at last the infant likeness of a man, to be developed by degrees in all the strength and beauty of the type to which it belongs. The beauties and defects of socially rudimental human beings may be contrasted in the following manner, to render our meaning more definite and comprehensible.

1. Physical man.	1. Handsome or ugly. 2. Weak or strong. 3. Healthy or unhealthy. 4. Whole or mutilate.
2. Instinctual man.	1. Artistic or unartistic. 2. Ignorant or experienced. 3. Perverted in taste, or not. 4. Sensible or idiotic.
3. Rational man.	1. Rational or irrational. 2. Weak minded or strong. 3. Scientific or sophistic. 4. Sane or insane.
4. Moral . man .	1. Moral or immoral. 2. Social or unsocial. 3. Honest or dishonest. 4. Religious or selfish.

All men are more or less ignorant and undeveloped, sane or insane, natural or perverted, in the present age of the world, but still differences of degree are sufficiently marked for definite distinctions. The laws of association being alike in all phases of existence, we may trace them where they are most conspicuously evident, as guides in more obscure departments; and for this reason we compare the physiological association of atoms with the psychological association of ideas; and the embryogenesis of the individual with the sociogenesis of the race.

The physiological processes of nutrition, or the association of atoms, are quite as unconsciously and mysteriously performed in the adult organism as in the fœtus; and we have already supposed that the living fœtus receives psychological impressions from the mother, as well as physiological atoms; and that both the body and the experiential soul are thus built up completely in the womb, though only in a very feeble state of evolutive development, to be continuously strengthened after birth, by conscious modes of alimentation, exercise, and growth, as well as by unconscious modes of assimilation and latent association.

CHAPTER III.—EMBRYOGENESIS AND PSYCHOGENESIS.

If the experiential soul be merely a gradual clothing of the ontological soul with ideas derived from sensations, as the experiential body is only a clothing of the ethereal body with organic cells and tissues derived from elemental substances, we have a pattern before us of the evolutive and involutive processes of embryogenesis and psychogenesis, as parallel orders of organic evolution.

The facts are obvious and easily discerned by those who are familiar with physiological and psychological analysis.

Constituents of the Experiential Body.—These are primarily elemental atoms of various kinds (sixteen in number), from which are derived, by successive stages of associative union, 1st, organic cells and fibres; 2nd, distinct tissues of various kinds; 3rd, definite organs; 4th, special apparatuses, such as air vessels, blood vessels, and water vessels (respiratory, circulatory, and urinatory); 5th, general systems (osseous, muscular, nervous, &c.); 6th, homologous hemialities (bilateral, bipolar, bifrontal, and arthroidal homologues); 7th, a unitary complex organism, male or female, for physical and industrial energies and uses.

CONSTITUENTS OF THE EXPERIENTIAL SOUL.—These are primarily general sensations of various classes from which are derived by successive stages of associative union, 1st, distinct ideas of outward things and inward feelings, separately or individually perceived; 2nd, these are grouped together in definite connections and correlations, forming instinctual faculties of observation, comparison, analysis, and synthesis, associated in complex union (corresponding with the associated cells and tissues, organs and systems, of the body), with a definite and special purpose of artistic energies and uses, in constructing words and sentences, poems and dramas, pictures, designs, and mechanisms, as works of beauty by the human intellect.

CONSTITUENTS OF THE EXPERIENTIAL MIND.—These are primarily general conditions of fixed principles, axioms, and invariable laws of different orders from which are derived by successive stages of associative union, 1st, definite cognitions of coexistence and sequence; internal and external correlations; organization and evolution; definite cycles and transitions; hereditary or procreative perpetuations; the general dependence of phenomena on determinative forces and conditions. 2nd, from these are formed mental faculties of induction and deduction; coordinative reason and memory of abstract laws and principles; mathematical reason and understanding; systematic or classificative reason; evolutive, rhythmological, analogical, and ontological reason; forming a complex unitary rational mind for scientific energies and uses in discovering and explaining the invariable laws which govern the mutable phenomena of nature.

CONSTITUENTS OF THE EXPERIENTIAL SPIRIT.—These are primarily general emotions of various denominations from which are derived, by successive stages of associative union, 1st, definite feelings of sympathy or antipathy; 2nd, special susceptibilities and desires; 3rd, propensities and passions (such as love, friendship, or ambition); 4th, moral faculties and yearnings for affection, society, justice, and purity of life; the complex of which forms a unitary spiritual organism in exact correspondency with the associated organs and systems of the body; the predetermined uses of the experiential spirit and its energies, being moral and religious, social and political, to realize (by metamorphic processes of social evolution), the domestic, corporate, municipal, national, and ultimately the continental and the universal confederation of mankind on earth;—not to mention the conscious amphimundane union of celestial with terrestrial humanity.

Thus we may discern that embryogenesis, psychogenesis, mentogenesis, and spiritogenesis, are parallel modes of metamorphic evolution in the experiential organism, and a continuous act of renovation perpetuates the life and motion of these cooperative energies during our mortal career.

It matters not how these different kinds of energy are combined in vital unity, so long as they are quite distinct and different in our experience. Preconscious, unconscious, subconscious, and conscious modes of action occur in the psychical body, and the same states occur in the life of the physical, the mental, and the spiritual organisms. All the phenomena which occur preconsciously in the fœtus are hereditary, inborn, innate, or "instinct," in the organism, before it is born, whatever be the type; fish, reptile, bird, or mammal, insect, animal, or man.

INNATE IDEAS.—Whatever sensations and ideas the soul may have had in its preexistent state, they seem to be lost in oblivion during the preconscious state of existence in the womb. After birth, the only sign of subconscious sensation and ideation is manifest in the cry of the newly born infant, and the spontaneous motion of sucking the mother's breast. The body is completely formed, or nearly so, at birth, but is only capable of feeble movements, and the instinctual soul seems to be already present in as definite a form as the body, though only capable of feeble degrees of manifestation in a child which sucks the mother's milk, or in a chick which breaks the prison-walls of its shell to escape. The body is not a shapeless mass when it is born, though not a powerful locomotive. The instinctual organism is not a perfect blank at birth, as Locke supposed. It is definitely formed in chicks and ducklings, new born infants and young lambs, at which early phase of life it is a very feeble mechanism of sensation and ideation, which grows in power and precision of thought as the body grows in bulk and energy.

Peculiar instincts and susceptibilities of sensation become manifest in chicks and ducklings, human infants and the young of different animals, as soon as these various types of life and organization, are born into the world. The definite instinct of a duckling is not the same as that of a chick, any more than their respective forms of body, and therefore we may say that the instinct of a chick is latent in the embryo before it leaves the shell, and that the peculiar instincts of every species of animal are latent in the fœtus before it comes into the world.

The emotional voluntary feelings and passions seem to lie dormant in human nature, until the new-born infant has learnt to see and hear its mother's or its nurse's face and voice, when it becomes more or less responsive to the caresses of those with whom it is connected: and thenceforward the affections grow in strength with the growth of the body, and seem to wane to some extent with the decline of life, although in some cases it is said that the "ruling passions of the soul are strong in death."

The rational perceptions of abstract truth bud forth in early youth, or later on, and sometimes attain great power as the body grows in strength, while in many cases the muscles may grow very powerful while the mind remains comparatively weak. The gigantic elephant, which lives much longer than a man, does not acquire more practical intelligence than a dog, whose life is very short. Bulk and strength of body, with age and experience alone seem not to influence the powers of instinctual and mental energy in individuals of any species, since a whale is not more intelligent than an elephant, nor does a horse become more knowing than a dog. Man is neither the largest nor the smallest of animals, although he is decidedly the most intelligent.

Nor does the power of reason depend upon physical bulk in mankind, for giants and dwarfs are never, that we know of, the most scientific or intelligent of men.

The chemical, physical, and physiological modes of action in a plant, are subordinate to predetermined limits of shape and size, variable in some degrees by the surrounding conditions of culture, food, and climate; and the same may be said of different types of animals, not only with regard to physiological life and form, but also with regard to instinctual, mental, and social energies or motives and volitions.

LATENT LIFE.—Are creation and evolution one and the same process in nature, or is the plan of an organism (plant or animal) created and determined before the organism is evolved by procreative and evolutive processes? Are latent energies and modes of *tension* the same in eternal essence as patent energies and modes of *motion?* In other words, can souls be dissolved as well as bodies? And if so, what determinative *force* or *principle* or *will* reorganises souls and bodies as fast as they are dissolved into chaos?

We know that the conditions of life and organization preexist in a definite state, and it is only natural to suppose that the vital energies and forms of life preexist in a predetermined state of individual and collective entity. Occultation and manifestation are merely alternate states of psychical existence, as latent tension and patent motion are alternate states of physical substance.

From experience and reason we are constrained to believe not only that definite forms of vital energy in plants and animals are predetermined factors in creation, but definite forms of physical energy and organism, such as suns and planets, are formed, sustained, controlled and modified according to eternal laws.

Infinite love and wisdom cannot destroy itself in any of its operations of finite evolution and transformation. Creations and evolutions of all kinds and degrees therefore are merely predetermined forms of energy in the Creator, in which all creatures "live and move, and have their being."

PART IV.—INSTINCTUAL GENEALOGY.

CHAPTER I.—PREEXISTENCE.

Does the soul exist with an ethereal form of body in another world, invisible to us, before it comes into this?

Does it form its own physical body, or is this formed by a supernal creative power?

Time, space, force and substance (the necessary conditions of life and organization), exist before any visible organism is formed, and we postulate the preexistence of the soul as a genetic entity; a complex potentiality of spirit, in the human form for mankind, and in other distinct types of form for animal and vegetable organisms.

This hypothesis enables us to distinguish creation from evolution, as we distinguish the plan of an architect from the gradual construction of an edifice. The Eternal shapes within Himself the souls of animals and men, and these build up their experiential bodies by simply clothing their ethereal forms with elemental substances in solid, liquid, and gaseous states of combination.

Natural instincts are perpetuated in animals of all classes, families, and species, and certain habits acquired by training become hereditary in the offspring. In man we cannot say that special instincts are hereditary in a family, since the children often show special aptitudes and vocations, differing from those of the parents; but still there is an influence of race and society which causes all Chinese and Japanese arts to differ from European arts and industries. Practical modes of thought and energy differ to some extent in all the human races, and theoretical modes of thought are not less various and peculiar.

CHAPTER II.—ULTRAMUNDANE ORIGIN.

All forms of body have a congenital and hereditary origin, but if they pre-exist in any sphere or mode of vitality, they must have an ultramundane as well as a mundane genealogy. Seeds and eggs are only complex elements of matter derived from physiological secretions, while organic principles of incarnative evolution and incessant renovation, transform homogeneous substances into definite types of organism. Ethereal forms of plants, animals, and human beings precede metamorphic evolution, not only in the visible progenitors of eggs and seeds, but also in the invisible energies of life which transform eggs and seeds into living animals and plants.

These architypal forms are only physiological energies in plants, but they must be psychological as well as physiological energies in animals and human beings. We have, therefore, an ultramundane psychological, as well as a mundane physiological, genealogy to seek for in mankind, and in all terrestrial forms of life and organization. Where shall we find the data of this biological problem?

It has been supposed that the principle of life which organises the chick in the egg during incubation is already in the "*germinal spot*" of the egg before it is hatched. In that case it must not only be in a preconscious state of rest, but also "without form and void" until a soul of some kind moves upon the waters of the plasmatic oceans within the shell. The same may be said of the seeds of plants, for there is an organising energy of physiological life in both plants and animals, not only in the early phases of metamorphic evolution, but as long as life continues in the individual.

Some plants renew their leaves and flowers every year; some birds renew their feathers twice a-year and have winter and summer suits of clothing. Crustaceans, such as crabs and lobsters, reconstruct a limb which has been broken off by accident. Most animals renew the matter of the whole body in a few short months, and man himself renews his body half-a-dozen times a year or thereabout. The latter process may be limited to rapid operations of cell-growths and decay; but the whole leaf of a tree, the whole feather of bird, the whole limb of a lobster, are not very minute portions of the organism; and although it has been supposed that all hardened secretions, like simple hairs on the skin, may in a measure be moulded by the shape of the walls of the hollow follicles in which they are formed, we can hardly admit that one of the magnificent feathers of a peacock's tail, with all its barbs upon a long unequal stem, can have been moulded by the shape alone of the glandular follicle or group of follicles in which it has it root. And moreover, the leaf of a tree and the limb of a lobster are not glandular secretions, but actual metamorphic evolutions; and although the egg of a bird is only a concentrically differentiated ball of soft secretions in a hardened shell, these successive layers of albumen have not the form or mould of any organ or system which are afterwards developed in them and from them by organic evolution.

The leaves of trees and the limbs of crustaceans are constituent parts of the organism, and so are the feathers of a bird, as necessary instruments of progression in the atmosphere without which it could not fly, and they are formed after the naked chick leaves the shell, so that the organizing principle of life not only exists potentially in the egg under due conditions of incubation, before it is completely hatched, but afterwards to form the feathers; not once only, as a continuation of the primary evolution, but ever after, as an invisible principle with power to moult old feathers and form new ones of a complex shape and structure, in lieu of those which are periodically shed and cast away, as the whole body is at death.

If we concede that the shape of the feathers may be microscopically contained within the minute secreting follicles of the skin, we cannot see how the complex shape and structure of all the organs of the body could be contained in the germinal spot of the egg before it is hatched. It is not so difficult to understand that an invisible organic force gives visible form to homogeneous substance by vital processes of metamorphic evolution.

INCARNATIVE DISTRIBUTIONS.—Plant a seed in due conditions and it will grow anywhere; hatch an egg by artificial heat, properly regulated, and a chick of the same species as the egg will be formed anywhere. How can we account for that in our hypothesis? Are invisible birds and plants of all species floating about in all parts of the globe, in quest of suitable conditions of incarnation, as birds in the air fly about in search of food when they are hungry? We do not know, but as the wind carries the pollen of all kinds of plants to fecundate the ova of their own species in extensive regions, so a winding girdle of magnetic currents may waft both animal and vegetal forms all round the earth, to incarnate their forms in the fecund eggs and seeds of their own species (and no other) wherever these are placed in due conditions of incubative temperature, and magnetism, to facilitate the metamorphic evolution of the body. As far as human beings are concerned, nurses and undertakers attend to the birth and burial of bodies, and for ought we know, angelic spirits may preside over the distribution of souls prepared for incarnation, as well as the reception of souls returning to a higher world, after the process of death or decarnation.

Guardian angels would thus be charged with the supervision of amphimundane phenomena, as we are charged with the care and supervision of mundane phenomena. Whether it be the business or not of spirits to preside over and direct the phenomena of incarnation, they certainly control those of inspiration. Problems of this order are not easily solved, but there can be no reasonable doubt that all forms of life and organization on our planet have an ultramundane as well as a mundane origin, and psychological is not less amphimundane than physiological genealogy. There is, in fact, no solution of any biological problem of origin and destiny to be found within narrower limits than those of an endless chain of cycles of existence, moving incessantly in the visible and invisible worlds of incarnation, natural life, resurrection, and spiritual life; not to mention cosmic evolutions and revolutions in all the planets of a solar system, and all the stars of a pancosmic universe.

The following facts, related in Mr. L. Lloyd's book on "*Game Birds in Sweden and Norway*," seem to have an indirect bearing on this problem. Speaking of capercali and black cock, he says,—

> "When the male birds are destroyed by poachers in one part of the country, more males than females are found in the broods of another part of the country."

What can be the efficient cause of this tendency to re-establish an equilibrium of the sexes? Is it not the pre-existence of male and female birds in due proportions, which incarnate themselves by incubation?

Out of the breeding season the young birds follow the mother, while the fine old male birds live in solitary loneliness, and are often systematically destroyed by poachers in certain districts, the females being unable to breed, until other male birds replace those which have been killed.

CHAPTER II.—HOMŒOGENESIS AND HETEROGENESIS.

Homœogenesis and heterogenesis in the body and in the soul thus become definite questions of biological science and speculation. Animals are known to be hereditarily *homœogenetic* within certain limits of *variability*, by means of "natural selection," domestic training, and the crossing of superior with inferior breeds. They are known to be homœogenetic in the construction of their nests and other forms of instinctual invention, which never exceed the limits previously known to varieties of the same species. The human race is known to be hereditarily homœogenetic within the limits of the variability of the human species, and intellectually homœogenetic within the limits of purely instinctive construction, by which one race imitates or repeats the inventions of another race; while entirely new conceptions and inventions, such as that of the steam engine for instance, are not merely instinctual imitations of something already known, but entirely new conceptions of a *heterogenetic* degree, at least, as inspirations received from beings in another world, of a higher order of development than that of the actual terrestrial man; and modern physiologists conceive that human beings may have been first incarnated in the bodies of anthropoid apes, which, instead of giving birth always to animals of their own species, may once or oftener have given birth to a low order of pre-historic humanity, as the origin of the whole human race on earth. A very learned and interesting small pamphlet has recently been published in Paris, by a disciple of Geof. St. Hilaire, M. Victor Meunier, ("La Philosophie Zoologique"), in which this hypothesis is maintained with great plausibility and moderation, admitting the principle of design in the creation.

Whatever we may think of physical heterogenesis or the mutability of species, as a questionable hypothesis, feebly supported by facts, there can be no doubt in our minds of inventive heterogenesis in the conception of new forms of mechanism, entirely unknown to terrestrial humanity before they were conceived by inspiration, by which ultramundane beings convey new ideas into the minds of mundane men and women of inventive genius, as contrasted with imitative imagination and contrivance. The same may be said of all forms of inspiration (intellectual, mental, and spiritual).

Animals *know* by instinct; they *learn* from each other by imitative intellect; on which may be *grafted* certain forms of thought and habit by heterogeneous instruction from man.

Man *knows* some things by instinct, as soon as he is born; he *learns* many things, by imitation, from his fellow-man and from inferior animals; he also receives new ideas by inspiration from superior intellects in the spiritual world; and the latter kind of knowledge is grafted on his mind, or suggested, as it were, instead of being learned by observation and imitation. Inborn instincts, acquired instruction, and inspired invention, are three distinct modes of intellectual evolution; and modern naturalists imagine there may be analogous diversities of bodily evolution in the realms of nature. Man can teach animals more than they would ever know left to themselves, and angels may teach mankind more than they would ever know by their own unaided ingenuity. The question now raised, assumes the following form:—

Can man graft one prolific species of plant on the stock of a different prolific species of plant?

Can God graft one prolific species of animal by incarnation in the womb of a different prolific species of animal? Or an indigenous type, such as that of the

American Indian, on imported races such as those of European colonists in America?

What are the laws and limits of normal embryonic evolution, and abnormal heterogenetic evolution? Animals are permanently prolific with all genuine varieties of their own species, and *transitorily*, with allied species of their own genus; but nothing beyond this degree of organic heterogeneity is known. Are other degrees of heterogenesis possible? We do not know, but, in nature's "circumlocution office, there are men who want to know—you know."

Metamorphic evolution is a fact in embryogenesis, by incarnation of living forms coming from above, and in sociogenesis, by inspiration of new ideas coming from above. Heterogenetic or progressive conceptions of the human mind are undeniable, in the novel forms of practical inventions and scientific discoveries; new forms of religious thought and social organization are also realized by means of new inspirations or suggestions from above. Is there anything analogous to this in realmogenesis?

Do new forms of life and organization descend from above by heterogenetic incarnation in older and lower types, by exceptional modes of embryogenesis? Or do inferior species modify their shapes and instincts by "natural selection," and thus give origin to higher types, transmitting their acquired endowments by hereditary descent?

Mutability of species by continuous natural selection, generation after generation, in this world, perpetuated by hereditary homœogenesis, is one hypothesis of realmic metamorphic evolution; and occasional heterogenetic incarnation of superior organisms in lower types, is another hypothesis; and these two theories of biological evolution, though perfectly reconcilable one with the other, are somewhat opposed, like the slow incessant action, and the sudden cataclysmic theories of geological evolution. Natural selection is a slow continuous process, requiring countless ages of time, while heterogenesis would be a cataclysmic process, causing immense changes at once, by embryonic deviations from ancestral types.

There is some truth in each of the geological theories of evolution. Is there any in either of the biological theories, or in both?

We sometimes see beautiful children born of parents who are very plain, ugly children born of comely parents; in both cases nearly as unlike each other as anthropoid apes from human beings. Men of genius and innate refinement are sometimes born of ignorant, vulgar, and low-minded parents; and exceedingly vulgar dolts are not unfrequently born of highly-educated parents and of gentle blood. What is that but psychological heterogenesis? And why should incarnative heterogenesis be more strange in embryological than in psychological phenomena, though not so common? We know so little of the origin and metamorphic evolutions of organic realms, though many facts are now well known concerning the metamorphic evolution of inorganic realms, and more especially of geological strata and their reliquial contents.

Inspiration is necessarily a revelation of something new in form to the intellect; a new form of thought, and not a reproduction of forms already known to our experience.

Prolific Invention is quite distinct from imaginative fertility. Few men and women of imagination become authors of works of art, which give them the rank of Inventive Genius. Not barren men and women alone are unprolific, since many are not sterile who are child-less; not unimaginative intellects alone are unprolific, since many are imaginative in excess without conceiving any genuine work of art. Incarnation and inspiration are necessary for genetic conception and practical invention, without which marriage and imaginative ingenuity remain fruitless.

Conceptive intuition is, therefore, quite distinct from imagination as a phenomenon of inventive intellect, although imagination is a necessary basis of inspiration and prolific genius.

In his treatise on Logic, Mr. J. S. Mill says:—"*Conception* consists in conceiving general laws in special facts, or assuming the probability." And this is true of scientific discovery, of which he treats; such is our conception of the laws of order in the human body, as a type of universal order, and a key to *organic philosophy*; our conception of the laws of metamorphic evolution of the human fœtus as a type of universal order and *evolutive philosophy;* but these belong to scientific discoveries and not to practical inventions. Watt did not see the steam-engine realized in special facts of the creation; nor do prophets see the facts which they foretell in any past realization of history. They receive ideas by inspiration from a world of more enlightened spirits, and even the conception of organic laws of order revealed in the human body, is given by the Creator, who put those laws prominently forward in all the phenomena of nature, to inspire the conceptive human mind with ideas of organic science and philosophy.

As the four depths of human nature are concentric and co-ordinate modes of motion in synthetic units, there are corresponding faculties of physiological conception, intellectual conception or practical invention, rational conception or scientific discovery, and spiritual conception or prophetic revelation: and, therefore, progenitors, inventors, discoverers, and prophets are inspired from above with new conceptions, just as eggs are engrossed during incubation by organic forms, from above; and just as new births require time for metamorphic incarnation in the womb, co-operating with the physiological functions of the mother, so new ideas, inspirations, or conceptions in the minds of inventors, discoverers, and prophets, require time for metamorphic evolution, in co-operation with enthusiastic imagination.

Where is the use or the necessity of supposing inspiration from spirits in another world to human intellects in this, since thought and imagination must be qualities of mind in both worlds? To this we reply that children get all ideas of a superior order from adults, who communicate them in course of training education, and that no child, left to its own simple though very active imaginative powers, has ever been known to invent a steam-engine or a theory of cosmic gravitation; and, therefore, although young and old terrestrial human beings have bodies and souls, they have not innate conceptions of all the possible arts and sciences in nature. Celestial humanity itself may not be omniscient, and though it may know much more of nature and her laws than is known to terrestrial humanity, it may, nevertheless, require inspiration from still higher beings, angels and archangels; and these, again, may not be omniscient, but require inspiration from still higher beings, and so on, *ad infinitum*, till we reach absolute and Infinite Being and Omniscience, from whom all influx and inspiration flow downwards to the lowest finite beings, by innumerable descending grades of ultimation in thought and action.

Animals have intellect and imagination of a certain order, but they learn from man all they know by artificial training, which they would never know or invent if left to themselves.

Proliferation and conceptual imagination, therefore, only prepare the physiological and the psychological pabulum in which incarnative energies and inspirational forms of thought are quickened by conceptions from above; and, since "there is nothing new under the sun," and never can be anything entirely unknown to omniscience, all new births of thought and life, in any world, descend from higher to lower, or ascend from lower to higher spheres of life, in perpetual evolutions and revolutions of finite forms and systems within the Infinite, "in which they live and move, and have their being." But as all creatures pass from one world to another in alternations of existence, and from rudimental to relatively perfect forms of natural and spiritual organism, genealogy in all degrees of being, cosmic and epicosmic, individual and collective, is necessarily homœogenetic of mundane or of ultramundane types, which pass through heterogenetic processes of metamorphic evolution in their progress from rudimental forms to the reproduction of the genealogical type, individual or collective, mundane or ultramundane. Mundane heterogenesis, therefore, would only be one form of amphimundane homœogenesis.

BOOK III.

THE MIND.

OUTLINES OF MENTAL BIOLOGY.

PHYSIOLOGICAL modes of motion are discernible in vegetable organisms; practical intelligence in animals; abstract reason and understanding are the attributes of mankind alone on our globe.

Human reason is a reflex of Divine reason, a finite type of the Eternal Logos, or it could never understand the phenomena of experiential life and organization.

All science accessible to man must come within the limits of human capacity. What, then, are these limits? What is the form of the human mind, predestined to understand the scheme of nature and her laws of order?

The frame of the mind corresponds exactly with that of the body; a microcosm, governed by the same organic laws of number, weight, and measure as the macrocosm. The body does not grow at once, however, into adult proportions, nor does the individual mind. The same may be said of the collective body and mind of humanity as a complex organic unity of being.

The physiological organism of man is more perfectly developed than that of plants, and his practical intelligence is more complete than that of animals; but as one race of animals is more intelligent than another, so one race of mankind is more rational than another; and amongst the most intelligent of races, many men seem to have had in all ages only a rudimental development of the faculties of reason and understanding. These faculties have been developed slowly in the most progressive nations, and science has been gradually evolved, as reason has been more extensively and profoundly manifested in the race. The faculties of reason (still but partially developed in the best of minds) seem to grow with the growth of humanity as a collective organism; and we may already discern that individual and collective reason are both as far removed from ultimate unity and harmony of structure, as a fœtus of three months' gestation compared with a new-born child. Still, there are indications of the special type of an organism in an individual fœtus, and similar indications may be discerned in a collective embryo. This is comparatively easy, where we have a relatively perfect specimen of complex biologic unity, in the individual organism of man.

The faculties of reason, in parallel with the systems of the body, are given in the following table, and we shall explain them by examples of the various modes of exercising reason :—

SCIENTIFIC REASON AND UNDERSTANDING.

Connective Faculties and Conditions.	Z. Data of Science.	H. *Eternal laws and forces.* U. Ultramundane phenomena. Ω. Embryonic phenomena. O. Mundane phenomena.
	Y. Sciences.	H. *New discoveries.* U. Accepted dogmas. Ω. Recent investigations. O. Acquired sciences.
	X. Theories.	H. *Hypotheses.* U. Theories. Ω. Argumentations. O. Axioms.
	W. Unitary Reason.	H. *Speculative reason.* U. Theorising reason. Ω. Generalising reason. O. Regulative reason.

Organic Faculties.	VII. CO-ORDINATIVE REASON.	H.	*Amphicosmic unity.*
		U.	Hypercosmic unity.
		O.	Hypocosmic unity.
		Ω.	Cosmic Unity.
	7. *Subordinative Reason.*	H.	*Cosmological hierarchy.*
		U.	Realmological hierarchy.
		O.	Sociological hierarchy.
		Ω.	Biological hierarchy.
	VI. Synthetical Reason.	H.	*Mental unity.*
		U.	Spiritual unity.
		O.	Instinctual unity.
		Ω.	Physical unity.
	6. *Inductive Reason.*	H.	*Mental relativity.*
		U.	Spiritual relativity.
		O.	Instinctual relativity.
		Ω.	Physical relativity.
	V. Analytical Reason.	H.	*Mental phenomena.*
		U.	Spiritual phenomena.
		O.	Instinctual phenomena.
		Ω.	Physical phenomena.
	5. *Deductive Reason.*	H.	*Eternal principles.*
		U.	Ultramundane facts.
		O.	Genetic facts.
		Ω.	Mundane facts.
Relational Faculties.	IV. ANALOGICAL REASON.	H.	*Amphicosmic analogies.*
		U.	Hypercosmic analogies.
		Ω.	Hypocosmic analogies.
		O.	Cosmic analogies.
	III. Ontological Reason.	H.	*Ontological principles.*
		U.	Methodological principles.
		Ω.	Abstract principles.
		O.	Cosmological principles.
	2. *Rhythmological Reason.*	H.	*Biological science* (methods).
		U.	Musical science (methods).
		Ω.	Linguistic science (methods).
		O.	Dramatic science (methods).
	II. Evolutive Reason.	H.	*Cosmological evolution.*
		U.	Realmological evolution.
		Ω.	Sociological evolution.
		O.	Biological evolution.
	1. *Mathematical Reason.*	H.	*Calculus (methods).*
		U.	Algebra (methods).
		Ω.	Arithmetic (methods).
		O.	Geometry (methods).
	I. Systematic Reason.	H.	*Cosmological classification.*
		U.	Realmological classification.
		U.	Sociological classification.
		O.	Biological classification.

The human mind is *subjectively* in exact correspondency with all the laws and relations of phenomena *objec-*

tively, indicated by a sort of verbal diagram in this synoptic view of mental faculties and objective realities.

PART I.—MENTAL ANATOMY.

MANY minds are but feebly endowed with theoretical understanding, while fully endowed with practical intellect and experiential knowledge, acuteness, and sagacity. Human intellect and human reason are really as distinct as animal intelligence and human understanding.

We see that physiological functions are very similar in vegetable and in animal modes of absorption, nutrition, secretion, and reproduction of their species, but the organic *sensitivity* and *motility* of plants, are very distinct from the instinctual *sensibility* and *mobility* of animals. The vegetable is only a *simple physiological* organism, while the animal is a *compound physiological*, emotional, and instinctual being. One may be termed a *monological* complex unity, and the other a *trilogical* complex organism. Man is a fourfold unity of organism.

CHAPTER I.—DISTINCT FACULTIES OF REASON.

There are distinct organs and systems in the body for special physiological uses, and there are definite faculties of the mind with distinct functions in ratiocinative and investigative operations of reason and understanding.

1ST.—MATHEMATICAL FACULTIES OF REASON AND UNDERSTANDING.—It is plain that none of the higher animals are endowed with mathematical faculties of calculation. They are not geometricians and arithmeticians. Abstract calculations are rational modes of thought, in faculties peculiar to man alone. This fact needs no other demonstration than the common experience of mankind.

Abstract reason is so inherent in mathematics, that symbols of imaginary factors and relations stand in lieu of real facts to any extent of calculation and demonstration. This mode of reasoning, therefore, may extend to any possible relations of phenomenal forces and motions, or real forms and qualities. It is the most universal of all possible methods of abstraction and ratiocination; the ground-work, as it were, of all positive science.

Mons. Mervoyer, in his "Etudes sur l'Association des Idées," *page* 144, says,—

"L'arithmetique et l'algèbre excluent toute consideration de la réalité concrète . . . . et c'est à cette elimination de toute diversité . . . . . et à la parfaite similitude de leurs *élémens* que ces sciences sont redevables du caractère particulier de certitude, qu'on leur attribue. L'arithmétique, l'algèbre, la géométrie, la logique vont du même au même; c'est la consequence des *axiomes* et des *hypotheses* qui leur servent de fondements. *Elles ne peuvent avoir* aucune application dans les phénomènes variables et hétérogènes."

What Mons. Mervoyer means here, in allusion to the association of ideas by resemblance, is clear enough, but he says more than he means, when he excludes mathematical sciences from all application to variable and heterogeneous phenomena. Mathematics cannot be excluded from any branch of absolute certitude. Pure mathematics are of course independent of all phenomenal evolutions; not so with logic and applied mathematics.

ABSTRACT REASON.—Simple inference and abstract reason are not the same. A dog seeing a whip held up by his master forms the idea that a stroke may be coming on his back, unless he refrains from approaching certain objects; a horse when he hears the crack of a whip may infer that unless he quickens his pace, a stroke of the whip on his back may very soon follow. These are practical modes of inference, and not theoretical modes of ratiocination. Practical "causality and eventuality" in animals and in man, are instinctual faculties, distinct from those of scientific abstraction, or the cognition of eternal principles.

I.—Systematic Reason and Understanding.—Man naturally wishes to understand the laws of organic unity and complexity in nature, and as many things seem mingled together in confusion, a practical knowledge of details gives us little or no insight into the laws of order which pervade and govern the organization and the distribution of organic beings. Order must exist in theory and in fact, or the world could not endure as an ever varying stability throughout the ages of historic evolution. What are these principles of organic unity and constancy amidst an apparently endless diversity of form and structure, in perpetual successions of evolution and destruction? A systematic classification of realms, classes, orders, families, genera, and species can alone give us a clue to collective unity; and a similar classification of organisms, systems, series, hemialities, groups, and organs can alone disclose the natural order of organic unity and complexity in individual beings. And, moreover, as the depths of nature in vital modalities are more clearly manifest in man than in any animal or vegetable organism, the laws of order are more plainly legible in human nature than in any other individualized part of the creation. The organic unity and complexity of human nature is, therefore, the best clue to a theory of universal unity and complexity.

This has been explained in our first volume on "Epicosmology; or, Man's true place in Nature," as well as in the present volume, and therefore we need not dwell further on the faculties and functions of systematic reason and theoretical understanding.

II.—Evolutive Reason.—The faculties of evolutive reason are best discerned in their modes of action and the ends subserved. The human mind is curious to understand the laws of organic evolution in nature; *personal* evolution, collective or *social* evolution, realmic or *co-ordinate* evolution, and cosmic or *ultimate* evolution. Their metamorphic phases are termed *embryogenesis, sociogenesis, realmogenesis,* and *cosmogenesis.* Numerous speculative theories have been propounded on all these degrees of evolutive phenomena, but little is yet known of any one of them, except that of comparative embryology.

Cosmogonies.—Theories of cosmogony abound in different systems of philosophy. The only one that has met with any general acceptance seems to be the "*nebular theory*" of Herschel and Laplace. The spiritual cosmogony of Jacob Beehman is incomprehensible to most minds, and that of the late Charles Fourier is not less imaginary and improbable. Many of his notions have in fact been proved erroneous during his own lifetime.

According to Charles Fourier's theory of cosmogony the planets of our solar system are to change places some time or other before long, and group themselves in a new order of arrangement, in accordance with the rhythmological laws of scales, modes, and modulations of music, as he understands and explains the laws of harmony. The earth is to have five satellites, and a permanent boreal ring or crown; Saturn, seven satellites; Jupiter, four; and Herschel, eight; Mercury, Venus, Mars (and "Proteus," an undiscovered planet in the system) being neutral planets without satellites. Since this theory was propounded, nearly a hundred new asteroids have been discovered, aud a new planet, Neptune, with several satellites, and these discoveries have thrown Fourier's theory into discredit.

Nor has his theory of epicosmogenesis and psychogenesis met with more success. His writings on social economy, industrial evolution, commercial credit, and exchange, are nevertheless very instructive, as he thoroughly understood these questions, from having been all his life practically engaged in commercial pursuits at Lyons and Marseilles.

EPICOSMOGONY AND PSYCHOGONY.—Here, again, we meet with several theories of epicosmic evolution and transformation. That of Charles Fourier has fallen into discredit along with his cosmogomy. The sea has not been transformed into "lemonade," as a wholesome beverage for seafaring people, nor does it seem probable it ever will be. The "new creation of plants and animals by the conjugative influence of all the planets and the sun with mother earth," has not yet appeared, nor does it give any signs of an approaching parturition. The "anti-lion," which was to supplant his ferocious congener, be twice as large and powerful, docile, and friendly to man, able to carry two people on his supple and elastic back at the bounding rate of twenty miles an hour, has not yet been created by the conjunction of Jupiter or Saturn with the earth; but a much more powerful locomotive has been created by man himself, in the automatic locomotive engine, which can carry more than two hundred people in its train, and travel at the speed of more than twice twenty miles an hour. The cosmogony of Fourier is a marvellous theory of evolution, and the episcosmogony is not less marvellous; but imaginary theories are losing credit in a scientific age.

The Darwinian theory of epicosmic evolution and psychogony has been suggested by geological and palæontological discoveries of great importance, but we have no experience of the actual transformation of one species of organism into another by "natural selection and the struggle for existence" during the historic ages of humanity.

The Book of Genesis has been held as religiously authoritative in Christian churches; but the facts of geological and palæontological discovery in modern times have unsettled the faith of scientific men in this direction. New theories have been propounded for the explanation of evolutive phenomena. Some try to reconcile tradition with known facts; others give up tradition altogether as an authority in science. We, ourselves, have no absolute theory to propound; although we have an amphimundane hypothesis. We see nothing but miraculous intervention in all possible views of evolution. By *miracle* we mean something unknown to human experience and practical experiment, not something contrary to the laws of nature. No man can create a simple organic cell from inorganic matter, nor transform one species of animal or plant into another, and still less create a complete organism of any kind. Creation is a mysterious mode of evolution therefore, and involves a miraculous or ultramundane intervention of some kind, on every hypothesis. If man were first made full grown at once, from the dust of the ground, and life breathed into his nostrils by the Creator, it was a miraculous operation: no man can imitate it. If woman was formed from a rib taken out of the side of Adam while he lay asleep, it was equally marvellous: no man can repeat the experiment.

The Book of Genesis is a very simple account of the creation, and exceedingly well suited to the practical intellect of mankind, but not to the dawning faculties of science and theoretical understanding. If it have a real foundation in wisdom, it will have to be explained eventually by analogical reason, as an allegory, not as a literal account of organic evolution. Theologians have attempted such an explanation, and the most consistent of these attempts is probably that of Emanuel Swedenborg, in his "Arcana Celestia," not a popular book, nor generally understood.

Some parts of the account in Genesis seem to favour the Darwinian theory, which is not analogical, but endeavours to be strictly logical. "And God said, Let *the waters bring forth* abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven. And God created great whales, and every living creature that moveth, which the waters *brought forth* abundantly, after their kind, and every winged fowl after his kind....And God said, Let the *earth bring forth* the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind."

These words seem to have been taken almost literally in Mr. Darwin's theory of organic evolution. He supposes that by the natural processes of geological evolution, elemental substance may have assumed the form of organic protoplasm, from which, at least, one organic cell may have been formed, and the "breath of life breathed into it," with power to propagate its species, and that the descendants of this primary organic cell, under the influence of changeable conditions, and the "struggle for existence," may, by "natural selection," have modified their simple forms and modes of life to accommodate themselves to difficult conditions, and so transformed themselves by slow degrees, in successive generations, during millions of ages, until innumerable new varieties, and even species, may have sprung in this manner, from one original form of the most simple organic cell formation.

In such a supposition, we have an original *miraculous* operation forming an organic cell, and "breathing life into it," with power to propagate its species. We have a sequential and continuous series of *miraculous* operations, changing the forms and qualities of one species of organic animal or vegetable cell into another, one type of complex organism into another, until man himself at last was evolved from an anthropoid ape, or family of apes, who took it into their heads, by "natural selection" and sagacity, in the midst of conditions which rendered the "struggle for existence" intolerable to progressive monkeys, that they had better change their form, improve their minds, learn to speak a definite language, form hordes of savages, construct implements of offence and defence, hunt the buffalo, ensnare fish in rivers, lakes, and seas, and thus become omnivorous animals of a higher order in the scale of nature.

This is a *conceivable* order of heterogenetic evolution, but we have literally no proof at all of its reality. It is, nevertheless, by far the most popular *hypothesis* that has yet been formed, and the most conducive to the advancement of natural science. It does not seem at all impossible that the Creator of all organisms may have used transformation as a means of developing souls and bodies, just as we see a simple ovum slowly transformed into a complex organism, by metamorphic processes of incarnation.

