

THE NEW PHILOSOPHY

VOL. LXXII

APRIL-JUNE, 1969

No. 2

AN INTRODUCTION TO RATIONAL PSYCHOLOGY

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579. PSYCHOLOGY is the science which treats of the essence and nature of the soul, and of the mode in which she flows into the actions of her body; consequently it is the first and last of those sciences which lead to the knowledge of the animal economy. But whereas the soul has her residence in a place so sublime and eminent (n. 270), that we cannot ascend to her, and attain to the knowledge of her, except by a particular and general investigation of the lower and accessible things of her kingdom; or whereas she lives withdrawn so far within, that she cannot be exposed to view until the coverings under which she is hidden are unfolded and removed in order: it hence becomes necessary that we ascend to her by the same steps or degrees, and the same ladder, by which her nature, in the formation of the things of her kingdom, descends into her body. By way therefore of an Introduction to Rational Psychology, I will premise THE DOCTRINE OF SERIES AND DEGREES (a doctrine, of which, in the preceding chapters, I have made such frequent mention), the design of which is, to teach the nature of Order and its rules as observed and prescribed in the succession of things: for the rational mind, in its analytical inquiry into causes from effects, nowhere discovers them, except in the Subordination of things, and the Coordination of subordinates; wherefore, if we would advance from the sphere of effects to that of causes, we must proceed by Orders and Degrees; agreeably to what rational

¹ This is a reprint of chapter VIII of Part I of Swedenborg's *Economy of the Animal Kingdom* (Amsterdam, 1740-41), translated from the Latin by the Rev. Augustus Clissold and originally published in London, 1845-46. The text can be found in vol. II, pp. 5-60, of the English translation. The numbers in the text refer to EAK unless otherwise stated. A few corrections and revisions have been made. (*Ed.*)

analysis² itself both approves and advises. (n. 67, 161.) The rational mind also, by means of this doctrine carefully investigated and established, will see opened to its view a broad and even path leading to the principles of causes, and will behold the dissipation of those occult qualities, which, like the shadows of a thicket, deepen at every step so as to shut out all further prospect and progress: for as often as nature betakes herself upwards from visible phenomena, or, in other words, withdraws herself inwards, she instantly as it were disappears, while no one knows what is become of her, or whither she is gone, so that it is necessary to take science as a guide to attend us in pursuing her steps. Without a guide of this kind, moreover, we shall have a tendency to fall into various premature opinions; we shall be apt to think, for instance, that the soul, either from principles proper to herself, or from such as are above herself, flows immediately into the effects of her own body; whence, it necessarily follows, that the communication of operations between the soul and the body must be explained either by *Physical Influx*,³ or by *Occasional Causes*;⁴ or if by neither of these, a third is assumed, as the only alternative, namely, that of *Preestablished Harmony*.⁵ Thus the one or other system flows as a consequence from our want of knowledge respecting the subordination of things, and the connection of things subordinate; even supposing the most accurate examination and the most profound judgment to have been exercised upon the phenomena; for reasonings naturally follow the course of their principles. But whereas all things in succeeding each other follow one another in order, and whereas in the whole circle of things, from first to last, there is not a single one which is altogether unconnected or detached from the rest; I am therefore compelled, as I said, previous to developing the subject of Rational Psychology, to take into consideration this doctrine concerning order and connection, so remarkably conspicuous in the animal kingdom. In the mean while, whether there be truth in what has been said, and what remains to be said, may be easily ascertained from the four following considerations: *First*, In case the truth spontaneously manifests itself, and as it were establishes a belief in its presence, without requiring any

² An analysis proceeding by ratios. (*Tr.*)

³ The doctrine of the Aristotelians. (*Tr.*)

⁴ The doctrine of Des Cartes.—(*Tr.*)

⁵ The doctrine of Leibnitz.—(*Tr.*)

support from far-fetched arguments; for we often, by a common notion, and, as it were, by a rational instinct, comprehend a thing to be true, which afterwards, by a multiplicity of reasonings drawn from a confused perception of particulars unarranged and unconnected with others which are more remote from our notice, is brought into obscurity, called in question, and at last denied. *Secondly*, In case all experience, both particular and general, spontaneously favors it. *Thirdly*, In case the rules and maxims of rational philosophy do the same. *Lastly*, In case the proposed views make the different hypotheses, which have been advanced on the subject, to coincide, supplying us with the proper condition, or common principle, which brings them into order and connection, so that, contemplated in this manner, they are agreeable to the truth. We may remark that a system constructed on the ground of such an agreement, merits the title of ESTABLISHED HARMONY. But to proceed to the Doctrine of Series and Degrees.

I.

580. By the doctrine of series and degrees we mean that doctrine which teaches the mode observed by nature in the subordination and coordination of things, and which in acting she has prescribed for herself. Series are what successively and simultaneously comprise things subordinate and coordinate. But degrees are distinct progressions, such as when we find one thing is subordinated under another, and when one thing is coordinated in juxtaposition with another: in this sense there are degrees of determination and degrees of composition. In the mundane system there are several series, both universal and less universal, each of which contains under it several series proper and essential to itself, while each of these again contains series of its own; so that there is nothing in the visible world, which is not a series, and in a series. Consequently, the science of natural things depends on a distinct notion of series and degrees, and of their subordination and coordination.

581. *By the doctrine of series and degrees we mean that doctrine which teaches the mode observed by nature in the subordination and coordination of things, and which in acting she has prescribed for herself.* This doctrine constitutes a principal part of the natural sciences; for everywhere in nature there is order, and everywhere the rules of order. It is a doctrine which ex-

pounds the nature of the veriest form itself, without which nothing which is predicable of anything can occur. If the form of which we may be treating be the veriest form itself, and things be regarded as the subject-matter, in this case the subject-matter joined to the form perfects the science; thus, for instance, in the anatomy of the animal body, everything we meet with is a subject-matter of science, while notwithstanding if the veriest form of the whole and of every part be not known, the science is not perfected. The most perfect order in the mundane system is that which reigns in the animal kingdom; so perfect, indeed, that it may be considered as the living exemplar of all other things in the world which observe any order. Consequently the doctrine of series and degrees ought to teach, not only in what manner things are successively subordinated and coordinated, and in what manner they coexist simultaneously in subordination and coordination, but also, in what manner they are successively and simultaneously determined according to the order thus impressed, that they may produce actions, in which may be causes, between which actions and causes there may be a connection, so that a judgment may be formed respecting causes from the order in which they exist.