EMBRYOGENESIS. — Every stage of transformation, from the ovum up to the complex organic form of a chick in the egg, fully hatched and ready to leave the shell, has been observed and noted by men of science, and some of the main types of radiata, mollusca, articulata, and vertibrata, have been carefully observed during metamorphic phases of evolution, as well as during their life history and progress from incipient growth to final decay and dissolution. We need not dwell on these well known facts, beyond observing that they throw considerable light on the obscure problems of sociogenesis, episcosmogony, and cosmogony. Having noticed the latter, we have only now to give a cursory glance at the social evolution of humanity and the philosophy of history, or the incipient theories of sociogenesis.

SOCIOGENESIS.—Philosophies of history and theories of human progress have been numerous and various in all ages, but only recently have definite theories of *sociogenesis* and the metamorphic evolutions of human society been mooted on scientific grounds in parallel with those of *epigenesis* and *incarnation.*

History shows that human beings exist in the natural world, as individuals and families, hunting, fishing, wandering tribes, before they form either pastoral nomadic societies, or stationary patriarchal tribes and clans. These become agricultural and industrial, military, conquering, and colonizing nations by slow degrees, and then grow into commercial and manufacturing communities or civilized nations. What is the philosophy of social progress? There are many theories propounded on this question.

Is the evolution of a complex organic unity of humanity analogous to that of a complex individual organism, with parallel degrees of progressive metamorphosis? We suppose it is, and by this hypothesis we see that humanity is not yet organised as a collective organism, and therefore it is only in an embryonic phase of sociogenetic evolution. How far is it advanced? This may be ascertained by a definite parallel between individual and collective phases of organic metamorphosis.

Individual incarnation consists of the gradual formation of a complete set of physical instruments for the use of the soul. The gradual formation of instrumentalities for the use of the abiding human race on earth, is a sort of artificial creation of physical and mechanical instruments to enable humanity to fulfil its destiny as a collective being, more efficiently than would be practicable without such an artificial organism, over and above the physical organs of individual men and women.

The instrumental organism of the individual is a natural living body, while that of the collective body is an artificial creation. True; but then the mortal body is merely a temporary organism, clothing an ethereal body, and is cast off as a worn out instrument at death. And as the "spiritual" body preexists in an ethereal form before it clothes itself with material organs by the processes of incarnation, so the natural bodies of individuals exist before a complete system of automatic instruments are created by the collective energies of humanity. The human race collectively have permanent ethereal bodies as instruments of ethereal activity in a spiritual world; temporary physical bodies in the natural world; and thirdly, an artificial organism of automatic forces, such as locomotive engines, railways, steamships, and electro-magnetic telegraphs, as instruments more powerful for industrial work than individual mortal bodies. Telegraphic wires and apparatus correspond to conductor nerves; railways and canals, ocean tracks and rivers, to circulatory vessels; optical instruments to artificial eyes; and so of all the rest. Vitality, corporeity, bicorporeity, tricorporeity, evolution, and metamorphosis. These are biological problems for the exercise of all the faculties of human reason, and particularly those of evolutive investigation.

III. Ontological Reason and Understanding.—What is the difference between causality as a faculty of practical intellect, and ontological reason, as a rational faculty of investigation, with regard to causes. "Causality" looks for phenomenal antecedents as causes of phenomenal effects or consequents; secondary causes of proximate or immediate effects. William the Conqueror invaded England, subdued it, and gave the confiscated lands to his followers: Napoleon was conquered in the battle of Waterloo, and forced to abdicate the throne of France, which was restored to the Bourbons. These are phenomenal causes, followed by phenomenal events. They are not principles or primordial forces, manifest in phenomenal modes of motion, which human reason wishes to fathom to their ultimate depths, so as to gain more comprehensive views of the eternal causes of transient phenomena.

It may be supposed that this is only a difference of degree in *causality:* why then separate intellect from reason in such a faculty? Transitory phenomena have relative degrees; eternal principles are absolute. Practical causality deals with relative degrees of causation; reason, with eternal truths, determinative principles, and laws of science.

Intellect and reason cooperate in many modes of thought, as light and heat are often blended in combustion. Light in frozen regions, and heat in dark places, are nevertheless distinct modes of physical motion; and so the intellectual faculties and rules of concrete art are distinct from the rational faculties and laws of abstract science. Intellectual causality traces effects a little way back to phenomenal causes only; ontological reason endeavours to penetrate down to the eternal foundations of existence, to discover the fundamental forces, laws, and principles of life and organization, the origin, career, and destiny of individuals and societies; the elementary constituents of nature, and their modes of motion, aggregation, combination, and disaggregation.

PHYSICO-MECHANICAL PHILOSOPHY.—Some minds analyse matter in all forms and states, solid, liquid, gaseous, inorganic and organic, visible and invisible, down to its constituent elements, below which chemical analysis cannot penetrate; and then, by mental processes of theoretical division, these elements are reduced to imponderable atoms of (ethereal?) substance, from which all possible forms and combinations of atoms in mineral, vegetal, and animal bodies must necessarily be derived; and, therefore, all modes of atomic aggregation and disaggregation must come within the limits of "molecular physics," as a science, and the only true foundation of philosophy. Physics and chemics, statics and dynamics, with mathematics as the method of calculation and ratiocination, are held to be sufficient, and the only trustworthy means of ontological investigation and demonstration. Ethereal or imponderable substance, however, is deemed hypothetical by many Positive philosophers, who speak of the progress of ideas with regard to correlations of force and ponderable matter, both organic and inorganic, as having passed through several phases. Thus:—

"1st. The complete separability of vital force from ponderable matter."

"2nd. The incomplete separability of vital force from ponderable matter."

"3rd. The complete union with and absolute inseparability of vital force from ponderable matter."

This is one of the recent modes of ontological query; but no distinction is here made between attractive and repulsive modes of action in any kind of force, or any state of matter. Solids, liquids, and gases are implied, but nothing said of the subtle substance which fills interplanetary space, and is not recognized as "ponderable matter."

Another step in this direction has been made by those who deem the atomic analysis incomplete, since they stop at materiality as the ultimate foundation, ignoring *spirituality* and *immateriality*. This is not going deep enough in search of primary causes, according to some minds, who reduce atoms themselves to "centres of force."

The following facts related in the "Quarterly Journal of Science" for January, 1866, are exceedingly important:—

"Deville's discovery of the permeability of certain dense metals at elevated temperatures to gases, has opened a curious question as to the boundary line between chemistry and physics. His partial decomposition or disassociation of compound gases, under the influence of temperature more or less elevated, throws some light on the anomalies which have hitherto beset the laws of gaseous volumes and the molecular theories of their constitution."

And, again,

"Solar heat-rays pass through space without loss, it has now been ascertained; so that they become effective only where wanted, and in proportion to the density of the atmosphere, or the amount of water present in that through which they pass. If it be so, the proportion of heat received at Mercury, Venus, Jupiter, and Saturn may be the same as that received at the earth, notwithstanding their distances from the sun.

"Father Secchi shows that Jupiter's atmosphere has a very strong absorbing power, different from that of the earth's atmosphere, showing that planets, according to their positions in space, are physically constituted so as not to suffer from loss of solar light and heat."

This fact corresponds in some measure with that of the carnivorous Polar bear of the Arctic regions generating animal heat as well as the carnivorous tiger in Tropical regions, and maintaining a like degree of physiological temperature in equilibrium with very different external conditions of food and climate. But, to return to atomic forces. The first emergence from immaterial force into material substance or atoms, gives us more than sixty simple elements of which all nature is composed, in a chemical point of view, and man himself is composed mainly of oxygen, hydrogen, nitrogen, and carbon, with a slight addition of about a dozen other simple elements, such as potassium, sodium, sulphur, phosphorus, &c. What principles of philosophy can we obtain by mathematical calculations, from this chemical point of view, as the first step out of force and substance? A fortuitous concourse of atoms?

When physical and mechanical points of view are added as a means of investigating inorganic realms in all the cosmic bodies of the universe, what can mathematical calculations make of all these forces and phenomena, beyond a physical and mechanical theory of energy and law in nature, which leaves thinking forces and phenomena entirely unexplained.

Rudimental Organic Ontology.—The best physical philosophers ascend from inorganic to organic phenomena, as a higher point of view, from which to regard indestructible forces and invariable laws of motion and mutation. Sir Henry Holland, in dealing with organic distinctions, observes, in his medical notes and reflections, that,

> "By separating instinct and reason, we are carried at once to the question of the origin of the former, even before discussing those intimate relations by which they are so singularly yet beneficently blended in the economy of life. Both faculties of action are derived from a higher power than the beings possessing them, and in this sense may be deemed the same. But one faculty is to be consciously and voluntarily used, with large capacity for improvement, and with other endowments which fit it for the most exalted purposes. The other is uniform, determinate, and having origin and guidance wholly apart from the will. Whence come this origin and guidance?
>
> "The question has naturally engaged the attention of philosophers in every age; and we find annexed to it the great names of Bacon, Newton, Descartes, and Locke, in succession to those of higher

antiquity. They again have been followed by many eminent writers of more recent date; and metaphysics and physiology have been brought into close alliance in seeking for a solution. The main point in the argument is that distinctly propounded by Sir Isaac Newton, in his 31st query—'can we otherwise explain animal instincts than by supposing that the Deity Himself is virtually the active and present moving principle in them?' This opinion Newton adopts, seeking to separate the doctrine and the ubiquity of the Deity implied in it, from that grosser Pantheism into which so many philosophers of all ages have fallen while dealing with these subtle questions."

"Unless, indeed, we merge both reason and instinct in this common chaos, it is difficult to avoid the general conception just stated. The instinctive action has express objects of which the animal has no prior cognizance; relating mainly, though not exclusively, to the preservation of the individual and the continuance of the species. To attain these objects the living organization goes through certain changes and movements, definite, identical, and constant for each one of the species. Where reason exists, even in the animals nearest to man, it is placed in subordination to this more absolute power; blending with and modifying but never annulling its influence. Here then, all proper volition or act of the individual is excluded; and the Creator of the organization becomes, in every sense intelligible to us, the motive power. We may choose to say that the organization itself is so; but to such a phrase, duly examined, we can attach no real meaning, nor can we substantiate it by any manner of proof."

From the same point of view Sir Henry *(page* 266), adds,

"From the simple and elementary forms of nervous matter which the microscope has detected in some of the radiata, there is a progressive development of this system as we ascend in the scale of the animal creation . . . . In the vertebrate animals we first find those cerebral lobes and cerebellum forming the true brain, highest in man. The general relation thus maintained throughout between the degrees of nervous development and the perfection of the animal functions incontestibly establishes this relation, and in so doing, it places before the mind a certain conception of the manner in which functions and endowments yet higher than those of man, might be associated with organic structure, and thus brought into more various and elevated relation with the external world. 'That there should be more species of intelligent creatures above us,' says Locke, 'than there are visible or material below us, is probable to me from hence, that in all the corporeal world, we see no chasms or gaps.'"

POSITIVE PHILOSOPHY.—Auguste Comte has done much to raise natural philosophy out of a chaotic state into something like a rational system. His co-ordination of the astronomical, mathematical, physical, and mechanical sciences, is a step in the right direction towards a unitary system of classification for all the sciences, but he himself confesses, that,

"All endeavours have yet failed to establish any point of general doctrine in biology; and we find ourselves merely with simple materials, which must be newly elaborated by *physiologists*, under the view of *vitality*, before they can be put to use." (Vol. I. *page* 349, Miss Martineau's translation.)

Comte was not a physiologist, and therefore he attempted to deal with the problems of biology from a chemical point of view, as he himself states in the following words, *(page* 497,)—

"We have now surveyed the whole system of natural philosophy from its basis in mathematical to its termination in biological philosophy. Notwithstanding the vast interval embraced between the extremities we have passed through the whole by an almost insensible gradation, finding nothing hypothetical in the transition *through chemistry* from inorganic to organic philosophy, and verifying as we proceed, the rigorous continuity of the system of the *natural sciences*. That system, though comprehending all existing knowledge (?) is however, still *incomplete*, leaving a *wide area* to the retrograde influence of the theologico-metaphysical philosophy to which it *abandons* a whole order of ideas, *the most immediately applicable* of all. There is still wanting to complete the body of positive philosophy, and to organize its universal preponderance, the subjection to it of the most complex and special phenomena of all—those of humanity in a state of association. I shall therefore venture to propose the *new science* of *social physics*, which I have found myself compelled to *create* as a necessary complement of the system. This new science is rooted in *biology* (the materials of which must be newly elaborated by physiologists) as every science is in the one preceding it; and it will render the body of doctrine complete and indivisible, enabling the human mind to proceed on positive principles in all directions whatever, to which its activity may be incited."

In the "Westminster Review," April, 1865, Mr. J. S. Mill has the following observations on "Comte's Positive Philosophy:"—

"The philosophy of science consists of two principal parts; the *methods of investigation* and the *requisites of proof.* The one points out the road by which the human intellect arrives at conclusions, the other the mode of testing their evidence. The former, if complete, would be an organ of Discovery; the latter, of Proof. It is to the first of these that M. Comte principally confines himself, and he treats it with a degree of perfection hitherto unrivalled. . . . We are taught the right way of searching for results, but when a result has been reached, how shall we know that it is true? How assure ourselves that the process has been performed correctly, and that our premises, whether consisting of generalities or of particular facts, really prove the conclusion we have grounded upon them? On this question M. Comte throws no light." . . . .

How is it that minds so differently constituted cannot understand each other, when discussing the phenomena and laws of nature from different points of view, since all are desirous of coordinating and conciliating the sciences?

On this point, J. S. Mill observes that—

"It is with Philosophy as with Religion, men marvel at the absurditity of other people's tenets, while exactly parallel absurdities remain in their own, and the same man is unaffectedly astonished that words can be mistaken for things, who is treating other words as if they were things every time he opens his mouth to discuss."

To have an idea of this difficulty amongst human beings of different mental types, we may suggest a parallel with animals of different instinctual types, still having much in common with regard to the ends of life. Take, for instance, half-a-dozen animals whose life is passed mainly in catching and eating fish: an otter, a seal, a porpoise, a shark, a penquin, and a large sea-gull. The porpoise, like the otter and the seal, is a mammal, the shark is a fish, the penquin and the gull are birds. When (supposing them to talk) the porpoise speaks of suckling her young, three of the company laugh at her, or rail at her, and say that she is mad; when the porpoise, the penquin, and the gull speak of breathing air, in a different medium from water, the shark (who has tried the experiment, and felt he should be stifled if he tried it long,) knows better than to believe such absurd stories of the experience and capabilities of his imaginative friends; knows it is all "humbug." Porpoise says to the birds apart, "Aërial friends and brothers, you know that I have to live in the sea with brother Shark, and as all aërial experience is inaccessible to him, I think, for the sake of peace, I had better admit that the question of aërial existence and experience is an 'open question.'" Agreed.

Penquin then states that he can live twelve hours and more at a time, without diving into the water; that he sleeps all night out of the water, lays his eggs and hatches them out of the water. "Oh, oh!" says brother Porpoise; "now *you are* drawing a long-bow, do be moderate and accurate in your statements. What do you mean by *laying eggs* and *hatching them?* Don't you marry as we do? and don't you have sucklings as we do? We have no such words as laying and hatching eggs in our vocabulary." Gull interposes, "My dear brother Penquin, don't insist,—you know brother Porpoise lives always in the water, and perhaps in that medium, all animals abandon the ova to the water, as fishes do, and take no further heed of them; or, may be, they are viviparous, like dogs and cats. Good bye, brother Penquin, I must now take a flight in the upper regions, to exercise my wings."—"His wings!" says the Penquin, "he is always talking about '*his* wings,' as if they were anything more than other birds' wings.

Conceited fop! I don't believe he can fly so high. It is all boast and moonshine."

In a second meeting, on practical questions, all agree that herrings are very good. Brother Shark says, he thinks dog-fish are quite as good. "Yes, perhaps," says Porpoise. "Do you think so?" says Gull to Penquin. "Why, no, not exactly; devilish hard to catch, and very tough." "Ah! thought so," says Gull; "never touch 'em myself."—In such a colloquy of "practical intellects," which can be deemed the most reasonable, or unreasonable, in conformity with their own various endowments and experience? The silence of the seal and the otter may denote wisdom or indifference. High flying birds are perhaps very wrong in forming a low estimate of important fishes, and *vice versa.*

We need say no more of mathematico-physical minds and their views of universal unity; nor need we dwell on these sciences, as they have been already well developed in all branches, while the biological sciences are still in their infancy and demand most of our attention. We may, however, give a summary recognized by all thinkers:

Unity of Nature. { 1. Force, motion, substance, atoms.
2. Life, thought, organism, individuals.
3. Law, order, types, realms.

Is it rationally possible to deem the first line a sufficient basis of organic science and philosophy? Would the addition of the third line exclude the second?

Force, life, and law, are necessary distinctions; motion, thought, and order, flow from these; substance, organisms, and realms are manifest to our experience. The first line, *alone,* would lead to a *chaos* of atoms; the second, to *crowds* of individuals; the third completes the others in *systems,* as we see them in the universe.

DETERMINATIVE FORCES OR EFFICIENT CAUSES.—To analyse primordial forces we must observe their modes of motion in phenomenal worlds of life and organization; first, within known finite limits, and then by extension, beyond known limits, *ad infinitum.* What are determinative forces within known limits on our own globe, for instance? Have we not *physical* forces in mineral compounds and simple elements of all the inorganic realms? *Physiological* forces over these in all vegetable organisms? *Emotional* forces over these again in all animal organisms, with *instinctual* forces to control both emotional and physiological modes of action in the experiential life of the individual? And have we not, in humankind, another kind of determinative force called mind or *reason,* to control all other kinds of forces in the individual and in the whole community? Physical, Physiological, Emotional, Instinctual, and Rational forces then are not only efficient determinative causes of phenomenal degrees of organization and evolutive modes of motion, in finite individual crystals, plants, animals, and human beings, but in whole realms or spheres and communities of finite individuals, covering the surface of our globe; and one kind at least of these primordial forces, namely, physical force, extends to the utmost known limits of the universe.

Physical forces or modes of motion are of four distinct kinds, in all realms; metaphysical or hyperphysical forces are also of four kinds or modes of motion in organic realms; thus,—

Immaterial Physical forces in all Realms.

Light, Heat, Gravitation, and Magnetism, { in atomic and crystal associations;
in plant life;
in animal life;
in human life.

Immaterial Organic forces in Organic Realms.

Physiological forces in vegetable organisms.
Emotional feelings in animal organisms.
Instinctual sensations in animal organisms.
Scientific perceptions in human organisms.

None of the organic modes of motion are found in the inorganic realms, although all the inorganic kinds are found in every realm, and are more or less convertible one with another. The organic principles are not all found in every kind of organism; one of them alone being manifest in plants, two in zootypes, three of them in animals, and all the four in human nature. One alone, or several, or all the organic forces combine and co-operate with the four kinds of inorganic modalities, without being convertible, either amongst themselves or with immaterial physical forces. Heat, light, and electricity may be evolved from shocks of gravitation, but crystals cannot generate plants, nor can plants become animals, nor animals, human beings, by any process known to human science. A sort of parallel, however, may be found between inorganic and organic immaterial forces, thus—

Physical Convertible Forces.	*Vital Inconvertible Principles.*
1. Magnetism.	1. Physiological sensitivity.
2. Gravitation.	2. Emotional feelings.
3. Heat.	3. Instinctual sensations.
4. Light.	4. Mental illuminations.

The convertibility of forces does not explain the genesis of power, by *impress* without loss or gain of force in the aggregate, as in the case of a magnet which communicates magnetic efficiency to numerous other rods of iron. This may be only a sort of polarization which enables molecules of matter to oscillate in electro-rhythmic concert, as a regiment of soldiers moving in measured step collectively over a suspension bridge would be able to rupture the bridge, where the same number of men and weight of body, moving with confused steps, would not effect a rupture. In this case, the word of command to the soldiers causing them to move in measured steps, does not add physical force or weight to the bodies of the men, but it modifies the modes of motion and oscillation by which that same amount of force is concerted in rythmical action, in lieu of being partly neutralized by contrary and mutually counteracting modes of oscillation.

Particles of matter in a rod of iron may be so distributed as to oscillate invisibly in electro-rhythmic, or in contrarious modes of motion, just as a regiment of soldiers moving forward in a body, may march in measured steps or in confused order; and in each case the amount of force remains the same while the effect is so different, as to simulate an increase of power—*Tantum series juncturaque pollet.*

Atomic elements are classed by chemists in two distinct categories, namely, metals and metaloids, which are said to be electrically *positive* in metals, *negative* in metaloids. Oxygen, chlorine, nitrogen, represent three series of *electro-negative* atoms; potassium, baryum, iron, tin, copper, gold, and aluminium, are types of seven distinct series of *electro-positive* atoms; but these electro-positive and negative affinities of elemental atoms can only act, combine, or associate, within given limits of heat and light (two other forms of physical force), for, at very low temperatures, atomic affinities are neutralised completely, and at very high temperatures they are dissociated. These questions have been ably dealt with by many eminent chemists, and recently by Mons. H. St. Claire Deville, and by Mons. A. Daxhelet.

Simple elements, therefore, are governed in their chemical modes of action, by immaterial forces, as well as in their physiological modes of organization and disorganization; and these immaterial physical forces are governed within finite limits at least, by organic vital forces. How far these may be co-extensive with physical forces, *ad infinitum*, we cannot positively say, but order in creation proclaims infinite reason or omniscience in the universe.

UNDERSOULS AND OVERSOULS.—The primordial forces of nature may be called the "souls of nature," mineral souls, vegetable souls, animal souls, human souls; and, in the estimation of some philosophers, that kind of force which is superior to the others on a finite scale is also superior on an infinite scale. Individual human beings are superior to individual animals, these again to plants, and plants to minerals; collective humanity is superior to collective animality, and this again superior to collective vegetality, which is superior to the amount of physical forces contained in the body of the whole vegetable kingdom on our globe.

One known kind of force then is superior to another kind of force, not only within the same limits and degrees, but beyond those limits; a *man* may control an animal physically much stronger than he is himself, or an automatic locomotive engine with a heavy train behind it, equal to many times the physical force of a human body; an *elephant* can root up and destroy a tree many times heavier than his own body; a *plant* can disintegrate the elements of a granite rock incomparably greater than itself in massive bulk and physical force. Still physical forces extend beyond the limits of our globe, and the heat and light of the sun control not only all the physical phenomena which occur on the surface of the earth, but, in a certain mode, the vegetable, animal, and human phenomena of life.

How is this? "Because physical forces govern molecular physics and mechanics in all worlds," say one sect of philosophers; within what limits? demand another sect; and here begins an endless controversy: fortunately for the progress of humanity.

We need not dwell at any length on such a dialectical contest. In actual experience, the Rational soul of man is the *oversoul* of humanity, animality, vegetality, and minerality, within given limits; not only within equal limits, but far beyond equal limits of phenomenality; and we infer that the same relations of undersouls and oversouls exist, not only in known individual types of organism, but in known collective types of organisms; and not only within known limits of epicosmic nature, but within unknown limits of epicosmic and cosmic nature, *ad infinitum.* Our opponents infer the contrary; and nobody knows anything of such a problem but what they infer from positive experience, by rational or theoretical induction.

Still, many things can be ascertained by scientific methods, which are inaccessible without them; and hence arises a question of methods of investigation and ratiocination; and not only a question of method of investigation, but of definitions and terminology or the use of words and symbols. Take, for instance, the word *God,* or the *oversoul* of creation. How many and how different are the meanings of this word? Monotheists and Deists admit no hierarchal degrees of definition for this word, while Polytheists and Tritheists imply some kind of hierarchical distinction. "Father, Son, and Holy Ghost, three persons in one God," seem to define Christ as the finite God of humanity in heaven and on earth, the light of the human world, as the sun is the finite light of our solar system or planetary world, while the Father is God of infinite cosmic worlds, as well as of angels and human beings in all heavens and all earths. "The Holy Ghost (proceeding from the Father and the Son)" would be the principle of reason and science personified in angels and archangels, governing all human beings by inspiration in all worlds, *one* in reason with the Father and the Son, while distinct in personality.

Is this a true definition or a useless supposition? We do not know, nor pretend to dogmatise. We think, however, that REASON in all possible degrees of ascent from finite man to infinite humanity and Divinity in all worlds, is the oversoul of every other kind of soul, in all degrees of extension from the finite mind of man to the Infinite, Omniscient Mind of Deity.

There is a physical soul of determinative forces in every cosmic body; and the sun is physically the hierarchical oversoul of all the planets of our solar system. Is there a physiological oversoul in each planet and in the sun? a psychological oversoul in every planet, and a rational oversoul in the sun, to control planets, as human reason in mankind controls all the epicosmic realms and souls on earth? We do not know, and need not guess: but we may say that physical or magnetic atomic forces and chemical modes of spontaneous motion and crystalization, though very interesting phenomena as data of science and philosophic speculation, are less interesting than the *sensitive* physiological forces of organicity with their nutritive and reproductive modes of life and organization in plants and animals; these again much less interesting than *emotional* sociological forces and volitional moral modes of action in animal and human nature; still more wonderful to us are instinctual or *sen-*

sational and psychological forces and innate vocational modes of artistic and industrial activity in animal and human nature; but most of all sublime and wonderful are the *conceptive* noological forces of humanity, with their penetrative and determinate will and understanding, spontaneously controlling, within given limits, all other kinds of forces and spontaneous modes of motion, on the surface of our globe.

IDEALISM.—There are numerous varieties of materialism, spiritualism, and idealism, dwelling severally on one aspect of nature more than another; agreeing in some modes of thought while differing in others. Idealists repudiate both materialism and spiritualism as ontological systems. The following extracts from Mr. Herbert Spencer's "Principles of Psychology," (vol. I., p. 617) will give his views of idealism, contrasted with views which he repudiates:—

"You see this piece of steel—cold, motionless, and, as you suppose, insensitive to all that goes on around. An artisan uses a portion of it for making the balance-wheel of a watch. Immediately it proves itself modifiable by changes of temperature, which our dull senses fail to appreciate. Though by no direct measure can we detect an alteration in the length of the beat; yet, indirectly, by finding that it loses one beat in a hundred thousand we get proof that an imperceptible increase in the molecular agitation propagated to it, by surrounding things, has augmented its diameter and expanded all its parts in the same ratio. Take another bit of this same apparently inert substance; shape it appropriately; bring it under the influence of an adjacent magnet; and throughout its mass there is wrought, in some *incomprehensible* way, an invisible change, which enables it to do—what? 'To point north and south,' you say. Yes; but to do far more than this. Its perturbations will now show to an instructed eye the rise and progress of a cyclone in the sun. . . . Spectrum analysis has made it manifest that every molecule of this so-called elementary substance is a cluster of minor molecules differing in their weights and rhythms. . . . . In each molecule of an oxide or an acid, the chemist sees one of these systems united with one, two, three, or more systems of another kind that are similarly involved.

Ascending to orders of compounds successively more heterogeneous, he finds himself obliged to recognize molecular complexities *unrepresentable in thought*; until, on reaching organic matter, he comes to molecules, each of which (taking into account the composite nature of its so-called elements) contains literally more *atoms* than the visible heavens contains stars—atoms combined, system within system, in such ways, that each atom, each system, each compound system, each doubly compound system, has its motion in relation to the rest, and is capable of perturbing the rest, and of being perturbed by them.

"This activity and this sensitiveness is possessed in common by ponderable matter, and by the seemingly-imponderable matter pervading space. That the ether, so extreme in tenuity that we can scarcely represent it to ourselves as having materiality, is nevertheless composed of units which move in conformity to mechanical laws, is now a common place of science. Hypothetically endowing these units with momenta, and assuming that in each undulation their courses are determined by composition of forces, mathematicians long ago found themselves able, not only to interpret known properties of the light constituted by ethereal undulations, but to assert that it had unobserved properties, which were thereupon proved by observation to exist. Far greater community than this has been disclosed between the ponderable and the imponderable; the activities of either are unceasingly modified by the activities of the other. . . Molecules of each kind are specially affected by molecules of the same kind existing in the farthest regions of space. Units of sodium on which sunlight falls, beat in unison with their kindred units more than ninety millions of miles off, by which the yellow rays of the sun are produced. Nay, even this is a totally inadequate illustration of the sympathy displayed by the matter composing the visible universe. The bonds of our earth are thus connected by bonds of interdependent activity with the elements of stars so remote that the diameter of the earth's orbit scarcely serves as a unit of measure to express their distances. . . . .

"Such we may imagine to be the reply of a materialist of the cruder sort, who failed to present his belief under its right aspect. Let us now listen to one of the same general school, whom we may suppose to understand better the meanings of these truths which science has revealed.

"The name you give me is intended to imply that I identify mind with matter. I do no such thing. I identify mind with motion; and motion is inconceivable by us, as in any sense material. . . . You think of me as seeing no essential difference between mind and the material properties of brain. As well might I think of you as seeing no essential difference between music and the material properties of the piano from which it is evoked. Because you assert that music is produced from the piano, do you therefore assert any kinship in nature between a piano-string and the aërial pulses it generates when struck? . . . .

"But this analogy is far too rude to convey a true conception. Not with sensible motion, even though it be that of the invisible air, has mind any direct kinship; but only with insensible motion of kinds inconceivably more subtle and immeasurably more rapid. Not to combined undulations of ponderable substance, however rare, is mind to be assimilated; but only to combined undulations of the all-pervading imponderable substance, though far simpler, and in that respect, far lower than the activities we call mind, are at the same time far higher than those we call mind in respect of their intensity, their velocity, their subtlety. What has been gained in adaptibility has been lost in vivacity. Though mind brings into adjustment the apparatus by which certain ethereal undulations emanating from the sun are brought to a focus, yet mind cannot, like these concentrated undulations, dissipate the diamond placed in that focus. Though mind is capable of devising an electric telegraph, yet it remains wholly insensible to these slight molecular agitations on the other side of the earth, which transform themselves into sensible motions on this side. And now that the rates of our ideas and volitions have been *measured*, we learn that though thought is quick, light is many millions quicker.

"Your conception, O spiritualist, is far too gross for me. I know not what may be the extent to which you have refined this creed, which you inherit from aboriginal men. Disembodied spirit was conceived by your remote ancestors (as it is still conceived by various existing savages) as material enough to take part in battle, and even to be killed over again. Becoming less concrete and definite as knowledge increased, the idea of a ghost continued, till quite modern days, to be that of a being which could cause alarming noises and utter words. Even your quite-recent ancestors, transparent as they supposed the substance of a ghost to be, nevertheless supposed it visible. Possibly you have still further purified their belief. But, whether you confess it or not, you cannot think of a disembodied spirit without thinking of it as occupying a separate place in space—as having position and limits, and such materiality as is implied by limits. This idea, not commended to me by its genealogy, quite *unsatisfactory* in its nature, and *wholly unsupported by evidence* (?), I cannot accept. Mind, I identify with that which is not *relatively* immaterial, but *ab-*

soltuely immaterial. It has not even the inconceivably refined materiality of the ether which fills what you call empty space; but it is assimilable (as inferior in principle?) to the activities manifested by this ether, as well as by all sensible forms of being. . . . .

"Comparatively consistent as is this answer, and serving though it does to throw back with added force the reproaches of the spiritualist, it is not the answer to be here given. In the closing paragraph of *First Principles*, and again in earlier parts of the present work, the position taken was, that *the truth* is not expressible either by materialism or by spiritualism, however modified and however refined. . .

"See then our predicament. We can think of matter only in the terms of mind. We can think of mind only in the terms of matter. When we have pushed our explorations of the first to the uttermost limit, we are referred to the second for a final answer; and when we have got the final answer of the second we are referred back to the first for an interpretation of it. We find the value of x in terms of y; then we find the value of y in terms of x; and so on we may continue for ever, without coming nearer to a solution. The antithesis of subject and object never to be transcended while consciousness lasts, renders *impossible* all knowledge of that *ultimate reality* in which subject and object are united.

"And this brings us to the *true conclusion* implied throughout in the foregoing pages—the conclusion that it is *one and the same ultimate reality*, which is manifested to us subjectively and objectively. For while the nature of that which is manifested under either form proves to be *inscrutable*, the order of its manifestations throughout all mental phenomena proves to be the same as the order of its manifestations throughout all material phenomena."

From this it appears that *idealism* means preestablished harmony between objective and subjective phenomena, —matter and mind; which we accept as one true definition of *the truth*. What then are we to understand by the words in the text which we have put in italics, such as *incomprehensible, unrepresentable in thought,* ideas and volitions which have been *measured, first principles* as a basis of science, *the truth* not expressible either by materialism or spiritualism; and the *true conclusion* that it is *one and the same reality* which is manifested to us subjectively and objectively? and which we add, must be comprehensible in some degree, if science be possible.

The simple truth is evident to all, namely, that the *essence* of matter and of mind is a mystery, while their modes of motion, thought, and impress, can be known as the basis of knowledge, and measured by *laws* which are the groundwork of science.

Systems of philosophy differ because modes of thought are not alike in all minds. One class of thinkers subordinates vital forces and phenomena to physical forces, both in cosmic and in human nature; another class of thinkers subordinates physical forces and phenomena to vital forces and modes of thought, in both cosmic and human life and organization. One constructs a system of mathematical argumentation to support his favourite hypothesis; the other constructs a system of biological argumentation to prove his theory. One can no more think as the other thinks than a sparrow fly like a swallow; or a turkey live on land and water like a swan. One can eat no fat; the other can eat no lean; and so between the two, they ——. Do they?

ORGANIC PHILOSOPHY.—Another class of minds, endowed by nature with a different cast of ontological reason, have a kind of horror of negative abstraction; and of simple *atomism* as a sort of chaos, devoid of organic principles and forces. They must have *something* to rest upon, as the foundation of being, however much that something may be immaterial or spiritual, mysterious, and unfathomable in essence. They are content to know eternal principles and forces by their phenomenal modes of action in organic order and arrangement, evolution, and perpetuation. They think that neither materialistic *atomism* nor immaterialistic *nihilism* are complete views of first principles. Primary elements of force are immaterial, and phenomenal modes of motion are both spiritual and material. By ontological methods of observation and analysis they find certain conditions of existence, such as *time*, *space*, *substance*, and *force*, to be omnipresent conditions of life and ultimate forms of thought, in fathoming the depths of nature. These alone do not exhaust the aspects of indestructible forces and principles manifest in phenomenal existence; nor explain omnipresent and eternal determinative causes (*organic*, *moral*, *instinctual* and *mental*); nor the purposes of Omniscience in creation; the ends and uses of phenomenal existence and activity, such as *use*, *beauty*, *truth*, and *goodness*; the continuous mutations of life and death in organic beings, alternating from one state of existence to another, in different worlds (*natural*, *lymbic*, and *ethereal* or celestial); nor do such theories explain the indestructible forces of life in different forms and functions of *individual*, *collective*, *co-ordinate*, and *ultimate organisms*, or creatures, in any of these worlds.

Mathematical, physical, and mechanical sciences may explain "molecular physics" and their laws, to some extent. They do not explain biological, sociological, and dialegmatical sciences, but assume that these are void of any other principle of indestructibility than that of omnipresent centres of atomic force. The human mind is then the only capacity of mathematical reason in nature; and that is at the mercy of an omnipresent chaos of centres of force without dimensions.

Apart from special views of theology, however, ontological reason and understanding postulate a sort of *à priori* maxim that—created worlds are manifestations of conscious or unconscious modes of thought and action, ruled by invariable laws of order; which worlds and laws can be observed, analysed, and understood by conscious human reason, as a part of cosmic reason, and of absolute reason, eternally consistent with itself; and thus a human science of phenomenal nature and her invariable laws becomes possible to man, along with the science of human reason itself, and Divine reason itself.

God and his thoughts, and laws, and creations, are All in All; and human reason can understand absolute reason and principient energy, as designer of creation, as constructive realizer of creation; as providential ruler of creation, in all its modes and degrees of evolution, organization, modulation, and transmutation.

Those who object to this mode of reasoning with regard to phenomenal nature and eternal principles should give us a better method; which, indeed, they profess to do, by descending from the most complex to the most simple units of nature, immaterial points of force, as a positive basis of science; but there is no advantage in such a method. What are the complex units of the universe? And what are the schemes of each of these?

Complex Units of the Universe.

The pancosmic universe itself is a complex unit.
The Milky Way is a complex unit.
Our solar system is a complex unit.
Our globe of earth is a complex unit.
An individual man is a complex unit.
An animal is a complex unit.
A plant is a complex unit.
A crystal is a complex unit.
A drop of water is a complex unit.
An atom of hydrogen is a simple unit.
A mathematical centre of force is supposed to be a still simple more unit of phenomenal nature.

What can the ontological faculties of human reason and understanding make of all these data, or of any of them? How can we discover the *scheme* of any one of them?

What are the Eternal Forces, Laws, and Principles which underlie them all, or any one of them, and govern them? *What* are the laws of associative complexity which govern all these natural limits or schemes of complex unity, as we ascend from points of force to atoms of substance?—from these to drops of water, crystals, plants, animals, human beings, planets, solar systems, and a whole universe of solar systems? *Where*, in this scale of units, more and more complex as we ascend, are we to look most conveniently for laws of science, that is to say, for laws of number, weight, and measure? *How* are we to study complex schemes?

Astronomers have studied the phenomena of cosmic worlds; geologists, zoologists, botanists, and mineralogists have studied the three kingdoms of nature on the surface of our globe; anatomists, physiologists, and psychologists have studied human nature, animal nature, and plant nature; chemists have studied the properties of atoms and their modes of combination or association; physicists have studied mathematical centres of immaterial or imponderable forces, and their modes of motion, permutation, or convertibility. Much has been obtained by all these methods, and more will be obtained in time by each of them; but *where* lies the greatest complexity of scheme, with the greatest depths and diversity of immaterial forces and modes of motion, known to man? Are they not found in human nature itself? Is an atom more complex in scheme than a drop of water, a crystal, a plant, an animal, a human being, or less complex?

Collective humanity is more complex, in one sense, than individual humanity, and the whole vertebrate realm more complex than humanity; all the organic realms more complex than a single one; and the whole globe more complex than the realms upon its surface; but we cannot find more *depths* of organic or associative forces in a globe than in humanity; nor as many depths of conscience in whole realms of animals and plants as in a single individual human being; still less in crystals, drops of water, atoms of oxygen, or hydrogen, or mathematical centres of physical force without dimensions.

What, then, is the advantage of studying the schemes of atoms, as types of complex unity and associative laws of order? The advantage is that of discovering the laws of chemical science, physical science, mechanical science, mathematical science, and, to some extent, astronomy. But none of these are sciences of human nature and social evolution. "The *proper* study of mankind is man" himself, as the type of complex organic unity in all the realms of nature, above and below his own degree of rank in finite dividuality or associative complexity. The scheme of human nature is more complex and unitary than that of any other complex unity within the limits of human penetration.

All finite beings and organisms seem to be governed by the *conditions* in which they are placed, but they have power to react upon conditions, and modify them within given limits; whence we may infer that Infinite Being can modify conditions to an infinite extent; but not annihilate.

Still, the study of phenomenal nature, as a means of discerning eternal forces, laws, and principles, is a matter of primary importance, and the method of investigation is equally important, as a means of study. We have given a general idea of our method in two preceding volumes, and a definite summary or category of ontological factors, in the volume of ontology, to which we refer the reader for details. These categories are more or less analogous, and more or less distinct from those of Aristotle, Kant, and other thinkers, who have dealt with the same subject. Aristotle gives the following list of primary distinctions in natural phenomena and human modes of thought:—"SUBSTANTIA, *qualitas, quantitas, Relatio, Actio, Passio, ubi, quando, situs, Habitus.*" These words and definitions represent modes of thought, deeply engrossed with ideas of the laws of order in nature, and the causes of phenomenal modes of motion; and, we need hardly say, that we regard Aristotle as one of the most profound thinkers of the human race on earth; never yet thoroughly understood by any critic; witness the approximately correct analysis of co-ordinate organic forces in his treatise, "De Anima," generally misunderstood, or only partially comprehended, by his successors and commentators. Our analysis, we hope, will do justice to Aristotle's penetration.

After Aristotle, Kant is one of the most profound thinkers. He also has defined his views in categories, in the following forms of definition and distinction:—

"*Sense, understanding,* and *reason.* From these three sources all ideas are derived. From sense, ideas of *space,* and *Time;* from understanding, ideas of *quantity, quality, Relation, Modality.* Under the head of Relation, he distinguishes *cause* and *effect, subject* and *accident, action* and *reaction.* From reason are derived ideas of *absolute totality, absolute limitation,* (?) *absolute substance,* cause, concurrence, *absolute necessity.*"

Is not the word infinite incompatible with "absolute limitation," unless it be understood as a limitation by absolute law.

We need not dwell, however, on these definitions and distinctions, which are not as simple as our own; but a few words on Mr. J. S. Mill's idea of all namable things may not be out of place here; these are—

1st.—Feelings or states of consciousness:
1. Sensation.
2. Emotion.
3. Thought.
4. Volitions.

2nd.—Mind.
3rd.—Bodies.
4th.—Succession, co-existence, likeness, unlikeness.

These are also categories of facts and modes of thought, useful as approximative definitions and distinctions, but where is the ontological science to be based on these categories?

In a more detailed explanation of his views, Mr. J. S. Mill distinguishes all namable things as "substances and attributes," and explains that

"SUBSTANCES are ether bodies or minds; and, while the substance body is the unknown cause of our sensations, the substance mind is the unknown recipient."

"ATTRIBUTES are of three kinds—quality, relation, quantity; the following enumeration and classification of all namable things, is the result of our analysis:—

1st.—*Feelings*, or the states of consciousness.

2nd.—*Minds* which experience those feelings.

3rd.—*Bodies*, or eternal objects, which excite certain of those feelings, together with the powers or properties whereby they excite them."

"4th.—The *successions* and *co-existences*, the *likenesses* and *unlikenesses* between *feelings* or states of consciousness. Those relations when considered as subsisting between other things, exist in reality (?) only between the states of consciousness which those things, if bodies, excite; if minds, either excite or experience. *Existence, co-existence, sequence, causation, resemblance*: one or other of these is asserted in every proposition which is not merely verbal. This fivefold division is an *exhaustive classification* of matters of fact: of all things that can be believed or tendered for belief: of all questions that can be propounded, and all *answers* that can be returned to them (?). Instead of *co-existence and sequence* we shall sometimes say, for greater particularity, *order in space, order in time*."

This being the latest classification of ontological categories, we may note the happy idea of substituting the words *order* in *space* and *order* in *time*, for *co-existences* and *sequences*; since the whole question of organic science and philosophy is involved in those simple words, '*order in space*,' and the whole question of evolutive science and philosophy, in the words '*order in time.*' Where are the organic and the evolutive sciences to be found exemplified on a finite and comprehensible scale of phenomena, so completely as in the anatomy and physiology of human nature? and in the metamorphic evolution of the human fœtus in the womb? These are the highest known types of organic order in space, and evolutive order in time.

We may conclude this section by stating that the quest of eternal forces, laws, and determinative principles, which underlie and govern all phenomenal worlds, and a due distinction of indestructible forces from mutable modes of motion and aggregation, are the special use and aim of the ontological faculties of reason, in co-operation with other faculties of mind. Secondary causes and effects are easily grasped by the simple faculties of 'causality,' or intellect, while eternally determinative principles of motion can only be discerned by the much more powerful faculties of reason.

As the framework of the bony skeleton supports all the other systems of the body, so the ontological faculties of reason sustain the whole organism of the mind. This being understood, we may now explain the use and aim of analogical reason and understanding, in parallel with ontological faculties.

ANALOGICAL REASON AND UNDERSTANDING.

Simple comparison and analogical reason are contrasted in concrete and discrete degrees of parallelism. Things are compared by instinct on the same level of creation; by analogical reason, on different planes of being. Thus one stone is *compared* with another in its general form and qualities; one plant with another; one animal with another; but analogical parallels dive from one level to another, one depth of nature to another; from the surface to the centre through any number of parallel and concentric strata, not only of the same concrete qualities and degrees, but of discrete planes of forces and phenomena, in which there is no other similitude but that of analogy: and it is mainly applicable to the primitive factors and functions of biology, where simple comparisons never penetrate thoroughly into the depths of mundane phenomena, not to mention amphimundane parallels, to which some minds have an unconquerable dislike throughout life, as a pheasant would dislike to follow ducks or geese upon the water. Such minds delight in natural science only; not supernatural. As a man who has no taste for music does well to neglect the art, so those who have no relish for amphimundane parallels and mystic correspondencies do well to shun them. Spiritual parallels and analogies, however, are abundant in natural life and organization.

Thus, for instance, body, soul, mind, and spirit are concentric depths of human nature, parallel in all their special factors and modes of motion, intimately blended in organic unity, but quite distinct as modes of action, with definite aims and uses. A few examples will suffice to explain our meaning: such, for instance, as the factors and functions of experiential life and organization.

Bodily absorption, nutrition, strength (weakness).
Spiritual absorption, nutrition, morality (immorality).
Instinctual absorption, nutrition, knowledge (ignorance).
Mental absorption, nutrition, science (nescience).

The results of experiential absorption and nutrition are quite different, while the modes of acquisition and retention are analogous.

Physical thrift results in strength of body;
Spiritual thrift, in moral strength of conscience;
Instinctual thrift, in practical strength of judgment;
Mental thrift, in theoretical grip of science.

Thrift or increase of all kinds is the result of nutrition, which is itself the result of various operations in body, soul, mind, and spirit. Smell and respiration, absorption and circulation, secretion and micturation are subservient to the functions of atomic nutrition and exchanges in the body; and a parallel array of factors and functions are subservient to the affectional nutrition and exchanges of the spirit; the sensational or ideational nutritions and exchanges in the soul; the cognitional or theoretical nutrition and exchanges of the mind. Analogy thus understood enables us to penetrate much deeper into psychological modes of action than simple comparison can ever do; analogical faculties of reason render nature as it were diaphanous in all its discrete planes and depths, in contrast with the opaque stratifications and parallels of mere concrete resemblances. As light passes through solid bodies made transparent, so analogical reason penetrates where other mental processes would be reflected without penetration.

Analogy also enables us to give more definite meanings to words in common use; thus, with reference to various kinds of experience in phenomenal life—

Physiological nutrition gives physical power.
Psychological nutrition gives practical knowledge.
Noological nutrition gives theoretical science.
Pneumatological nutrition gives social virtue.

Bad or poisonous foods generate disease; bad habits false doctrines, and depraved conduct generate disease of mind.

Due attention to analogical parallels enables us to make good choice of words, which is equally important to literature and to science; for instance—

Physical health, elasticity and energy.
Instinctual judgment, discernment and knowledge.
Mental reason, penetration and science.
Spiritual happiness, sociability and virtue.

Physiological secretion,—magnetism (comfort).
Psychological imagination,—heat (enthusiasm).
Noological generalization,—light (illumination).
Pneumatological affection,—gravitation (happiness).

Parents transmit hereditary traits of bodily as well as mental physiognomy to their offspring, and the mother furnishes magnetic influence and atoms of matter, for the *incarnation* of the experiential fœtus in utero; passional affections and emotions for the *affectionalization* of the preconscious spirit; actual warmth, sensations, and ideations for the *instinctualization* of the preconscious soul; rational illuminations for the *diaphanization* of the preconscious experiential mind, in lymbo. Were it not so, we do not see how peculiar habits of mind could be transmitted from human parents to their offspring, and from inferior animals to their progeny (although alloys always affect pure metals).

From this point of view we may see that gestation is superior to incubation, as a mode of transmitting parental influence; and incubation superior to hatching eggs by artificial heat. The seeds of vegetables, and the eggs of the lower types of animals, are left to physical heat alone for germinative and embryonic evolution, while higher types of organism are influenced by psychological emotions, as well as by physiological warmth and fostering care.

Human nature is a type of organic analogies, homologies, parallels, and correspondencies. There are *concentric* parallels of organism and vital modalities in body, soul, mind, and spirit; right and left sides are parallel and *homologous; bipolar* aspects of the body, in the upper and lower limbs, are parallel and *similar* in many respects; the seven general systems and series of organs with their satellitic organs of sense, are parallel and concentric in structural distribution, though contrasted in function or vocation; and besides these, there are *arthroïdal correspondencies* of adaptation, such as ball and socket joints, hinge-joints, serrated joints, etc.; the systems and faculties in each organism coincide in concentric parallels, and the parts of each are associated on the same principles of number, order, etc.: whence the analogies and correspondencies observed in this complex microcosm, are types of organic analogies and correspondencies in the unity of the complex macrocosm.

Analogical reason penetrates into the *science* of correspondency in natural phenomena and laws of order, while simple comparison merely subserves the *art* of symbolism and metaphorical modes of expression in language or poetry. The manner in which we have described the parallels of biological faculties and functions in the present volume is an example of analogical modes of reasoning on problems of biology.

RYTHMOLOGICAL REASON.—Birds sing but they cannot understand the theory of music; animals express their feelings and emotions without understanding the theory of language. Monkeys can imitate almost any movements they see; and numerous insects simulate death to escape from danger, but none of these can understand the theory of dramatic arts and sciences. Rhythmological reason and understanding, therefore, are faculties of humanity alone and not of animality.

This form of reason coincides in abstract forms of thought with mathematical forms of reason, while it is applicable to biological phenomena as well as to other concrete factors and modes of motion, such as scales of sounds, or cycles of existence, and their objective relations to the human mind. It is the subjective generator of the dialegmatical sciences which underlie the practical arts of music, linguistics, dramatics, and biological methodics as mathematical sciences underlie the practical arts of physics and chemics, statics and dynamics, or physical and mechanical arts and appliances.

Organic philosophy is based on the hypothesis that rhythmological laws are eternally and mathematically true in all the realms of nature, in all worlds; that all the known phenomena of the universe are demonstrably governed by these laws; that the everlasting stability of nature in perpetual modulations and mutations, depends upon the harmony of these laws with organic evolutive permutations and progressions; and that human nature is a definite type of the organic laws of rhythmological *order*, *number*, *weight*, and *measure*, (the foundations of positive science), in all worlds visible and invisible, inorganic and organic, natural, lymbic, and supernatural; *ad infinitum*.

We have shown that the human body is a definite scale of systems and series of organs associated in complex unity, and that all animal and vegetal organisms are similar scales of physiological factors and functions, more or less complete, analogous and homologous (like those of so many different musical instruments), in a general concert of biological unity and harmony. It is not merely an intuitive hypothesis like that of Pythagoras, but a scientific theory, verified in all the realms of nature by systematic and comparative analysis, as we have already shown. Biology thus becomes a key to every other science; music being one of the least important, though it must necessarily agree with every other, being based on the same rhythmological laws of number, order, weight, and measure. Laws of weight in this case meaning laws of gravitation, cohesion, or association, of atoms, cells, tissues, and organs; globes, or human beings: not only in concrete organization, but in measured modes of motion.

We need not dwell on the distinction of structural scales of organs, and evolutive cycles or phases of existence; these have been already explained, and will be technically defined in a volume on methodics. We repeat, however, that biology is the real key to rhythmology; music being merely one of its secondary outbirths; the laws of harmony being the same in natural phenomena, and in artificial modes of motion and association.

ANALYTICAL REASON AND UNDERSTANDING.—Animals can make experiments and learn by experience, but they cannot analyse. Some human beings make experiments, where they are unable to analyse. Analytical dissections may be empirical, or they may be systematic. Empirical analysis may suggest inductive hypothesis, but rarely with much success; whereas systematic analysis, guided by the idea of observing the order and arrangements of parts contained in any natural organism, may lead to an hypothetical induction of much importance with regard to the possible similarities of order and number in other complex unities of nature.

It is thus that the anatomy of the human body by empirical ideas and methods of dissection, during many generations of practical investigation, has failed to suggest any valid hypothesis with regard to organic laws of order in other departments of science; nor has the same method in comparative anatomy suggested an organic method of classification, although it has to some extent, in connection with comparative embryology, suggested metamorphic hypotheses with regard to the paleontological evolution of organic realms on our globe.

In contrast with practical and empirical ideas and methods of analysis in comparative anatomy and physiology, we have made a systematic analysis of the organs and functions of the body, in parallel with the faculties and functions of spirit, soul, and mind, and this has revealed to us definite laws of number, weight (or associative unity), and measure or proportion, which naturally suggest the idea of similar laws of order, in every complex unity of the creation. This idea has led us to analyse all the realms of nature, to test the value of such an hypothesis, and the result of comparative analysis has stimulated our synthetical faculties of reason and understanding to construct a mental system of epicosmic unity, as a faithful reflex of the objective world, described in our volume on *Epicosmology*. This has been further developed in biology and ontology, and will be continued in sociology and dialegmatics.

Inductive Reason and Understanding.—Inductive reason is based on experiential observation and experiment, but it differs widely from instinctual modes of *inference;* and Mr. J. Stuart Mill, in his system of logic, has sometimes confounded one with the other, as in vol. i., page 311, where he states that,

"Formerly in Europe it was a common *inference*, from limited experience, that all *swans* were *white*, which showed that in this order of phenomena, whiteness was uniformly and invariably a *quality* of the *swan-nature*, and therefore a *law* of swan-nature, and phenomenal swan-modes of being; an instinctual mode of inference from limited experience, contradicted by the discovery of black swans in Australia."

The *inference* of universality and uniformity of whiteness in swan-plumage, from the limited experience of Europeans during many centuries, was not a *law* of swan nature, but a mere empirical inference requiring the test of both reason and experience to show that it was a *fact;* but such a general fact would not have been a *law* of any kind, though subject to law.

Induction consists in discovering and proving *general propositions* first suggested by well-known particular instances, as deduction consists in discovering and proving *particular relations* between general and particular correlatives. A theoretical hypothesis of any kind may be suggested by *experience and inference* from such experience, but cannot claim the rank of a legitimate *hypo-*

thesis until it can show that some kind of law is already involved in the known facts of experience. For instance, in our own hypothesis, that human nature is a type of universal nature, we received the *idea* from tradition in all ages, in the form of an instinctual intuition, but not in the form of a *scientific hypothesis*. The anatomy of the human body had been continued during centuries, but no law of *order*, *number*, *weight*, and *measure* had been detected in the organism by anatomists. We suspected there must be such laws, not only in universal nature, but in finite human nature, and we undertook a systematic analysis of the human body, to discover the laws of organic unity and complexity. The result has been our elaboration of organic philosophy, to prove that a legitimate hypothesis could be formed in corroboration of the heretofore sterile *intuition* of ancient philosophers, who have affirmed their belief without giving any proof, that "man is a microcosm, an image of the macrocosm," and the "measure of all things," human and divine.

Simple inference is drawn from known facts and relations to unknown facts and phenomena of like nature, but *theoretical induction* proceeds from known laws and relations in observable phenomena to like laws and relations supposed to exist in unknown or invisible worlds of phenomena. An inference may be drawn from imperfectly known facts in the sphere of practical experience, where no law has been discovered, but a rational induction must be drawn, not only from a knowledge of actual phenomena, but from a science of the laws of those phenomena.

SYNTHETICAL REASON AND UNDERSTANDING.—Inductive reason having lead from individual to comparative anatomy and physiology in all organic realms, to test the laws of order found in the human body, these laws being carefully ascertained to be universal in organized bodies, the question at once arises, how far the same general laws may rule in the structure and modes of action of inorganic realms. Careful and systematic analysis find similar laws of order, number, and distinction in both organic and inorganic realms, as far as the physical plane of natural forces and phenomena are concerned, but no farther.

This leads to an elaborate investigation of different planes or depths of inorganic and organic forces and phenomena in the three kingdoms of our globe, from which analysis we find one kind of forces only in the mineral kingdom, two kinds in the vegetable kingdom, four kinds in the animal, with a fifth in mankind. The human body is on the same plane as a plant, which grows by nutrition and perpetuates its species; and both are on the same plane as the atmosphere and the ocean, with regard to chemical and physical modes of action and mutation. It is on this first plane only, then, that we can trace laws of order in the realms of epicosmic nature, and extend them by a systematic synthesis, to all the known phenomena of cosmic nature; and this we have done in our classification of the sciences. From this plane of synthetic unity we cannot fathom the unknown factors of cosmological unity below the depths of physical forces and phenomena; but from a positive knowledge of the same laws of order, ruling in all the *known* depths of cosmic and epicosmic nature, we are led to infer that the same invariable laws which characterise the determinative principles of finite mental forces and modes of action in human nature, characterise the determinative principles of omniscient mental forces and volitions in the Infinite, and this induction is strongly corroborated by the evidence of design in creation, and the relation of design to mental activity and laws of science in mankind and in Omniscient Deity.

DEDUCTIVE REASON AND UNDERSTANDING.—Induction from known kinds of forces on a finite scale, of physical, physiological, instinctual, mental, and spiritual forces and phenomena, lead to comparative analyses of these distinct planes of life and organization in all epicosmic realms; and by extension, to all cosmic worlds. The question then arises, are cosmic worlds merely inorganic realms of nature on a single plane of physical forces, according to all appearances, like mechanical automata; or have they complex depths of force and life in them, like vegetal, or animal, or human creatures? Inductive and synthetic reason cannot tell; but analytic reason discovers evidences of design in every world; adaptation of means to ends and purposes in every world; laws of order in every world; and these are the main characteristics of the human mind on our globe, as the designing agent of a determinative will and understanding. Final causes of purpose and adaptation, efficient causes of motion and mutation; invariable laws of order, in one plane, being found to correspond with the same laws in all the known depths of nature, lead the deductive mind to suppose, *à priori*, that there are concentric depths in cosmic worlds as well as in epicosmic realms, although it cannot be verified, by *à posteriori* evidence, in one as it is in the other.

Thus, inductive processes lead to a certain amount of synthetical generalization and co-ordinative unity in known realms of phenomena, and from these known data and their characteristics, deductive reason draws conclusions with regard to unknown characteristics on a larger scale.

Within finite limits man has power to create new forms and combinations, or determine special modes of motion, by controlling, when necessary, all the known forces of spontaneity of animals, plants, and mineral or atomic forces, and therefore, within these limits, will and understanding have power to rule all inferior powers of creation, by means of human *science*; a very small portion of omniscience. Is there such a thing as omniscience? That is to say, more science than man himself possesses? If there were not, how could man obtain more? And if he can obtain more, where is he to find it, and how obtain it?

He can only find it in nature, and therefore he must study nature. But why interrogate her if *she* does not know; or convey a message from a mind that does know? She does not seem to know *herself*, as far as we can learn, any more than a locomotive engine seems to know itself, or its own laws of structure; but then both nature and the automatic engine bring a message from the minds that designed and constructed them to the minds that contemplate them. A locomotive engine is designed and constructed by a determinative will and understanding on a finite scale, and within due limits of science, laws, and conditions. Universal nature is either an automaton, or something more, within due limits of science, laws, and conditions, as far as human penetration can reach and demonstrate. Is there a design in the construction?—a designer and determinating will anterior and superior to the automatic mechanism on so large a scale? An omniscient mind and an omnipotent determinating will? It does seem highly probable, as a deduction from results obtained by inductive processes of ratiocination, and this deduction from the uniformity of natural laws and forces in phenomenal modes of motion is strongly *corroborated* by religious revelations and spiritual communications from angels to mortals in all ages of the world.

In a syllogism the reasoning stands thus:—

Evidences of design in human constructions imply the necessary existence of a finite human mind as a pre-existing cause of the finite creation.

Evidences of design in universal creation imply the necessary existence of an infinite Divine Mind, as an eternally pre-existing cause of transcient phenomena.

Consequently there must be a God as the only possible and satisfactory explanation of design in the creation. Spontaneous crystallization does not invalidate this Biological deduction, any more than spontaneous motion in a plant, an animal, or a man.

In the two primordial principles of nature distinguishable by analytical reason (namely, Absolute reason, and Infinite force), which is probably the master? Creative reason, or Chaotic force? God or Devil? Regulative law or lawless chance? Deductive reason says at once—Creative reason rules perpetual motion and the evolution of all forms of life and organization, in all possible worlds of force and substance, throughout infinite space, eternally. Some people maintain that the Devil is master, because they see more evil and imperfection in nature than they would tolerate if they were gods; and they denounce deductive methods of reasoning as entirely delusive, in all cases, just as if their own conclusions on these questions were not the result of inductive and deductive method. If God be master, well and good; but, if by induction we deem the Devil master, what then is our deduction? Where would science be and happiness? morality and virtue? stability and security? progress and perfectibility? Atheists are just as much inductive and deductive reasoners as theists; only one contends that chaotic force is master, and the other that Perfect reason rules. Theists maintain that the laws of order in the universe are the same as the laws of order in the mind of the Creator, and that unless these laws of order in creation were exactly the same as the laws of reason and science in the human mind, Man could never understand the laws of nature, and positive science would be utterly beyond the reach of human reason.

Co-ordinative Reason and Understanding.—The association of cells in tissues, organs, systems, and bilateral hemialities, forms the synthetical unity of an individual organism, such as that of the human body: this does not, however, fathom the depths of co-ordinate forces in human nature. The body is a complete organic unit, but not a complete human being, which contains four concentric organisms or vital modalities in associative and co-operative unity. *Entellechia*, *Pneuma*, *Psyche*, and *Nous*, are four Greek words which denote Physiological, Spiritual, Instinctual, and Mental organic modalities, in one co-ordinate community of individual being, male or female.

All beings of high or low degree in the organic realms of our globe, are complex co-ordinate units, containing several depths of organism; two in plants, four in animals, and five in human beings; namely, physical and physiological kinds of force in plants; physical, physiological, pneumatological, and psychological in animals; to which is added mind or noological energy in man. The vital principles of human nature being essential, while the physical forces and matter of the body are conditional, transitory, and connective only.

The discrete depths of co-ordinate complexity in human beings which exist preconsciously before they are born into the natural world, are consciously manifest in them afterwards; and disembodied human spirits manifest in their communication with mortals the same co-ordinate depths of organismic complexity, as when they were in the flesh; whence we know from actual experience, that associative unity and complexity of vital forces in human beings are phenomenal realities in the natural, the lymbic and the spiritual spheres of human existence; and moreover that the same laws of co-ordinate reason and understanding rule in these spheres. We also know that the three worlds in which these organisms live alternately, are concentric and co-ordinated worlds. Whence it follows that the synthetic unity of a simple organism (such as the body alone) in any world, is not absolutely identical, though it is temporarily associated, with the co-ordinate community of several *discrete* organisms in a living being.

It is one thing, therefore, for human reason to know and understand a *concrete* synthetic unit of organic association, and another to discern and understand a co-ordinate unity of *discrete* vital modalities, associated in co-operative modes of concentrality, as we find them in human nature and in epicosmic realms.

There is nevertheless an intimate solidarity of harmony and discord in simultaneous and successive modes of co-operation in the complex community of human nature, which solidarity is easily traced in the nutritional exchanges of each special organism, in connection with surrounding elements and conditions.

If nutrition and exchange of atoms be deranged or arrested in any part of the mortal body, psychological sensations and the association of ideas are more or less deranged or arrested along with them; emotional feelings are affected, and rational appreciations likewise.

Take for example a scale of degrees of heat by which the body is affected in its nutritional exchanges within the limits of healthy, injurious, and fatal results. Thus—

excessive.
—Fatal disorganizing burns and scalds (death).
0. Excessively painful burns (unconsciousness).
7. Painful burns and scalds (suffering consciousness).
6. Oppressive heat (uneasiness).

moderate.
5. Unpleasant heat (discomfort).
4. Pleasant warmth (comfort).
3. Unpleasant coolness (discomfort).

depressive. 2. Oppressive cold (uneasiness).
1. Painful cold (suffering consciousness).
0. Excessively painful cold (unconsciousness).
— Fatal disorganizing cold (death).

All these degrees of heat and cold affect the association of atoms in the body, and in parallel degrees the association of ideas and feelings in the mind.

This shows plainly that excitements and depressions of functional activity, (such as those of nutritional exchanges) in the organs and tissues of the body, correspond to excitements and depressions of functional activity, such as those of the association of feelings and sensations in the soul.

Analytical tables of the systems of the body, the passions and emotions of the spirit, the instincts of the soul, and the faculties of the rational mind, show exactly how each synthetic unity corresponds with every other, in the co-ordinate community of vital forces, in male or female individuals.

Subordinative Reason and Understanding.—Besides the co-ordination of discrete kinds of force or modes of vitality, we find subordinative degrees of rank and power in associative and co-operative unity. Mankind rank higher than animals, and animals than plants. It is important, therefore, to discover the laws of hierarchal order and gradation, function, and co-operation, in all the realms of nature, and more especially, the natural order of associative unity in humanity, not only in this natural world, but in all worlds.

Within finite limits we know that physical elements are subordinate to physiological forces and modes of nutritional motion in plants; these are inferior to instinctual forces in animals; and these again to reason in mankind. Moons are subordinate to planets, which are themselves inferior to suns. Subordination is as manifest and as manifold as co-ordination in the universe; not only as a subjective law of reason in the human mind, but also as an objective law of the creation, in pre-established harmony with laws of thought and understanding.

HYPOTHETIZING FACULTIES OF REASON AND UNDERSTANDING.—These correspond to *intuition* or the evidence of the senses in the instinctual organism. "Common sense" supposes that the sun rises in the east and sets in the west by moving daily round the earth, which occupies the centre of the universe. The Ptolomaic system of astronomy was based on this evidence. Copernicus found that many facts could not be scientifically explained on that hypothesis; he therefore looked upon the solar system as a mechanical automaton, and tried how the relative motions of the stars could agree with the *supposition* that the sun was the real centre of a system, and that all the planets rotated on their axis and revolved around the sun, instead of round the earth. This *hypothesis* of reason, contrary to the *intuition* of the intellect, made all the facts observed agree with theory, but then the "common sense" of mankind in general was shocked by the natural consequences of such a scheme as well as by the direct contradiction of appearances. Admitting the earth to be a ball or globe, revolving round the sun, as the moon around the earth, how is it possible to imagine that people could stand on this ball, at the antipodes, with their feet opposite to ours, their heads being relatively downwards and their feet upwards? The great Lord Bacon maintained that the idea was absurd, and contrary to all "*common sense.*" The evidence of the senses and the opinion instinctively formed on experience, have nevertheless been rectified by the evidence of *reason* and scientific demonstration. Theoretical *supposition* has supplanted practical *intui-*

tion, and made reason and experience agree in every particular. The senses and the intellect with the emotions and the will, require to be enlightened and controlled, then, by the *light* of the understanding. Intuitive "common sense" is a faculty of instinct; theoretical supposition is a faculty of reason.

THE FACULTY OF GENERALIZATION.—External stimulants of generalising thought incite the human mind to scan the breadths and peer into the depths of nature, both external and internal, self and not-self, as modes and conditions, principles and laws of existence.

SCANNING BREADTHS OF NATURE, *AD INFINITUM.*

1st.—The continuation of *time*, present, past and future, *ad infinitum.*

2nd.—The extension of *space* in time, *ad infinitum.*

3rd.—The forms of *matter*, in space (suns, planets, and systems), *ad infinitum.*

4th.—The motions of imponderable *ether* in molecular physics, planetary bodies, and cosmic systems, *ad infinitum.*

The modes of motion of imponderable ether are commonly called light, heat, magnetism, or electricity, and gravitation, and these are the data of photological, thermological, barological, and electrological laws and sciences; the physico-mathematical sciences of astronomy, optics, thermotics, and electro-magnetism.

So far the human mind has scanned the breadths of cosmic nature in the utmost degrees of generalization.

PEERING INTO THE DEPTHS OF NATURE, *AD INFINITUM.*

How does the mind peer into the depths of nature, *ad infinitum?* Here it is limited to more and more restricted fields of direct observation and experience.

Within the limits of nature on our own planet, we find from experience, 1st.—That ethereal modes of motion, or imponderable physical forces rule molecular physics in all states of communicative impress as well as of static and dynamic tension or motion, solid, liquid, or gaseous, contractile condensation or relaxive expansion, in both inorganic and organic nature.

2nd.—Other kinds of determinative force rule ethereal modes of influence in molecular physics, within given limits, in vegetal and animal organisms. Vegetable organic forces rule the same kinds of physical force and substance differently in different realms and species; animal organic forces rule "molecular physics" still more variously in different realms, classes, orders, families, genera and species; with regard both to internal molecular arrangements and external forms.

3rd.—Gravitative or social affections and repulsions between animals of different classes and species, rule or control the associations of individuals in hives, swarms, flocks, herds, troops and communities.

4th.—Instinctual forces rule special modes of individual activity and social modes of aggregation and co-operation, amongst individuals of different types and of the same type; such as solitary bees and social bees, industrial and artistic co-operations of human beings.

5th.— Mental forces rule instinctual forces and modes of action in mankind, where human reason can discover the laws of nature and govern the opinions and prejudices of "common sense" by the light of science.

> Mental light and physical light seem to be analogous;
> Instinctual heat and physical heat;
> Social attraction and physical gravitation;
> Organic cohesion and physical magnetism.

Physical forces and modes of motion are convertible within given limits by human ingenuity, although they co-exist in definitely limited modes of motion in the cosmic universe.

Organic forces are not convertible by human ingenuity within any given limits that we know of.

Physical light is omnipresent in cosmic nature, darkness being merely a temporary phase of alternating motion and relation.

Is mental light omnipresent in the universe, and ignorance or mental darkness a temporary phase of evolution?

As far as the human mind can reach, laws are omnipresent in the *order* of nature. Is not reason then the principle of science, the mind which *understands* laws of order, omnipresent to *determine* phenomenal evolutions of growth and decay, organization and destruction, alternations of life and death, incarnation and decarnation, in all the realms of nature? Or, does blind chance give origin to laws of order in the objective universe and in the subjective mind which understands these laws? Practical common sense turns away from all such speculations to attend to its own wants, but speculative reason will not be silenced by practical considerations of immediate utility. It wants to know, and though it may be ridiculed by common sense, it is an irrepressible force and an important faculty of the human mind, which cannot be entirely subdued where it has a real vocation. When only rudimentally developed in individuals, it may very properly be subordinated to other and more developed faculties. Here it is at home, however, in its own vocation.

A philosopher is a generalizer who systematizes the laws and principles of science as far as he is able, and we may obtain some idea of the value of his efforts, by ascertaining—

1st.—What knowledge of facts he has acquired as the data of investigation.

2nd.—What facts and phenomena are neglected, disregarded, or unknown to him.

3rd.—What principles of method, mathematical and dialegmatical, he adopts in his investigations.

4th.—What standard of unity (atom, monad, zoonite, or organism), he accepts as the fundamental basis of his simplification, generalization and classification.

5th.—What are the limits of application to which his method extends in the depths and evolutions of natural forces and phenomena.

Inorganic atoms alone cannot explain the existence nor the mysterious origin of physiological atoms, organic cells or monads. Organic cells alone do not reveal the mysterious origin of zoonites, nor do these explain the complex unity of an individual organism, vegetal, animal, or human, not to mention cosmic orbs and solar systems. Hypothetical generalization is rife on all such questions.

Some philosophers suppose that human intelligence and animal instinct are exceptional phenomena, and that "molecular physics" explain all modes of motion, including that of mind. They deny that human reason and benevolence can possibly be accepted as representatives of infinite love and wisdom, because the human body is infested by many kinds of parasitical organisms, and by innumerable other so-called evils, "which a benevolent being could never have created, nor even tolerated." These are called *Atheists* or Idealists.

Others suppose that animal and human life are microcosmic representatives of cosmic life, and that suns and planets are animated beings of a higher order than man, whence they infer that Deity is the animating and ruling principle of all cosmic and epicosmic beings. These are called *Pantheists*.

Others, again, have experimental proof that human spirits live in ethereal bodies after they have left their material and mortal frames, and that spiritual worlds of humanity, and, probably, of higher beings, called angels and archangels, exist in an ethereal, invisible, or unseen sphere, ruled by an invisible and spiritual Deity, the Almighty Creator and ruler of all spiritual and natural worlds. And these are called *Theists.*

Still, other generalizing minds suppose that amphimundane worlds exist *ad infinitum*, and in all degrees of life and hierarchal intelligence, from the lowest zoonite up to the most exalted suns and cosmic systems, in visible natural worlds, in tenebrous lymbic worlds, and in ethereal invisible worlds, and that infinite Deity is amphicosmic, and not solely sidereal or Pantheistic. These may be called *Transcendental Theists.*

We use the word *amphicosmic* to denote the spiritual pancosmic universe in union with the natural pancosmic universe. The word *amphimundane*, to denote the invisible world of celestial humanity, in union with the visible world of terrestrial humanity. The natural *mundane* is contrasted with the spiritual *ultramundane* or supernatural, and the two combined form an amphimundane world. Thus :—

$$\left.\begin{array}{l}\text{Natural Pancosmos—cosmic.}\\ \text{Spiritual Pancosmos—hypercosmic.}\end{array}\right\}\text{Amphicosmic.}$$

$$\left.\begin{array}{l}\text{Natural world—mundane.}\\ \text{Spiritual world—ultramundane.}\end{array}\right\}\text{Amphimundane.}$$

Formulative Reason.—The laws of nature are fixed and invariable guides of regulative reason, while forms of doctrine and argumentation are variable with the progressive evolution of science and the discovery of fixed laws. A theory is based on some hypothesis or other, to account for the known facts of science, while a doctrine is merely a conjectural mode of statement in connection with some particular system.

The mathematical theory of probabilities is one of the methods of approximative reason applied to social and statistical phenomena, within the reach of calculation. The *doctrines* of religion, with regard to amphimundane truths and probabilities, beyond the reach of demonstration, are another mode of approximative reason; and these modes of formulating theological doctrines vary with the evolutions of human faith and science. For instance, the Jews believed themselves to be a chosen people, the elect of God, with a mission in this world, to substitute Monotheistic faith in lieu of the worship of human gods and heroes, as well as that of Sun, Moon, and Stars. They not only deemed it their religious duty to obliterate idolatry from the face of the earth, but also to exterminate idolatrous populations, Canaanites, Philistines, and Gentiles of all denominations. Such were the religious doctrines of the ancient Israelites, whatever be the views of their descendants. This, we have no doubt, was true within given limits of time and circumstance, although it is now revolting to many minds who believe that tigers are divine creations, with a useful mission, until mankind can people the whole globe and exterminate ferocious animals and "noxious" insects.

The moral law of the Old Testament is continued in the New, but the leading doctrines of theology have been greatly modified. *Monotheism* has become *Trinitarian* theism, and the doctrines of *resurrection* and eternal *damnation* have taken the place of Jewish election and Gentile extermination. Orthodox Christians believe in the doctrines of the resurrection of the physical body gathered together from the ends of the earth, at the day of judgment, and in the eternal damnation of the wicked, after judgment.

In our own day, a very large class of minds, who accept the moral law of the Bible, have lost all faith in the theological doctrines of the resurrection of the physical body, after its disorganization and dispersion in the form of gas and chemical atoms, re-absorbed in other animal and vegetable organisms; they also repudiate the doctrine of eternal damnation, as taught by theologians. Free-thinkers of all shades of opinion agree in these repudiations, but only a small sect of "spiritualists" have substituted the doctrines of the immediate resurrection of the soul with the "spiritual body" at the decease of the physical body, and the doctrine of *expiation* and *re-incarnation* in lieu of eternal damnation. The spirits are said to teach this new doctrine, and we have no means of disproving the statement. It is not our business here to discuss religious doctrines; we only mention them to explain the faculties and modes of action of formulative and approximative reason. Many minds regard all these tenets of belief, with equal indifference, and seem to be none the worse for it, either morally or religiously. The same may be said of medical theories and doctrines, homœopathy, allopathy, hydropathy, vitalism, organicism, &c., which are merely approximative views of therapeutic art and science.

It is curious to compare the last discourse of Socrates on the immortality of the soul (and its destiny in a future state of spiritual existence in "Tartarus" with the possibility of expiation and re-incarnation) with the modern doctrines taught by "spirits" through speaking and writing mediums. The only difference seems to be that Socrates supposes that human souls may be re-incarnated in the body of birds of prey, or insects, or quadrupeds, or human beings, while the moderns only speak of the latter species of eventuality.

The *knowledge* of phenomena based on experience, and the evidence of the senses strengthen *intuitive* judgment, while the *science* of laws, which govern phenomenal modes of motion and mutation, based on the evidence of reason and ratiocination, illuminates the rational mind, and modifies the judgment of common sense. The languages of nature and of revelation speak to the senses of the intellect, before reason is enabled to penetrate below the surface of appearances and thoroughly understand realities. The Bible is addressed to the common sense and experience of all races, classes, sexes, and ages, before reason is sufficiently developed to understand and interpret the more recondite utterances of the spirit. The familiar parables of the Gospel are addressed to the moral sense, in which the faculty of comparison is able to appreciate them, while the mystical and symbolical language of the Prophets of the Old Testament and the New (in Revelations), is addressed to the faculties of analogical reason and understanding, hitherto unable to interpret the hidden meanings of such enigmatical forms of language.

Simple descriptions and parables are easily understood by all, while stronger powers of reason are required for the interpretation of mystical and symbolical revelations. Ancient traditions and imperfect translations render the task more difficult, and it is hardly reasonable to expect anything more than remote approximations to probability in formulating creeds and doctrines on such subjects. We may, however, form an intelligible parallel between psychological and physiological faculties and functions in the body and the mind of man, as a means of distinguishing faculties of approximative reason from those of absolute demonstration, as we distinguish the association and accumulation of atoms of interstitial fat, from the nutritional association of atoms in nerves and muscles.

How is approximative reason in the mind analogous to the physiological secretion of fat in the body?

The physiological secretion of fat is not the same as the nutrition of the organs, although both are latent associations of atoms of substance. Hence organic *nutrition* and adipous *secretion* are not the same order of physiological operations, although both are in a certain sense, latent associations of atoms and atomic forces. And so it is with the parallel operations of memory, and the formation of opinions, creeds, or doctrines in the soul, or in the mind, contrasted with the processes of imagination and generalization, already explained.

We cannot detect the operations of nutrition and secretion, nor can we detect the operations of latent association in the mind, but we can analyse the leading operations which give us the results in both the body and the soul; and thence it is that we define occult psychological operations in analogical parallels with physiological operations. Where different modes of latent association in the mind are almost too subtile for direct analysis, we obtain definite views by comparison with parallel, but less mysterious modes of associations in the body, and these are of distinct orders in the accumulations of fat, contrasted with the nutrition of working organs. One order of these physiological phenomena is analogous to *probability* in science and philosophy; the other corresponds to *certainty* in the invariable laws of nature.

Open Questions.—The open questions of science and philosophy are such as cannot be resolved by mankind during the early ages of scientific evolution. Enlightened minds agree to respect the freedom of opinion of all sects and parties on such questions, until positive science enables man to decide on the authority of absolute and irrefragable demonstration. Some of these open questions may be deemed more probable in a *positive* sense, by one class of minds, while another class of minds may deem the *negative* sense more probable, but neither can with reason pretend to dogmatise authoritatively on personal preferences and apparent probability.