582. *Series are what successively and simultaneously comprise things subordinate and coordinate.* Subordination indeed and coordination properly have respect to order in causes, of which also they are commonly predicated; but whereas there is nothing in the animal kingdom, which does not, in some way, act as a cause, it is all the same, whether we call the several things in this kingdom successive and coexisting or simultaneous, or whether we call them subordinate and coordinate. When the things themselves are subordinate and coordinate, and thereby distinct from other things, their whole complex, in such case, is called a series, which, to the end that it may coexist, must exist successively; for nothing in nature can become what it is at once, or simultaneously: since nature, without degrees and moments, whether of time, velocity, succession, or determination, and consequently without a complex and series of things, is not nature.

583. *But degrees are distinct progressions, such as we find when one thing is subordinated under another, and when one thing is coordinated in juxtaposition with another; in this sense there are degrees of determination, and degrees of composition.* With philosophers, degrees are quantities of qualities; as degrees of heat,

of gravity, of colors, and of many other things; thus they constitute relations. But degrees are properly progressions and determinate steps; thus, for instance, in the case of ourselves, when we walk forward, we measure out with our feet determinate distances, and not only so, but in climbing a ladder, the very ladder itself has its separate steps or gradations. Hence it is that degrees never exist but in things successive. In things coexisting they are conceived to exist, for which reason they may also be predicated of them; since upon reflection we perceive that they exist within them, because without succession, and thus without degrees, they could not have coexisted. (n. 582). Hence we say that a series, or coordination of several things, is to be considered as distinguished into its degrees; for we do not, because it coexists, deprive the mind of its idea, that it existed or came into existence; since otherwise there would be no distinct perception of the efficient cause, and of its effect.

584. *In the mundane system there are several series, both universal, and less universal.* These series, the instant they are determined, or viewed as determinate, are usually arranged into genera and species, whence arise superior and inferior genera, and in like manner species, which acknowledge degrees of universality; wherefore species, and occasionally even individuals, are considered as a genus; and *vice versa*, when compared with genera more universal. The most universal series is the universe, or the system of the world, which contains within itself several series. The world or universe, according to the celebrated Wolff, is a series of finite entities connected with each other, consequently it is one entity; but this system comprises many simultaneous and many successive things. (*Cosmologia Generalis*, § 48, 51, 52, 60.) The series which the world comprises, are three superior, and three inferior. The superior series are those of the circumambient universe or world; the inferior are those of the earth. Of the circumambient universe or world, there is a series of substances simply derived from the first substance by the order of succession. The second series is that which the same substances constitute when left to themselves and their own nature, or when endowed with the liberty of gyrating, whence comes fire, both solar and inferior elementary fire. (n. 84.) The third series is that of the auras of the mundane system, arising from the combination of the two former, thus from their active and as it were passive principles: this latter

series is that for the sake of which the former exist ; it constitutes the circumambient world itself, and without it, the three inferior series, which are those of the earth, cannot exist. The auras themselves, which constitute this series, when examined as to their causes, by a rational analysis founded on facts, are four, which, as they succeed each other in order, decrease in simplicity, purity, universality, and perfection. These are the most perfect forms of active and passive nature, representing her forces brought into forms. The world itself confirms their existence ; so that he who doubts it, precludes himself from the investigation of every phenomenon and from the discovery of causes in every effect. (n. 53-58, 65-68.)

The general series of the earth, which in relation to the former ought to be denominated inferior, are themselves also three, and are commonly called kingdoms ; namely, the mineral, vegetable, and animal kingdoms. The mineral kingdom contains several species ; as metals, stones, salts, earths, liquids, in short, numerous inactive substances. The vegetable kingdom contains also various species, one under the other, such as trees, herbs, flowers, shrubs, and pulse. In like manner the animal kingdom contains its several species, which it would be tedious to enumerate. These kingdoms, or general terrestrial series, succeed each other in time and in order. The first is the mineral kingdom, or the earth itself, the parent of the rest. The vegetable kingdom derives its existence from the minerals of the earth, in which also, as in a matrix and womb, it deposits its seed as often as it proceeds to renew its birth. After this follows the third general series, or the animal kingdom ; for an animal requires for its existence and subsistence both the whole of nature and the whole of the world previously existing. The last of the series in the animal kingdom is the most perfect animal, or man, who is the complement of all things and of the whole, and the microcosm of the macrocosm. In these six series nature seems to have rested ; for there is no seventh.

585. *Each of which contains under it several series proper and essential to itself, while each of these again contains series of its own.* This is the case, not only in the genera, but also in the species, and in the individuals of every species ; and, since the animal kingdom is more immediately the subject of our present attention, we shall select for our example the human body, as anatomically and physically examined, in part, in our preceding chapters. Every

individual animal is a series of several other series that are essential and proper to the general one. Its essential and proper series are the viscera ; of which the higher series are the cerebrum, cerebellum, medulla oblongata, and spinalis ; the lower, or those of the body, are the lungs, stomach, liver, pancreas, spleen, womb, kidneys, and several others : for these, taken together, are constituent of the form. Each of these series contains other subject series which are essential and proper to it. The latter may be called partial series, and the former integral, or the former single and the latter common, all belonging to the whole series. Thus the liver, which is a large gland, includes in it a conglomeration of several glands, as do these again a conglomeration of their own most minute glands. The case is the same in the rest of the viscera which have reference to their integral series, in the same manner as the integral has reference to its common series, and so forth. A similar law prevails in the other kingdoms ; as for instance, in the vegetable kingdom, in which a tree is one series comprising branches, which are its proper and essential series ; whilst, in like manner, to these branches belong lesser ones, twigs, and leaves ; then finally fruits and seeds, which correspond to the generative members in an animal, only with this difference, that in the tree they are renewed every year, whereas in an animal they are permanent.

586. *So that there is nothing in the visible world, which is not a series, and in a series.* The first substance of the world is the only one which does not fall under the notice of the understanding as some kind of series : from this, as from the first determining substance, or the substantia prima, proceed all the rest, as series, and betake themselves within the sphere of nature. Thus, whithersoever we turn our attention, all things that we meet are merely series, originating in the first, and terminating in the first. Mere series, and series of series, constitute arithmetic, geometry, physics, nay, all philosophy. Even governments, both public and private, have respect to their forms and their subordinations ; and are consequently series of things. By series it is that we speak, reason, and act. Our sensations, too, are series of varieties, more or less harmonious, whence result agreement, imagery, idea, and reason. For where all is equality, or where there is no series, nature perishes.

587. *Consequently, the science of natural things depends on a distinct notion of series and degrees, and of their subordination*

and coordination. The better a person knows how to arrange into order things which are to be determined into action, so that there may exist a series of effects flowing from their genuine causes, the more perfect is his genius. And inasmuch as an arrangement of this kind is prevalent throughout nature, so the faculty of arranging is perfected by observation and reflection on the objects of nature, by natural abilities, and by the assistance of those instructors whose minds are not too artificially moulded, or under the influence of prepossessions, but who claim to themselves a freedom in contemplating the objects of nature with a view to become instructed by things themselves, as they flow forth in their order.

II.

588. To the intent that we may advance from the primary sources of existence, we shall begin with substances, which are the subjects of accidents and qualities. These substances are manifold; nevertheless, of all that are in the universe, there is only one from which the rest flow, and on which, as their first principle, the principles of natural things are impressed by the Deity. Each series has its first and proper substance, which substance nevertheless depends for its existence on the first substance of the world.

589. *To the intent that we may advance from the primary sources of existence, we shall begin with substances, which are the subjects of accidents and qualities.* A *subject* is that, in which are all things that can be predicated of it. *Accidents* are the things thus included; such as form, figure, magnitude, determination in agreement with the form, active force [*vis agendi*], etc. *Qualities* are predicated of substances considered as the subjects of accidents; as the quality of form, figure, magnitude, intrinsic determination, force, etc.: all these things are sustained by the substance, as the subject. For if it be inquired, *What is there* in a substance? The reply is, accidents. If again, *What sort of things are accidents?* The reply is, They are determinable qualities. If again, *What is their quantity, or How much?* The reply is, They are quantities, which are also degrees of qualities. Aristotle defines substance to be an *ens* which subsists *per se*, and sustains accidents; that is, to which the things within it are proper, or appropriately belong, so that they cannot be attributed to other things; as essence, or form and nature, together with the rest of the par-

ticulars which flow from them. If it subsisted from other things, it would not have a distinct subsistence; wherefore it must be said to subsist of itself, whence it derives the name of substance. For example: every compound substance, or one series, if the things contained in it were not proper to it, would not be a substance *per se*, consequently there would be no substance or universe. Nevertheless, there is a connection of all things, in respect to existence, as also in respect to subsistence, so far as subsistence denotes perpetual existence. Wolff observes, that "substance is the subject of intrinsic, constant, and variable determinations," and "is that in which dwell the same essentials and attributes, while modes successively vary." He, therefore, supposes that substance, without active force, is not conceivable (*Ontologia*, § 769, 770, 776); and hence he describes its accidents [forces?] as alive. (*Cosmologia*, § 378, 379). But there are also inert substances.

590. *These substances are manifold; nevertheless, of all that are in the universe, there is only one from which the rest flow.* The reason is, that there is a connection between all things in the world, and a mutual dependence on their first principles, since there is nothing which is not a series, or in a series. (n. 586.) This transcendental truth is manifested only by contemplation of the various objects in the world; and is consequently not acknowledged except by a rational view of the facts presented by general experience. Nevertheless, that the truth is such, both reason and experience abundantly testify.

591. *And on which, as their first principle, the principles of natural things are impressed by the Deity.* Consequently, the above-mentioned substance is the first substance of nature, and the first of the mundane system. To this first substance are appropriated and attributed the things which are in it; thus it may be said to *subsist by itself*; but not to *sustain accidents*; for when we reflect on it abstractedly, we perceive that the idea of accidents, resulting from the forms and essences of finite things, is not in any wise adequate to it; since nothing can be categorically predicated of those things which are above nature, as are those which are in the first substance. Wherefore only half of the philosopher's definition of a substance, namely, that it is an entity which subsists by itself, and sustains accidents, applies to this first substance of the universe; but the whole to all other substances. The ancients, therefore, said with Plato, that the *materia prima* is a thing of

abstruse and obscure consideration, and that it is impossible in the nature of things that any knowledge should be obtained of it, except such as is indirect; or, as Aristotle affirmed, except by way of analogy and similitude; and that it is to be considered as without form and accidents, etc. But so far as it contains the cause of the existence of all other substances, it is to be understood as their first principle; yet not a first principle of itself, because it was created by the Deity.