1.—Is there an omniscient creator and ruler of nature? or do physical forces govern all phenomenal evolutions by a fortuitous concourse of atoms in aggregative and dispersive modes of action?

2.—Is there a spiritual and ethereal universe as well as a natural and material universe, or not?

3.—Are what human beings define as good and evil, *one* and the same principle in essence, differing only in modes of action, as extreme degrees of cold and heat, belong to one principle of temperature? or radically and eternally *dual* in principle, and irreconcilable in perfective evolution? or, in other words, does the passion of acquisitiveness which leads one man to murder another to eat his flesh, or rob him of his money, differ radically from the passion of acquisitiveness which urges another man to cultivate his field to grow corn for food?

4.—Is human reason *one* in principle and essence with omniscient reason? or distinct and incommensurably *different*?

5.—Is the evolutive progress of humanity definite, organic, and comprehensible, regulated by invariable laws, analogous to that of individual human evolution and alternations of existence? or are all possible modes of evolution and progress in nature indefinite, and incomprehensible?

6.—Does elemental or mathematical monadism in its ultimate degrees of tenuity, lead the human mind necessarily to atheism, as some philososophers suppose? Or to pre-established harmony and omniscience, as Leibnitz supposed.

7.—The origin of species.—Can one species be derived from another by accidental transmutation, and hereditary transmission of such changes? Or can species only be modified partially, so as to produce *varieties* by changes of food and climate, domestication, and crossing allied species to form *hybrids?*

8.—Are all organic beings derived from a spiritual world by incarnations? Or evolved at once from matter by mere convertibility of forces?

9.—Is natural selection sufficient to account for all known degrees of metamorphic evolution? Or is heterogensis probable?

10.—Is humanity on earth inspired with new ideas and governed by humanity in Heaven? Or left to discover heavenly truth and wisdom from mundane experience alone?

11.—Are all religious revelations, (Pagan, Mohammedan, Jewish, and Christian), complete and final? Or relatively incomplete forms of eternal truth?

12.—Are organic immaterial forces convertible with one another, like inorganic forces? Or inconvertible?

13.—Are simple elements of matter convertible, as supposed by some modern chemists, and by the alchemists of former ages (who searched for the philosopher's stone with which to convert inferior metals into gold)? Or inconvertible.

14.—Are cosmic bodies in all solar systems merely automatic organisms of matter? Or instinct with life and rationality superior to animals and human beings?

15.—Are the destiny of the earth and of all the realms of life upon its surface, subject to the ruling influences of the sun and of the stars? Or is the destiny of humanity in a measure independent of these influences, and superior to them?

16.—As phenomenal organic life in the natural world is only compatible with limited degrees of temperature between burning and freezing extremes, is phenomenal organic life in the spiritual or ethereal world compatible with all possible degrees of physical temperature, in the interior of the globe, or elsewhere, as Socrates believed in his last confession of faith before he drank the poison?

On all these and many other open questions, opinions differ widely; some deem one view probable and some another, and nearly all consider their own opinion rational and the opposite absurd. The controversy stimulates investigation by which some degrees of positive science are discovered, and thus humanity advances in scientific and in social evolution.

When open questions assume the form of fanatical creeds and dogmas, they become dangerous forms of mental disease, analogous to inflammations and the fatty degenerations of important organs and consequent functional diseases of the body. The massacres of the "St. Bartholomew" by fanatical papists, centuries ago, in Paris, and the sacrifice of innocent victims recently, by fanatical and incendiary communists in that city, are examples of atrocities committed in the name of erroneous creeds and doctrines, derived from most imperfect forms of generalizing speculation.

In both cases natural faculties and functions were perverted by erroneous and fanatical opinions. Religion is the natural vocation of the clergy in all churches, who have no business to pervert it by political and ecclesiastical fanaticism, as the Roman and other clerical corporations are but too often prone to do, to the injury of true religion. Social progress is the natural aim of trades unions and international societies, who have no business to substitute political opinions and fanaticisms for social aims, to the detriment of social progress; or usurp political authority in the name of socialism, or communism, or co-operative union, as the ferocious victims of political delusion did recently in Paris, and might possibly attempt again if not held in check by stringent discipline, or duly enlightened with regard to the real principles and aims of industrial co-operation. Political clericalism and socialism are fiendish perversions of religion and co-operative union; malignant cancerous degenerations of important organs in the body politic, analogous to the fatty degeneration of important organs in the animal economy.

Regulative Reason and Understanding.—What is regulative reason, distinct from other faculties? What does it regulate? It is by correspondency with organs that we explain the faculties of reason, instinct, and desire: and regulative reason in the mind, corresponds to regulative areolar tissues and secretions in the body.

But how are we to explain these correspondencies by means of words in common use? A few parallels of physiological and psychological states and modes of motion will serve our purpose.

States of Body.	*Of Spirit.*	*Of Soul.*	*Of Mind.*
1. Integrity.	Integrity.	Common sense.	Reason.
2. Health.	Morality.	Politeness.	Equanimity.
3. Strength.	Firmness.	Knowledge.	Science.
4. Use.	Goodness.	Beauty.	Truth.

Integrity of body is easily contrasted with deformity and *mutilation*; *health* with disease; *strength* with weakness; industrial *use* with idleness. *Integrity* of spirit is easily contrasted with dishonesty; *morality* with immorality; *firmness* of character with weakness; *goodness* of life with badness of life and disposition. *Integrity* of intellect is easily contrasted with idiotcy; *politeness* with coarseness; practical experience, skill, and *knowledge*, with inexperience, unskilfulness, and ignorance; *beauty* of person, manners, and artistic work, with ugliness of person, speech, and artistic productions.

Integrity of mind or sanity is easily contrasted with insanity; *reasonable* modes of argument and equanimity with unreasonable intolerance; *science* with nescience (which is not the same as ignorance, because a person may have much knowledge and not be acquainted theoretically with any branch of exact science); *truth* with error and falsehood.

These are very distinct factors and functions of physiology and psychology, which ought to be under the guidance of regulative reason. The body should be guarded against deformity and mutilation; against disease, weakness, and idleness; the spirit should be guarded against dishonesty, immorality, weakness, and wickedness; the soul against idiotcy, coarseness, ignorance, and ugliness of all kinds; the mind itself should be guarded against insanity, unreasonableness, intolerance, want of science, and want of truth; against nescience, error, and falsehood; so far we may indicate what reason has to regulate in body, soul, mind, and spirit. And now, with regard to what regulative reason is itself, in comparison with other faculties of understanding, we must analyse various modes of action in body, soul, mind, and spirit, to distinguish one from another and give definite names to each.

In the body we find tensive and motive forces and modes of motion; latent *associations* of atoms, and patent or manifest *liberations* of atoms. There are hungers or *wants* and *nutritions* in all the organs and tissues; settled interstitial *accretive secretions* of fat and serum in all parts of the body; and these are two distinct kinds of latent association of atoms, or tensive forces; there are two kinds also of patent *liberations* of atoms or motive forces, namely, *excretive secretions* of milk, ova, mucous, saliva, &c.; and *mechanical motions* of all the organs: and these are regulated by vital forces and processes in the physical organism, ruled by organic laws of order.

There are similar forces and processes ruled by spiritual, instinctual, and mental laws of order. Desires and virtues, affections and volitions, of the spirit; sensations and beliefs, imaginations and propensities of the soul; yearnings for truth and settled doctrines; active speculations and ratiocinations of the mind.

It is easy to distinguish the *nutrition* of the organs from interstial *secretions* of fat, although both are *latent associations* of atoms of substance; it is also easy to distinguish the active modes of *liberating atoms* from the blood by *excretive* secretions from the active expenditure of forces (heat and substance) by physiological and *mechanical motions* of all the individual organs. It is not, however, quite so easy to make similar distinctions in the latent associations and patent liberations of spiritual, instinctual, and mental forces in the invisible organisms of human nature. The analysis has never been systematically made, and words in common use have no technical or settled meaning. Before we can explain the faculties and functions of regulative reason we must define different acceptations of words in common use, such as faith, fallacy, illusion, delusion, &c.

Experience and evidence of bodily *sensitivity*, ease, and, comfort.
Experience and evidence of spiritual *emotion* and affection.
Experience and evidence of instinctual *sensation* and knowledge.
Experience and evidence of mental *comprehension* and science.

All these kinds of experience and evidence give birth to different kinds of faith and belief, illusion and delusion. We have perfect faith in that which is pleasant in the body, happy in the spirit, delightful in the soul, and steadfast in the mind. Perfect use, goodness, beauty, and truth are the everlasting foundations of faith.

But in human experience imperfection is more common than perfection; imperfect grounds of evidence and faith than perfect. Still, a plant has faith in its own sensitivity; an animal in its own experience of sympathy and antipathy, and the evidence of its own senses; a human being has faith in similar kinds of evidence and experience, but finds at times that such kinds of evidence are not to be trusted without the evidence of reason to corroborate or rectify them. Regulative reason is more luminous and powerful than regulative instinct, passion, and appetite.

The illusions of appetite are learned in cases of intoxication and poison; the illusions of passion in cases of seduction; the illusions of instinct in traps and snares for animals; not to mention the evidence of the senses in such cases as the movement of the earth on its axis, by which the sun appears to rise and set daily; the delusions of the mind by sophistry and unwarranted trust in the evidence of the senses. "Seeing is believing," it is commonly said; yes, but then it is only instinctual belief, not rational or scientific. Regulative reason should be able to guard us against deceptions and illusions of body, soul, mind, and spirit, and regulate the conditions of health, happiness, common sense, and rationality.

It may require all the faculties of the mind to discover the subtle nature of poisons and medicinal remedies for disease; illusions of the senses and consequent beliefs with disciplines to break their spells; fallacies and falsehoods of the mind with logical and scientific means of refutation; the vices of the spirit with moral disciplines to remedy those vices; but *regulative reason* must discern and apply hygienic modes of securing and preserving the physical conditions of bodily health and usefulness; the moral conditions of spiritual happiness and goodness; the sensational and vocational conditions of instinctual delight, common sense, and artistic beauty; the mental conditions of rational comprehension and scientific truth; the laws and conditions, in a word, of physical and industrial, moral and social, instinctual and artistic, rational and scientific harmony. The *light* of reason must regulate the *heat* of instinct, the *gravitation* of the spirit, and the *magnetism* of the body; the physiological, pneumatological, psychological, and noological modes of action in mankind.

Complex psychological phenomena seem difficult to analyse in their details, chiefly because language itself is not yet properly formed in all departments of human thought, and different authors use words in a different sense. John Stuart Mill, for instance, uses the word *intuition* in the sense of "innate ideas" as opposed to acquired experience, because the "introspective school" of philosophers are supposed to use the word in this sense; and he combats this view from the point of view of the "psychological school" of philosophers and their analytical method. We use the word to represent *spontaneous judgment* of the soul from the evidence of the senses, without analytical processes of thought; not as ideas, independent of the evidences of external sense or internal feeling. In this we agree with the psychological school, but we do not discard the word intuition or intuitive intellection in a duckling which sees water for the first time, or in a chick which, after being hatched, breaks the shell of the egg (in which it is enclosed) with the temporary hard nib of its beak, made expressly for that purpose. That is what we mean by instinct, or innate ideas: the ideas of the experiential soul which are one with the sensations of the experiential body, both of which have been formed in the womb before they were born into the open world. Such is intuitive sense before reflection contrasted with "common sense" after prolonged experience.

In forming parallels between physiological and psychological phenomena, it may be asked how we can compare the associations of ideas with the association of atoms of matter in the body, as if ideas were a sort of intellectual atoms.

The way we understand the parallel is this:—All kinds of forces are only known to us by their modes of motion: inorganic forces (heat, light, electricity, and gravitation) are always associated with atoms of some kind, either material or ethereal, and these atoms are invisible in their minutest forms; so that we can only see them when they are associated in complex groups or molecules. In all the inorganic realms of nature, invisible physical forces are associated with these atoms, and in all the organic realms invisible vital principles are associated with inorganic forces, so that all kinds of forces being invisible, we can only know them by their modes of motion amongst atoms of matter or of ether. Now the atoms themselves are not what we call immaterial forces, but they are visible exponents of these different kinds of energy connected with organic or inorganic matter; and as heat, light, electricity, and magnetism are the real exponents of physical and chemical modes of motion in atoms, molecules, and masses; and as *organic* principles are associated with inorganic forces in physiological phenomena in the atomic and molecular motions and mutations of plant life and animal life; and as *emotional* and *instinctual* principles and modalities are associated with chemical and physiological modes of action in animal life and organization; and as *mental forces* and rational modes of thought are associated in co-operative union with instinctual, emotional, organic, and inorganic forces in mankind, we infer that these different kinds of energy associate, combine, and co-operate, not only in the whole body, but in every system and every organ, every tissue and every minute cell, even to the very invisible atoms of the body, which are themselves associated in minute cells and fibres, consistent tissues and organs, general systems and interstitial deposits or accretions. Physical forces rule chemical modes of motion in atoms and masses; vital principles rule chemical forces in the physiological mutations of atoms; emotional and instinctual forces influence physiological processes in the atoms and organisms of animals; rational forces and faculties rule instinctual and emotional faculties and feelings in human nature.

This method is more easily understood than the ordinary method of psychological analysis. For instance, we can distinguish physiological processes in the atomic associations and circulations of atoms in the body, thus:

1st.—Absorption of atoms in the chyliferous vessels.

2nd.—Circulating complex atoms and molecules in the blood and lymph.

3rd.—Fixation of atoms of blood in the organs.

4th.—Fixation of atoms of blood in the interstitial deposits of fat, &c.

5th.—Exchange of old atoms for new in nutrition.

6th.—Re-absorption of atoms in the interstices of all the tissues by lymphatics.

7th.—Repair of waste in tissue by new atoms.

8th.—Elimination of atoms by glandular secretions and excretions.

Now all these invisible modes of absorption and association, concurrently with active liberations and excretions of atoms, correspond to and co-operate with analogous modes of feeling, sensation, and cognition, in the co-ordinate kinds of invisible faculties called spirit, soul, and mind.

Unsettled atoms floating in the blood are analogous to unsettled feelings, opinions, and reasons floating in the circulatory faculties of spirit, soul, and mind, as hesitations, doubts, and probabilities. Settled atoms fixed in the organs are analogous to fixed affections, knowledges, and sciences in spirit, soul, and mind. Interstitially fixed atoms of fat in the body are analogous to temporary fixations of affections, beliefs, and doctrines in the spirit, the soul, and the mind. Motions and associations of organic atomic forces in the body, motions and associations of feelings and affections in the spirit, motions and associations of sensations and ideas in the soul, motions and associations of cognitions and reasons in the mind,—these, and the laws of order which govern them, are all that we can know of invisible forces and their modes of action in human nature and in universal nature.

Areolar sheaths and tissues, fat, serum, and synovia regulate all the mechanical movements of organs in the body; and just as these physical factors regulate the physical economy of motion, so the regulative faculties of reason, conscience, and judgment, should control and guide all the appetites and actions, passions and associations, instincts and vocations, studies and ratiocinations of the mental economy of human individuals and societies.

The policy of a government, a corporation, or an individual, rules the conduct of a person, an assembly, or a cabinet, and shows the strength or the weakness, the degree of mental light or darkness, science or ignorance of the regulative faculties of reason and of policy. *Wisdom* is one common name for this faculty, and *free-will* is another, in opposition to blind impulse. It is not so much an active as a presiding faculty, however;

a guiding and controlling rather than a driving or a yearning faculty.

Human nature is a compound of distinct kinds of motive power in correlation with external conditions of existence, which, in a measure, control the will as a determinative energy. Physical nature has its physical wants and industrial vocations; social nature, its affections, interests, and aspirations; instinctual nature, its sensations, pleasures, and vocations; rational nature, its cognitions, contemplations, and illuminations. Physical wants, passional excitements, and sensual inclinations are common to animals and to man, whereas reason is the distinctive attribute of human nature. The rational will and understanding are the man himself in contradistinction from his animal nature; and therefore where reason rules, the rational will is *free* from the tyranny of blind impulse in physical wants, passional excitements, and sensual inclinations. Regulative reason gives freedom to the man in governing the animal volitions of his soul; as light gives freedom to his bodily movements in comparison with darkness.

Reason itself is governed by eternal laws of order, which alone give liberty and happiness in contrast with disorder and misery.

THEORETICAL IMPREGNATIONS AND INFESTATIONS OF REASON.—What is meant by theoretical impregnations and infestations? Physical *impregnations* of procreative germs determine natural gestations and normal metamorphic evolutions, which result in the birth of new individuals of the same species, by means of a parasitical process of sustentation, without injury to the parents. Physical infestations of the blood or of the tissues by poisonous gases and atoms, or by organic germs of vegetal or animal parasitical organisms, determine abnormal metamorphic evolutions, which result in the birth of abnormal products in the blood or tumours in the tissues, by means of a parasitical process of sustentation, fermentation or reproduction of the parasitical species, at the expense of the physical organism, but not without injury to the health and happiness of the victim.

In parallel with these physiological impregnations and infestations, we have the true impregnations of the human mind by science and the discoveries of science, contrasted with the infestations of the mind by false doctrines and theories, which multiply fallacies and errors at the expense of reason and sound understanding. Acquired sciences and laws of truth invigorate the mind; recent studies and investigations furnish new supplies of science for the understanding; approved theorems and demonstrations clothe the mind with logical protective armour, and enable it to ward off fallacies of all denominations; but still the mind remains susceptible of rational impregnation by new truths and irrational infestations by old or new fallacies, dogmas, and hallucinations. Mental diseases are as common as zymotic diseases, or infections, and fanatical delusions are as prevalent as parasitical diseases, or infestations of all kinds. Physical tumours and pustules are unsightly; mental delusions and aberrations are sometimes dangerous and infectious.

We need not here discuss the nature of mental infections and infestations, pathology, and means of cure, as these are dealt with at great length by "mad doctors" and keepers in lunatic asylums, lawyers in courts of justice, and wardens in jails and penitentiaries, as physical diseases are dealt with in hospitals by nurses, surgeons, and physicians.

Thus, it is easy to see in what manner the faculties and functions of the body are exact counterparts of those of the mind.

6. The ingestion of food is an addition or *induction*.
VI. The digestion of food is an assimilation or *synthesis*.
V. The secretion of milk from the blood is *analytical* division.
5. The elimination of milk a *deduction* or subtraction.
7. The absorption of chyle and lymph is a *collection* and *re-collection* of the elements of blood circulating in the body.
VII. Nutritional circulation and exchanges of atoms in the organs are a *co-ordination* of atoms in all fluids and tissues.
IV. Nerve and blood relations with states of consciousness and unconsciousness in the soul are *amphibious*, parallel, and *analogical* correspondencies.
III. The bony skeleton is the *fundamental* statical support of all the other systems of the body.
2. Musical sounds of hearing are *rhythmological* vibration.
II. The relations of muscles with bones are motorial, as *ratiocinative* faculties with fundamental principles in active modes of thought.
1. External senses, limbs, and forms are distinct in *numbers*, the elements of mathematical science.
I. Skin relations are *limitative* and inclusive of internal details, as general outlines of *systematic reason* and classification.
W. Serous membranes are *regulative* factors.
X. Interstitial fat is *moderative* and rotundative.
Y. Glands secrete new substances; imagination, new ideas; *theorization*, new doctrines of science.
Z. Conception and gestation bring forth new births: new *inventions and discoveries*.

AMPHIMUNDANE CONDITIONS OF REASON.—The evidences of the senses are the external conditions of intellect and intuition, and these are not only objective but subjective; not only mundane but amphimundane. Spiritual communications and manifestations are witnessed by the *movements* of physical bodies, the *audible* sounds of voice and language uttered by invisible beings, with occasional *visions* of the forms and features of disembodied spirits, and their clothing; not to mention the frequent experience of *touch* by invisible hands, and even the embrace of the whole form, or the pressure of the weight of the whole body of an invisible being. Those persons who have not had such experience in the waking state may hesitate to admit the evidence as valid, for reason; but lack of experience is not wisdom, and tradition is full of such evidence, in corroboration of modern experience; reason is obliged to deal with all *kinds* of forces and phenomena in order to discover the laws which govern them. We are surrounded by ultramundane phenomena and conditions of thought; mundane revelations of phenomena and conditions of thought; social teachings and traditions, as conditions of rational thought and science; and still more subject to innate or hereditary capacity of understanding.

It is evident that one race of mankind inherits a greater capacity of reason and understanding than another; one individual of the same race and class than another. It is also clear that individuals are surrounded by social conditions of education and scientific training, which vary in different races and nations, classes and professions. The cosmic conditions of nature vary also in different quarters of the globe, in hemispheres, and latitudes of the same hemisphere; and as these differences of natural revelation, or phenomenal modes of experience in the human mind, affect the faculties of reason differently, they are important factors in the analysis of subjective faculties and conditions of reason. Ultramundane revelations and conditions also differ in eastern and western nations, and religions of the northern hemisphere, not to mention those of the southern hemisphere. Mundane and ultramundane phenomena and revelations of life and thought, creation and design, laws and principles, are the conditions of human existence, and the data of human science. We must recognise them in connection with the faculties of reason, which live and move and have their being in these amphicosmic worlds.

PART II.—MENTAL CHARACTERISTICS.

HAVING already explained mental faculties by describing their functions, we need only describe here a few of their evolutive and relational characteristics.

Mental aptitudes and vocations for science are seen in all the instances of scientific discovery made known to us in history. Euclid, Archimedes, Descartes, Newton, Leibnitz, Napier, in mathematics; Copernicus, Galileo, Kepler, Newton, Herschel, Fresnel, Fraunhofer, Brewster, Faraday, Helmholtz, and many others, in astronomy and physical science; Anaxagoras, Pythagoras, Socrates, Plato, Aristotle, Locke, Kant, Cuvier, Jeoffroy St. Hilaire, and numerous others, in natural science and metaphysics.

We need not here discuss different types of reason or mental vocation in mankind, but observe that as general education and learning advance in a community, so dialectical powers of reasoning advance in energy and elasticity. In the middle ages university education was very limited; metaphysical modes of reasoning were imperfect, and biological science in its infancy; the same curriculum, with very little modification, is continued in the richly endowed schools and colleges of Christendom, and thence the same want of solidity in orthodox teaching as in the middle ages. In a recent account of Grammar Schools in England, we find the following description of university education and degrees:—

"In the times in which the majority of our Grammar Schools were founded, a liberal education consisted of a knowledge of the following seven liberal arts:—grammar, logic, rhetoric, arithmetic, geometry, astronomy, and music. A Bachelor of Arts was one who had been examined and approved in the first three of these; a Master of Arts one who had been examined and approved in the whole seven. It was the function of the *school*, therefore, to teach grammar—the first of these subjects—as it was of the University to teach the other six. And as all knowledge was then locked up in the Latin tongue, by grammar was understood the Latin language. Hence, in some college statutes the teaching of Latin is forbidden, it being required that every student should be able to read, write, and speak that language before admission. Hence, also, both in England and on the Continent we seldom find a Latin Professorship of early date in any University. Latin was the language of Oxford and Cambridge, and English was, in theory at least, till the very recent alterations, as much a foreign tongue as Welsh or Gaelic."

Chemistry and physics, statics and dynamics, the natural sciences, zoology, botany, mineralogy, geology, palæontology, comparative anatomy, physiology and sociology, political economy, and many other branches of modern science being thus more or less neglected, the mind, stunted in its growth, had very little span of comprehension or elasticity of understanding. *Congenital symmetry* of the dialectical faculties of understanding varies in relative proportions in accordance with special vocations, just as in the animal world symmetry of bodily proportions varies with special instincts and vocations. The eagle has well balanced limbs as means of progression and vocation on land and in the air, while the ostrich has powerful legs with rudimental wings, as means of progression on land; his vocation does not require that he should be able to fly, and would only be impaired by weakening the legs to strengthen the wings.

So in the human mind, some men have mathematical faculties enormously developed, with only rudimental powers of biological reason, while others have the latter well developed and the former not; others again seem to have duly balanced minds in all directions. Mathematical minds are well adapted to the study and advancement of astronomy, physics and chemics, statics and dynamics, while dialegmatic minds are better adapted to the study and advancement of biological, sociological, and cosmological sciences. Dialegmatics include the sciences of music, linguistics, dramatics, and biological methodics, properly so called. And, curiously enough, mathematical minds are prone to run on the ground of physical speculations with regard to the paramount influence of "molecular physics" in creation as the basis of a Physical Philosophy, while biological speculations ascend to higher regions, and proclaim the existence of Omniscient reason, or Divine love and wisdom, as the Almighty Creator of the universe.

Some minds are born weakly and unable to acquire much science, while others are born vigorous and capable of manly growth. All minds, however, may be starved and stunted for want of education or proper quantities of wholesome mental food.

Dialectical Modes of Ratiocination.—In musical harmony, a tune or melody must be composed and executed in a definite mode, and a special key, on a simple instrument, or on several instruments, subject to the same conditions of *rhythm, mode, clef, motive,* and expression; and so of dialectical *conditions, relations,* and *connections,* in the logical harmony of ratiocination. Though it be true that two and two make four, that truth may have no direct bearing on a certain line of argument, and would, therefore, in such case, be a discordant element of dialectical concatenation.

This question involves the whole art and science of logic, as one of the chief characteristics of the relational faculties of human reason. Modulations from one mode to another, one key to another, are quite legitimate in musical melody, and similar modulations are equally legitimate under proper regulations, in logical harmonies of reason. Tricks of substitution are common, however, with expert debaters, as well as with clever conjurors, and this is where many minds are puzzled by sophistry, for want of development in the faculties of relational dexterity, or logical and analogical reason and understanding.

AMPHIBIOUS UNDERSTANDING.—All men and women are not somnambulists, or sleep-walkers, trance mediums, inventors, poets, or inspired prophets. Nor is it necessary that they should be equally endowed with faculties of this class more than any other; since special vocations require vocational endowments in all the faculties of human nature, and the economy of social organization requires that individuals should be as variously constituted elements of the organized collective body of humanity, as individual atoms or cells of organic tissues should be variously constituted elements of the individual complex organism; some cells being adapted to associations in the skin, others in the muscles, or in the bones, and others again in the nerves; the latter alone being endowed with amphibious properties, as media of communication between the invisible forces of the spirit and the physical forces of the body. The number of individuals, therefore, pre-eminently endowed with the peculiar genius of amphibious life may be supposed to bear the same relative proportion to other special vocations and endowments of the whole community as the mass of nervous substance in the body bears to the mass of all the other cells, tissues, organs, and systems, cutaneous, muscular, and osseous, not to mention the internal viscera and the special organs of sense. A person may be physically, spiritually, or mentally amphibious. What, then, are the special functions of analogical reason and amphibious understanding?

The functions of analogical reason are logical, analogical, and amphicosmological, to comprehend and explain the laws and forces of natural mundane phenomena, as well as the laws and forces of ultramundane phenomena, commonly called supernatural. The soul lives in two worlds, and the gases of the blood, as we have seen in physical biology, form the connecting link. But as body and soul are one in union, the laws of order are the same in physical and moral nature, in natural and supernatural worlds, however much phenomenal modes of motion may differ from each other in the spiritual as they do in the natural universe.

Angelic communications from a higher world of light and life have been given to mankind and handed down from generation to generation, mingled with mythical traditions of more or less doubtful origin, and a special class of men, called *divines*, have been set apart as interpreters of these revelations in all communities. Divines have done their best to penetrate into the mysteries of spiritual phenomena, as philosophers have done their best to penetrate into the mysteries of natural phenomena, and "sufficient for the day" have been the interpretations thus obtained. But, as time advances, humanity progresses in all the modes and phases of sociogenetic evolution. New theories and systems of science, to interpret natural phenomena, succeed each other rapidly in modern times, and new systems of divinity are hardly less numerous and various.

It would be tedious to analyse the obsolete systems of astronomy, philosophy, and theology of bygone times; but we must take a cursory view of evolutive progress in human science, reason, and understanding.

Evolution of Analogical Reason and Understanding.—Under the direction and control of Divine providence, angels convey to men forecasts of heavenly truth and morality, in symbolical language, for the guidance of human society on earth, and these revelations to the churches of different races, are made in a form to suit the degrees of understanding in those communities at the time they are given; and also, in such a form as to be translatable from a lower to a higher meaning, as the mental faculties of analogical reason are developed by the progress of *natural science* in the course of ages. It is in this sense that "the letter killeth and the spirit giveth life," because the letter is merely symbolical in most cases, and susceptible of progressive degrees of meaning and interpretation.

Natural science progresses, and spiritual science progresses, as humanity advances, although absolute truth be eternal and invariable. Human interpretations of natural phenomena and laws are not infallible, nor are the interpretations of spiritual phenomena and revelations at any period of time infallible.

It is always right, therefore, to question the established doctrines of natural science as well as those of moral and religious creeds. The *revelations* of nature and of scripture are one thing, however, while human *interpretations* are another and a very different thing. Certain spiritual revelations are, nevertheless, offensive to many minds, because they are "cruel and inconsistent" with their ideas of a God of love; but then, natural creations, in the shape of wolves and tigers, are "cruel and inconsistent" with puerile ideas of Omniscient benevolence; and some philosophers deny the existence of Deity on this very ground. Natural death of animals and men seems not unnatural, as a means of exit from this life, but accelerated means of exit are deemed perverse and cruel in a designing Providence, although hunger makes these very benevolent sceptics shoot pheasants for sport, butcher sheep and lambs for the sole pleasure of feasting on lamb and green peas. Some of them, however, may be consistent vegetarians. But then again, spiritual revelations are symbolical and mystical, not easily understood, and an infallible Providence "*ought* to speak plain truth, and nothing else," for the guidance of his children. It is not so in the language of natural revelation; but then, nature is not responsible, and if you will only interrogate her properly, she will give you satisfactory replies. Nature, in fact, may be as mysterious as she likes, and no complaints will be made, no scepticism tolerated; but God must be plain in His spiritual revelations, or these philosophers will not tolerate His existence.

Analogical faculties are amphibious faculties, enabling us to speak in parables and metaphors, translatable into different spheres of thought and life. Revelations of spiritual truths, pertaining to spiritual life in this world and the next, may thus be clothed in the language of analogy, as parallels between natural and spiritual facts and laws of life, in all worlds.

Spiritual revelations succeed each other in the history of humanity, replete with beautiful truths and prophecies, but religious doctrines are moulted periodically as birds moult their feathers. Oriental and Egyptian theologies were discarded by the Jews, who retained many of the ancient revelations and traditions: Jewish rabbinical theologies were discarded by the primitive Christians who retained the Bible; Roman theology and dogmatism have been repudiated by Lutherans and Protestants of all denominations; sectarian theology has been rejected by modern spiritualists, some of the most intelligent of whom retain the Gospel and the law, while others of the less scientific class reject all spiritual revelation as effete, up to the time of modern seers, who try to convert atheists to a belief in modern revelation, by denying the authority of the Bible, and its "cruel" dictates, so offensive to their *instinctive* ideas of benevolence.

All genuine spiritual revelations are true, and may be rationally interpreted, just as extinct and living species of organic types in natural revelation are true, and may be finally explained by the science of biological evolution. Religion is the triune sphere of amphimundane life and understanding, to be finally conciliated in all the evolutive phases of humanity. Errors of judgment and abuses of authority and trust are just as natural, not to say inevitable, in religious as in social and political communities and institutions. Churches fall into corruption and decay as well as states, and dispersion is the final result of such decay. Ancient and powerfully organized states have passed away and been succeeded by new societies and institutions. Ancient churches and ecclesiastical hierarchies have been succeeded by new religions and ecclesiastic systems: ancient prophecies have long foretold these foredoomed events, as natural and necessary transformations. Angelic wisdom in a higher world has been able to foresee and foretell these wonderful events in the life of humanity as a collective organism, just as easily as we may foretell the metamorphic changes of a caterpillar, and the future form of the incipient butterfly.

The progress of natural science has much to do with the social evolution of mankind, but in this as in all other cases, heavenly humanity under Divine providence, governs and guides humanity on earth. Angelic messengers from heaven bring glad tidings to mortals below, concerning happiness eternal as well as spiritual welfare in this world. Inventors, poets, philosophers, and prophets bring new truths which promote human progress, and these truths, new to us, are brought from a higher world of thought, where truths are never new, since they are eternal. Poets and prophets are inspired, and so are philosophers and inventors, whenever new ideas of importance are communicated to mortals. A man who thinks that he discovers something of his own accord, is like a child who might suppose he had invented his own mother tongue, which existed long before he was born.

To those who believe in spiritual communications, it will be interesting to compare the symbolical language of modern spirits with the "mythological fable" of a future state of life, related by Socrates (in Plato's "Phædo") as a religious tradition of oracular communication, in which he himself deemed it reasonable to believe, although no positive proof could be obtained of its real truth, as a description of ethereal, aërial, intraterranean, and subterranean spheres of spiritual life and destiny. It is quite plain that in the last discourse of Socrates the pluvial realm of our atmosphere is defined by the word *acheron*, along with the status of disembodied souls inhabiting the air; by the word *acherusides*, where departed souls congregate in great numbers, is meant those regions of the crust of the earth through which the rains of heaven filter to form underground rivers and lakes, hot and cold mineral springs, &c.; from which regions, after a sufficient time of probation, the souls of the departed are sent back into this world, by the process of reincarnation. The word *puriphlegeton* denotes a region of subterranean waters flowing into plutonic depths of molten lava, mud, and steam, in connection with volcanic phenomena; and from this fluvial sphere spirits descend into the fiery regions of *Tartarus* in the centre of the globe. Another region is denominated the *Stygian Lake* (opposite to *puriphlegeton*) from which runs the river *Styx*. These regions, says the "Fable," are the homes of departed souls; those who have led a life on earth neither very good nor very bad, are sent through the pluvial realms of the atmosphere, *Acheron*, to inhabit *Acherusides*, the realm of subterranean springs and waters; and after due probation and expiation they are called to judgment and rewarded according to their merits. Those who are found to be *incurable* on account of the enormity of their crimes and the obduracy of their spirit, are precipitated into *Tartarus* or the burning lake, in the centre of the globe, where they are doomed to remain "for ever;" some of those, however, who have been thus precipitated into the burning pit, on account of odious crimes, remain there one year, and if they duly repent, and expiate their crimes, they are sent into other regions; homicides are sent into the river *Cocytes*, and parricides, into the lake of *Puriphlegeton*, and are thus brought *near* to the lake *Acherusides;* where they utter loud cries and lamentations, calling upon those whom they have injured to be forgiven and admitted into their society. If forgiven, they are delivered from their sufferings; if not, they are sent back into the burning pit of Tartarus, for a time, to be purified, and then return to implore forgiveness, until they are forgiven.

Such is the destiny of the wicked: while those who have led good and charitable lives on earth, and those who have been forgiven their sins, and delivered from the lower terrestrial regions of suffering and expiation, as from a prison, are carried up to heaven, or the purely ethereal regions above the atmosphere of the globe, in which heavenly regions there are many mansions for the habitation of good spirits and angels.

The most curicus part of this interesting oracular communication from the gods (angels ?) is the description of meteorological and geological phenomena quite above the natural sciences of those days, but which correspond accurately enough with phenomena well known at present, and partially explained by modern science.

Socrates deemed it reasonable to believe in these revelations without scientific proof, and modern spiritualists receive similar communications from the spirits (Gods of Polytheism ?) in whom they seem to have almost implicit faith, although many lying spirits have been detected in nearly all circles of believers.

Socrates believed in spirits, but would not accept Pagan theology, in which the Gods were made to quarrel and commit injustice ; he was religious, but not orthodox, and was condemned to die for unsettling the minds of the faithful. Modern spiritualists believe in the immortality of the soul, but they cannot accept sectarian theologies, and thence they are denounced as heretics and atheists, by orthodox believers. Serve them right; let them drink the hemlock of religious persecution and excommunication. It will enable them to leave a grovelling world of mundane interests and hypocrisy for a higher world of spiritual peace and consolation, even in this life. Sectarian theologies may be false, while the Bible, imperfect in the letter, is, in spirit, truly the Word of God; sectarian philosophies may be false, while nature is certainly the work of the Almighty.

We do not know what *evidence* Socrates may have had to enable him to believe that disembodied spirits can live in "the burning lake of *Tartarus*, situated in the centre of the globe," but we have abundant evidence in our day, that even mediums in the flesh, entranced and possessed by spirits, can handle burning coals, without being injured in the least, and that paper can by spirit mesmerism be rendered incombustible, as stated in *Human Nature* for February 1870, giving an account of Mr. D. D. Home's Séances at Glasgow. Nor, as the spirit says, is there anything miraculous in such phenomena, since one law of nature is counteracted by another, just as when fire is quenched by water.

Spirits can act on ether more powerfully than we can act on ponderable matter, and their manifestations only seem miraculous to us, because we do not know the laws and forces of invisible ethers and permeative modes of motion. We know that light can pass through solid glass, but cannot conceive how spirits can pass through solid walls, and never dream of the fatuity of deeming all things impossible to spirits, which are not familiarly known to ignorant mortals.

Analogical reason and understanding, then, are not less important than ontological reason, since it enables us to discover laws of eternal truth, not in one sphere of life, or one depth of nature only, but in all depths of vitality, and in all states of consciousness in every world of phenomenal existence.

ANALYTICAL GENIUS.—As genius in the instinctual and rational organisms corresponds to sex in the physical organism (being sterile or prolific in discovery and invention), we have to note the causes of barrenness and fruitfulness in all, and more especially in the genius of discovery. Take for instance biological science; what is the reason that practical anatomy and physiology never discovered the laws of systematic anatomy and physiology during so many past ages? Is it not because anatomists and physiologists were first drawn to these studies for the sake of practical utility alone, in the arts of surgery and medicine, and never dreamed of looking for mathematical laws of number, weight, and measure in organic realms; although astronomers and natural philosophers have for ages been seeking for such laws in cosmic and physical phenomena? Newton sought incessantly to discover the laws of gravitation, and at last succeeded. He did not invent these laws of order, but he discovered them as reflected in his own mind by the mechanism of the solar system, and thus his analytical genius was prolific.

Is it possible to discern laws of order in organic phenomena as well as in cosmic worlds? Descriptive anatomy and physiology, regional or surgical anatomy, general and comparative anatomy and physiology have not discovered any such laws, because they never looked for them; and though not practically barren of results, they have been scientifically barren, not for want of talent, but lack of analytical genius, or power to reflect the mental light of laws in nature without distortions in the mirrored forms.

CO-ORDINATIVE REASON.—As the body is a physical *heat*-generating apparatus for mechanical and physiological work, so the mind is a mental *light*-generating apparatus for illuminative work and social intercourse. Practical memory and theoretical memory are as distinct in the unitary soul, as heat and light in burning wood, or in the air; and may act separately or in union.

MEMORY AND IMAGINATION.—There are several kinds of latent associations of atoms, namely, the association of atoms in the tissues by *nutrition;* the association of atoms in quite new combinations by glandular *secretions;* the association of atoms by adipous secretions and accumulation; not to mention serous and synovial secretions and absorptions. The collection of atoms by absorption and inhalation to be poured into the blood; the circulation of the blood, and the exchanges of new atoms for old, in the nutrition of the tissues, are special processes of latent associations and liberations of atoms; and a similar series of mental operations take place in the *acquisitions, circulations, latent associations,* and *definite liberations* of ideas in what are called the faculties and functions of the memory, and the imagination; memory proper being analogous to nutrition as the main result, while imagination is analogous to new combinations of ideas drawn from memory, as secretions of milk, &c., are new combinations of atoms drawn from the blood.

Memory penetrates into all the faculties of the mind, just as blood vessels penetrate into all the organs of the body, where latent associations and liberations, exchanges and *re*collections of atoms occur, just as latent associations and liberations, exchanges and *re*collections of ideas occur in the mind.

Vague rumours, idle converse, conflicting evidence, and newspaper gossip, float rapidly through the memory of current events, as an excess of water passes rapidly into the current of the blood and out again. Certain facts of doctrine and belief are accumulated as interstitial fat, while positive knowledge and science are fixedly retained by latent associations of ideas and reasons in the working faculties of the mind, to be recalled into active recollection when required, just as atomic forces are stored up in the organs of the body by the latent associations of atoms, to be expended as working force, when necessary.

What is the difference between *present* consciousness, *memory* of past consciousness, and *anticipations* of future consciousness or experience? What is the difference between *memory* and *imagination?* between objective *reality* of any kind, and subjective *thought* of any kind? These questions lead us to make distinctions between subjective and objective experiences of all times, present, past, and possible or future; and they induce us to think of the difference between brute force or reality, and thought force or ideality.

Present states of experience are complex co-ordinate states; memories of past states of consciousness are ideal recollections or imaginary revivals of such states of consciousness; anticipations of similar future states of consciousness are also ideal or imaginary revivals of such states of consciousness; but these ideal revivals of really past, or possible future states of consciousness, are not what is usually meant by the word imagination, which predicates *invention* of new combinations of ideas, or plans, or designs of possible realities or experiences. Memory differs from imagination as nutritional exchanges in the organs differ from glandular secretions.

Subjective sensations, emotions, and reasonings in dreams, although real experiences, and well remembered, are said to be imaginary or illusive, where no physiological accompaniments testify to their reality; and even where children or adults wet their beds in such dreams, the experience is nevertheless deemed delusive, or merely subjective. This, however, is a vulgar judgment, because all possible modes of experience are subjective, whatever be the internal states of consciousness, or the external conditions of experience. Invisible spirits or agencies of various descriptions may be just as really objective to the dreaming soul, as visible beings or material agencies to the waking soul; those who are awake cannot see them, and thence conclude they must have been delusive, just as we suppose them to be delusive in cases of insanity or hallucination.

What is external reality of any kind mentally, but a subjective experience within us? What are time, space, substance, force, as external conditions of life and experience, but modalities of subjective consciousness, engendered by our own feelings of sensation, emotion, and reason? Subjective states may be sane or insane, rational or irrational, when in sleep or wide awake.

And herein lies "the difference between knowing something as an objective reality, and as a mere thought." It is the difference between a plan or a design in the mind alone, and a plan or a design objectively realized. There is also this further difference between a thought and a reality, namely, that the latter is a plan not only realizable but realized, whereas a complex thought, plan, or design, may be not only unrealized, but unrealizable, and yet be just as well known to subjective consciousness as a plan externally realized.

All possible kinds of knowledge, therefore, are those of subjective consciousness, and we can only distinguish true science from false imaginations by rational or experiential modes of verification.

The data of experience are cosmic, hypercosmic, and amphicosmic, with regard to the pancosmic universe; they are mundane, ultramundane, and amphimundane with regard to the realms of nature on our own globe. Synthetic memory records a *knowledge* of these facts, (as far as they can be observed) in subjective ideas of objective phenomena on a superficial plane of concrete forms of thought, with reference to various distinctions in vital phenomena; while co-ordinative memory of principles and laws of *science* records modalities and limitations of depth as well as of extension. A stone, a tree, an animal, and a man, are simple individual facts in the synthetic memory of an animal, but very different in the co-ordinative memory of a man of science. In a stone there is physical force only; in a plant, physical and physiological forces; added to these are instinctual energies in a polype, emotional feelings in an animal, and rational faculties in a man. These differ from each other as *heterogeneous* and *ideal* units and fractions; and both differ from *homogeneous* units and fractions, in biological and mathematical modes of distinction. Without discussing Pythagorean ideas of numbers, or Plato's distinctions of ideal monads, dyads, triads, &c. (of inconsociable numbers from consociable numbers), we may explain what we mean by homogeneous and heterogeneous co-ordinates of conformation and association. And here we are on the ground which separates mathematics, or homogeneous integers and fractions, from dialegmatic or biological integers and fractions. One deals with matter and motion in time and space, the other with vital forces and phenomena in discrete depths of modality, spheres of life, and alternative evolution.

Physical forces are homogeneous units and multiples of conformation in cosmic inorganic realms; vital forces are heterogeneous co-ordinates in epicosmic organic realms.

Minerals are *monads* of various types.
Vegetables are *dyads* of various types.
Zoophytes are *triads* of various types.
Animals are *tetrads* of various types.
Human beings are *pentads* of the human form.

One mineral is not biologically equal to one vegetable; nor a vegetable to a zoophyte, nor a polype to an animal, nor an animal to a man, as one mineral is equal to another, or one vegetable to another. Geometrical distinctions of points, lines, surfaces, cubes, and spheres may be analogous to biological depths of vitality, but they are not identical or convertible forms of thought.

In the organic depths of nature then, co-ordinate units of organism are monads, dyads, triads, tetrads, and pentads, as far as we can fathom the biological roots and powers of epicosmic nature, in the so-called kingdoms of our globe. The co-ordinate conformation of mankind is *pentadal*, because physical, physiological, pneumatological, psychological, and noological faculties are combined in one type of organic unity. These distinctions could not be remembered or adequately recorded by the synthetic memory of an animal or a practical intellect alone.

Co-ordinate organic unity differs again from synthetic unity in constitution and methodical analysis. In human nature, for instance, the co-ordinate pentad contains four distinct synthetic units in combination with the substratum of physical force and matter. The body is a physiological synthetic unit, composed of organic fractions or systems; the soul is a similar synthetic unit; the mind another, and the spirit another. We have no symbols to represent these synthetic units as distinct modalities of a co-ordinate individuality, but we have formed special symbols to represent different fractions of each synthetic unit. In the body, for instance, we symbolize the different systems and series by certain numerals and letters. Thus :—

Z. Conditions.
Y. Ingestions.
X. Secretions.
W. Connective tissues.
VII. Vascular system { H. Placental apparatus. U. Respiratory apparatus. O. Circulatory apparatus. Ω. Urinatory apparatus. }
VI. Digestive system.
V. Generative system
IV. Nervous system.
III. Osseous system.
II. Muscular system.
I. Cutaneous system.

Here the numerals are not homogeneous numbers, representing one, two, three, &c., of any particular quantity; but symbols of special parts of a synthetic unit, which is itself a monadal fraction of a more complex co-ordinate individuality of collective humanity.

We have symbols for different sexes, ♂, ♀, ☿, ρ, male, female, bisexual, and asexual, but none for distinct synthetic units, soul, mind, spirit, which form parts of a co-ordinate whole.

Organic and inorganic realms are distinct ideals and realities of collective unity and multiplicity, which differ, as Plato said, from abstract or mathematical units and multiples of number.

Co-ordinate monads, dyads, triads, tetrads, pentads, must not be confounded either with synthetic views of ideal numbers, such as Pythagorean "decads," nor with the fractional organic numbers, seven and twelve, as we find them unexemplified in the seven systems, five senses, and connective tissues and secretions of the human body.

There are various types of *synthetic monads* in the inorganic realms; the atmosphere differs in physical conformation from the sea, the ocean differs from the solid crust of the earth.

There are realmic types of co-ordinate dyads in the vegetable kingdom. Cryptogamia differ from Phanerogamia, and in each of these dyadal realms one class differs from another, one order, family, genus, species, from another.

There are realmic types of co-ordinate triads and tetrads in the animal kingdom; vertebrata, articulata, mollusca, and radiata. In each of these realms one class of type differs from another; one order, family, genus, species, from another. Monads, dyads, triads, tetrads, and pentads of *co-ordinate conformation* differ, then, fundamentally from each other; and in each of these perennially distinct realms, one class of type differs innately from another. And besides the radically co-ordinate distinctions, we find inherent subordinative distinctions in each species, genus, family, order, class, and realm of the creation. Before we deal with these, however, we must notice the *relational* and the *evolutive* aspects of co-ordinate types of organism.

Let us take, for example, the co-ordinate pentad of human nature, of which there is but one type that we know of, although we may easily conceive this type to be more or less modified in angelic beings, or in human beings inhabiting different globes of the solar system, or different systems of the universe.

Whatever kind of flesh a fox may feed upon, and whatever kind of experience he may have in life, his body will be vulpine and his instinct also; the same may be said of a lion or a bull, a bear or an elephant, and also of mankind. Whatever kind of food the body feeds upon, its form will be human of a particular race and breed; and whatever kind of experience a man may have in life, his mind will have the form and character of his innate vocation. Nutritional associations naturally take the form of the body, and the soul of the individual organism and instinct, whatever these may be; and although the flesh of an animal may be flavoured by the food absorbed, and the conversation of a man may savour strongly of the sort of mental food acquired by his habits and experience of the world, as the language which he speaks will show his nationality, still his mind will have the impress of his inborn vocation, and his memory will collect, associate, and retain ideas of all kinds in adaptation to the vocational character of his mind. The human mind collectively is a reflex of all varieties of animal instincts and vocations, and each individual reflects one kind of instinct and vocation more than another—retains one kind of knowledge more easily than another.

There are congenital and vocational differences of nutritional activity in the four experiential organisms, and as these differences have obtained the name of *temperament* in physiological phenomena, we may give them the same name (for want of better) in all the four. We shall then have

1. Physiological temperaments of *vascularity*.
2. Emotional temperaments of *ambition*.
3. Instinctual temperaments of *memory*.
4. Mental temperaments of *understanding*.

Quick or slow circulation and nutrition of the body.
Quick or slow emotional susceptibility and nutrition of the spirit.
Quick or slow mnemonic receptivity, nutrition of the intellect.
Quick or slow co-ordinative understanding, nutrition of the mind.

It is well known that some bodies are sanguineous, and others lymphatic; some spirits very emotional, and others phlegmatic; some memories very slow or weak, and others very strong; some understandings weak and slow of apprehension, others quick and comprehensive.

The four distinctions commonly made of physical temperaments do not include all possible varieties, and the same may be said of emotional, mnemonic, and co-ordinative temperaments; but, as a rule, the physical and mental temperaments are contrasted in individuals, because vocations are contrasted. A thoughtful and scientific mind of sedentary habits requires a powerful co-ordinative understanding, and a retentive memory, united with a phlegmatic emotional, and a lymphatic physiological temperament; while an active, industrial vocation requires a sanguineous or active temperament of body, with a less intensely absorbing and contemplative temperament of mind. There are, therefore, numerous degrees of mental temperament and co-ordinative understanding in scientific, artistic, social, and industrial vocations, and the same may be said of innate emotional, mnemonic, and vascular temperaments.

Alimentary constitutions are equally diversified in the four organisms of human nature, in accordance with differences of race and sociological vocations; but we need not dwell on these distinctions here, as they will be noticed in their proper places.

Not bulk or weight, but nutritional capacity governs ratios of alimentation, respiration, and circulation. A bird consumes probably ten times as much air and food in a given time, as a reptile or a fish of like weight. Within narrower limits relative proportions vary in human temperaments, physical, moral, and mental.

Nutrition is a latent association of atoms, unconsciously performed in all the organs of the body, and like associations are unconsciously realized in all the faculties of mind; while alimentation is partly conscious and partly unconscious; and so are respiration, perspiration, and elimination. Organic associations of atoms store up latent physical forces in the body, to be liberated as heat, or mechanical force, or work; and hence nutrition is called a latent association of atoms. The same definitions and distinctions, names and parallels, are applicable to body, soul, mind, and spirit. *Knowledges* stored up in the intellect and memory, and *sciences* stored up in the mind by co-ordinative understanding, are latent associations of vital forces unconsciously organized in the faculties; while modes of alimentation or acquisition, circulation, recollection and thought-work, or speech and writing, are some of them consciously performed, and others unconsciously.

MENTAL CAPACITY OF UNDERSTANDING.—As the hereditary capacity of growth in the experiential body to acquire physical strength and elasticity for industrial work varies extensively in different orders, families, and individuals of the same class of animals, so the mental capacity of growth in the experiential mind to acquire rational powers of penetration and comprehension for scientific theories, differs still more widely in different races, families, sexes, and individuals of mankind; and probably for the same reason, namely, the adaptation of physical, instinctual, and mental energies and individualities to a hierarchal order of faculties and functions in co-ordinative and associative unity and complexity.

Physical capacities of growth seem to be hereditary, (although giants are sometimes born of average parents), but it is evidently not the same with mental capacities; for although children of the same parents may be equally well formed and physically healthy at birth, one is endowed with greater mental capacity than another; under the same training attains more knowledge; while in after life, one attains to eminence, another not.

Hierarchal degrees of mental capacity are necessary in every order of society, industrial, artistic, scientific, and social or political. In all corporate organizations, such as an army, for instance, there must be soldiers, officers, and general commanders; peripheral, medial, and central degrees of hierarchal order and gradation. The central directing capacity and authority commands the whole army, or, in a lower and intermediate degree, one whole division of an army; the minor degrees of subdivision, such as regiments, battalions, companies, and squads, are commanded by colonels, majors, captains, and non-commissioned officers. The private soldiers form the lowest rank, and the most numerous body of the army; about one hundred in a company; ten or more companies in a battalion; several battalions in a regiment; several regiments in a division of an army; central division, with right and left wings, in a whole army under the commander-in-chief.

In all professions the physical requirements of officers and men are about the same, while mental requirements are very unequal; men are endowed at birth with different degrees of mental capacity, and probably in the proportions of privates, corporals, sergeants, lieutenants, captains, majors, colonels, major-generals, generals, and field-marshals. The central commander-in-chief may, therefore, direct four or more corps d'armée in a campaign; these may have several divisions in each corps d'armée; and sub-divisions of these proceed in natural order; so that a sort of logarithmical parallel may be formed of a dozen grades of rank, denoting an increasing ratio of numbers of officers and men in each step of a descending progression. This logarithmic order is that of innate hierarchal mental capacities in human nature, which natural endowments are improved in the experiential mind by artificial education. Biological logarithms of this kind, however, are not decimal though definite and proportional.

Education may be adequate or inadequate to the due development of innate mental capacities of all degrees, just as physical nourishment and training may be adequate or inadequate to the full development of hereditary physical strength and stature. False education may be injurious also, just as unwholesome food is injurious.

IGNORANCE AND WEAKNESS.—If nutrition and growth in the body are analogous to nutrition and growth in the soul and in the mind, how is it that ignorant minds seem to have scant nutrition and little growth? How is it that some bodies have very scant nutrition and little growth in half-starved individuals, rickety children, and diminutive dwarfs? The phenomena are parallel and analogical in all respects. Ill fed bodies, if properly formed at first, have very little bodily strength: ill fed minds, if well formed at first, have very little strength. Many well formed and well fed bodies over-indulge in sensuality, take little or no exercise, and remain sickly throughout life; many well formed minds, over-indulge in mere gossip, frivolous conversations, and reading novels, take no serious thought or study, and remain common-place through life; or worse than common-place, being more or less intensely perverted in proportion to original endowments of mental capacity.

Besides these accidental differences of evolutive growth in bodies, souls, minds, and spirits, there are natural and inherent differences of co-ordinate unity in different species of animals, and in different vocations of human beings. The body of an elephant is much more powerful than that of a lion, or of a man, and yet its intellect is inferior to that of man. Some men with very large bodies and great powers of physiological nutrition, have less powers of intellect and memory than other men with smaller bodies and feebler powers of alimentation. Co-ordinate unity of organisms in humanity is not equal quantities of nutritive power and working energy in each of the four modalities, but unequal quantities of each. We do not know exactly what the ratios may be, but we may suppose them to vary in accordance with the ends and uses of vocation; approximately thus:—

Co-ordinate degrees —	4	3	2	1
Industrial vocations—	body,	soul,	spirit,	mind.
Artistic vocations —	soul,	body,	mind,	spirit.
Social vocations, —	spirit,	mind,	body,	soul.
Scientific vocations —	mind,	spirit,	soul,	body.

The ratios of 4, 3, 2, 1, here indicated, do not relate to physical forces in the body, but intensities of vocational attraction and aptitude in body, soul, spirit, mind. Or they may vary in other orders and degrees of relative energy and proportional co-ordination, of which we are at present ignorant, but which may nevertheless be some day measurable by experience, in hierarchal orders and degrees of vocational energy and perseverance. It is already certain, that co-ordinate unity does involve various proportions of energy and capacity in each of the four organisms, and these proportions are adapted to predetermined differences of vocation, and of hierarchal rank in each vocation.

Physiological *sensitivity* is selective and retentive, even in plants, and in accordance with hereditary type and constitution. Psychological *sensibility* in animals and in man is selective and retentive, in accordance with innate vocations; pneumatological feelings and *emotions* in animals and in mankind are selective and retentive, in accordance with pre-determined sociological attractions and vocations: co-ordinative *understanding* in mankind is selective and retentive in accordance with innate endowments of mental rank and capacity.

RELATIONAL ASPECTS OF CO-ORDINATE PHENOMENA.—*Poisonous* to the body, *hateful* to the spirit, *hideous* to the intellect or taste, and *false* to the truth of reason, are definite terms with regard to external conditions or phenomena. "The sound of thunder," says Mr. Alison, "is perhaps of all others in nature the most sublime;" yet, as Mr. James Mill observes, "the rolling of stones from a cart, produces a sound so exactly the same, that it is often mistaken for thunder. While the mistake lasts, the feeling of sublimity lasts. When the mistake is corrected, it instantly vanishes; that is, the association is dissolved."

What association is dissolved? not that of sound with regard to sense; but that of causation with regard to intellect.

All associations of ideas, feelings, and reasons, relate to one or more of the distinct modalities of human nature, in a pleasurable, or a painful, or an indifferent manner. This has been briefly noticed by Mr. James Mill, in his analysis of the phenomena of the human mind (vol. ii., p. 251, edition of 1869), where he says:—

"A particular description of the sort of ideas which constitute each of the more remarkable cases of our pleasurable trains (that they are of one kind in one train, of another kind in another train—of one kind, for example, in the trains called sublimity, another in the trains called beauty, another in the trains for which we have no better name than moral approbation, no one can doubt) would be highly necessary in a detailed account of human nature. It is not necessary for the analysis, which is the object of this work; and would engage us in too tedious an exposition."

It is evident from this that Mr. James Mill felt the want of co-ordinate analysis and synthesis, but had not leisure to undertake it.

The relational aspects of objective phenomena to subjective modalities, are evidently co-ordinate with the unity of man; not with sense and appetite alone; emotions or cognitions alone; but with all combined: some being more dominant than others in proportion, though never altogether absent, or quiescent.

External substances are nutritious or poisonous; external objects are ugly or beautiful, loveable or hateful, sublime or ridiculous, in relation to the subjective states of body and soul. Certain kinds of food and drink are agreeable to taste at one time, and not at another time; certain relations of sympathy and affection between persons may be strong at one time and not at another; some works of art may please the taste exceedingly, and excite a sort of enthusiastic admiration, which is not lasting, but may be succeeded by a feeling of indifference; certain pursuits of science may interest us much at one time, and very little at another; and these fluctuations of relational pleasure and indifference may be either periodical at times and seasons, or transitory during youth, without return, in after life, or only in feeble degrees.

Monogeneric vocations may be more constant in relational affections than dyageneric vocations, and these again than triageneric and tetrageneric vocations; that is, *industrial* alone, or combined with *artistic*, or *scientific*, or *social* and political vocations. Higher ranks in each class of vocations must be more various and comprehensive in relational capacity than lower ranks of vocational aptitude.

HIERARCHAL SUBORDINATION.—Inorganic or monadal types of creation, such as air, water, and earth, are distinct and more or less superior one to another in the economy of nature. The atmosphere, in some respects, controls the ocean; the sea controls the land; while heat and light, electricity, and gravitation, as immaterial forces govern all forms of ethereal, gaseous, liquid, and solid matter.

Some of the simple elements rank higher than others in human estimation (gold, silver, copper, iron), although their real uses may be variously estimated. Simple metals, however, are less complex in elemental composition than dual alloys; these again than quadruple combinations; and the rank of organic substance seems to be higher than that of inorganic elements.

One plant is of higher rank than another; one animal ranks higher than another of the same class; one human being ranks mentally higher than another of the same species. This is one of the necessary conditions of collective unity in organized social and political humanity, as well as in organic and inanimate realms.

Is it an inherent vocational characteristic of human nature, or merely an evolutive phase of progressive perfectibility? We do not know, but the fact is evident. *Hierarchal temperaments* seem to be as definite as vocational temperaments, and destined to higher degrees of vital activity.

Hierarchal order is not despotism; liberty is not anarchy. Personal, domestic, municipal, and national health, morality, liberty, and independence or self-government, are compatible with all degrees of rank and supervision, where these do not overstep the bounds of duty and legitimate authority, or counsel and direction.

A prime minister of state should know more and be endowed with higher faculties of reason and understanding than the captain general of an army, since the ruler of a nation holds higher rank and is entrusted with greater responsibilities than the director of a corporate body or an army of any kind. Philosophers and men of science have to discover and understand the laws of nature in all degrees of synthetic unity, and in all depths of co-ordinate unity: not only the laws and conditions of terrestrial humanity and of sociogenetic evolution, but those of realmic unity and evolution, on our globe; and by rational inference, on all globes; not to mention the correlations of epicosmic with cosmic unity and evolutive phenomena in all worlds and systems, which may be ultimately brought within the limits of human comprehension, when once organic laws have been thoroughly recognized in all the known depths of nature, as far as scientific observation and experience can penetrate. The highest powers of reason and understanding hold the highest rank in human nature then, just as the highest powers of solar illumination and attraction hold the highest ranks in cosmic nature. Reason holds solar and illuminative rank, while intellect holds planetary and reflective rank, instinct being to intellect as satellites to planets, namely, reflective bodies of unequal rank in the creation. Animal instincts are subordinate to human intellect, and practical intellect is subordinate to reason.

As mind transcends physical force with which it co-operates in human nature, we may easily conceive it to transcend physical force in universal nature. Physicists are obliged to go beyond atoms of matter to get at "centres of force without dimensions," and if we pursue the analysis as far as the human mind can reach, we may state the question thus, and show that forces transcend space in *depths*, as space transcends visible matter in *extension*, materiality expands into immateriality.

Hierarchal Co-ordination and Subordination.

I. Physical Forces and Conditions of all Degrees of Extension.

1. There is space beyond and between all cosmic worlds;
2. Beyond and between the planets of our solar system;
3. Beyond and between animals and plants on our globe;
4. Beyond and between the organs of an animal body;
5. Beyond and between the minute cells of an organ;
6. Beyond and between the particles of cells;
7. Beyond and between the atoms of particles.
8. Is there physical force in and beyond invisible atoms?

II. Vital Principles in all Degrees of Depth and Extension.

9. Is organic force superior to physical force?
10. Is instinctual force superior to organic force?
11. Is mental force superior to instinctual force?
12. Is spiritual force superior to mental force?

W. Is man a subjective reflex of Infinite Being? or is he merely the dupe of subjective hallucination?

As there is brain and mind in the human body; in the central authorities of all communities; and suns in all solar systems; so there may be ruling principles of determinative and efficient modes of action in all the hierarchal centres of the pancosmic universe.

Mental Impress.—The ruling instincts of an animal are those of its natural vocation, and its persistent volitions are in accordance with these. The ruling passions of a man are also those of his innate vocation, and the impress of his mind accords with the persistent volitions of his inborn instinct.

The bodily type of an animal reveals the nature of its instincts, in each realm and class. A lion, an eagle, a rattle-snake, and a shark, have predatory instincts of like nature, although their bodily forms are very different; large and small species of the same type in each class, such as the tiger and the cat, the eagle and the sparrow-hawk, the boa-constrictor and the viper, the monstrous shark and the small dog-fish, have similar instincts and vocations, with different degrees of power and volition, proportioned to the hereditary stature and capacities of type and species.

The instinct and the *will*, however, may be as tenacious and persistent in a cat as in a lion, though the needs and the capacities of each be widely different in amount; and so it is, in some degrees, with human instincts and vocations, although the bodies of men are not as unequal in physical power and stature as those of the feline tribe. The reason of this seems to be, that hierarchal degrees of instinctual endowment in animals are marked by corresponding degrees of stature in co-ordination with instinctual powers of volition, whereas, in human nature, hierarchal degrees of mental and vocational passions of all grades are co-ordinate with relatively feeble degrees of physical strength, not uncommonly, even, in an inverse ratio of physical and mental powers; for just as the smallest types of mankind are more intelligent than the largest types of animals, such as whales, elephants, buffalos, and lions, so men of small or medium stature are generally more highly endowed with intellect than men of gigantic size.

The will of an animal is as persistent as the inflexible fixity of its instinct, and so may be that of a man of small intelligence, whereas, the will of a man endowed with strong powers of reason is equally persistent and indomitable, in accordance with his innate vocation, but being more flexible and elastic in adapting means to ends, under varying conditions, it may seem to be weak and yielding to those who confound blind obstinate persistence in a given track, with rational adaptation of means to ends, without loss of time and energy by useless efforts, in a wrong direction. Success is the criterion of well or ill directed efforts in all cases. The strong will of a man is of little use against the strong will of a bull, unless he *knows* how to circumvent the animal and subdue it. The *impress* of the mind is in accordance with the ruling passions of the man, and strength of will, in following a pursuit or a vocation, may be just as marked in a common soldier as in a commanding officer; but flexibility of mind in the adaptation of means to ends will be very differently shown in each.

The work of a man shows the rank and power of his will; not the talk and obstinacy, or stolidity.

"Wisdom is justified of all her children;" but the wisdom of the industrialist and the merchant is not that of the artist, nor the wisdom of the artist that of the man of science.

Natural varieties of vocation need mental aptitudes and tastes, adapted to their special requirements; varieties of mental impress, causing individuals to form different opinions on the same questions, are quite distinct from questions of moderation and excess, or health and disease in mind or body, and should lead us to understand the cause of opposite views of all subjects, as a legitimate ground of toleration and respect for such opinions. Vocational excellence requires vocational constancy or faithfulness, and as each one has only twenty-four hours a day to work and rest in, he cannot give his time to twenty different pursuits at once, and must neglect some in order to attend to others, and more especially to favourite ones.

MENTAL IDIOSYNCRASY.—As one man has a natural tendency to become very fat, and another very lean—one hirsute, and another glabrous—so one mind has a natural tendency to doctrinal speculations, and another not; one man is naturally loquacious, and another not. And as physiological idiosyncrasy is indicative of the modes and degrees of functional activity in the connective tissues of the body, so mental idiosyncrasy is indicative of the modes and degrees of functional activity in the connective faculties of regulative reason.

These connective faculties and functions are parallel in the body and the mind.

Connective Tissues of the Body and their Functions.

H. Fœtal connective tissues and secretions.
U. Glandular tissues and excretive secretions.
Ω. Adipous tissues and cumulative fatty secretions.
O. Areoloserous tissues and lubricative secretions.

Regulative Faculties and Functions of the Mind.

H. Faculties and functions of speculative reason (hypotheses).
U. Faculties and functions of generalizing reason (doctrines).
Ω. Faculties and functions of formulative reason (argumentations).
O. Faculties and functions of regulative reason (principles).

These factors of regulative reason have been more or less explained already. Here we have only to notice contrasted modes and degrees of functional activity, according to the mental idiosyncracy of the individual mind. Some minds are prone to active hypothetical speculations, while others are dull or sluggish in that respect. Some minds are much infested by other people's speculative notions and insanities, as the body may be infested by minute parasitical, animal, or vegetable organisms, while others, who are cleanly in bodily habits, and scrupulously careful of rational criticism in their mental habits, are not infested, either bodily, by noisome parasites, or, mentally, by speculative insanities.

DOCTRINAL IDIOSYNCRASIES. — In the sciences of biology and sociology, for instance, there are many different schools of physiology, psychology, moral philosophy, social and political economy, "Liberty, equality, fraternity," &c., and each school of doctrine, on any of these questions, is attractive to some orders of mental idiosyncrasy, and indifferent or repulsive to others. Homœopathy, allopathy, hydropathy, and omnipathy, are special sects of doctrinal opinions in physiology and medicine; Jews, Catholics, and Protestants, Mahomedans, Mormons, and numerous creeds of Brahmins, Boudhists, and Parsees, are special sects of religious opinions, apparently congenial to various idiosyncrasies of generalizing reason, in different races and individuals.

The evolution of reason and science in humanity modifies creeds and doctrines more or less in each successive generation, where the mind of the race is of a progressive character, whereas the same creeds endure for ages in the same race or nation where the dominant impress of the mind is unprogressive or "conservative," that is arrested in development, something like inferior species of animals which have a given type or impress, resembling the undeveloped forms in embryo, of superior species.

Jewish creeds seem to be arrested developments of religious doctrine; Roman creeds, arrested developments of religious doctrine and understanding; nearly all Protestant creeds seem to be arrested developments of sectarian doctrine and understanding.

Creeds and opinions in Africa accord with arrested developments of understanding; the same may be said of races and nations in Asia, and Australasia; and although progressive evolutions of reason are manifest in Europe and America, still "conservative" sects and parties in Europe show a most decided arrest of development, in wishing to perpetuate the laws and customs, creeds and privileges of the middle ages, and "obstruct" the progress of society in social, political, and religious evolution, or truly conservative health and growth.

Mental Diathesis.—There are different states of physiological health and diathesis, with parallel states of mental health and diathesis. The body may be diseased without perceptibly affecting the mind, and the mind deranged where there are no strongly marked signs of disease in the body; still, deranged functions of digestion are often coupled with depression of spirits; scofulous diathesis, with mental aberration and uncontrolable temper; functional derangement of the generative system with hysterical and maniacal habits.

Depressions, excitements, and aberrations of the mind are sometimes more visibly connected with organic diseases or functional derangements of peripheral organs than with discernible diseases of the brain, although the contraction of cerebral blood vessels and the arrest of nutrition and exchange in the cerebrum, seem to paralyse all forms of conscious thought, and sensation, in the mind. Morbid states of peripheral organs may cause abnormal modes of action in the brain, even where the latter is not itself diseased. Disease of the retina may affect the sense of vision, and this may affect the judgment of the intellect, as in cases of "colour blindness," where there is no disease.

Dreams are very various in degrees of incoherency and madness, and are often attributed to indigestion or other functional derangements during sleep; but they are sometimes very rational or coherent, especially in somnambulists, and people of so-called "nervous temperament." In such cases they resemble very much the phenomena of superinduced hypnotism, animal magnetism, or mesmeric psychologization in the waking state; and some spiritualists, well acquainted with such experience, think they may possibly be the result of "spirit-influence" during sleep. Mad dreams, however, seem to be an utter absence of rational thought to control intellectual imagination; so that we might suppose reason to sleep while intellect was active, just as the external frame is motionless, while the internal viscera are busy in their functions.

It is difficult to ascertain the limits of isolation between the four modalities of human nature, or measure degrees of partial co-operation between two or more of them at any given time. We know from numerous cases of prolonged abstinence and abnormal *physiological vitality* in animals and human beings, with little or no *physical activity*, and almost no conscious mental activity, that the body may live (like a plant) isolated from active or conscious co-operation in the mind; and many facts tend to prove that the body may be mutilated or deformed without affecting reason; that moral insanity may co-exist with apparent bodily health, and intellectual vigour; that mental insanity may exist with apparent bodily health, and moral harmlessness; and, in fact, that complete or partial states of co-operative union in mind and body, may be recognized in sleep, somnambulism, trance, disease, mania, and melancholy.

The simplest method of obtaining an insight into the phenomena of physical and mental isolation and co-operation, is to compare parallel variations of vegetable, animal, and human vitality. Vegetable life depends upon nutrition, which governs all the subordinate functions of absorption, circulation, respiration, secretion and reproduction; and as one species of plant can only live in tropical regions, another in temperate, and a third in polar or alpine regions, the *nutritive diathesis* of each one of these species, is correlated with a special mode and degree of climatic physical forces, such as heat or cold, magnetism and electricity, not to mention different degrees of moisture and dryness in the air, or of insolation in marshes, rivers, lakes, and seas.

Animals of different species are also adapted to various climates and conditions by varieties of nutritive diathesis; and where the seasons, in the same locality vary beyond the limits of diathetic adaption, as in the case of hibernating trees and animals, we see nutrition arrested in both cases; and, with arrested nutrition in the hibernating animal, all consciousness of life is lost, and instinctual activity.

Animals which cannot hibernate, when removed from a warm native climate to a colder region, such as monkeys, for instance, brought from tropical Africa or Asia to northern Europe, suffer from imperfect nutrition under such conditions, and die of consumption. Climatic conditions have also much to do with the aggravation or the cure of consumptive symptoms in human beings. The main facts, to be noticed here, however, are those of the relations between external conditions and physiological nutrition, on the one hand, and between arrested nutrition and simultaneous loss of consciousness in hibernating animals, on the other.

When nutrition is arrested for a time in any part of the body, capillary action or exchanges of blood with the tissues are arrested more or less completely; and when, by capillary contraction in the brain, or any of the nervous centres, nutritional exchanges are arrested, loss of consciousness is more or less complete, as in ordinary sleep, and in abnormal cases of somnambulism, trance, catalepsy, &c. In concussion of the brain by a fall or a blow, all consciousness is lost, memory is temporarily paralysed. When the skull has been trepanned, and a finger is pressed upon the brain so as to arrest nutritional exchanges with the blood, consciousness is lost until the pressure is removed and capillary circulation re-established.

When capillary circulation and exchanges in the brain are accelerated by alcoholic fumes in the blood, and then depressed by capillary reaction, the mind becomes first excited into a sort of madness, and then depressed into a sort of lethargy.

When long continued anemia arising from indigestion or want of food, causes a less quantity of blood to flow to the head and other parts of the body, the mass of the brain collapses in some measure, and no longer fills the cranium, and this sensation of cerebral shrinking from the coronal region of the skull causes the patient to imagine that the top of the skull is flying upward from the head; spectral illusions often accompany this state of the abnormal relations between the nervous centres of nutrition and their relations with the blood.

Congestions of the brain, and more especially of the basal regions, compress the mass, and more or less arrest the normal functions of capillary exchanges and cerebral nutrition, causing loss of sensibility and motion, memory, and articulation. The blood may be narcotised so as to produce effects in the organism similar to those produced by external temperature in hibernating animals.

Oxygen exhilarates the physiological relation of the body with the soul; carbonic acid gas depresses it, and in sufficient quantity suspends it altogether for a time or permanently. The vapours of ether, chloroform, and alcohol will do the same. There are, however, numerous varieties of physiological and psychological effects produced by different kinds of narcotics, and by different degrees of intoxication or anæsthesia.

"*Coculus indicus* in certain doses makes the body drunk without much affecting the mind; the *Siberian fungus* gives insensibility to pain, without interfering with consciousness; the common *puff ball* paralyses muscular action, leaving the perceptive powers intact; *coca* is said to have the marvellous power of sustaining muscular strength of the body for a considerable time without food, and preventing the wasting of the tissues during the greatest exertion, continuously prolonged.

"*Haschish* produces real catalepsy and exaggerates rather than prevents the report of the external senses as to external objects. *Thorn-apple*, on the other hand, causes spectral illusion, enabling the Indian to converse with the disembodied spirits of his ancestors.

Opium and Haschish, similar in some of their effects, are opposed in others; opium diminishes sensibility to external impressions, haschish greatly increases it. Betel is an antidote to opium as tea is to alcohol. Tobacco lowers mental activity, haschish and opium in certain doses increase mental activity, or the rapidity of thought." —*National Review*, January 1858.

Arrested nutrition in the brain and nervous centres has much to do with concomitant loss of consciousness and memory; and we may judge from this, that all forms and degrees of conscious co-operation between soul and body are intimately correlated with degrees of exaltation or depression of vascular action and nutrition, which may result from scanty or plethoric quantities, healthy or morbid qualities or states of the blood; which again may be traced back to the functions of digestion, absorption, circulation, and secretion.

Apart from accidental diseases of body with excitements or depressions of the mind, there are hereditary diseases or diathetic habits of body and of mind.

A healthy body makes good blood from all kinds of proper food, and healthy organs from that blood, whereas a scrofulous body makes bad blood from good food, and unhealthy organs from that blood. All depends then, in such a case, upon healthy or unhealthy *diathesis* apart from accidental derangements.

Are there healthy and unhealthy moral, intellectual, and mental diathesis, as well as physical? As some individuals make good blood and healthy organs from good food, while others make bad blood and unhealthy organs from good food. Do some make good moral principles and healthy conscience from good moral food or education, while others make bad principles and a perverted conscience from good moral surroundings? Do some make good practical common sense from every-day experience, while others make silly or perverted practical sense from every-day experience? Do some make sound reason and positive science from the study of revelation in nature and in Scripture, while others make irrational dogmas, and unsound doctrines from the same studies and surroundings.

If there are scrofulous, tuberculous, cancerous, and other forms of defective nutrition in the body and consequent degeneration in the tissues, may there not be, and are there not, parallel forms of unhealthy diathesis in the spirit? in the intellect? in the mind? And will not these hereditary diseases of body, spirit, soul, and mind, die out in time? Of course they will, but not in our time. Are hereditary diseases of the experiential mind, then, intimately connected with hereditary diseases of the mortal body?

All modalities of light, heat, gravitation, and magnetism are closely correlated with any one simple element of matter, gold, silver, copper, tin, iron, or zinc, and the same with particles of an alloy. All the modalities of body, soul, mind, and spirit are intimately correlated, if not really convertible, in a simple biological unit, such as that of man. The mortal body is closely and intimately united for better and for worse, with the immortal spirit during mortal life, (whatever be the quality of the 'spiritual body' after separation from the natural,) as that of gold with an inferior alloy.

A cancerous diathesis of the mortal alloy may, therefore, affect both the spiritual body and the mind during experiential life, and transmit bodily with mental insanity to its descendants, just as inferior alloys affect pure metals with which they are fused.

People should be careful with marriages, not only with regard to money and position, but also, and particularly, with regard to the carnal alloy.

The ends and uses of human life, of all grades and vocations, consist in being, consciously or unconsciously, useful to others, in doing that which is directly or indirectly, actually or prospectively, agreeable to self; for as the Poet says,

"Self interest and social are the same."

And this is not only true of the destiny of human beings, but of all finite creatures, whether conscious of life as animals, or unconscious of life as plants; and however strange the doctrine might appear to animals killed for human food, if they could think, it must nevertheless be true, to justify the ways of the Creator to the creature. Great is the "mystery of iniquity."

This is one of the puzzling problems of collective biology, which will come before us again in various forms, as we proceed with our investigations of the origin and home, conditions and vocations, predestined for mankind in this life and hereafter.

PART III.—NOOGENESIS.

CHAPTER I.—EXPERIENTIAL MIND.

How is experiential reason formed, and whence is it derived? The growth of the mind in the human race keeps pace with the gradual evolution of the sciences, and is easily traced in history, while the origin of mental faculties and their gradual evolution in the individual mind is a vexed question of psychology.

The chick of a bird is a type of instinct as well as bodily form, as soon as it is hatched, and an infant is a type of humanity with all the potential faculties of reason, as soon as it is born. We cannot trace the formation of an experiential mind in utero, as we can trace the formation of the body, but biological unity involves mental as well as physical faculities in the new-born child.

Hereditary and congenital influences are also as marked in the mind as in the body; born idiots are as common as born cripples or monsters. Mathematical prodigies, or calculating boys, are examples of inborn faculties and precocious development.