592. *Each series has its first and proper substance, which substance nevertheless depends for its existence on the first substance of the world;*—as the first substance of the mineral kingdom, the first of the vegetable, and the first of the animal; or the first of every species, that is, of every individual of the respective kingdoms. These first and proper substances are what are called by some elements, monads, primitive and simple substances; not that they are absolutely primitive and simple, but that they are so in respect to the compound substances of their series; for if they were absolutely such, they would all differ from the first substance of the world as to essence, or as to form and nature; and would flow as differences immediately from the first substance; which nevertheless they cannot do but by an order of succession, from the most universal substance of nature. Consequently, we should then trace up nature to no higher an origin than nature, and should bound the rational analysis of the mind either in things already thus simultaneously created, or in things thus to be created, successively from one instant to another. Hence all irregularities and imperfections would be made to flow immediately from the first substance, or to be immediately created such, whereas they ought to be ascribed to nature alone. In a word, we should involve the causes of things in numberless occult principles, which the ancient philosophy involved only in a few. I would allow the first substance of any series to be absolutely primitive and simple, if anything in nature would be thereby rendered capable of explanation; but since nothing whatever can be so explained, I think that I ought not to make the admission. Still less can I do so, if that substance is to be conceived as simple according to the usual description of a simple entity, viz., as destitute of parts, magnitude, figure, internal motion, divisibility; by which adjunct, substance would be deprived of the notion essential to it; as is done when a negative is associated with an affirmative, and a privative with a positive. I do not say that

these things are to be affirmed of the first substance; but still, that for want of better terms, they are not absolutely to be denied. (n. 650). Wherefore if the first substance of every series be assumed as depending for its existence on the first substance of the world, then, according to Wolff, "Every state of every element involves a relation to the whole world. In elements and simple substances are contained the ultimate causes of those things that are found in material things. The connection of material things depends on the connection of elements. Extension cannot originate from Zenonic or self-similar points." (*Cosmologia*, n. 213, 191, 192, 205, 218.)

III.

593. The first substance of every series is its most simple and only substance, which reigns through the whole individual series. From it, and according to its nature, flow all things which have a visible determination in the entire series. For from it, by order of succession, and by connecting media, are derived substances more compounded, which are its vicegerents in the ultimates of the series, and thus give determination to the things existing in that series. By the determination of these substances are formed others more compounded, which may be called mediating and sub-determining substances; by which the essential and proper series, which constitute the entire series, are compacted and connected together. By determining substances, through the medium of such as are subdetermining, one thing is so perpetually connected with another, that an unconnected part is not proper to the same series; consequently, there is a coestablished harmony. The establishment of this harmony is the more perfect, in proportion as the more simple substances are more distinctly discriminated from the more compound, and substances of the same degree, from their associates, their essence and attributes remaining the same: consequently there exists a harmonious variety.

594. *The first substance of every series is its most simple and only substance, which reigns through the whole individual series.* Thus the spirituous fluid in every individual of the animal kingdom, is the only living substantial fluid, and the all in every part; by the operation of which, everything in that limited universe is continued, supplied with moisture, nourished, renovated, formed, actuated, and vivified. (n. 37, 38, 40, 41, 91, 97, 100, 101, 152-154.

177, 360, 361, 370, 556.) The vegetable kingdom has also its own formative and plastic substance, diffused throughout the whole of every individual, and stored up in the inmost bosom of the seed. Every species, too, of the animal and vegetable kingdom, has its own proper substance, in respect to which all the other things which are in the compounds, are accidents. But this most simple substance is such only in regard to its own microcosm or little world, and is not the most simple of all, which latter is only in the macrocosm or world at large. (n. 592).

595. *From it, and according to its nature, flow all things which have a visible determination in the entire series.* This I think is confirmed in Chapter III., On the Formation of the Chick in the Egg.

596. *For from it, by order of succession, and by connecting media, are derived substances more compounded, which are its vicegerents in the ultimates of the series.* Thus there is the purer or white blood consisting of plano-oval spherules; next to this follows the red blood, which is the third in order when the spirituous fluid is considered as the first. Wherefore the red blood is called the corporeal soul (n. 46, 102); and the spirituous fluid is called blood by way of eminence. (n. 91-94, 100.) The nature of the composition of each species of blood from its own spirituous fluid is explained in n. 91, 92, 95, 96, 108, 371. This composition is effected by saline connecting corpuscles taken from the family of such as are inert. (n. 43-45, 50-57, 91, 92.) These corpuscles act as concurrent and accessory causes; and being accessory, although they are such by virtue of an express provision, they are called contingent. (n. 263.) Thus the mineral and vegetable kingdoms concur to the existence of the animal kingdom, since without those kingdoms, the connecting, compounding, and perfecting elements would be wanting; and the spirituous fluid, being destitute of its auxiliaries, would in vain attempt to carry on its work of formation.

597. *And thus give determination to the things existing in that series.* To the intent that they may give this determination, it is requisite, 1. That they be fluids; for fluids, especially the atmospheric fluids of the mundane system, and the living fluids of the animal kingdom, represent most perfectly the forces of active and passive nature in their form: since in these forces is contained the cause of the coexistence of things. It is requisite, 2. That they

flow within their tunics or membranes, by which they receive their determination. Thus the spirituous fluid is determined by its tunics or membranes, whence arise fibres; and both kinds of blood are determined by their tunics and membranes, whence arise vessels. (n. 130). For a fluid uncircumscribed is only an indeterminate flow. It is requisite, 3. That the fluid and its tunic act conjointly as one and the same determining cause; thus will the one be in conformity to the other. (n. 134, 135, 522.)

598. *By the determination of these substances are formed others more compounded, which may be called mediating and subdetermining substances.* Such, for instance, are moving or muscular fibres, which are produced by the determination of their fluids in their fibres and vessels. (n. 503, 510.) For that fluids may put anything in motion, the little vessels containing them must be so arranged, as to possess the ability of moving, which is a consequence of determinations, or of subordinations and coordinations. Wherefore no part of the body is destitute of its motive fibre; and whatever part becomes destitute, lives not in its entire series, in an active, but a passive character, or lives not in the particular, but in the general; such as bones, cartilages, tendons, which yet originally were formed by the coalescence of moving fibres. (n. 536.) But motive fibres are not determining substances, because they are the fibres and vessels of those fluids which determine them; neither are they, in respect to the members which are put in motion, substances determined, for they exercise a moving force; wherefore they may properly be called subdetermining and mediating substances. To the subdetermining substances of the body correspond the subdetermining substances in the brain, which are its organic substances, spherules, and cortical tori. (n. 287, 505, 557, 561, 644, 647.)

599. The little glands themselves, or congeries of most minute vesicles, may also, in some measure, be called mediating substances, since they are the first substances which are determined by the muscular fibre, so as to receive, secrete, dispense, and distribute, alimentary matter to the blood and viscera, and to cause them to exist perpetually such as they existed at first; consequently, they enter the animal economy as inferior subdetermining substances. (n. 163-165, 205.)

600. *By which the essential and proper series, which constitute the entire series, are compacted and connected together.* Such are

all the viscera and members, and also the organs, which construct a series, and cause it to act according to its structure or form. Therefore the viscera and members themselves, as being substances determined, consist merely of muscles and glands; the muscles and glands consist merely of diminutive vessels, these diminutive vessels of mere fibres, and the fibres of a mere spirituous fluid, which is the all in every part. Consequently, the viscera and members consist of the same spirituous fluid, for which reason they are its essential and proper series. (n. 585.)

601. *By determining substances, through the medium of such as are subdetermining, one thing is so perpetually connected with another, that an unconnected part is not proper to the same series; consequently, there is a coestablished harmony.* This flows as a consequence from what has been said above, and from what remains to be said, without any further comment. In the mean time, the subject here principally treated of is the connection of the animal series, which being the most perfect of all in the system of the world, may be considered as the exemplar of the rest. For a similar order everywhere prevails; that is to say, there are determining substances, subdetermining substances, and things determined, where descent or ascent is made by three degrees; but in cases where there are only two degrees, there is no complete determination. For to every perfect determination there is required a threefold progression; since to the existence of an agent and a patient, there is requisite an intermediate having reference to both.

602. *The establishment of this harmony is the more perfect, in proportion as the more simple substances are more distinctly discriminated from the more compound.* This is the case more especially in the brains, although it is verified likewise in the body. For in the brains the spirituous fluid, with its fibres, secretes and separates itself most distinctly from the blood or its vessels, inasmuch as the red blood, at the instant of its arrival at the cortical substance of the brain, ceases to be red, and enters into it as white blood, and hence again into the little fibres as pure blood, or spirituous fluid, yet still it is in perpetual continuity, and suffers no part of itself to be excluded from that continuity. The more distinctly, therefore, the fluid of one degree secerns itself from the fluid of another, whilst the continuity still remains unbroken, the more perfect is the harmony established. So likewise in the body; the more perfectly the vessels of the red blood distinguish them-

selves from the vessels of the white blood, and those of the white blood from the fibres, whilst the continuity still remains unbroken, the more perfect is the harmony. (n. 91-94, 100, 149, 150, 158, 214-216, 371, 557.) Hence the circulation of the blood is sub-triplicate. (n. 148.) Thus one fluid in its place may act as a cause, and another in its place as another cause, and also all together conjointly as one cause. (n. 147, 150.)

603. *And substances of the same degree, from their associates, their essence and attributes remaining the same.* For throughout the whole body there is not a single artery, vein, or drop of blood, which, as to all its accidents and qualities, is exactly similar to another, there being a diversity in all. (n. 97-99). Thus neither is there a single fibre altogether similar to another, as to its essence and attributes; consequently neither is there any fluid pervading them altogether similar to another: hence neither is there any fibre but has its own proper little heart prefixed to its origin in the brain. (n. 177; 471). And if the fibres themselves, or their most slender matres or membranes, are formed and elicited out of their own fluid, by the privation in some degree of its forces and fluidity, it follows, that no individual thing can possibly be the subject of an exactly similar accidentality. Nevertheless, in each and all, there may be the same tendency conspiring to produce effects, of which the essence may be rendered the more perfect, in proportion as the substances from which they result, are distinguished from each other, and in proportion as the more simple are distinctly secerned from the more compound.

604. *Consequently there exists a harmonious variety.* By harmonious variety we mean all that difference, taken collectively, which can exist between individuals of the same genus or species in their accidents and modes, while the common form and nature, or the essence and its attributes, remain the same. The title, harmonious variety, is the more applicable to these differences, inasmuch as they exist most perfectly in prior substances. As for example; they exist in the first aura, or inmost atmosphere; the individual parts of which we may conceive as nowhere equal to each other, but most distinctly various, according to their distance from the common centre of their activity, whence arises a variety, of which the most perfect harmony may be predicated. This, however, is imperceptible to the human understanding, since the differences, degrees, or moments, are inexpressible by common numbers.

For an aura of this description, formed to receive the forces of the most perfect nature, possesses within it all possibility of applying itself to every inconceivable minutia of variety, and consequently, of concurring with every possible determination; so that there is nothing whatever within it that admits of any comparison with number, nor is there any surd or irrational, which it cannot supply with its own unit, degree, or moment. For it is well known that every number, whether integral or fractional, rational or irrational, has relation to its own units, and from these to its numbers and ratios, as homogeneous. It is well known that by the more simple units, a number of which either constitutes or proximately defines a given unit, we can approximate to a true ratio in an irrational quantity, and we arrive the nearer to it, in proportion as the simplicity of the said unit is more unassignable: thus we come very nearly to the proportion which the diameter bears to the circle, and the diagonal to the side of a square. Consequently, if the individual parts of this aura are susceptible of every variety, whilst its essence and attributes remain the same, then there never can be any disharmony in the derivatives and compounds, which they cannot render harmonious; and indeed in things absolutely irrational, they can approximate so nearly to a proportional, that the difference is of no account, or may be said to vanish; especially when this unassignable minimum, or least quantity, which has in potency all the units which it is to put on, is compared with its unassignable maximum or greatest quantity, that is, the mundane system. Let us take our explanation of harmonious variety from a nearer object, and let the air serve as our example. No individual part of this air is equal to another. The parts of it which occupy the higher region, are more expanded, consequently lighter, and act less by their *vis inertiae* and more by their *vis activa*. Yet they are so conjoined with each other throughout the whole atmosphere by contiguity, that the result is harmonious variety.