Human races are not equally endowed with physical beauty, intellect, reason, and spirituality. African negroes and Australian races are inferior in all respects to Europeans; these again are not equally developed in all their faculties. Some families and individuals are much more moral and religious, thrifty and inventive, rational and scientific, than others. We cannot say there is no mind at all in ignorant tribes where science is unknown, nor in the new-born infant before mind is developed.

The experiential faculties of mind are more or less exercised in all the sciences, as the organs of the body in all physical vocations; but, like these organs, they must be formed in utero before they can be developed in adult life.

Instinctual vocations are limited to experience and work on the surface of the globe, while the mind investigates all the depths of nature in the universe, bounded only by infinity.

We have given illustrations of mental exercises applied to the investigation of nature and her laws on an extensive scale, in two previous volumes; examples of classification mainly, in the first; of ontological researches, in the second. There are examples of co-ordination and subordination in the present volume; of analogy, deduction, induction, analysis and synthesis in all, but very little of the rhythmological, which will be more called for in sociological investigations and inductions.

We need not dwell on questions of noogenesis, as kindred problems of psychogenesis and embryogenesis have already been dealt with, at some length; and problems of mental genealogy will bring the subject before us in a more general form as we proceed.

By rhythmological modes of investigation, we mean the study of definite cycles of evolution in comparative embryogenesis, and lease of life. Each species of animal has a *natural* lease of individual life, and a general *average* lease. It has also a collective lease of life, subject, perhaps, to laws of average. Some extinct species have had a definite, though unknown lease of collective existence, as well as of individual life. The incubation of chicks of birds requires a fixed number of days and hours differing for each species, while all are subject to definite cycles of incubative evolution, bearing a relative proportion to the natural (not the average) lease of individual life. The same law applies to the gestations of mammalia. The known data of this category of phenomena are numerous and various, while the unknown laws of proportionality are very interesting problems of biology, legibly written in the book of nature, if we could learn to read. We ought to know the exact periods of time occupied in the metamorphic evolution of each species of animal, in every realm and class, as well as incidental causes of acceleration or delay, in any case or cases, with the natural lease of individual life of every species of animal now living, as well as the variations of average, in different conditions. What is the lease of collective life for each living species, in parallel with that of extinct varieties and species? What is the fixed cycle of sociogenetic evolution for the collective organism of humanity, compared with that of individual human embryogenesis? These and many other questions are problems for rhythmological modes of investigation in evolutive and organic method.

PART IV.—MENTAL GENEALOGY.

CHAPTER I.—PROBLEMS OF MENTAL ORIGIN AND DESTINY.

WHAT is the origin and destiny of experiential reason and understanding? Is it not subject to metamorphic phases of evolution in the womb, like other aspects of human life and organization, with phases of growth after birth? As the body derives its first substance from the mother, and is influenced by her physiological conditions during uterine gestation, so the fœtus may be influenced by her mental and emotional conditions, inheriting peculiarities of temper, ability, timidity, or ferocity. Not very evident in early infancy, this becomes manifest in after life, as a continuation of that which is innate in the species of animals, or the races of mankind.

The inborn minds of Red Indian American savages, or of African negroes, are quite as different from the innate mental organism of a European, as the bodily forms and features of these different races. The Negro intellect is quick and lively throughout life, somewhat like that of a child of the European races. The American Indian is dull and taciturn, something like an ignorant European peasant in senility.

The communities in which these races live are very different, but still the influence of society alone is not enough to account for innate and enduring differences. The Negro can imitate the social habits and manners of Europeans, when educated in these nations, but he cannot attain to equal mental faculties and scientific distinction. The Red Indian of America can neither adopt the manners, learn the crafts, nor attain to the scientific eminence of European emigrants around him; and the same may be said of all inferior races; Asiatic, American, African, Oceanic; for even the Chinese and the Japanese, however skilful in art, have not been able to cultivate and discover principles of science equal to the Europeans. The genealogy of a race, is, therefore, not only physical, but moral, instinctual, and mental. This is a known fact, which leads up from the data of mundane genealogy, to problems of ultra-mundane origin and destiny; from individual to collective evolution; from special questions of biology to general questions of sociology, where we shall meet with them again in a more definite shape.

The mental evolution of experiential understanding consists mainly in the discoveries and teachings of science, which are only recognitions of the invariable laws of nature, eternally present in the Mind of Omniscient Deity. The creation of the sciences by human reason and discovery on our globe, then, is merely a descent of pre-existent science to a lower plane of life; an experiential finite incarnation of omnimundane science. And here again we must distinguish the perpetuation of known branches of science by homœogenetic generation or hereditary transmission, from new discoveries of previously unknown laws, by heterogenetic modes of origin. How and where do these phenomena of mental evolution and experience occur? In two very different laboratories of original creation and hereditary perpetuation.

CHAPTER II.—SCHOOLS AND SANCTUARIES.

Common schools of industry, art, and science, perpetuate that which is in theory and practice already known to the parents of new generations, while inventors, poets, and discoverers of science leave the beaten tracks of schools and colleges, to enter into the sanctuaries of nature, and explore her depths of physical, instinctual, mental, and spiritual mystery; seeking for inspiration from mysterious realms, to draw down spiritual fire from heaven, not for self gratification only, but to illuminate the darkness of an ignorant world suffering for want of light and life, to understand the designs of the Creator, in the marvels of creation and the destiny of man.

The laws of gravitation were known to God and to the higher angels of creation before they were discovered by Newton, and through him to mankind in the natural world: and so it is with all other new discoveries and revelations of perennial Nature to the experiential souls of finite humanity on earth.

Each generation transmits the science it possesses to its successors, but new openings of the mind (unveiling hidden mysteries of law and order in creation), are obtained by individuals rising into higher regions of mental light by inspiration from Divine sources of experience in the heavens above and the earth beneath. The methods of perpetuating known laws of science are those of practical and logical exposition and demonstration; methods of investigation in the sanctuaries of nature are different from those of logical deduction and induction, illustration and explanation in schools and colleges; they are not only educative, but experimental and statistical investigations of all kinds of evolutive and organic phenomena, discovering laws and principles veiled in such phenomena, and giving them birth as new and strange arrivals amidst older forms of thought and understanding in the world. Thus new discoveries have always a heterogenetic genealogy, while the perpetuation of previously known truths in schools and universities have an hereditary or homœogenetic genealogy (like animals which give birth occasionally to new species, while continuing their own habitually, if such things ever happen in physiological generation). Reproductive talent then is homœogenetic only, while Genius may be alternately homœogenetic and heterogenetic, in psychological generation.

Terrestrial homes and churches are only hereditary progenitors of bodily and mental forms; celestial homes and churches superintend all new incarnations and inspirations which descend from above into the natural world.

AMPHIMUNDANE GENIUS.—Great poets and inventors, as well as the founders of new religions, have nearly all been men, and it is a curious fact, worthy of note in the history of invention, prophecy, and revelation, that nearly all new psychological conceptions have been received by the male sex, while physiological conception is the special function of the female sex on earth, although both incarnations and revelations descend from higher planes of existence into this lower world.

The prolific female sex receives incarnations and inspirations from a higher world; the male sex receives inspirations only. Both are mediums of connexion between the natural and spiritual worlds. Man and woman are conjoined in all spheres of life and in all mediumship between celestial and terrestrial humanity. Both sexes co-operate no doubt, in all phenomena of generation, as a rule; still there are well known cases of metagenesis and parthenogenesis in the physiological plane of life. and probably also, in the psychological plane; but we have not yet penetrated far into the mysteries of homœogenesis and heterogenesis, in either individual or collective modes of evolution. Through the portals of embryogenesis, we have been able to penetrate a little way into the sanctuary of sociogenesis (the metamorphic evolutions of embryonic social organism), but we are still in outer darkness with regard to the sanctuary of realmic creation; the origin of new, and the extinction of old species of animal and vegetal organisms.

AMPHIMUNDANE SANCTUARIES.—As the individual fœtus lives in natural darkness until completely organized in the womb, and fit for birth into the light of the natural world, so the collective embryo of a terrestrial social organism, lives in spiritual darkness until it is completely formed as a collective unity of human brotherhood, fit to be born into the light of the upper spheres; in conscious communion with the spirits of celestial humanity, though still living naturally on the substance of mother earth, as the infant lives for a time on its mother's milk, after being born into conscious communion of spirit and emotion, with her affectionate soul.

Natural blindness of the individual fœtus in utero, and spiritual blindness of the collective embryo of terrestrial humanity, are parallel phenomena of darkness during the phases of metamorphic evolution. As the mother by her emotions affects the living spirit of the fœtus in utero, while it is unconscious of her influence, so the spirits of a higher world affect individuals, who are unconscious of the influence of guardian angels; and although religious revelations profess to be Divine inspirations from above, how little is the bulk of humanity conscious of such modes of communication, and the real import of revelations concerning conduct in this life, and our doom hereafter. This is practically proved by the incredulity of the present age, with regard to spiritual communications now received by a few in all quarters of the globe, and easily accessible to all genuine inquirers.

In questions of biology one problem leads to another without end. The chief guide we have in rising from one plane of life to another, or one degree of complex organic unity to another, is analogy; the same thread of organic unity conducts us through the winding mazes of creation in descending from the highest realms of thought to the lowest atoms of finite limitation.

What could the Creator possibly embody in creation, but an image of his own complex thoughts, animated by His own spirit? A reproduction of Himself in fact, as the All-Father. Homœogenesis is then the end and aim of all creation, the first necessity of genesis of any kind; but then, the processes of creation or of procreation and incarnation (counterbalanced by those of decarnation and resurrection) are necessarily processes of metamorphic evolution; heterogenetic phases of transformation of the embryonic forms, belonging to pre-existent types. And as nothing can come from nothing, all creations must be balanced by decreations, or changes of organic form and phenomenal relationships, by ascending and descending modes of incarnation and decarnation. Creation and destruction, therefore, are necessarily metamorphic and apparently heterogenetic, though finally homœogenetic.

What is the incubation of an egg, but a transformation of matter by a living principle of life in the chick? What is the evolution of a globe, but a transformation of nebulous matter, without form and void, into a definite form of complex structure, by an organic pre-existent principle of metamorphic evolution? Whence comes an egg? from a bird. What then is the genealogy of a globe? When a chick is hatched, after passing through the embryonic phases of formation, what is it like? The parent bird; a race of innumerable individuals like itself. When a globe is completely formed, with all its realms of organic life developed on the surface, after passing through long ages of metamorphic evolution, what is it like amongst millions of other globes in the Pancosmic universe, which existed long before it was formed at all, in its present state and place?

All forms of the creation pre-exist then, in the Mind and Power of the Creator; all individual types pre-exist in procreative parents and incarnative forces; and the same may be said of collective species, realms and classes of organic beings; which are not only copies of their immediate progenitors, but independent pre-existent individualities, which come from an unseen world into a visible plane of existence; to vanish again or become invisible, after a short lease of life on the mortal plane.

The incubation of a globe brings nothing absolutely new into the universe of globes, any more than the incubation of an egg into the preexistent universe of birds. Whence comes the living bird into the inert matter of an egg? Whence come all the forms of life into the matter of a globe? They pre-exist somewhere else unseen, before they exist visibly here below; and palœontology shows that they come by slow degrees into mundane life, as the different organs of a chick come into visible form and life by rapid degrees of metamorphic evolution. Still all the known processes of transformation end in reproducing the parental type, however different the embryo may be from the perfect form, as the caterpillar from the butterfly. And by analogy, we may infer that all the transformations on our globe, are metamorphic processes of evolution, to reproduce eventually a perfect organism, exactly like millions of others of the same class and species. If embryo chicks become perfect birds, embryo globes become perfect; and as all the feathers of a bird are potentially in the organism, though unseen, before they become visibly formed by secretion, or incarnation, so all the organic realms and classes of animals and plants exist potentially in the planet (or elsewhere) though unseen, before they are visibly formed upon its surface. Whence it follows, that the unseen world of collective humanity exists in its spiritual completeness as a social organism, before it is visibly complete on earth, and the metamorphic processes of sociogenetic evolution at the present time, are only rudimental indications of a perfect social organism already realized as a terrestrial type of being, on countless other planets, and not improbably on some of those of our own solar system.

Terrestrial humanity is being embodied and brought to perfection under the natural warmth of the sun, and the inspiring love and care of the living God. And so of all the forms of life upon the globe, as visible embodiments of the invisible principles of being in the omniscient and omnipresent Creator and Allfather.

This is the amphimundane theory of genealogy by heterogenetic and homœogenetic incarnations and inspirations. We deem it more general and complete than the mundane hypothesis of slow and gradual changes of form and instinct by continuous efforts of natural selection in some types only. Both may be true, just as both theories of geological evolution may be true in gradual and slow changes, as well as in abrupt cataclysmic evolutions at long intervals of time.

Very little of the whole living chick is seen in the first rudiments of organs; very little of the perfect spiritual humanity is seen in the first rudiments of social organism on earth. In the heterogenetic transformations of a chick in the egg, homogeneous protoplasm first becomes organic lymph and rudimental tissue, then skin, bone, nerve, muscle, blood, internal viscera, and organs of special sense; and, according to the Huxleyan hypothesis, organic protoplasm on the surface of the globe first became a sort of cellulose, the basis of rudimental, vegetal, and animal tissue, the substratum of low cellular organisms in all the organic realms, low forms assuming gradually higher degrees of evolution by natural selection and hereditary transmission in each general plan of structure (vertebrate, articulate, molluscan, and radiate), and in each class of type (fish, reptile, bird, and mammal); until, at last, the highest animal type became a man by successful efforts of natural selection, and then gave birth to a human form or animal man, which, being multiplied (by successive generations on the mundane hypothesis, by successive incarnations of spirits from the unseen world, on the amphimundane theory), forms a terrestrial human race, gradually developed in the animal kingdom of the globe, as a central nervous system in the complex organism of an individual, to serve eventually as a means of communication between the spiritual and the natural world, or the soul and body of the planet, as the nerves unite the soul and body of an individual.

This, of course, is only an hypothesis, not yet confirmed, on either theory, by direct evidence, as far as realmic evolution is concerned; but then, it is an attempt to find a clue to the solution of a problem of organic evolution, one of a series of the most engrossing problems of biology. No other hypotheses have yet been started in the scientific world, except the recent notion of Sir William Thompson, that fragments of broken planets, falling as meteorites on our globe, may contain germs of life, and land them at successive periods on earth. How then did life originate on the surface of the broken planets?

The Bible gives no idea of the laws of metamorphic evolution on any plane of life, in any world. It is a very general indication of successive phases of creation during six days or periods; but scientific investigation can make nothing of it. We must accept the Book of Scripture for what it gives, and consult the Book of Nature for more definite forms of biological revelation. This can be done by comparing the known phenomena of evolution with unknown phenomena, governed by one general law; for instance, we may suppose that, as three weeks are to the metamorphic evolution of a chick, nine weeks for a dog, forty for a man, and more than fifty for an elephant, so a hundred thousand generations, more or less, are to the evolution of terrestrial humanity, and a thousand, or a million times as long for that of an organic realm of any type (vertebrate, articulate, molluscan, or radiate). We have no sufficient clue, as yet, to relative proportions of time in different orders of metamorphic evolution, although the processes are quite analogous in all the realms of procreation, but we may feel sure that all are necessarily ruled by mathematical laws of rythmological number and proportion, as much as any other order of phenomena in nature.

Prophetic Indications of the species of form and instinct to which a chick in the egg belongs are visible a few days after incubation has commenced, and become more definite every day, until the evolution is complete; so, in the embryonic phases of mammalian evolution, the species to which the embryo belongs is easily seen in the earliest rudiments of form, notwithstanding its general resemblance, in those imperfect states, to types of an inferior class or species. In the human fœtus, embryonic indications of the final shape are discernible through every phase of metamorphic evolution, although the earliest forms resemble those of animals in their imperfect outlines. What, then, are the prognostic indications of divine humanity, as a future social organism, in the past and present rudimental states of sociogenetic evolution in which the animal instincts and propensities are much more general in reality than the ideal of human love and wisdom?

In all ages there have been saints and martyrs, prophets and lawgivers, prophesying future degrees of happiness for man in this world, and giving laws of social and religious life to realise such prophecies of preordained destiny; but the fullest indication of divine humanity yet traceable in the rudimental history of the race is, "The Lord Jesus Christ, the Saviour and Redeemer of mankind." We say the fullest and most perfect, not absolutely final, since he said Himself that he had many things to say to his disciples, but they could not bear them then, and he promised to send the comforter, the Holy Spirit of truth and inspiration, who should testify of Him, and lead the human race on earth into all truth. He sent the Holy Ghost to comfort and inspire the apostles at Pentecost, and the same Holy Spirit still inspires humanity with heavenly ideas and feelings in all generations. The form and spirit of divine humanity is discernible then in the early phases of sociogenetic evolution, during which phases of history, individuals, and societies resemble the lower tribes of animals in their instincts and propensities, habits and relations, rivalries and conflicts, more than the ideal forms of human life and brotherhood, foreshadowed in the Divine humanity of Jesus Christ (crucified by Jews and Pagans; horribly misunderstood by fanatics who assume the name of Christian). The individual fœtus is a monstrous imperfection during the early phases of embryonic life, and so is the collective embryo of humanity, although unmistakable indications of the human soul divine may be traced in rudimental lineaments of religious history and national evolution.

The spirit of truth in Christ will organise the social and religious brotherhood of mankind; no other spirit can. "To Him is given all power in heaven and on earth," to inspire and direct the work of sociogenetic evolution. Less elevated spirits give the semblance of animality to successive nationalities, which come and go in the metamorphic evolutions and revolutions of history and civilization.

Sceptics, who lead good lives but doubt the sources of spiritual light in Revelation (which, to them, is darkness), are nearer to Christ than many who make loud professions of Christianity, but do not live in charity and peace.

Jews of strong faith and cunning intellect, with little evolutive understanding, say they would again crucify any man in their community who called himself the Son of God, one with his heavenly Father; not perceiving that the Word given to Moses, spoken by an angel in the human form to a man in the flesh, a Prophet of the Lord was a human form of the Divine, and that the Word of God brought to us by man is God with us, the Spirit of Eternal Truth, that all men are brethren, sons of God, heirs of salvation, exhorted to become *one* with Christ in spirit and in life, as He is ONE with the Father in Heaven; and, moreover, that until this is accomplished, the social organism of humanity on earth cannot be formed in harmony with the spirit of Eternal Love and wisdom; cannot do the will of God on earth, as it is done in heaven; cannot transform animal humanity into the form of divine humanity, as the fœtus in the womb is changed from one semblance of animality to another, until it assumes finally the human form divine.

Jews may possibly remain for ever Jews, in faith and life, just as the primitive rudimental tissue of the individual fœtus becomes, in a manner, permanent, as areolar, cellular, or connective tissue in the organism, all through life. It has a restrictive and controlling function to prevent violent frictions and commotions in the viscera and the external frame. Faith in the unity of God is corrective of polytheistic anarchy, and is not incompatible with hierarchal degrees of authority under providential government. Parents are the subordinate providence of children; guardian angels protect adults; archangels govern angels; and all ranks of the creation are under the control of superiors, ordained and inspired by the Providence of the Eternal One Allfather.

Humanity is celestial and terrestrial in alternative and continuous states of individual and collective existence. In the alternating phases of metamorphic evolution, all the faculties of life are equally involved in physiological, pneumatological, psychological, and noological embryogenesis and sociogenesis, in ultramundane as well as in mundane origin, in heterogenetic incarnations and inspirations as well as in homœogenetic pro-creations and perpetuations. Mind is innate as well as instinct; new discoveries and inventions are as foreign to common experience as new forms of body are alien to those of inferior species. Heterogenesis is a necessary process of homœogenesis in both individual and collective metamorphosis and reproduction. It is the natural process of descent from higher to lower planes of life, in all worlds, balanced by an inverse process of resurrection in ascending from lower to higher planes of existence.

As nothing can be unknown to omniscience, mental genealogy in the evolution of human reason is merely a descent of that which pre-exists, from higher to lower planes of understanding; from ontological and celestial spheres of science, into terrestrial and experiential forms of mentality. That which is homœogenetic in its own plane, descends by heterogenetic processes of evolution into a lower plane of experience, to become in its turn, homœogenetic in its new home. And thus all forms of generation are hereditary, on the same plane of reproduction, and ultra-hereditary in supernal origin and genealogy.

BOOK IV.

THE WILL.

SPIRITUAL BIOLOGY.

THE emotions and the will have been distinguished from the senses and the intellect; the sensitivities of the body from cognitions of the understanding. Emotions and desires are as diverse as the organs and systems of the body, and may be analysed in the same fourfold aspects of anatomy, physiology, embryology, and genealogy.

PART I.—PASSIONAL ANATOMY.

CHAPTER I.—NAMES AND DEFINITIONS.

THE *passions* and desires of the *spirit* are more or less blended in common language with the *instincts* and propensities of the *soul*, and we must therefore define the meaning of words used in a technical sense. *Love* is a passion; the natural selection of food is an instinct; *ambition* is a passion; the natural selection of conditions in which to seek for food is an instinct, as we see in ducks and snipes compared with partridges and pheasants. *Friendship* is a passion; gregariousness an instinct, as we see in bees and other insects. Economic discipline or *thrift* is akin to ambition; acquisitive *courage* is germane to frankness or friendship; *devotion*, idolatry, and self-sacrifice are handmaids of love: and these are the passions and desires which prompt us to organize societies and families; not as insects do invariably by instinct, but as human beings in *progressively perfectible* forms of social community.

Besides these *organic* passions there are *relational* desires, to regulate the modes and conditions in which families and corporations, municipalities and nations, live together in freedom and progressive evolution. *Unity, community, liberty, order, progress*, and *immortality* are the objects of these relational desires; and as no special names have hitherto been given to these *faculties* of associative impulse, we give them the names of their respective aims in life: and we shall have to do the same in naming their sub-divisions.

It has been the fashion of late to give up all ideas of defining and naming "*faculties*" of the mind or spirit, and to describe psychological in parallel with physiological phenomena; but then, physiological functions imply anatomical organs or faculties, and so do psychological activities. We are nevertheless obliged to name spiritual faculties by their modes of action, just as in the body, the intestinal organs are described as a "digestive system," because their *functions* are digestive.

It may be asked, what we mean by the passions of *unity, community, liberty, order, progress*, and *immortality*. We mean spiritual yearnings for these things, just as in the organs of the body we mean physical cravings for pleasant food and free motion. Free motion of what? Of the whole body in search of what it wants, and more especially of the muscular system which is the main agent of locomotion. What do we mean by social *liberty* as a faculty and a function of the spirit? We mean the desire of social and personal freedom of thought and locomotion, unfettered by artificial restraints; not unlimited by natural laws and conditions of necessity.

In the metaphysical controversy of "liberty and necessity," natural *limits* of freedom are often confounded with artificial restraints, on the one hand; invariable laws of necessity, with blind *fatality*, on the other. Liberty can only mean free movements and modulations, within given natural limits, which limits cannot be overstepped.

A bird in the air is free to follow its natural instincts: a bird in a cage is not. A bird in the air, however, is not free from the laws of necessity, in the natural conditions of the country and the climate in which he is placed, nor from the laws of necessity which give him his instincts, whatever they may be, as an eagle or a vulture, a parrot or a crow, a turkey or a partridge, a swallow or a sparrow, a swan or a goose. Nor is a man free from the innate necessities of his vocation, whatever that may be in art, industry, science, or social activity. Still, any species of bird may be put in a cage, and any human vocation may be restrained by accidental conditions or artificial control, and the spirit yearning for liberty of action in its natural vocation, protests and rebels against unnatural restraints: not against the necessary laws of order and stability in nature.

By *unity* we mean society of which the individual forms a part, as a simple cell of any tissue forms a part of the whole body to which it belongs. An outcast, who belongs to no corporation, family, city, or nation, yearns for social unity of which he wants to form a part or be a member. We also wish to preserve the unity and integrality of personal existence. "Self-love and social are the same."

By *community* we mean mutuality of intercourse, equality of rights and duties, fraternity of social and religious brotherhood, in a community of which the individual is a member.

Progressive perfectibility is not desired for a life-time only, but for ever; and thence the desire for *immortality* in all worlds of existence, mundane and ultramundane is innate.

We need not discuss the question of belief or unbelief in immortality, since we merely note the passion or desire which is constant in the spirits of all men, in all ages. It is as definite and unmistakable as the love of liberty and progress, comfort and happiness, which crave for endless variety throughout eternity. We may use the words continuous existence, comfort, or happiness in lieu of immortality, for happiness is the real desire, without which we should not wish for immortality.

Besides organic and relational passions and desires classed in parallel with physical organs, to which they correspond in co-operative faculty and function, we have to note connective *conscience* in parallel with the connective mechanism and its regulative functions, organoleptic and organotaxic, analeptic and anataxic. *Taxis*, order; *lepsis*, incidence; *ana*, equal; *analeptic*, equally incident; *anataxic*, equally controlling order. These technical words need seldom be used.

Connective tissues *control* the order and degrees of motion in the organs; they are therefore *organotaxic* in function; the secretions of these tissues lubricate and *regulate* the mechanism of motion; they are then equally controlling or regulative in co-operation with connective tissues, and therefore *anataxic* in function.

External forces and conditions are *incident* upon the organism, and thence called *organoleptic*; while the food derived from external substances, and the blood derived from food, are *equally incident*, though internal conditions, and therefore *analeptic* in function.

These distinctions are connected with the factors of causation in organic nature.

Incident forces, such as light, heat, and the vibrations of gaseous, liquid, and solid substances, fall upon the

Differentiating peripheral organs of the body, such as the eye, the ear, the organs of taste, smell, &c., which are connected with

Conducting nerves from peripheral organs to convey different impressions of light from the eye, sounds from the ear, taste from the tongue and palate, smell from the nose, touch from the skin to the cerebro-spinal centres of sensation, in which *ganglionic centres* of nervous action reside the sensor and motor faculties of the *spiritual organism*, which react through motor nerves upon the external frame and outer world; and these reactive faculties, in correspondence with the organs of the body, are the passions and desires we have now to analyse and describe.

In subdividing the passions we distinguish different sets of faculties by their special forms and functions, and name them sometimes by one, and sometimes by the other. The respiratory and the urinatory series in the vascular system are named by their functions, while the circulatory series of vessels in the same system, are named from the tubular form of their structure. Air vessels, blood vessels, and water vessels, belong to one general system, but common usage admits a mixed system of terminology which is sufficiently definite (without being inconvenient) to be accepted by technical science; and in analysing the natural distinctions of faculties and functions of the spiritual organism, we need not be more particular with regard to terminology than we are in physical anatomy.

CHAPTER II.—SYSTEMATIC ANALYSIS.

The love of unity is one of the general passions of human beings in society, and the most definite aims of this faculty are, first the love of *personal* unity and integrality ; unity of all the co-operative organs of the body, instincts of the soul, faculties of the mind, and desires of the spirit, to secure physical health and comfort, sensational pleasure and delight, mental sanity and truth, moral purity and happiness ; in a word, self-preservation, or *mens sano in corpore sano.*

The second aim of this general passion is the love of social unity, or the *collective* unity of the species ; the unity of the family, the city, the nation, and of all the races of humanity as a collective being. The third aim of the passion is that of *co-ordinate* unity, or the unity of all the conditions of human life ; that is, of the three kingdoms of nature, any serious defect of unity and integrality in which would render human life uncomfortable, if not impossible. And beyond this degree of unity on earth, the *ultimate* unity of the globe is not less necessary and desirable than that of the three kingdoms on its surface. Hence we have *individual, collective, co-ordinate,* and *ultimate* degrees of unity in earthly life, without mentioning cosmic and amphimundane unity of all degrees, as necessities of human immortality, and natural desires of all intelligent human beings.

Personal unity, commonly called *selfishness,* is stronger in children and undeveloped individuals than the love of humanity, but still the martyrs of religion and patriotism in all ages, testify to the love of social unity, and poets ween that "self love and social are the same," in kind, at least, if not in degree.

Continuity of life is not less strongly desired than unity of personal, social, realmic, and cosmic existence, and hence it is that immortality is one of the most solid foundations of religion. It is a definite and persistent passion of the spirit.

The love of *liberty* is not less natural than that of unity and continuity; its aims are similar in regard to personal, social, realmic, and ultimate degrees of limitation and distinction. The individual wishes to be free, bodily, mentally, and morally; to live in a society which is free industrially, artistically, scientifically, socially, politically, and religiously. He also wishes freedom of conditions in the realms of nature, so that the technical subdivisions of all the passions are the same with regard to special aims and purposes to which their faculties and functions are respectively adapted.

The love of *order* in self-hood and social conditions is not less definite than that of liberty, and the love of *progress* is as irrepressible as that of liberty and order. Order without progress is intolerable to the partisans of liberty, and liberty without order is anarchical. The battles of progress are fought by these passions in a state of ignorance and blind selfishness, which are only held in check by a natural love of peace in all degrees of unity, liberty, and order. Where war and persecution exists between intolerant partisans of any sect or community, the enlightened lovers of peace stand aloof until conciliatory intervention becomes possible.

Besides the love of order as a peacemaker, there is the love of *community* and mutuality in all degrees of unity. These are defined in social community by the desires of *equality* of rights, *mutuality* of respect, *reciprocity* of duties, and the *brotherhood* or *fraternity* of the human race. There is of course a certain degree of orderly community and mutuality between all the co-operative organs and faculties of personal unity, all the individuals of collective humanity, all the realms of nature on our globe, and all worlds and systems of the universe. When all these passions or desires are realised and satisfied to some extent in this life, we have a fear of death which cuts them off, and we strongly yearn for their continuance in a future state of immortality. This then is also a primary and persistent passion of the spirit.

Love and devotion are definitely *conjugal*, *parental*, *filial*, *fraternal*, and *collateral* or consanguineous. *Ambition*, *enterprise*, and *honour* are natural distinctions of one general aim or passion; *economy*, *thrift*, *caution*, *secretiveness*, and *reserve* are modes of action and desire which come under the general denomination of *thrift* as a passion. Avarice and meanness, imprudence and presumption, are abusive forms of the same passion.

Love and devotion organise families and domestic society; *friendship* and *courage*, (in the chase of game, &c.) organise free co-operative corporations for acquisitive pursuits and recreative assemblages; while ambition and thrift organise hierarchal order and discipline, economy and thrift in corporations and associations of all kinds and degrees, local, national, international, and universal.

Free corporations are organised for certain acquisitive aims and pursuits, to obtain or procure, produce and preserve, distribute and consume more or less on a footing of mutual advantage.

Acquisitive courage is a necessary quality of industry to hunt and fish, entrap and ensnare wild beasts to procure food, and also to enter upon difficult or unpleasant work of any kind, bodily or mental. Good behaviour, *temperance*, and *conviviality* are necessary for social communion and co-operation; a sense of *duty* and *faithfulness* is necessary to co-operate with others for the common good; and mutual *confidence* and *generosity* are necessary in co-operative action of any kind. *Suspicion, distrust, idleness,* sullenness or unfriendliness, and *cowardice* of any kind, moral or physical, are sins against friendship and co-operative association, or communion.

The natural passions of friendship and co-operative association, with their opposites, may be thus defined.

H. Friendship and communion (antagonism and disunion).
U. Confidence (distrust).
O. Faithfulness (faithlessness).
Ω. Honesty (dishonesty).

The natural auxiliaries of these, with their opposites, are

H. Courage (cowardice); industry (idleness).
U. Temperance (intemperance).
O. Acquisitiveness (recklessness).
Ω. Generosity (niggardliness).

Ambition, enterprise, honour, are contrasted with lack of aspiration, enterprise, and dignity, or predacious cupidity, violence and vain-glory; thrift, prudence, savingness are contrasted with the vices contrary to these virtues.

Conjugal, parental, and fraternal love and devotion are contrasted with their opposite vices of promiscuity, infanticide, exposure, and bestiality.

The organic and relational desires being thus defined, we have now to notice the connective or unitary passions and desires of the human spirit. These are *conscience* and *conscientiousness,* but we must distinguish organoleptic from organotaxic factors in the spiritual as well as in the physical organism, and intermediate or analeptic and anataxic factors in both.

The word *organoleptic* is commonly used by physiologists to designate external influences which stimulate the body to act or react, such as cold or heat, &c.; and we use the word *organotaxis* to designate the connective tissues of the body such as the areolar, the adipous, and the glandular tissues which control and keep in order the movements of the organs of the body.

Conscience is organotaxic or regulative; *conscientiousness*, the result of conscience in action, is anataxic (equally regulative). Acquired habits and principles of morality imbibed by the spirit from social and religious conditions and teachings, are anataxic and analeptic factors, or controlling and regulative faculties of the spiritual organism. These distinctions are important, but the terminology may be neglected by those who take no interest in technical definitions.

Conscience is also personal, social, general, and universal, the aims of which are conscientiousness in modes of action, namely *self-preservation* and respect, *justice* between man and man, *benevolence* towards all creatures, and *veneration* for the Creator and Ruler of all nature. These virtues rule, or ought to rule, the moral actions of life, in a well-balanced organization, but their opposite vices are predominant in ignorant and immoral individuals and societies. Piety, benevolence, and justice are not perhaps as common as impiety, malevolence, and injustice; and self-preservation is not really as common as self-destruction in the true sense of the word, for many destroy the health of the body by excessive self-indulgence, and the health of the soul by similar excesses or neglect of moral culture.

We need not dilate on virtues and vices in the analysis of spiritual faculties and functions, but proceed at once to give a systematic outline of the spiritual organism in parallel with the physical. Showing the analogy between physiological and pneumatological modes of action. This is easily seen in a synoptic view.

PASSIONS OF SPIRITUAL ORGANISM.

Connective Conscience.

- Z. Religious Conditions.
  - H. *Spiritual Revelations. Bibles.*
  - U. Natural Revelations. Nature.
  - Ω. National churches and religions.
  - O. Family prayers and morality.
- Y. Religiosity.
  - H. *Inspirations and infestations.*
  - U. Adopted religion and politics.
  - Ω. Daily self-examinations.
  - O. Acquired habits of morality.
- X. Conscientiousness.
  - H. *Veneration, humility, prayer.*
  - U. Benevolence, charity, pity, forbearance.
  - Ω. Justice, equity, conscientiousness.
  - O. Self-respect, patience, fortitude.
- W. Conscience.
  - H. *Cosmic conscience.*
  - U. Realmic conscience.
  - Ω. Social conscience.
  - O. Self-conscience.

Organic Passions and Desires.

- VII. AMBITION.
  - H. *Hereditary rank.*
  - U. Aspiration, ambition.
  - O. Enterprise, perseverance.
  - Ω. Honour, disciplinary rectitude.
- 7. *Thrift.*
  - H. *Thrift, avarice.*
  - U. Moral sensitivity.
  - O. Active economy.
  - U. Secretiveness, prudence.
- VI. FRIENDSHIP.
  - H. *Friendship, candour.*
  - U. Confidence, trust.
  - O. Faithfulness.
  - Ω. Honesty.
- 6. *Courage.*
  - H. *Courage, physical, moral, social.*
  - U. Temperance, moderation.
  - O. Acquisitiveness, application.
  - Ω. Generosity, liberality.
- V. LOVE.
  - H. *Consanguineous ties.*
  - U. Fraternal love.
  - O. Conjugal love.
  - Ω. Parental love.
- 5. *Devotion.*
  - H. *Consanguineous devotion.*
  - U. Fraternal devotion.
  - O. Conjugal devotion.
  - Ω. Parental devotion.

Relational Passions and Desires.

IV. HAPPINESS.	H.	*Spiritual.*	*Ultramundane.*
	U.	Mental.	Resurrectional.
	∩.	Instinctual.	Incarnative.
	O.	Corporeal.	Mundane.
III. ORDER.	H.	*Religious.*	*Cosmic.*
	U.	Scientific.	Realmic.
	∩.	Artistic.	Social.
	O.	Industrial.	Personal.
2. *Liberty.*	H.	*Spiritual.*	*Cosmic.*
	U.	Mental.	Realmic.
	∩.	Instinctual.	Social.
	O.	Physical.	Personal.
II. PROGRESS.	H.	*Spiritual.*	*Amphimundane.*
	U.	Mental.	Ultramundane.
	∩.	Instinctual.	Lymbic.
	O.	Physical.	Mundane.
1. *Community.*	H.	*Brotherhood of mankind.*	
	U.	Reciprocity of duties.	
	∩.	Mutuality of respect.	
	O.	Equality of rights.	
I. UNITY.	H.	*Cosmic.*	*Ultimate.*
	U.	Realmic.	Co-ordinate.
	∩.	Social.	Collective.
	O.	Personal.	Individual.

CHAPTER III.—PHYSICAL AND MORAL PARALLELS.

It is evident that physiological states of the generative organs are coincident with psychological states of the passion of love; that relative states of activity and inactivity in the physical organs, and the spiritual faculties are in some cases coincident and parallel phenomena; and therefore it is not improbable that similar parallels of coincident states of excitement or inaction may characterise in various degrees all the organs and faculties of the body and the soul, at all times, under varying conditions.

Physical respiration and spiritual aspiration or *ambition;* incessant circulatory pulsations and persevering spiritual *enterprise;* renal depuration of the blood and the self-disciplinary rectitude of *honour*, seem to be parallel and analogous modes of action in the body and the spirit of a man. Growth in the body and *thrift* in the spirit; detective smell in the nose, and *cautious* feeling or moral sensitivity in the spirit; retention of urine in the bladder waiting for fitting opportunity of emission, and prudent reserve or *secretiveness* of feelings and emotions, until fitting opportunity for expression occurs, are analogous and parallel phenomena in physical and spiritual modes of action. Intestinal and lymphatic absorptions are functions in the body, analogous to the passion of active economy in the soul or spirit.

The excitement of hunger and thirst arouse procurative industry and *courage* in the spirit, allied to *destructive* instincts or acquisitive rage in the soul; common feelings of alimentary wants in a group of persons, lead to like pursuits to satisfy these wants, and these pursuits lead to friendly feelings amongst co-operative individuals; and thus acquisitive *courage* and co-operative *friendship* are coincident in the spirit with feelings of hunger and thirst in the body, which lead to co-operative action in the internal digestive organs and in the external frame and limbs of the body.

Thus the passions of *love*, *friendship*, *ambition*, in the spirit are analogous to physiological organs and functions, although we cannot always trace coincidence in their respective states of excitement and modes of vitality.

It may seem strange that we should place *frugality* of alimentiveness with *temperance* and moderation in the spirit, on the one hand, and fertilizing *evacuations* with noble *generosity* on the other; and both in connection with digestive functions and friendly relations. It may seem at first sight to be depreciative of the virtue of generosity, to form such a comparison. And yet a man or a woman cannot dispense with that which is absolutely necessary to their own existence, unless they give up life itself, and return the whole body to the earth from which it came; and although this may be in some cases the most sublime act of generosity, it is only giving up that which was acquired by labour from the soil to which it is given back, when no longer useful, and could not be taken into another world, where it is not required; just as daily eliminations from the body are returns of effete matter to the earth.

Constipation during the life of the body, is not healthy evacuation; nor is diarrhœa healthy, except as an occasional phenomenon, whereas active exercise and health, acquisitive industry and good appetites, imply daily eliminations of waste matter to fertilize the land from which good food is derived; and active social intercourse with strong sympathies for others, and affections drawn from them, imply generous liberations of surplus gains, to fertilize the world of sympathy, from which we derive all our social happiness.

A mother's *devotion* to her offspring is a noble affection. She gives her milk to her infant, not because it would be useless and even injurious to retain it in the breast, but because she loves the child, and is devoted to its life and welfare. The milk she gives is nevertheless a physiological evacuation of that which she herself could not retain without loss of health.

The father is not less devoted to his child than the mother, although he cannot suckle it as she does; and sentiments of generosity are as distinct from physiological functions, as those of paternal love and devotion to children. Pneumatological and physiological faculties and functions are nevertheless parallel phenomena in the life of individuals and societies.