605. From this aura we may now advance to the first substance of the mundane system, and inquire whether a similar harmonious variety may be attributed to this also. It seems indeed that this substance must be acknowledged to possess the highest degree of constancy and permanency in regard to its essence and attributes; and that in regard to its other faculties, which in the subsequent substances are called accidents and modes, it possesses the most perfect harmonious variety: otherwise we could not possibly under-

stand anything to be contained in it beyond a most fixed oneness. This I believe to be the meaning of the celebrated Wolff, when he describes substance as the subject of intrinsic, constant, and variable determinations, and as that in which dwell the same essentials and attributes, while modes successively vary. (n. 589). By reason of the insufficiency of terms, instead of harmonious variety being predicated of this substance or first aura, harmony alone seems predicable of it, without the addition of variety; for although variety is not inconsistent with it, yet that term is not adequate to express the true idea.

The view of the subject developed both here and in the foregoing observations, seems to have been favored by some ancient philosophers; as by Anaximenes, and Diogenes of Apollonia, who held, that the first elements of all forms were susceptible and flexible. By Xenophanes of Colophon, and Melissus (who was opposed by Aristotle), who held, that one thing is infinite, one finite: where he seems to have used the term infinite, not instead of God, who impressed those principles on things, but instead of the terms indefinite and unassignable, for he does not specifically define what his infinite is. By Anaximander, who held that a certain infinite principle was founded on the infinity of things in the world, one of which continually produced another. By Pythagoras, who held that there is harmony and agreement, and thus unity. By Archelaus, the Athenian, who held that there is an infinite aura, from which all things were brought forth. By Anaxagoras of Clazomene, who held that there are certain similar substances, by the composition of which all things are produced, etc. Thus the idea of them all seems to have been similar, although not expressed in similar terms; for it is only by a slow progress that names or terms attain their peculiar bearings, and are distinctly explained. The ancients, who lived nearer to the golden age of truths, seem to have been content simply to describe the bare thing itself, not to circumscribe it with any ornate investiture of words.

606. Thus in these respects, the animal microcosm, or little world, is similar to the macrocosm, or world at large; viz., its fluids, especially the purest, are in the most perfect harmonious variety; as are also the substances and auras of the mundane system, particularly the first and purest; the harmonious variety of which, in consequence of the defectiveness of language, cannot possibly be expressed in adequate terms. (n. 650).

IV.

607. By this process the corporeal system is constructed and perfected; in which one thing remains fixed in such a state of subordination to, and coordination with, another, that all individually respect and depend upon each other; in such a manner, that the more simple substances are rendered conscious of every change which takes place in the compound series and substances; and whatever is determined into act, is effected by the more simple; either determining, or concurring, or consenting. Moreover this is accomplished according to natural order, proceeding from an inferior substance to one proximately superior, or from a superior to one proximately inferior; but not from the supreme to the ultimate except by intermediates.

608. *By this process the corporeal system is constructed and perfected; in which one thing remains fixed in such a state of subordination to, and coordination with, another, that all individually respect and depend upon each other.* This law prevails universally and perpetually in the animal body; as also, in the vegetable and mineral kingdoms, and in the world at large, as the complex of all. The first substance of every kingdom, species, and subject, is what gives being [*esse*] to the rest; it is that, also, by which, and for the sake of which, the rest have existence, so that there is nothing in the whole series which has not respect to it, both as the beginning and end of the whole, and as that under which everything else exists in a state of subordination. Thus, there is nothing but what is an intermediate to some further use and end, in such a way, that, being placed between the things which precede and those which follow it, it both contains the relation of the things which follow it, and is itself in relation to those which precede it, on which it depends, and for the sake of which it exists in that and in no other manner. (n. 252.) See also n. 248–253, 257–298. Thus in every series there is established a kind of circle, in virtue of which the first thing can have reference to the last, and the last to the first. Thus in the human body it is the soul to which all things in the body refer as their first substance, by which, and for the sake of which, they exist. The purposes, state, and happiness of the soul, therefore, are the objects which all these regard; and to the intent that its purposes may be carried on, there must be something which has precedence, or which is prior and superior, by which, and for

the sake of which, the soul exists. Thus nothing terminates in the finite universe, but all things universally in the first Ens of created things, in respect to whom there is nothing in the whole compass of nature and of the mundane system, which is not a medium or intermediate, He being, preeminently, the Beginning and the End; for which reason also all things flow, in a most wonderful manner, from an end, through ends, to an end. (n. 296–298). Thus it is that even the universe itself is distinguished into its series. (n. 584–586). And thus in every series there is a similar chain of subordination, order, and form of rule, so that each, whilst accomplishing, individually, its own purpose, is accomplishing also, the common and hence the universal purpose of all.⁶

609. *In such a manner, that the more simple substances are rendered conscious of every change which takes place in the compound series and substances.* This follows as a consequence from the connection established between them, which is the more perfect, in proportion as the more simple substances are distinct from the more compound, both in the brains and in the body (n. 602); and in proportion as the substances of the same degree are distinct from their associates, their essence and attributes remain the same. (n. 603, 604). To the intent that these effects may be secured, organs are provided, which may have a sense of all changes that take place out of the series, and of all things that are in contact with it. The tunic or membrane which is the clothing of the whole, is sensible of the more general impressions arising from the touch, appulse, and impact of external objects. The tongue is sensible of the forms of differently shaped bodies, and especially of those which are somewhat rough, or hard, and floating in aqueous fluids: the nostrils are sensible of similar purer bodies floating in the aerial fluid: the ear is sensible of the modulation of the atmospheric fluid; and the eye, of the modifications of the ethereal fluid; thus there is nothing in the earth which does not produce and induce some change with regard to some organ of sense. But in regard to changes of a higher order, such as those, for instance, which occur in the still more perfect auras, and which answer to the modification of the inferior auras, there are also more eminent organs within the series, which have a sense even of these, but in a more perfect manner according as the harmony established between them (n.

⁶ Or, "so that each, while acting in its capacity of an individual cause, acts also in that of a common, and hence in that of a universal cause."—(Tr.)

602-604) is the more perfect; and according as the compounds suffer themselves, without the intervention of mutable substances in the world and in the body, to be determined to a more orderly arrangement by their more simple substances. But in what manner the more simple substances and series are rendered conscious of what happens in such as are compound, can be known only from their connection, some idea of which is suggested in this Part, as in n. 216, 217, 234, 268, 287, 505, 557, 561, 574-576; also in the sequel, n. 641-647; and as respects the cerebellum, in n. 558-561, inclusive, where it is shown that this organ is rendered conscious of the general changes existing in the body; but as those changes do not come into the distinct perception of the cerebrum, they are generally supposed not to reach us.

610. *And whatever is determined into act, is effected by the more simple, either determining, or concurring, or consenting.* What the substances are, which give determination to the things existing in their series, may be seen in n. 597; and inasmuch as they are distinct from each other (n. 602), determination may be predicated of each. When, therefore, the determination comes from the more simple substances, it is according to natural order (n. 271-278); but when it comes from such as are compound, viz., when causes out of the body, or when causes within the body, are those which excite, then the more simple substances either *concur* (for to the intent that a full action may exist from sufficient causes, a concurrence of several things is requisite, with which the force of the more simple substances, being that which gives determination to all the rest, must concur); or else they *consent*, since without consent no action ensues. Even parts which are dissentient can enter into consent; but when the determination exists in act, the parts which had consented prevail over the rest.

Thus *freedom* is predicable of the will, when causes arising from the world, or the body, can be referred as exciting causes to the will of the superior faculties or powers, and when at the same time these latter concur or consent before they are determined into act: consequently to the freedom of the will, it is of no importance what has ingress, but what has egress, or not what excites, but what is determined. The freedom of the superior faculties of the same series, therefore, is the less, in proportion as they are the more drawn to that side of the question to which the inferior faculties are impelled; and, on the other hand, the freedom of the superior

faculties is the greater in proportion as they are able to descend to that side of the question of their own accord; especially in proportion as they are more strongly induced to descend. In the meantime, when determination takes place, the inferior faculties can no longer be said to determine or act, but to be determined and acted upon; because they are under the superior, and are bound to comply, in order that what is determined may come into existence. For the existence of an action is owing to the principal cause; but as to the quality of the action, we may observe, that those, or many of those things which are in the action, are either owing to the principal cause providing that such accessories shall attend it; or to some mediate or proximate cause doing the same, and hence to the principal cause which admits them into the action; or finally it is owing to a still higher cause, which provided them from a still earlier origin. Thus an action is endowed with qualities according as it derives them either from a more principal and hence a more perfect cause, or else from other causes. Now, so far as there is liberty of acting, so far also is there the liberty of suffering one's self to be acted upon by what is superior. And since, as already observed, liberty is predicable of the will, therefore when causes arising from the world, or the body, can be referred as exciting causes to the will of the superior faculties or forces, and these concur or consent, that is, condescend to them, it hence follows, that there is a liberty of so disposing one's self as to be in a state of suffering one's self to be acted upon; to form which state, things superior also concur, which provide for the accession of those things which qualify, or give the quality, as was said above. There is, therefore, a liberty of acting, relatively to things inferior; a liberty of suffering one's self to be acted upon, relatively to things superior; from both which results a liberty of disposing one's self to be acted upon.

611. *Moreover this is accomplished according to natural order, proceeding from an inferior substance to one proximately superior, or from a superior to one proximately inferior; but not from the supreme to the ultimate except by intermediates.* On this account subordination is distinguished into degrees, that all things may flow in due order. For a fibre cannot act except upon its own motive fibre, which is its mediating and subdetermining substance; nor can this latter act upon the fleshy moving fibre, except by an intermediate. (n. 503-505, 510, 532, 557). The same law prevails

with all other substances, whether existing in an animal (n. 571-578), vegetable, or mineral; for it is contrary to the nature of things, that a remote cause should be a proximate one, and that one prior in order should be the immediate cause of the one which is ultimate, or of the effect. (n. 270). Thus the same law prevails, whether an inferior cause act upon a superior, or a superior on an inferior, as in the cases mentioned in n. 609, 610.

V.

612. Simple substances, and those which are less and more compound, which are the determining substances of the things in their own series, are, according to their degrees of simplicity or of composition, prior and posterior; superior and inferior; interior and exterior; more remote and more proximate; and, amongst each other, are as efficient causes and effects. Those which are prior are also more universal, and in every quality are more perfect than those which are posterior. The prior also can exist without the posterior, but not the posterior without the prior.

613. *Simple substances, and those which are less and more compound, which are the determining substances of the things in their own series, are, according to their degrees of simplicity or of composition, prior and posterior; superior and inferior; interior and exterior; more remote and more proximate; and, amongst each other, are as efficient causes and effects.* By simple substances I mean the first of every series, in respect of which those which follow are compound; such for instance is the spirituous fluid in the animal kingdom, after which follows in order the blood of each kind; next, the medullary or nervous fibril, which is only a most simple artery; then, the motive nervous fibre in the muscles; and so on. (n. 115.) The substances, therefore, which are more simple, are also *prior*, both in order and time: they are *superior* in order with respect to degree, for the first holds the supreme station (n. 91-96, 100, 148-150, 158, 371); they are also *interior* (n. 216); and likewise *more remote*. (n. 548, 549). Wherefore nature is said to ascend, and to betake herself inwards, and indeed the more highly and internally, in proportion as she approaches nearer to her simple substance, in regard to which, all the rest, which are compound, are posterior, inferior, and exterior. A simple substance may thus be considered a cause, since a prior, superior, and

interior substance continually operates as a cause to one which is posterior, inferior, and exterior. Hence arise the expressions of, *a priori* and *a posteriori*; of ascending, descending, and transcending in series; of numbers being raised to higher powers, and of nature retiring into herself, which she does when returning to prior causes, and more inwardly still, when returning to their first principle.