What functions of the skin, the muscles, the bones and the nerves are coincident with the faculties and functions of the spirit?

The muscles are dynamic organs and cannot move without *liberty*; the bones are statical organs and levers, which cannot move without offering *resistance* or limited degrees of alternate oscillation, in a pre-determined *order;* and this order must be either practically easy and agreeable, or uneasy and disagreeable; concordant or discordant as the basis of orderly freedom in locomotion. And so with the correspondent faculties of the spirit. Vibratory modes of motion and progression in the body are either harmonious or inharmonious, and so are the relations of order, liberty, and progress in the soul.

The *skin* is a limitative system and so is the spiritual faculty of *unity*, which delights in the lines and limits of individual form and beauty; of collective, co-ordinate, and ultimate unity and integrality.

The senses of sight, touch, temperature, and gravitation are faculties of relativity in the collective physical community of the organs of the individual body, and so are all the faculties of relativity and mutuality in the complex community of humanity.

The nerves are telegraphic conductors of sensation and motor reaction, in small and large circles of communication and co-operation between peripheral organs and ganglionic centres of psychological communion or happiness; links between the immortal soul and the mortal body; between physical and spiritual modalities of life, in personal and social, mundane and ultramundane evolutions and relations.

Thus all the organs of the body, and the passions of the spirit are co-operative factors and functions of life and organization, involved in the complex unity of individual Being; not only physiological modes of action are simultaneously involved with psychological, but the various actions and reactions of the physical organs themselves are involved in simultaneous and alternating states and modes of co-operation during all the phases of healthy and happy growth and progressive evolution.

CHAPTER IV.—EMOTIONS AND VOLITIONS.

Emotions are states of feeling, analogous to sensations, not unfrequently accompanied by physiological excitements and secretions. There are proper names for the organs of sense, as well as for various sensations, but not for the perceptive faculties of intellect, the emotional faculties of the spirit, nor the cognitional faculties of the mind. Eyes, ears, nose, mouth, and palms are organs of sensation, the general names of which are sight, hearing, smell, taste, and touch; each special sense including numerous varieties, such as those which have reference to the sense of sight; for instance, darkness, light, colour, tint, sheen, transparency, radiation, reflection, refraction, and diffraction or dispersion, polarization, &c.

The emotions of the spirit are variously named from their effects, not as faculties in parallel with organs, nor as general and special definitions, but by words in common use, which designate the active faculties of emotion, by collateral relations, as if we were to designate the organs and the sense of sight, by such words as light and dark, colour and tint, radiation and refraction, calling the eye a refractive organ, and the sense of sight refractivity. Such a method is not analytically accurate and scientific, but it is descriptively convenient, and perhaps sufficient for all conversational and literary purposes.

Psychologists recognize that emotions are analogous to sensations, but say they cannot be classed with senses, "or with reference to the structure of the human frame."

That is so, because there have hitherto been no systematic parallels of faculty and function in the four primary modes of organic motion or vitality.

Our analysis differs somewhat from that of other psychologists, not only in general outline, but also in primary distinctions and in secondary or derivative denominations. Thus, in "Chambers' Information for the People," the description of the human mind includes five primary distinctions, subdivided in the following order :—

"I. SENSATIONS, APPETITES, INSTINCTS.—1st. Sensations of organic life, nutrition and secretion ; 2nd, sensations of the alimentary canal, hunger, thirst, &c. ; 3rd, special senses of taste, smell, touch, hearing, sense, sight.

"APPETITES allied to sensations, *but* involving other active circles (of nervous, sensor, and motor conduction), 1st, *cravings* for food, muscular activity, rest, sleep, light, &c. ; 2nd, the appetites of sex, &c.

"INSTINCTS.—1st, a large class of instincts are referable to the tendency of the system at large to accord or fall in with the state of any part. Rapid movements in the limbs produce like movements in the exclamations, looks, features, gestures, and even in the very thinking processes. 2nd, walking may be reckoned an instinctive action, although it takes a little practice to be perfect in it. 3rd, the most strongly-marked description of instincts are such as seem to proceed upon an innate knowledge of what is usually learnt by experience; as in the selection of food most suitable to the organism (of carnivorous, insectivorous, herbivorous, and omnivorous animals); or when an aquatic bird knows water by sight before it has ever been in it. The migrations of birds show the same characteristic of pre-ordained knowledge. The elaborate constructiveness of many animals, such as the bee, the beaver, and the nest-building birds, is still a higher stretch of instinctive or pre-ordained power.

"II. THE INTELLECT—arising, first, from sensations, appetites, and instincts; secondly, from the association of ideas. The laws of intellect properly so called (in the association of ideas) have been termed by psychologists—1st, the law of contiguity; 2nd, the law of similarity; 3rd, the law of compound association; 4th, the law of constructive association.

"III. The Emotions.—These are of various kinds, such as—

"1st. *Terror*; alarm, prudence, morality, bashfulness, shyness, ignorance, uncertainty, superstition, fear, dread.

"2nd. *Wonder*; surprise, astonishment.

"3rd. *Looking before and after*; past, future, or distant things, 'plot interest,' eagerness, expectation, pursuit of prey, betting, lottery, strategy, hope, anxiety, wish, sports, day-dreams, romance, &c.

"The emotions of sociability are: 1. tenderness, pity, compassion; 2. parental, filial, fraternal, conjugal love; 3. grief, sorrow, wounded affection; 4. rage, resentment, hostility; 5. warm heartedness, kindliness, geniality, benevolence; 6. veneration, reverence, worship; 7, admiration, delight; 8. esteem, respect, deference, and their opposites; contempt, disrespect, disregard; 9. emotions of the ludicrous, laughter, &c.; 10. humour, laughable and tender, good will, sympathy; 11. wit, without tenderness or sympathy (as in the works of Butler, Pope, Swift, Dryden, Ben Jonson, Voltaire); 12. emotions of similarity, 'luminous comparisons give delight;' 13. fitness and unfitness; 14. 'keeping,' or the opposite; 15. harmony or discord; 16. beauty or ugliness.

"IV. Activities.—1. *Desires*, cravings, longings, 'intellectual appetites,' &c.; avarice, ambition, curiosity, desire of self-cultivation; the satisfaction of desires, and their opposites; contentments, conflicts, disquietudes, unhappiness, anxiety. 2. *Habits* correspond to instincts, as desires to appetites; habits modify instincts by education; training, bodily movements, and continuous repetition of processes from artificial habits by the adhesive power of contiguity, and the confirmation or fixation of habitual motions. 3. *Repression of instinctual habits* or tendencies by self-command, under exciting stimulus; coolness, composure under irritating taunts, courage from resisting instinct of fear; promptitude, activity, politeness, graceful manner. 4. *Beliefs*, faith, trust, confidence to act, instinctive in nature, in science, &c. 5. *Imitation*, sympathy. 6. *The will*, noblest of impulses based on intelligence; reason against instinctive and passionate impulses.

"V. Complex Faculties and Susceptibilities.—Observation, memory, abstraction, reason, judgment, imagination, conscience, genius, &c."

Such is the summary of instincts, intellect, emotions, activities, and complex faculties, in popular descriptions. The *activities*, or active powers of the mind, as here defined, are faculties analogous to the activities of cells and tissues, organs and systems in the body. All organs feel and act, or they would not be living sensitivities; all faculties feel and act, or they would not be living modes of thought and emotion. *Sensation* in a minute cell is a feeling, and *absorption* is an activity. Sensations and appetites in the whole organism are feelings; volitions and reflections are activities. Emotions and volitions affect the minutest cells as well as the whole system of bodily and mental faculties.

We need not refer all the emotions and volitions to their respective origins in external influences and internal faculties, but a few words will show that *terror*, tenderness, pity, grief, and sorrow proceed from the active faculties of self-conscience (self-preservation), social conscience (benevolence), social sympathy, and self sympathy. Terror is an extreme degree of the fear of losing one's own life. Grief is an extreme degree of regret for self-privation in losing a much-prized treasure of companionship or wealth. Tenderness is an emotion of love, and devotion to loved ones; pity is an emotion of benevolence, or fellow feeling for others who are suffering (animals or human beings); sorrow for the loss of a dear friend or relative, a favourite pet, or a much-prized inanimate object of possession, is an emotion of privation in self-belongings, and is referable to self conscience more than to social or general, or reverential conscience. Self-preservation and sociability are, therefore, two of the main sources of various kinds, differing in degrees of intensity from pleasant to unpleasant, or from extreme depression to exquisite delight.

Excessive degrees of emotion, long continued, are dangerous to health of body and of mind, and those who minister to a craving for sensational excitements are responsible, in many instances, for more than they suppose. Sensational novels may be ingenious and harmless, or even useful and instructive, like those of Dickens and some other writers; or they may be reeking with descriptions of abomination in all shapes, deeply injurious to inexperienced youth, such as the works of many French and English writers of the present age. Sensational preaching may also be useful or injurious, in keeping with the modes of spicing the wholesome spiritual food of the Word, or distilling poisonous errors from the simple truth. Not a few persons have been led into sin and crime by reading bad novels; or demented by theologians who psychologize their congregations by vehement denunciations of sin, and the consequent punishment of sinners in "eternal torments;" thus impressing weak minds with terror and despair of possible salvation in a future world. Others are infected with a mania for converting sinners to sectarian doctrines and superstitions by fanatical warnings and denunciations, appealing more to ignorance, fear, and dread, than to common sense and rational understanding. Instead of showing that hell is an eternal fire for the purification of souls through discipline and suffering (just as hospitals and prisons in this world are permanent places for the cure of physical and moral diseases by surgical, medicinal, and moral or disciplinary modes of treatment, where there is "weeping and wailing, and gnashing of teeth," under painful but necessary forms of treatment for the benefit of the patients, by benevolent nurses and warders, surgeons, and physicians); these maniacs endeavour to impress upon the mind, not only that hell is an eternal institution for punishment alone (and not for purification), but that sinners are absolutely incurable, and can never leave the prison or the hospital, to lead a useful life in any heavenly society. "As the tree falls so it lies," is a text from which poisonous error is distilled, by supposing it implies that progress and regeneration are impossible in a future state, instead of stating simply as it does, that, as the soul leaves this world, so it enters the spiritual world, in a regenerate or an unregenerate state; and that what has not been accomplished by obedience to moral law, through discipline and tribulation, will have to be accomplished in a future world, through pain and suffering, in a place "where there will be weeping and wailing and gnashing of teeth." A prison from which there will be no release until debts incurred have been paid, even to the utmost farthing. When a mother warns her child to beware of danger and consequent pain, she does not imply that accidents are always fatal, or that burns and bruises, colds and coughs, cannot be cured by benevolent nurses and physicians, but tells it beforehand, in merciful warnings, of the necessary pains and troubles which follow disobedience and folly, wilfulness, and want of care.

Gin palaces send many victims to hospitals and asylums, and spiritual distilleries of poison from the Divine Word of truth send not a few to lunatic asylums, or leave them to roam about the world in a demented state of what is deemed harmless fanaticism and superstition. It is difficult, in a free country, to meddle with distilleries of any kind, or with the liberty of the subject in seeking for excitement, by imbibing poisonous waters distilled from pure natural and spiritual food, provided for mankind, but we may all protest against abuses, and point out where danger threatens the unwary.

PART II.—SPIRITUAL CHARACTERISTICS.

A complete description of the biological characteristics of the emotional organism of man, would be very elaborate and minute; very long and somewhat tedious to most readers; we refer, therefore, to the physiological functions and relations of the body, as a type of what might have been more fully explained with regard to psychological and sociological functions and relations.

There are four general aspects of SPIRITUAL ORGANIC UNITY and COMPLEXITY; namely, the *congenital* aspect in which human nature is compared with animal nature, on the one hand, and sound moral nature with undeveloped conscience, on the other; the *evolutive* aspect in which infantile innocency is compared with adult development in morality; the *functional* aspect in which social, political, and religious orders of associative unity are described: the *relational* aspect in which social, political, and religious *vocations* and *aptitudes* are discriminated. As all these will be dealt with in sociology we need not dwell upon them long, at present.

There are four aspects also in the analysis of spiritual forms and features or TYPES OF MORAL CHARACTER; namely, the *congenital type* of spiritual character, according to race and religion, such as Orientals and Europeans, Africans and Americans; and in Europe alone, English, French, German, Scandinavian, Russian, Italians, Swiss, Spaniards, and Portuguese; all differing, to some extent, hereditarily, in morals and religion, social, political, and unitary, habits and feelings, sympathies and antipathies, laws and institutions; the *evolutive* aspect of sympathies and antipathies peculiar to infancy, youth, virility, maturity, and declining age, in all these, races and religions have some characteristic features worthy of attention: the *functional* aspects of moral and spiritual sympathy and antipathy between different races and religions, callings and professions, sects and parties, physical complexions and conformations, sexes, ages, tastes, and propensities, are not to be overlooked in a systematic analysis: the *relational spheres* of different professions (industrial, artistic, scientific and social), are primary characteristics of the spiritual organism to be duly recognized in biological analysis, as elements of associative unity or sociology.

The natural *sympathies* and *antipathies* of the spirit are the factors of social attraction and repulsion, (or associative *gravitation*,) which cause individuals and families, vocations and corporations, classes and races to form distinct groups and series, sects and parties in a nation; to revolve at *tolerable* distances from each other and from their common centre of connective unity, as satellites revolve, at measured distances, round planets, and these again around the sun: not to mention moonless planets, coregraphic asteroids, and innumerable meteorites shooting in all directions through the same social solar system.

The *temper* of the spirit under trials of disrespect and dishonesty; the *buoyancy* of the spirit under trials of persecution, misfortune, and affliction are characteristic of dynamic energy and equanimity, which vary greatly in degrees of strength and elasticity, in different individuals. Some are easily chafed by injustice, rudeness, arrogance, while others treat such modes of behaviour with the patience and forbearance requisite; some are easily borne down by misfortune and affliction, while others bear up against ill-luck, and succeed eventually by dint of fortitude and persevering energy. Personal liberty and independency have many trials to submit to in this world; a long apprenticeship is often necessary to learn the lesson of keeping an even temper and good heart, under all manner of ill-luck and injustice, which fall to the lot of mortals in this world.

Strong spiritual bone and muscle enable individuals to bear heavy burdens a long time, or to throw off with ease the shackles that would bind them, while weaker frames are reduced to helpless despair by less heavy trials and afflictions.

Resistance to temptation, with *firmness* of moral character, are also spiritual characteristics of great importance, in a strong will, analogous to a strong build of body which is able to resist the foe. The *moral order* of the spiritual community of faculties in the organism is preserved by spiritual firmness and resistance to sensual temptations and infestations. The bones are weak in children, but they gain strength with age in healthy growth; moral firmness to resist provocations and temptations of all sorts is feeble in youth, but gains solidity and strength with riper years, where moral rickets do not hinder natural development. Slight frames are often strong where they are healthy, and giant bulks are weak, where scrofulous taints have been inherited; and so it may be with the spiritual organism as well as with the physical. Hereditary taints of body and spirit may, however, and no doubt will, die out in time. This kind of firmness differs from that of justice and strong conscientiousness rightly located in the coronal region, by phrenologists (near self-esteem), as the bony skeleton differs in the body from fatty plumpness and firmness of the tissues under the skin. One belongs to moral strength of character; the other to regulative will and consistency of conduct. One is analogous to instinctual 'causality'; the other to consistent and persistent tact and judgment, in such degrees of moral strength as the individual may possess. A cat has the same persistent instinct and fixity of will as a lion, but not as much fearless strength of will and courage, supported by physical force to match. Small minds may be obstinate without great strength of will and persevering determination. Great minds never flag.

Musical, linguistic, dramatic, and symbolical means of emotional expression are *functionally* more richly developed in human society than in animal gregations. The means of communication and of locomotion are more limited in brutes than in mankind, for although birds can fly in the air and warble songs of delight to their mates, man will, no doubt, eventually be able to navigate the air more swiftly than a bird can fly, as he can already run a locomotive faster than a horse, and chant glees of rapture more exquisitely than the birds can sing. Animals remain stationary also in their means of locomotion and emotional communication, by language, music, and dramatics, while mankind *progress* from age to age in all the arts of emotional expression, with *rapid* telegraphic communication from one spirit to another in this world and another. Congenitally, functionally, evolutively, and finally, man is endowed with the means of emotional communication and bodily locomotion more richly than any animal: and this is one of the most remarkable characteristics of mankind.

The *concords* and *discords* of the spirit are dramatic phenomena of social life and personal relations. Peace and happiness, war and misery, in different nations and classes, professions and callings, sexes and ages, interests and feelings, are important characteristics of the human spirit in the pilgrimage of life, and the ever varying vicissitudes of social, political, and religious evolution.

As the nerves are media of communication between the external conditions and the internal forces of life, in the body, so the spiritual faculties of amphibiety are media of communication between mundane and ultramundane worlds of existence. The physical nervous system leads us into the mysteries of bicorporeity; the spiritual nervous system leads us into the mysteries of amphibiety. What is the destiny of man in this natural world? What is the nature of the world to which the immortal spirit must return after death? What are the *subjective* sensations of the soul in dreams, contrasted with the *objective* sensations in the waking state? What are ghost stories and spiritual communications? What are angels' visits and prophetic revelations of social evolution in this world and the next? Thirst for knowledge and experience beyond actual realities is one of the main characteristics of the human spirit of progressive evolution and prospective happiness.

Animals have no such longings. They remain in a manner collectively stationary in emotional and instinctual modes of evolution. Mankind wishes to progress in health and happiness, morality and science, not only individually now, but collectively now and ever onwards; not only in this world, but in all future states throughout eternity. Human *depths* of spiritual-reach into futurity transcend those of animal depths of emotional aspiration; human *modalities* of trance-vision and communication with disembodied spirits and angels transcend those of mere animal hibernation. We only note these facts here to indicate one of the chief characteristic functions of the amphibious spirit of immortality in human nature.

The main characteristics of love are those of *domestic association* for the perpetuation of the species.

The *congenital* characteristics of the spirit of love between the *sexes* are just as definite and distinct as the contrasted conformations of the body. The *functional* characteristics of the spirit run parallel also with those of the physical organisms and their family relations. The *evolutions* of family affection (filial, fraternal, congugal, parental, and collateral) keep pace with those of infancy, youth, virility, maturity, and senility; and *relational* consanguinities run parallel with the feelings of collateral relationship in families.

Some *homes* are more complete and happy than others, according to the morals of the parents, and the training of the children; the progress of society is greatly promoted by the moral excellence of domestic life. Where mothers have to struggle alone, without the active and watchful co-operation of their husbands, the children suffer; and where mothers fail in their parental duties the result may be still worse. Domestic morality and immorality are therefore most important characteristics of the spirit in both sexes, and in all the family relations of parents and children, brothers and sisters, uncles and aunts, nephews and nieces—in all the consanguineous and collateral affections of the spirit.

Connubial dispositions differ amongst human beings in parallel with those of animals, some being of a constant and faithful turn of mind, like doves and foxes, while others are given to polygamy and promiscuity, like dogs and pheasants. Some parents love their children and provide for them abundantly as long as necessary, like watchful birds, while others, like cuckoos, abandon them heartlessly to foster parents, or expose them, like reptiles, to the chances of lucky or unlucky external conditions. Modes of *marriage* differ also in different races and nations, not to mention different sects and classes of the same community; and this again in parallel with animal habits and propensities. In heathen nations some men have several wives, some only one; some women have one husband only, others more paramours than one. All these characteristic dispositions of the spirit, with the consequent modes of marriage, tell upon the progress and prosperity of a national community, by the elevation or the depression of moral and industrial activity.

Man, however, is progressive, and though he may incline to animality a while, he may improve his spirit, and become eventually manly in domestic life and pure morality.

The chief characteristics of friendship are those of *co-operative association* for the *acquisition* of treasures of some kind, physical, spiritual, artistic, or scientific, and the *enjoyment* of these treasures in mutuality or friendly community.

Different tastes and pursuits in life send spirits in different directions; similar tastes and pursuits bring them together. The ends of life being industrial, social, artistic, and scientific, these pursuits attract natural dispositions in special directions and friendly co-operation; and natural acquisitive dispositions are as definite in the spirit, as natural alimentary conformations in the body. Just as herbivorous animals of the same species herd together to pasture in the fields, and some carnivorous species hunt together in the forest, so human beings congregate in friendly association to pursue like tastes and pleasures in common, not only in adult life, but in earliest infancy and in declining age.

Co-operative morality, therefore, is of enduring importance; honesty and dishonesty, faithfulness and unfaithfulness, confidence and distrust, truthfulness and untruthfulness, generosity and meanness, are not matters of indifference to the well-being of society.

As physiological characteristics of special alimentary conformations, constitutions, appetences, and procurative modes of action, differ in carnivorous, herbivorous, and omnivorous animals, so moral or sociological characteristics differ in special acquisitive characters, dispositions, avidities, and acquisitive modes of action; and just as herbivorous animals are mostly gregarious and social, while carnivorous animals are oftener solitary and unsocial in pursuit of prey, so human beings of a rapacious disposition are often solitary and unsocial in pursuit of gain, while those of moderate avidity in seeking for sufficiency, are most social and friendly in co-operative industry. Thieves and robbers, murderers and defrauders love darkness better than light, because their ways are evil, and they wish to gain much and rapidly by dishonest means. Owls and panthers prowl by night to seize their victims unobserved. Military heroes, in barbaric nations, seek for conquest and plunder by stratagem and carnage in open day, as eagles and lions watch and pursue their victims whenever they are hungry. Some animals are greedy and violent, while others are temperate and peaceful; some acquisitive appetites in mankind are greedy and violent, while others are moderate and easily satisfied; these diversities of intensity in the acquisitive dispositions of human beings are natural endowments for different vocations in productive industry, adapted to the accumulation of wealth for the good of society. When not perverted, all kinds of activity are organized in associative unity, with just laws of participation in the produce of co-operative labour and concerted action; honours and emoluments being awarded in proportion to talents and perseverance in each rank and class, corporation or association of the general community. But where violent avidity with courage has no opportunity of gaining wealth and distinction by legitimate means, it is apt to become impatient; and where ignorance is coupled with such violent avidity, crimes and misdemeanours are the common consequences. Co-operative association, with due regard to the rights of capital and labour, in every branch of industry, and sufficient education for every class of society, seem to be the only remedies for crimes and vices of every description. Cats and tigers, small thieves and great, have exceptional vocations in the world, until human brotherhood has replenished the earth and gained dominion over every creature, and subdued all kinds of animality.

Co-operative modes of action in pursuit of like ends and uses, treasures and enjoyments, vary in accordance with *congenital* differences of *acquisitive disposition;* differences of *age and sex*, in tastes and natural vocations; *functional modes* of the division of labour; and *relational modes* and degrees of activity and courage. Some men of little taste are lazy, while others are industrious; some are courageous in battle and in strife with difficulties, others cowardly; some are persevering in their acquisitive dispositions, while others are fitful and unsteady; all these various characteristics of acquisitive and co-operative faculties and functions have an influence on the friendly or unfriendly relations of those who are engaged in the same special corporations and pursuits of interest or pleasure.

Nothing can ever satisfy these various dispositions, but habitual occupations and associations in accordance with natural endowments, and the best interests of the community; and until society is better organized for the general education and useful occupation of all classes, murder and violence, theft and fraud will be the natural result of violent acquisitive dispositions in certain individuals whose courage and cunning might be very useful if properly directed. Not that we suppose perversions and insanities of body, soul, mind, and spirit will ever be entirely eradicated from the race, but social and individual health may be improved incessantly by the progressive evolution of society from imperfect, ignorant, and greedy, to enlightened and relatively perfect phases of development.

The main characteristics of ambition are those of authority, in hierarchal degrees of associative unity. *Love* organizes families, *friendship* organizes corporations, but *ambition* organizes communities and nations, and establishes hierarchal gradations of functions to economise forces by the division of labour, and multiply the powers of elementary factors by concentration.

The spirit of social gravitation organizes and arranges industrial corporations and pursuits, artistic corporations and pursuits, scientific corporations and pursuits in all degrees ; social, political, and religious corporations and authorities in all degrees, so as to ensure the utmost liberty of vocation for each and all in distinct spheres of action, or different orbits of revolution, with the greatest economy of forces in producing definite results. This at least is what it ought to do, and will eventually succeed in doing. *Congenital* aspirations of ambition are dominant characteristics of the spiritual man in every vocation. One man's natural bent is industrial mainly, another's social, a third one's is artistic, and a fourth's scientific ; and whatever the vocation be, the ambition and capacity in that vocation will be of a certain order and capacity, as an element of associative unity and hierarchal rank. Soldiers, officers, commanders, and rulers are the constituent elements of any army and its governors. Comparing these with geometrical relations, we may place the soldiers in a very large circle, the commander-in-chief in the centre, the officers in radial lines from the centre to a small inner circle, from this again more numerously in a wider circle until we come to non-commissioned officers in a larger circle near to the external ring in which the common soldiers are all placed. The governors outside the ring to control the whole army, send it out or keep it at home, and dictate war or peace, work or no work, for the whole military body and its commissariat. All the capacities of ambition belong, therefore, to one or other of these peripheral, medial, central, or tangential ranks; that is to say, the spirit will be capable of central command, or of subordinate direction, or of willing and intelligent disciplinary obedience to superiors, as soldiers to their officers, and these again to the chief, who is himself under the control of the government and people by whom he is entrusted with command. Or again, as musicians in an orchestra willingly obey the director of the band, who is himself obliged to follow faithfully the score of the composer. Unwilling obedience and unskilful direction are merely discords of this passion which do not alter the general definition.

Ambitious temperaments differ, just as physical temperaments differ, in accordance with active or slow degrees of respiration and circulation in one case, active or slow degrees of aspiration and social activity in the other. And just as a man is physiologically sanguine or lymphatic from birth, so is he sociologically energetic or apathetic. Spiritual conformations, dispositions, and temperaments run parallel with physical conformations, appetencies, and temperaments, not always equally developed in the same person, but in accordance with the dominant rank and vocation; which may be either of high or low degree of hierarchal aptitude, in any vocation—industrial, artistic, social, political, or scientific.

The amount of work Napoleon the First did with his brain would kill less powerful spirits of military and political ambition. The work Sir Isaac Newton did far exceeds the powers of concentration in ordinary minds, who may aspire to become first wranglers at Cambridge. The powers of observation, attention, concentration, and perseverance in a Michael Angelo, far exceed those of inferior artists; and not less remarkable must have been the working powers of many bankers, merchants, contractors, and manufacturers who have made colossal fortunes by their own efforts, with little or no help from parents, in a single lifetime, or in less than forty years of ceaseless toil and concentrated thought.

Thrift is a characteristic of economy in the accumulative growth of wealth, distinct from that of acquisitive avidity in the production of wealth, and may lead to avarice and fraud, just as violent greed may lead to theft and murder. Some men work hard to gain money, but care not to save, while others, less able to gain money, are constitutionally economical, or avaricious.

Fluctuations of fortune are about as common as fluctuations of health in the body, and *tidal periods* of fluctuation in political popularity, almost as regular as the "ins and outs" of parliamentary parties in authority and in opposition. These questions will be dealt with again in collective biology, so that we may pass them with slight notice here.

Evolutive phases of ambition vary in infancy, youth, virility, maturity, and decline. *Functional modes* of action differ in artistic, scientific, industrial, social, political, and religious corporations; in the army and the navy, compared with a manufacturing establishment; in domestic authority, compared with municipal and national. *Fluctuations* of office and electoral investments with authority are relational characteristics of ambition, which vary in many ways; and alternations from one state of public opinion to another, are sometimes heart-burning characteristics of private and public ambition and desire.

Military heroes have generally been the founders of dynasties and nations; the history of the world is mainly a history of battles and conquests, revolutions and mutations, in which the ambitious temperaments of individuals and races have been the ever-surging cause of war and national disaster. Political and ecclesiastical intrigues may be traced to the same ambitious rivalries, under pretence of plausible reasons for securing public interests against supposed enemies, or defending "orthodox" creeds against supposed heresy. As society improves, ambitious passions will have more noble aims and aspirations to occupy their restless spirit, and promote public good instead of ruinous wars and depredations.

Hierarchal modes of election and selection are subject to various customs and usages. Some places of authority are hereditary, others are conferred by selection on the part of superiors, while many are conferred by inferiors, who elect their own commanding or administrative officers. *Tidal periods* of election are regulated in accordance with general interests or convenience, monthly, or at longer intervals. *Functional degrees* of hierarchy are central, medial, peripheral or tangential, as we have seen; evolutive modes and degrees of ambition differ amongst children, youths, adults, middle-aged people, and superannuated veterans. *Hierarchal temperaments* are comparatively feeble in those who never rise above the ranks; medium in those who attain to subordinate grades of promotion; strong in those who attain to high command; and strongest in those who are able to control the movements and operations of armies and whole nations, not as ministers and directors only, but as legislators and law-givers of industry, art, science, and social organization. These are by far the most indomitable temperaments of ambition, and have generally to prove their force of character by suffering life-long privations to accomplish their social mission.

The moral impress of the spirit is remarkable, just as the physical impress is remarkable. If a man is born blind and deaf, or mutilate, without arms or legs, he remains a cripple throughout life ; and if a man be born spiritually blind or deaf, without faculties of conscience for spiritual work and progression, he remains a moral cripple through life. How many criminals and paupers are born social cripples ? animals in human shape.

If not born cripples, both the body and the spirit are born weak, and liable to numerous diseases. Physical and moral infections are very prevalent in all countries and at all seasons of the year. The *congenital* impress of the spirit, therefore, may be defective ; the *evolutive* impress of moral education may be defective ; the *functional* activity of conscience in well-born and well-educated persons may be sluggish or deranged by epidemic prejudices and moral fashions ; or it may be naturally sterile and indifferent to moral duties.

The following scrap of statistics will give an idea of congenital defects of organization in individuals of different nations, for none but spiritual monsters we think commit murder ; although defective education and bad spiritual food may cause moral degradation, as defective nutrition from bad and insufficient food causes physical degeneration of a race.

"CURIOUS STATISTICS.—The *Neue Freie Presse* publishes the following curious statistics .—In England the proportion of murderers to the whole population is one in 675,000 ; in Holland, one in 163,000; in the North-German Bund, one in 100,000 ; in Austria, one in 77,000; in Spain, one in 4,000 ; and in the Papal States, one in 750.

The moral idiosyncrasy, or humour of the spirit may be sociable or unsociable, dignified or undignified in general *habits and bearing ;* affectionate in youth and heartless in old age; or loving throughout life; or the reverse; general and indiscriminate in its affections, or reserved and select; reverent in spirit, or profane; humble and peaceful, or proud and self-reliant, saturnic or mercurial, hopeful or misanthropical; social atmosphere may be sunny or cloudy, bracing or relaxing; so that spiritual habits and conditions differ just as physical climates differ, and very often in strict correspondence with external climate and internal states of health.

There is a moral as well as physical *diathesis;* a moral growth and development in *health and in disease,* as well as a physical; moral purgations and *repentances,* as well as physical medications and reforms; moral, religious, and social *prejudices* and infectious diseases of the spirit, as well as infections and infestations of the body.

The moral conditions and destiny of the spirit are not only terrestrial and local, but dependent on the social and religious organization of the family and race to which it belongs, and on the degree of progress realised by that race in the evolution of historic ages. All this again depends upon the relations of that race and religion with the spiritual world of Providence and divine revelations. Jews, Christians, and Mahomedans, Hindoos, Chinese, and American Indians have not the same religious light vouchsafed to them; not the same relations with the spiritual world; not the same moral, social, and religious destiny on earth in the present phase of humanitary evolution.

These characteristics of the spirit are important factors of collective biology or sociology.

PART III.—PNEUMATOGENESIS.

CHAPTER I.—EVOLUTION OF THE SPIRIT.

IT is commonly supposed that the human soul is a perfect "blank" at birth; but this is a superficial view of the fact. All the organs of the mortal body are *derived* from uterine supplies of blood; they are *formed*, nevertheless, by the physiological *sensitivities* of the fœtus. The body is thus, more or less, completely formed at birth, in a feeble and comparatively helpless state of spontaneity, and so are the soul, the spirit, and the mind, which are only diverse modes of vitality in one biological unit.

We see the body in its infant state of helpless completeness, but we do not see the faculties of mind or conscience in their incipient unity, until they are strong enough to show themselves in acts of volition. We see that instinct is innate in the chick before it leaves the shell in which it has been hatched, and that, in all types of animals, it grows to fixed limits and no further, in accordance with the type in which it is innate. From this alone we might infer that reason and conscience are innate at birth, in the only type of organism in which they ever become manifest in adult life.

We cannot see the instinct of a blind puppy as soon as it is whelped, but we know that it is there, and no amount of suckling by a cat, away from animals of its own kind, would cause it to become a feline instinct in the body of a dog; nor would the human infant suckled by an ape ever become a monkey.

Feebly conscious of external experiences during lactational infancy, it only becomes fully conscious of a portion of such experiences in adult life, and then only while awake, relapsing nightly into objective unconsciousness; though dreamily conscious during sleep, to wake up suddenly, as if from non-existence to existence.

The formation of character by discipline and education can only develop that which is innate though perfectible in mankind, just as in animals which are not progressive in their instincts.

The evolution of individual spirits, then, keeps pace with that of the race, class, and nationality in which they are born and educated, and will be more or less influenced by the virtues and the vices of the community in which they live, and the society which they frequent.

CHAPTER II.—VIRTUES AND VICES.

WHAT are virtues and vices, crimes and misdemeanours, infirmities of temper, and other imperfections of the spirit?

Sins against property and person, morals and manners, are amenable, in some cases, to courts of justice, while many physiological, industrial, commercial, moral and mental, religious and political vices are left to the reprobation of public opinion, as the only check on their baneful influence.

Intemperance of all kinds injures the health of individuals, fills hospitals and asylums, refuges and union workhouses, with its victims who are more pitied than blamed, at the expense of the community. Crimes and misdemeanours of all kinds, injurious to the moral health of individuals, fill jails and *bagnios* with victims, who are more blamed than pitied, at the expense of the outraged public.

What are the main causes of vice and crime? Ignorance and greed, poverty and violence, intemperance and intolerance are the roots of evil.

Who are the most responsible for all these vices? infants or adults? — individuals or classes?—families or professions? — churches or states?—subjects or rulers?

It is not easy to answer these questions, put in such a form. All are more or less responsible, and we can only infer that all may be improved by the progress of individuals in families and professions, classes and nations, as the race advances from a rudimental state to a more comely phase of existence in the metamorphic evolution of terrestrial humanity, under the guidance of celestial wisdom. Individuals are more or less ignorant and greedy, intemperate and intolerant, even where they are neither poor nor violent; and so are families and corporations, classes and races, churches and states; war and conflict in one shape or another, varying in degrees of intensity, from spiteful animosity and predatory violence or cunning, to individual homicide and wholesale murder, are the natural consequences of these awful vices, generated by ignorance and greed, intemperance and intolerance, not to be eradicated by magic of any kind, (nor by the railing of "saints" against "sinners"), but effaced by slow degrees of sociogenetic evolution, in successive and apparently heterogenetic incarnations of improved ultramundane spirits in the collective body of terrestrial humanity. Many of those who are now deemed virtuous may have been vicious in a previous existence somewhere else, and those who are now vicious here, may possibly become virtuous hereafter, if hospitals and prisons for the purification of souls and bodies in another world are permanent institutions as they are in this.

But why hospitals and prisons in any world? Why should there be sin and suffering at all? Why indeed! Why should life and organization in individuals and societies commence in rudimental imperfection and progress by metamorphic evolution to relative degrees of perfection? The facts are there, and the laws which govern them belong to absolute perfection. Human reason must learn to recognize and understand these laws.

Some minds may shudder at the thought of having ever been ignorant and greedy, vicious or intemperate, in any former state of existence, as they would feel humiliated by a very humble or depraved ancestry on earth; and yet, the recognized mother of the whole human race was convicted of disobedience, in taking that which did not belong to her, and inducing her husband to become a receiver of stolen goods; both were condemned for the crime, transported for life to a foreign land, and doomed to forced labour all their lives, they and their posterity, to earn their bread by the sweat of their brow, until the end of time, in this convict colony of probational discipline. Who will venture to deny this origin, or be proud of it?

Ignorance and greed were the original state of mankind, and disobedience the original sin against divine law and wisdom; and these sources of vice and sinfulness seem to be as rife in the present generation as they were in primitive humanity. Where shall we find individuals or families, corporations or classes, races or nations, who are not ignorant and greedy? How much better than simple individuals are families and corporations, churches and states, with regard to the vices of ignorance and greed, intemperance and intolerance, however they may mask their sins by strategy and cunning, policy, intrigue, and state necessity?

Where is the necessity for punishing the results of ignorance and greed in one case and not in another? Useful work is a necessity for all, and greed which renders men and women useful and industrious is rewarded, while that which renders them idle and predacious is punished, not uniformly by human laws, but surely by natural results. Everybody is doomed by fate to labour for a living, and those who labour usefully are rewarded in proportion to their usefulness, while those who shirk their duties will be punished, sooner or later, for injuring themselves and their neighbours. Trying conditions of experience are the school of discipline for mankind.

All classes may be discontented with their lot in this world, and probably one class is quite as happy or unhappy as another, though not as wealthy or as highly educated; for Providence overlooks all, and distributes favours quite impartially, as well as troubles and anxieties. How often do we see poor victims of disease, intemperance, or deformity in the higher classes of society, while robust health, good sense, and temperance bless the lot of some of the hardworking poor? Anxieties and responsibilities weigh more heavily on the rich than on the poor in many cases, though not in all. One class may be as happy as another with equal health and temperate habits, and not less miserable in disease and dissipation, vice and immorality, though one spends pounds in reckless self-indulgence, where the other has but pence to squander daily.

Dugald Stewart observes, that—

> "As there is no situation so prosperous as to exclude the torments of malice, cowardice, and remorse; so there is none so adverse as to withhold the enjoyments of a benevolent, resolute, and upright heart."

Ignorance and greed being the roots of vice and violence in all classes, education and temperance are the best correctives of such evils; hospitals and prisons are but palliatives, which may or may not cure the evils of intemperance and vice, disease and crime; it says little for the schools and churches of a nation, where hospitals and prisons, refuges and lunatic asylums are crowded with victims who are increasing in numbers rather than diminishing.

Health is a real blessing for those who have sense enough to use it temperately; and so is wealth, to those who are wise; but either health or wealth may become a curse to those who abuse the gifts of Providence. Sickness and privation, trials and tribulations, are also blessings, if we could only learn to understand the laws of Providential discipline for the progressive perfectibility of mankind.

CHAPTER III.—RIGHT AND WRONG.

The words virtue and vice denote whatever conduct is deemed morally or practically good or bad for individuals and for society: the words right and wrong denote the rationale of that which is deemed good or bad by the "moral sense" of mankind. The "common sense" of intellect and the "moral sense" of conscience are thus placed in parallel as factors of human faith and belief, derived from the evidence of the senses and the feelings of conscience. By the evidence of the senses men believe that the sun rises in the morning and sets in the evening, but the verifications of science alter this belief, by showing that the earth rotates upon its axis, while the sun is relatively still. By the natural feelings of the conscience or the "moral sense," men deem *evil* whatever is unpleasant or apparently injurious to themselves and to society, as at present constituted in their race and nation; *good*, whatever suits their dominant passions and interests, however detrimental to other persons, families, classes, or nations. Good and evil, therefore, are words in common use which do not always accord with that which is morally and rationally right and wrong, any more than common sense, on the evidence of the senses alone, accords, in its judgment and belief, with the dictates of reason and the evidence of science.

These questions have been variously discussed, and the following quotations from the "Outlines of Moral Philosophy," by Dugald Stewart, will give an idea of the controversy :—

"Sensation and reflection are the sources of all our ideas, according to Locke, and the only power the mind possesses is to perform certain operations of analysis, combination, comparison, &c., on the materials with which it is thus supplied.

"This system led Mr. Locke to some dangerous opinions concerning the nature of moral distinctions, which he seems to have considered the offspring of education and fashion. Indeed, if the words right and wrong neither express simple ideas, *nor relations discoverable by reason*, it will not be found easy to avoid adopting this conclusion.

This *if* postulates too much with the phrase in italics, which has no right to be included; because what is wrongly believed to be true on the evidence of the senses and the feelings, may be rectified by a better knowledge of facts and relations discoverable by reason. But, to continue—

"In order to reconcile Locke's account of the origin of our ideas, with the immortality of moral distinctions." [Whose moral distinctions? Those of different religions, classes, and nations? or of a hypothetical science not yet discovered.] "Different theories were proposed concerning the nature of virtue. According to one, for example, it was said to consist in a conduct conformable to truth. The great object of all these theories may be considered the same—to remove right and wrong from the class of simple ideas, and to resolve moral rectitude into a conformity with some relation perceived by reason and understanding.

"Dr. Hutcheson saw clearly the vanity of these attempts, and hence he was led, in compliance with the language of Locke's philosophy, to refer the origin of our moral ideas to a particular power of perception, to which he gave the name of the 'moral sense' (conscience). 'All the ideas,' says he, 'or the materials of our reasoning or judging, are received by some immediate powers of perception, internal or external, which we may call senses.' Reasoning or intellect seems to raise no new species of ideas, but to discover or discern the relations of those received.

"According to this system, as it has been commonly explained, our perceptions of right and wrong are impressions which our minds are made to receive from particular actions; similar to the relishes and aversions given us for particular objects of the external or internal senses.

"From the hypothesis of a moral sense, various sceptical conclusions have been deduced by later writers. The words, right and wrong, it has been alleged, signify nothing in the objects themselves to which they are applied, any more than the words sweet and bitter, pleasant and painful; but only certain effects in the mind of the spectator. As it is improper, therefore, (according to the doctrines of modern philosophy) to say of an object of taste that it is sweet, or of heat, that it is in the fire: so it is equally improper to say of actions that they are right or wrong. It is absurd to speak of morality as a thing independent and unchangeable, inasmuch as it rises from an *arbitrary* relation between our constitution and particular objects."

Here we may observe that natural relations between our (moral) constitution and particular objects are not "arbitrary," although the evidence of our senses and our feelings may be deceptive from at least two sources of error; namely, the appearance of such phenomena as the rising and the setting of the sun, and defects of our senses themselves, such as colour blindness, with analogous relations in the "moral sense." Again—

"In order to avoid these supposed consequences of Dr. Hutcheson's philosophy, an attempt has been made by some later writers, in particular by Dr. Price, to revise the doctrines of Dr. Cudworth, and to prove that moral distinctions, being perceived by reason and understanding, are equally immutable with all other kinds of truth."

The attempt has been made, no doubt, but cannot be successful until we know at least as much of the moral laws of gravitation and association in the universe, as we know of the physical phenomena of motion and gravitation in the solar system. Until then, systems of moral philosophy must be as numerous and various in different religions as the systems of astronomy before Copernicus, Kepler, Newton, and Laplace. The same phenomena, revealed incessantly in the solar system, gave origin to false and true theories of astronomy, just as the same truths revealed in scripture have given rise to various schools of interpretation and doctrines of theology.

The constitution of the human mind corresponds no doubt to that of universal nature, and truth can only be a reflex of nature and her laws in the understanding, but this reflex from the senses may be deceptive in appearance, and require correction by more ample knowledge, as in the case of astronomical systems and beliefs: and so the "mortal sense" may be deceived, as well as "common sense," by mere appearances, requiring much more ample knowledge and a deeper insight into nature, to distinguish real truth and goodness from simple appearances to sense and feeling.

The faculties by which we judge of vice and virtue are those of

H. God-love or conscience; veneration.
U. Nature-love or conscience; benevolence, pity.
Ω. Social love or conscience; justice.
O. Self love or conscience; righteousness.

The love of self-rectitude is not the same as selfishness or self-indulgence, with which it is often confounded; the love of our own family alone, or class, or nation, is not the truest and fullest form of social equity and conscientiousness; benevolence is not limited to our own pets, or property, or neighbourhood; the love of God is not confined to venerations of Saints, and lawgivers, although many people narrow their feelings of love to one or other of the low degrees of "moral sense" and feeling, without calling in the faculties of reason to expand their views of right and wrong in natural and spiritual worlds; with the relations of mankind to all creatures and their Almighty Creator.

We have duties to all, of which we are more or less conscious, and right or wrong conduct is referable to all these moral obligations. Duties to ourselves is easily admitted, if not much understood; and so are duty to our neighbour, in regard to justice, if not to love and charity; duty to animals and pity for their sufferings are practically felt, though little understood; but duty to God and love to the unknown Creator of the universe are little felt, and still less understood, while superstitious fears are rife in many hearts. Love of God and devotion to Divine uses, beauty, truth and goodness, or perfection in the Infinite, urges mankind, however, to work and worship, prayer and praise, even where the understanding is not enlightened by the science of immutable laws and eternal wisdom. Moral obligations are nevertheless personal, social, general, and ultimate or supreme, and what we call right and wrong in act and thought, are relative to one or other of these moral states and obligations.

This is a rational definition of right and wrong, according to the higher law of reason and understanding; but still the practical view is limited by each nation and religion, class and corporation, family and individual of a community, to that which is held by general consent of public feeling and opinion, to be right or wrong, virtuous or vicious; and these views differ greatly in some respects while they agree in others. In the late war between France and Germany, for instance, public feelings and opinions with regard to political and social right and wrong, were violently discordant in the belli-

Offences against the "moral sense" of propriety are of various kinds with regard to habits, manners, conduct, and reason or religion, and orthodoxy varies in these relations as society advances from one phase of progress to another. Cleanliness and temperance of habit, politeness of manner, propriety of conduct, orthodoxy of religion or opinion differ also in degrees, where offences against public or private feelings and opinions are measured by the fashions of time, in different ranks and classes of society. Various degrees of cleanliness or temperance are tolerated, and offences against either are blamed according to class or national opinion. Various degrees of rudeness or politeness of language and of manners are praised or blamed, tolerated or resented in different classes and in different ages of history; morality and probity, truthfulness and beneficence are also variously estimated at different times and places, while certain degrees of improbity, untruthfulness, sensuality, and selfishness are not only tolerated in some cases, but more or less admired and envied as clever schemes and fashionable vices, in civilized and uncivilized corporations and communities.

Some individuals are much more scrupulous than others in conforming to *orthodox* or fashionable feelings and opinions; or unscrupulous in setting them at nought; others again, who are scrupulous with regard to their own habits and conduct, manners and truthfulness, are tolerant and charitable with regard to slight degrees of impropriety in the manners and conduct of their neighbours and acquaintances. Some are narrow-minded and censorious; others, liberal-minded and large-hearted. The same habits and feelings do not suit all tastes, nor do the orthodox feelings and opinions of one sect or class meet with the approval of all others, and for this fact there are numerous causes.

When a human foot is well proportioned, a well-made boot of the right shape and size will fit the foot, but an ill-shaped boot too large or small will not be suitable. Where the foot itself is ugly or deformed, or afflicted with corns and bunions, a handsome well-shaped boot will not fit, but may hurt the luckless foot, if forced to wear it. And so it is with a well or an ill-formed conscience. The religion of Christ did not fit the "conscience" of the Jews, and they not only rejected it with contumely, but crucified the man who dared to bring it to them, as a gift of the highest value. Where the feet of Chinese ladies are made divinely small, by orthodox opinion and discipline, well-made boots are quite unfit for wear; and where sectarian minds are warped and minimised by orthodox creeds and discipline, religiously comprehensive principles are quite intolerable irritants of a settled self-righteous conscience.

Religious, political, and social consciences are variously developed by churches and by states, or warped by ignorance, neglect and prejudice; so that offences against vulgar propriety and "orthodox" opinions may be either real perversions of truth and justice, manners and morality, or higher forms of truth and beauty, goodness and utility, than those which are deemed orthodox and proper by the public of a given sect or party, class or nationality.

Degrees of impropriety in any kind of habits, manners, conduct, or religion, may be ludicrous, incongruous, offensive, intolerable, cruel, or criminal; and these admit of shades of difference, variously estimated by different persons and societies, although there is a general consensus on most points, in each sect or party, class or nation. It is nevertheless difficult to draw the line between vice and virtue in many cases, or between tolerable and intolerable degrees of license, with regard to habits and manners, morals and doctrines; nor is it easy to draw a line in some cases between degrees of sanity and insanity in the conduct of individuals and communities with regard to all these questions. Were filthy begging friars sane or insane, in the middle ages? Would they be more insane now, than they were then, because less in unison with public opinion and orthodox religion? Were the Jews, who crucified the Lord, sane or insane? The Romans, who tortured and murdered Christians? Catholics, who persecuted Protestants and took their lives? Protestants, who retorted in like manner? Are religious, political, and social bigots and fanatics sane or insane? Exaggerations of all kinds are more or less insane, as well as hallucinations, cruelties, and imbecilities; and each faculty of the soul, the spirit, and the mind may be the seat of excitement or depression above or below the healthy mean, just as each organ of the body may be, alone or otherwise, the seat of organic or functional disease.

Excessive degrees of heat will injure;
Excessive degrees of cold will paralyse and injure;
Poisons will injure, and even kill the body.

What are excessive degrees of excitement or depression? What are the natural foods, and what are the poisons of body, soul, mind, and spirit?

Some kinds of poison in small doses are medicinal for the body. What kinds may be deemed medicinal for the soul? Flatteries are soothing; superstitions consoling; absolutions grateful to weak minds—males and females, infants and adults; lies and fictions pleasanter than truth and candour, to many souls. Are these poisons good for moral health, or bad? Are they medicinally useful in some cases, though poisonous and deadly in large doses? We need hardly decide by any form of casuistry. Certain imperfections are natural to every phase of metamorphic evolution, and monstrous births or deformities have sometimes been more luminous for science, than normal evolutions and developments.

CHAPTER IV.—MORAL SANITY AND INSANITY.

Insanities of the body and the mind are very numerous, and morbid states of the one are not indifferent to the other. The spirit may seem healthy while the body is afflicted, and the body, in some cases, sound, where the mind is not; but these are only differences of degree, for one is always more or less affected by the other. Excitements of the nervous centres by intoxicating or narcotic vapours in the blood cause temporary delirium in the mind, and emotional excitements of the spirit; extreme and long-continued emotions induce temporary or prolonged derangements of the reason. Common sense and bodily functions are easily disturbed in their equanimity, and so are "moral sense" or conscience and reason.

Organic and Functional Disease.—Diseases of the body are functional and organic, and so are those of the soul. Hereditary madness is as common as hereditary tubercule, gout, scrofula, or cancer, and not unfrequently the mental and bodily forms of these organic diseases are concomitant in the same persons or families. Moral and mental weakness and deformities are also, in some cases, congenital, like bodily deformities and feeble constitutions. Still the spirit of an angel may lodge in the body of a cripple, and a demon in the form of an Apollo. Bodily and mental deformities do not always correspond, then, in human nature, though brute instincts and organisms always correspond exactly to vocational ends and uses. Brutes may be deformed in shape, however, as much as men, without being physically diseased or instinctually perverted.

Infirmities of the body are easily recognized and pitied; infirmities of temper are also soon perceived, but not easily excused; infirmities of common sense or judgment are common enough, and often ridiculed; while weakness and infirmity of the mind (reasoning faculties) are still more common in all sects and parties, families and individuals; not to mention infants and undeveloped youths, but confining our view to the mature age of adults in all classes of ignorant peasants and highly educated men and women: highly educated in a few of their faculties, of memory and imagination chiefly, while other faculties of mind are as little exercised as most of the muscles of the body, seldom brought into dexterous play by any but clever acrobats or conjurors, who earn their living by feats of agility, or dexterous sleight of hand, in tricks of substitution.

ACUTE AND CHRONIC DISTINCTIONS.—"Acute pains of toothache in a sound body may be more intolerable for a time," says Hume, "than the continuous ailment of an incurable disease," and the delirium of a temporary intoxication, narcotism, or fever, may be more demoniacal than the confirmed hallucinations of an incurable insanity. And, as any one organ of the body, or several, or all at the same time, may be affected by disease, or weakness, or deformity, so any one or more of the faculties of the instinctual soul, the emotional spirit, or the rational mind, may be affected by organic weakness, or disease, or congenital deformity, or by functional weakness or disease at any time. And although mental and moral pathology have not been as well investigated and defined as physiological pathology, because mental and moral anatomy have not been as carefully studied as physical anatomy, still much has been done of late in this direction by eminent physicians, who have had life-long experience of various kinds of moral and mental insanity, in lunatic asylums and private madhouses.

Moral and mental infirmities are not less interesting than insanities, being much more general, and sometimes verging closely on the confines of the latter, in both families and corporations, sects and parties, classes and nations, without being duly recognized as chronic dangers to the peace of society, exposed to fits of fury and fanaticism, as lately manifested in the civil war of France, and the destruction of public and private property in Paris; not to mention feuds of all kinds in history and at the present time.

All criminals are morally and mentally infirm, though physically and intellectually strong, for they are often very dexterous, cunning, and resentful, like the inferior carnivorous animals, which prey upon the peaceful herbivora. They are in fact, indocile human animals fully developed in body and instinctual intellect, but undeveloped in the higher faculties of mind and conscience; and mostly quite as indocile as wolves and tigers, irreclaimable by any mode of treatment. Harmless idiots are also undeveloped human animals, like stolid sheep or polypes, devoid of thought or understanding. Paupers and vagrants are morally and mentally infirm, in many cases where bodily weakness or senility are not conspicuous causes of debility. Ignorant peasants are always mentally undeveloped, and sometimes morally, just as starved and ill-fed bodies are physically weak, degenerate, and brute-like in physiognomy.

DEGREES OF INCAPACITY AND OF INFIRMITY.—Mental and moral incapacities and weaknesses differ in degrees, with various peculiarities in each:—1st, Interest in one's self alone, and personal wants; 2nd, interest in one's own children and family connections only; 3rd, interest in professional and corporate relationships exclusively (priests not allowed to marry); 4th, class interests and sympathies alone; 5th, sectarian and party interests, sympathies, and conflicting views; 6th, patriotic or national interests and sympathies exclusively; 7th, narrow or limited international sympathies and sentiments; 8th, universal benevolence or philanthropy, as final limits; 9th, ultramundane interests of personal salvation only, irrespective of all others; 10th, theistic fear and superstition, instead of real faith in God's love and confidence in His mercy, with submissive reverence for Divine Providence, and hopeful resignation to all the conditions and vicissitudes of life. These are only degrees of "moral sense" and reach of sympathy.

So far as these degrees of moral and mental capacity, or incapacity, are natural degrees of wisdom in animals and human beings, with definite limits of instinct and vocation, they are perfectly sane, although that which agrees with practical sense, in one case, may seem not to agree in others, as the personal instincts of a wolf may seem practically inconsistent with those of a lamb; but, apart from the inborn ranks of capacity for special ends and uses, in animals and in mankind, there are sane and insane degrees of excitement in all the vocational limits of capacity.

A person devoted to his own personal wants alone is apt to be indifferent to other people's wants and interests; or reason falsely on their claims in conflict with his own; and so of all the degrees of social sympathy, or reach of mind and conscience here described. We might as well expect a sparrow to fly like a swallow, as a narrowly selfish man or woman to reason like a judge or a philanthropist; and where the supposed interests of individuals or families, classes or nationalities, conflict and cause individual and general excitement, moral and mental infirmities and incapacities become manifest in angry feelings and false reasonings, private and public meetings, conversations, and publications. Sultry atmospheres of feeling generate lurid flashes of lightning in the mind, while revolutionary storms, or civil war or national conflict, scatter death and ruin all around to clear the emotional air, and cool the temperature of the social world.

These are as natural, perhaps, as physical storms and ravages, in the present phase of social evolution on our globe, but we can hardly suppose that war is more permanently necessary than pestilence and famine; or that one of these scourges is not destined to disappear eventually as well as the others.

CHAPTER V.—EXCITEMENT AND DEPRESSION.

Problems of insanity are only questions of undue degrees of excitement or depression in the faculties and functions of vitality in body and in mind, and we have experience of these degrees in states of wakefulness and sleep, as well as in health and in disease. Sleep is not simply a lowering of activity in the external frame and in the organs of sense, but a relative suspension of function in the sensor and motor functions of these organs, while organic functions are still active in most of the internal viscera. Subjective states of sensation and thought, however, become consciously active in dreams while the objective senses are closed, and memory may be accurate in vivid dreams where the co-ordinative faculties of reason are asleep; the emotional faculties may be unduly excited by rage or cruelty, while the "moral sense" of conscience is quiescent in such dreaming sleep. These are subjective forms of insanity, while the body is asleep; and, apart from objective delusions of the senses when awake, all kinds of hallucination are merely subjective states of consciousness in a disordered state, for want of due control by the faculties of "moral sense" and co-ordinative reason. We can easily wake up the sleeper from this dreamy state of insanity, and bring all the faculties into a state of rational consciousness, but the art of reviving dormant faculties in cases of wakeful insanity, is not yet far advanced in mental therapeutics, any more than the art of healing physical paralysis.

Physiological pathology is, nevertheless, more or less analogous to psychological pathology, and means of cure may possibly be somewhat similar, when not identical. All modes of medical treatment are supposed to excite the functional activity of special organs, or depress physiological excitement in them; and the same may be said of remedial modes of treating the insane. Without entering into the practical details of medical art and experience, we may form general ideas of the vital forces and their various modes of excitement and depression, in parallel with those of physical forces and their various degrees of convertibility in special modes of tension or of motion, as a preparatory step towards other modes of studying the question.

Magnetism and electricity, cohesion and gravitation, heat and light, are distinct but convertible modes of action in physical forces, and though concomitant in cosmic nature, they are supposed to be hierarchal in relative degrees of influence and co-operation; magnetic conduction and circulation, subordinate to cohesion and gravitation, which are subordinate to heat, and this again inferior to light in velocity of motion, and in general influence.

Cosmic Forces.—We know that light comes to us in measurable degrees from stars immensely distant, whose heat is imperceptible, and Mons. Tremaux has shown (we think conclusively) that gravitation and cohesion in our solar system (and by inference in all sidereal systems) depend upon relative degrees of temperature or active modes of motion in the cosmic bodies of the system. Great differences of temperature causing attraction, with centripetal modes of tension and revolution, while similarity of temperature in high degrees of heat or motion causes repulsion, with centrifugal modes and degrees of tension and revolution; as witnessed graphically in the alternate centripetal and centrifugal motions of our comets before and after being heated by the sun; and inferentially in the relatively constant distances of satellites from their planets, and of planets from the sun. Gravitation in direct proportion to the mass, and inverse proportion to the square of the distance, is only another mode of stating the same relational degrees of force and distance, since the mass of a body depends upon density more than volume, and density depends on specific tension or coldness, while volume and distance are governed by heat or active modes of motion. Coldness (centripetal) and heat (centrifugal) are contrasted modes of motion in one and the same principle of force, qualified by various conditions, which we need not here enumerate.

The circulation of magnetism and electricity in our globe is evidently subordinate to the forces of cohesion and gravitation, not to mention the influences of heat and light; and we all know that currents of air and of magnetism may be caused on a small as well as on a large scale, by difference of temperature in contiguous or proximate bodies.

As these various modes of motion are convertible on a small scale by human agency, it is supposed they are identical in principle, and differ chiefly in degrees of intensity and velocity. If vital principles are analogous in essence and in modes of motion, we may form the following parallel, as a guide to further steps of speculation:—

Body —sensation—magnetism.
Spirit—emotion —gravitation.
Soul —instinct —heat.
Mind —reason —light.

Magnetic conduction, molecular cohesion, heat, and light are relative modes of motion or tension in physical elements. Physiological, instinctual, mental, and spiritual excitement or impress are characteristics of biological organisms.

DREAMS.—In dreams we find subjective sensation, emotion, memory, imagination, language, fear, anger, and cruelty highly excited, while the body is asleep, and the co-ordinative faculties of reason with the "moral sense" of conscientiousness and reverence as quiescent as the sleeping body. The body is, however, excited to locomotion in sleep-walkers or somnambulists. What is this but over-excitement in some faculties with simultaneous depression or suspension of activity in others? Magnetism may be manifest in simple metals without sensible degrees of heat, and high degrees of heat, without sensible degrees of light, either permanently or accidentally; and so in vital organisms, physiological processes may be active or inactive, alone or in co-operation with one or several, or all the other modes of vital activity, subjective sensations and intellections, emotions and volitions, without the co-operation of sleeping organs and faculties of sight, hearing, smell and taste, moral sense or rational understanding.

Insanity is accidental during sleep, and may, like bodily disease, be temporary or continuous during wakeful life. It is nevertheless, in all cases, a question of correlative degrees of excitement and depression in the relational and visceral organs of the body and their analogous faculties and functions of the mind.

Soul and Body.—In forming a parallel between the systems of the body and the faculties of the mind, we may observe that the nerves, which are the immediate agents of communication between the two, as far as thought and action are concerned, are intimately united in their peripheral extremities with every organ of the body, and in their central ganglia with every faculty of the soul. And we may further observe that when the body is asleep in the external frame, and active in its internal viscera, the mind is also dormant in its relational faculties, for, in dreams, the subjective memory and the imagination are often very active, while reason is asleep or paralysed; the most incongruous recollections and imaginations being strung together in disorderly association and succession, without the least rational perception of incongruity or inconsistency; just as the vascular system and the glandular organs are active, while the external frame is perfectly quiescent during sleep. It is also manifest that the faculties of the mind are distinct and separate, as the organs of the body are distinct in the physical organism; and that one system of the mind may be active while another is asleep, just as one system of the body may be active while another is at rest.

And again, as one organ or system may be strong while another is weak, or one healthy while another is diseased, in the same individual, so one system of the mind may be strong while another is weak, or healthy while another is diseased, in the same person.

Nor is it without interest to medical art and science, to know what relation may exist between disease in particular organs of the body, and derangement in corresponding organs of the mind; for, where the nervous centres are affected by congestion, anæmia, or any kind of disease, the action of the mind upon the body from those centres is obstructed or perverted, paralysed or excited, and the nature of the mental apathy or aberration, might often lead a well-informed physician to discover both the nature and the seat of the affection in the corresponding nervous centres or peripheries.

The first step in this line of investigation is the study of dreams in healthy subjects; the second, that of drunkenness and various kinds of intoxication in healthy subjects; the next that of delirium and hallucination in temporary disease; and the next that of idiotcy and insanity in all their different degrees and forms, not to mention mesmeric, hypnotic, and trance cases, which are more or less abnormal with or without manifest disease.

In dreams we find the memory, the imagination, and all the senses subjectively active at times, while the corresponding feelings are excited also, with some degree of penetration and intuitive understanding, but almost no discrimination or comparative reason. From this we may infer that the nervous centres corresponding to the first are active, and to some extent operative on the peripheral extremities, while those which correspond to the relational faculties and systems, are totally inactive both in their central and peripheral extremities. When a person is intoxicated or excited, we observe that the rational powers are affected in connection with a like derangement in the locomotive organs of the body, with or without a marked difference in the organic systems of both mind and body.

Animals have neither reason nor conscience to rule their instinctual sensations and impulsions when in health, and thence they are deemed irresponsible. Some human animals have neither reason nor conscience developed when awake and in good health, although they are deemed responsible. Where the reason and the conscience are asleep with the external frame in healthy men and women, or dormant in the wakeful state of body, or enfeebled by disease, we have some clue to these various states of relative excitement and depression, and modes of treatment may eventually improve with better knowledge of the anatomy and physiology, pathology, and idiosyncrasies of human souls and bodies.

PART IV.—SPIRITUAL GENEALOGY.

CHAPTER I.—GENEALOGICAL PROBLEMS.

THE genealogy of mankind must either be terrestrial or celestial, or both one and the other. How shall we state the problem? We do not know when the first animal appeared on earth, nor the first man and woman, but something is known of the manner in which they come into this world now, and leave it when they die; and we *suppose* they are not created from nothing, nor annihilated when they quit the mortal tenement. May they not exist in an ethereal invisible world before they are born here, and after they die? Suppose they do not, what then? Nothing. Suppose they do, what of it? The following states and relationships will show.

1.—Co-existent celestial and terrestrial humanity in amphimundane existence.

2.—Alternative states of life in these two worlds.

3.—Co-operative modes of relationship; procreative and incarnative.

4.—Procreative parental types, superior, equal, and inferior.

5.—Incarnative filial types, superior, equal, or inferior.

6. Progressive relations of amphimundane co-operation.

7.—Variable conditions of terrestrial affiliation.

8.—Are they always homœogenetic or sometimes heterogenetic?

9.—Are children always exactly like their parents, or somewhat different?

10.—What are the processes of procreation?

11.—What are the transformations of incarnation?

12.—What are the amphimundane conditions of incarnation and resurrection?

Procreative processes are those of secretion, fecundation, ovulation, gestation, parturition, and lactation for mammals, varied by incubation and alimentation in oviparous species; what are the processes of incarnation by the animating principles of life? Are they not inception, molecular conversion, embryonic metamorphosis, and lacteal filiation? Births and deaths are carefully attended to by nurses, doctors, clergy, and undertakers in this world; the conditions of incarnation and resurrection are no doubt equally well attended to by guardian spirits in the other world.

Palæontology testifies that inferior types of animal organisms have preceded superior types in their first appearance on earth, and therefore the latter must either have started into life at once, without progenitors, or come into this world by the procreative co-operation of inferior types. We suppose the latter to be not impossible, although no instance of such a fact has been recorded in history during the last six thousand years; and natural selection, with hereditary transmission, mark such very small degrees of variation within known limits, that we cannot give it credit for the real origin of species. The possible incarnation of superior types by nearly related inferior progenitors is then a rational mode of accounting for the terrestrial origin and metamorphic evolution of individuals and species. Preexistence may account for both the rise and fall of mankind on earth, as well as for the appearance, development, decline, and final disappearance of any collective realm or species of animal or vegetable organism, and thus ultramundane origin is not less important than mundane genealogy in problems of spiritual evolution. If uncultured and indocile races of spirits were incarnated on a large scale during many generations in the families of a highly cultivated and morally refined nation, such a process would eventually bring the nation down to barbarism and ruin. New revelations and religions may disorganize old nationalities, and reconstruct them on new foundations of laws and doctrines, as history shows in all past ages; and in either case, ultramundane causes, in the shape of extraneous incarnations or spiritual revelations, produce the mundane effects of social and religious evolutions and revolutions. These are problems of collective biology which we shall have to deal with again, when questions of sociogenesis will suggest those of realmogenesis, still more puzzling and complex; for although we may account for the spiritual conservation and progressive evolution of extinct races of mankind, by successive incarnations in superior races living on the earth, we cannot easily conceive the transformation of *lost palæontological* types of animal organism and instinct by successive incarnations, since this would not be heterogenetic evolution in outward form alone, but also in organic constitution; a problem of ultramundane as well as of mundane evolution. The Darwinian theory would account for all kinds of creation by mundane variations transmitted to posterity, but that ignores all worlds of life beyond the natural the lymbic, and pre-supposes the destruction of s as well as bodies at the death of individuals. Collec mundane continuity alone is thus postulated with immortality for individuals of any species, animal human. A very dreary prospect for the yearning sp of mankind. Still the problems of genealogy are simply homœogenetic, but heterogenetic, ultramund as well as mundane.

We cannot know much of ultramundane genealc at present, but we have a clue to mundane evolutic and revolutions.

What are the meanings of the words mundane, ult mundane, and amphimundane existence? Palæc tology and biology, embryogenesis and sociogenes homœogenesis, metagenesis, parthenogenesis, heterog nesis, incarnation and resurrection?

How are the phenomena denoted by these nam connected together in the history and mystery of li and organization?

Spiritual humanity is supposed to be immortal i celestial spheres; terrestrial humanity is perennial i the natural world, and these two constitute an amph mundane unity of life in mankind at least, if not i animal and vegetal vitality.

Incarnation means the descent of an immortal spiri into a mortal body, by the processes of embryogenesis Resurrection means the rising of an immortal spiri from the mortal body. This is not the vulgar notior of the resurrection of the mortal body as a mass o dust which had long been scattered to the winds.

These views are supported by the testimony of history, accessible to all, and by the direct evidence of so-called spiritual manifestations, familiar to some observers, and more or less disliked and stolidly discredited by the incurious, sceptical, and superstitious majority of mankind. Palæontology and biology, however, are recognized sciences, and embryogenesis, metagenesis, parthenogenesis, are known forms of metamorphic evolution in biology, while homœogenesis is the normal mode of perpetuating a species by hereditary transmission. Heterogenesis is a plausible theory of abnormal variations in species, by genealogical descent, suggested by the known facts of palæontology, in which fossil remains of extinct species are abundant, along with the evidence of successive appearances of new and higher species of animal and vegetal organisms, in the past evolutions of the mineral, the vegetal, and the animal kingdoms of our planet.

These phenomena, and the speculations they suggest to the human mind, lead further to ideas of the metamorphic evolution of human society, from the imperfect organization of wandering tribes, scattered loosely over the continents and islands of the earth, to a gradual formation of religious and industrial communities, first on a small scale of sects and clans, then of languages and nationalities, to be further united by international alliances; and, finally, it is supposed, to be united in confederations of states on each continent, and continents with each other, in bonds of universal brotherhood, so as to form a collective organism or grand-man. On the same plan, the organs and systems of the individual body are united in co-operative bonds of unity and sympathy for the individual and collective advantage of the whole personal community.

From this point of view humanity on earth is in process of metamorphic evolution, unconscious of its future destiny, analogous to the state of the human fœtus in utero, unconscious of a future birth.

We need not dwell on the value of words and pig, and are as incompatible in spirit as in form. Like the animals, however, they can live in the same field, and feed together, and, within certain limits, they can generate useful hybrids, like mules from the ass and the horse.

As old inferior species continue to live and propagate beside the new and superior types of animals, so old religions and forms of society continue to live and propagate beside new and superior forms of religion, language, and nationality. Wild races of mankind continue to exist from pre-historic ages up to the present time, in Africa, Australia, Oceania, and America. Heathen religions and societies, nations and languages, continue to exist in China and Japan, India, and the Archipelago.

The ancient Jews form a community apart from modern Christians and Mahometans in all parts of the globe ; Roman Catholics form an antiquated mediæval community, side by side with new-born progressive Protestants ; Mahometans form unprogressive communities in Asia and Africa, Syria and Arabia, incompatible with Christian fellowship and modern civilization.

Is it necessary that there should be but one religion in humanity, or one form of faith and worship, to unite all nations in confederate alliances for common good ? any more than one form of government ; theocratic or military, monarchic or republican, despotic or constitutional ? The organs and systems of the body differ in form and function, bulk and proportion, and the faculties of the mind correspond in all respects of diversity in unity with those of the body. The forms of government in ganglionic centres differ in accordance with the forms of organs, which they govern under the general control of the brain, and the faculties of the soul are directed by special instincts and vocations, under the general control of the will and the understanding, to be guided eventually, not by faith alone, but science.

Why should not collective unity become as manifold as individual unity? The heart, the lungs, and the kidneys have very different constitutions and vocations, and yet they co-operate as parts of one system. Bones and muscles differ in form and structure, but cannot do without each other. Eyes, nose, and mouth are not alike in form, or function, though equally useful to the whole community of organs and systems. Small circles of sensation and reaction are more numerous and various than large circles of centripetal and centrifugal action and reaction in the life and government of the complex individual organism; and why not as much diversity in the collective organism of humanity? And again: Heterogeneous classes, orders, families, and species of animals are found in the vertebrate realm of organic unity, and for ought we know to the contrary, may be equally necessary to the prosperity of the whole, according to pre-ordained laws of origin and destiny.

The fundamental principles of religion are the same, however various the creeds and whatever forms of worship and ecclesiastical disciplines may be established in a social community.

Various communities live side by side in some regions, and totally apart in others, just as herds of different species feed side by side in some pastures, without intercommunion. Many species of animals have appeared for a time, and then, after long ages, become extinct on the surface of the globe, while more ancient and more recent forms, inferior and superior, still continue to flourish, and perpetuate their breeds; and we find in history that numerous forms of social organism, languages, and nationality, have arisen, flourished for a time, and then become extinct, while more ancient pre-historic forms, and much more recent forms of nationality, language, art, literature, and civilization, flourish together in different parts of the world at the present time.

The human fœtus resembles, (*longo intervallo,*) all types of animal organism in successive phases of its metamorphic evolution; and more especially those of the same general type, such as fishes, reptiles, birds, and mammals; and so may the collective fœtus of humanity pass through all the phases of human animality, or unconscious ignorance and imperfection, in the successive phases of sociogenetic evolution, before it arrives at universal unity and perfect rationality; or before it attains even to the birth-time of infantile collective reason and understanding. And moreover, as the individual fœtus prophesies the human form, even from the earliest dawn of definite lines of organism, while resembling in its imperfection the inferior forms of animal life in some respects, though not in all, so we may observe, that all religions prognosticate, more or less distinctly, the ultimate unity of mankind in universal brotherhood, as the aim of their existence, and the destiny of the race, in this world, as well as in the next; they also proclaim their origin to be from God, by means of ultramundane revelations, superior to mundane concepts and imaginations.

Spiritual genealogy is ultramundane, then, since all religious revelations are given from above, and one is just as hostile to another as animals of different species, which not only hate, but kill and eat each other, as we kill and eat them. None deny that animals are Divine creations because they prey one upon another; or have different instincts and vocations where they live in peace together; while different religions cannot claim Divine authority, it is supposed, if they are contradictory in spirit and in practice. But why should we deny the

Divine origin of different spiritual revelations, while we recognize the genuine creation of different types of animal organism, with incompatible instincts and propensities? Because Divine truth cannot contradict itself in religion, although it may in the animal creation? That is a human notion, not warranted by experience. Divine facts are true on the instinctual plane of contradictory creation; why not on the spiritual plane of inspiration and revelation? and on the rational plane of science? Because the laws of nature being eternal and immutable, the truths of nature cannot vary, or science would be impossible. Very true; but that does not solve the question. We have the seeming contradiction of genuine facts on the one hand, and the assertion of an apparently self-evident axiom, on the other. Divine reason has conceived the facts and given them existence, and human reason must learn to understand and reconcile apparent contradictions and incompatibilities in genuine nature, by inductive methods of investigation, before it can pretend to dogmatize, by deductive processes of reasoning, from *à priori* maxims of "self-evident truth." Real axioms will be just as true after being reconciled with apparent contradictions in Revelation and Creation, as they were before inductive processes of ratiocination had confirmed them, *à posteriori*. Impatient minds do not like hard mental labour, and prefer short cuts to truth by flying deductions from recognized axioms. We cannot argue with impatient minds on the puzzling problems of origin and destiny. It would carry us beyond the limits of an outline to dive into the details of facts and arguments on all these questions, which will present themselves again more opportunely in collective biology.

CHAPTER III.—BIOLOGICAL UNITY AND UNIVERSALITY.

We cannot solve the problems of experiential biology and genealogy without subordinating individual to collective life, mortal to immortal, mundane to ultramundane spheres of existence; and these involve both individual and collective alternations of experiential evolution in endless succession, without loss of identity in variable states of consciousness. New globes in any solar system are reproductions of forms innumerable in other sidereal systems; the inorganic and organic realms upon the surface of a globe are reproductions of epicosmic realms on countless other planets; collective humanity on earth is a counterpart of celestial humanity in heaven; new births of individual men and women are copies of their ancestors; so that heterogenesis or metamorphic evolution, in all degrees of embryogenesis, sociogenesis, realmogenesis, and cosmogenesis, is merely a transitional process of homœogenesis.

The human soul exists as a biological element of unity in this life, subject to distinct modes of consciousness. As an indestructible unit it must be capable of complex modalities of consciousness in all natural and spiritual spheres of existence. In this world it is only *conscious* of the relational modes of action in the body, while it is *sub-conscious* of reflex action, and almost totally *unconscious* of automatic motion. It is apparently altogether unconscious of all the processes of incarnation and of resurrection. Is it equally conscious of autocratic, automatic, and autotelic or reflex vitality in any sphere of life? We do not know.

But one thing is evident, namely, that loss of consciousness is not necessarily loss of identity, nor loss of life; for alternations of obliviscence and reminiscence are facts of common experience. We may then form the following parallels consistently with biological udity and identity of personality in mutable states and conditions of consciousness in present and future worlds.

Hyperconscious states.	H.	*Omniconscious memory.*
	U.	Ultraconscious memory.
	$\underline{\cap}$.	Postconscious hadean resurrection.
	O.	Preconscious uterine incarnation.
Conscious states.	H.	*In hallucinations.*
	U.	In conscious activity.
	$\underline{\cap}$.	In subconscious reflex action.
	O.	In unconscious nutrition.
Hypoconscious states.	H.	*In hibernation.*
	U.	In somnambulism.
	$\underline{\cap}$.	In vivid dreams.
	O.	In sound sleep.

By *ultra-conscious memory* we mean possible consciousness (in a future state) of all past and present states of existence in the natural, the uterine, and the spiritual worlds: and of all modes of action in the body, voluntary, sub-voluntary, and involuntary, by a single act of will, as we now become conscious of pulsations in the heart by fixing our attention. This would be analogous to the waking states of remembering past and present alternations of wakefulness and sleep, with nightly forgetfulness of both.

By *omni-conscious memory* we mean a possible reminiscence in the next world, of all our past states of existence, on our planet and in other planets of the solar system. Such is the conjecture of alternating states of existence and of conscious memory.

Individual immortality implies collective immortality, and as physical globes are perishable like finite mortal bodies on their surface, changes of planetary habitation are inevitable consequences of human immortality with alternations of experiential life.

Biology is therefore not a problem of mundane life only, but of amphimundane alternations and successions;

and collective biology will present in the next volume the same questions of terrestrial mortality, in contrast with celestial immortality, as that of individual biology in this, not to mention the following list :—

I. { 1. The human body is a universe of organs.
2. The soul is omnipresent in the body.
3. One is a type of the other.
4. Subjective and objective are identical.

II. { 1. Humanity is a universe of individuals.
2. Human souls are omnipresent therein.
3. Subjective and objective are identical.

III. { 1. The whole earth is a cosmic universe.
2. Is there an omnipresent soul therein ?
3. Subjective and objective being identical.

IV. { 1. Humanity is an amphicosmic biniverse.
2. Human souls are omnipresent therein.
3. Subjective and objective are identical.

V. { 1. Are all cosmic worlds amphicosmic ?
2. With souls omnipresent in each biniverse ?
3. Subjective and objective being identical ?

VI. { 1. Could objective bodies of any kind exist without souls in any cosmic universe or biniverse ?

VII. { 1. Are not the feathers of a bird a constituent part of its body, although they have no feeling ?
2. Is not the crust of the earth a constituent part of the moving globe, although devoid of life ?
3. Are subjective and objective identical in all living organisms, individual and collective, and in all worlds, cosmic and amphicosmic ?

These are questions of biology connected with problems of ontology, which cannot be indifferent to enlightened minds ; nor deemed incomprehensible in principle, however much experience in this life may fall below the limits of experimental verification, as a sound and satisfactory basis of biological induction.

THE END.

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