614. *Those which are prior are also more universal.* Thus the first substance of the mundane system is the most universal of substances, because the only one in compound substances. In like manner, the spirituous fluid is the most universal substance in the animal series, because it is the all in every part, and the only substance in the series that lives, or by which the rest live. The medullary or nervous fibre is the one only determined substance in the same kingdom, whence it is the most universal; and the nervous motive fibre is the one only determined substance in the muscle, because it rules universally in that kingdom. So likewise in all other cases. For according to Aristotle, that is a universal which is predicated of many things (*De Interpret.*, lib. i., tr. iv., cap. vii.), and which naturally is in many things; for, as he says, the common essence or nature, which others call the universal principle in many things, is always preserved even during the perpetual and continued succession of individuals.* Wherefore, the philosophy of universals is that which contains the principles and elements of the things which follow from them. But a universal has respect not only to substances as giving determination, but also to series as receiving determination from them: hence it is usual to arrange things into genera, as also genera into species, and indeed into genera superior and inferior, the determinations of which, as being general, enter into the species and into their particulars or individuals. Therefore, since there are degrees of universality, and there is nothing in the whole system of the world which has not respect to something more universal, a species is sometimes taken for a genus, either superior or inferior, according to its relation to the things which belong to it in order. (n. 584).

615. *And in every quality are more perfect than those which are posterior.* In other words, prior substances viewed in themselves and in their own nature, are more perfect than such as are posterior viewed in themselves and their nature. (n. 176.) They are more

* Unverified reference.

perfect, for instance, in regard to form, essence, attributes, accidents, and qualities; consequently they are more distinct, similar, unanimous, constant, and fluid; they are in the fuller enjoyment of all their virtue or force, just as active substances are in the fuller enjoyment of their elastic force; they are also more beautiful, and more disposed to agreement: hence also it follows, that they are less limited, more free, in greater potency, more sensible, more rational, more durable. (n. 100–102, 115, 258, 259.) For the smallest defect in the first determining substances would occasion the greatest in the substances determined; since error would increase according to descent in degrees. (n. 248, 249, 251.)

616. Order also itself exists in greater or less degrees of perfection: but the perfection of the order flows from the perfection of the first substance or first determining principle in every series; for the very determining principle itself is a series, because in the series of the universe. (n. 586.) Wherefore the order of the whole series depends on the order of the first substance, as being in itself and in its own nature the more perfect. The greatest perfection of any entire determined series, is, when it corresponds to the perfection of the determining series; yet the highest perfection cannot on this account be predicated of it, unless the perfection of its first determining series, from which a like determination flows, corresponds to the perfection of the first series in the mundane system. But that the order of derivatives may correspond to the perfection of primitives, we must suppose that all those things which are to enter into the derivation of things posterior, accede to it, either by express provision or contingently: they accede to it by express *provision* in the natural formation of every series, nay, even in what is thence formed, in order to its perpetual existence, that is, to its subsistence. Wherefore the series of the contingents are simultaneously included in the determination of the first substance of every series, which so arranges them as to cause them to accede.⁷ (n. 263–265, etc.) If they accede *contingently*, they are provided either by some other superior principle, whence comes a more perfect order; or by some inferior principle, whence comes a more imperfect order. Concerning the perfection of harmonious coestablishment, see n. 602–606. This perfection in things successive coincides with the “transcendental goodness” of the ancients, which, according to Wolff, is predicated of the order which prevails

⁷ A qua sic disponuntur ut accedant.

in the variety of those things which are together, and follow one another ; or of the order of those which agree with an Entity ; whose perfection is greater, in proportion to the greater (or better) variety of consenting things. (*Ontol.*, § 503: *Cosmol.*, § 552.) Hence it is evident that the world at large, and also our little world, are themselves most perfect (n. 115, 239, 240), but that we ourselves are the cause of our imperfection.

617. *The prior also can exist without the posterior, but not the posterior without the prior.* I speak not of things undetermined, which are the subjects of the theoretical sciences, but of things determined, which are subjects of the world and of nature, in which there is nothing whatever that is undetermined, because there is nothing which is not either a series, or in a series. (n. 586.) For the spirituous fluid exists prior to the purer blood and the purer blood prior to the red blood, in which last the spirituous fluid is the one only substance which lives. The same holds in all other cases, as may be seen throughout Chapter III., on the Formation of the Chick in the Egg. Consequently, what is prior can subsist without what is posterior (n. 67) ; and thus, after the decease of the body, the soul will survive ; for when the body perishes, nothing perishes but mere accidents, and nothing recedes from the soul but mere accessories, or elements borrowed from the kingdoms of the earth.

VI.

618. Such as are the substances, such likewise are their essences, attributes, accidents, and qualities; or all their adjuncts. Of these also it may be predicated, that they are series, and are in a series; of the adjuncts, that some are more or less simple, prior, superior, interior, universal, and perfect, compared with others; just as is the case with the substances in which they are, and from which they flow. It may be predicated further, that the superior enter by influx into the inferior, and *vice versa*, according to the mode in which the substances are formed, and in which they communicate by connection with each other. But those which occupy a superior place are incomprehensible, and to the sensory of things inferior appear as continuous; whilst those which occupy an inferior place are comprehensible, and appear to the sensory of things superior as contiguous. Yet such is the coestablished harmony of all things in the same series, that they mutually correspond to each other, without any difference but that of perfection according to degrees; wherefore the inferior regard the superior as their analogues and eminences.

619. *Such as are the substances, such likewise are their essences, attributes, accidents, and qualities; or all their adjuncts.* For substances are the subjects of accidents and qualities. If therefore we say, that matter joined to form is the substance; that the nature by which it determines itself according to the form, or the nature joined to the form, is the essence of that substance; that the possibility of admitting modes is its attribute; that the modes themselves are its accidents; and that the variety of modes is their quality; we may in such a case infer the following to be the order of the whole:—that essentials properly belong to the substance itself, attributes to essentials, accidents to attributes, and qualities to accidents. Consequently, whatever is predicated of a substance, is such as the substance itself is.

620. *Of these also it may be predicated, that they are series, and are in a series.* For unless accidents be series, quality cannot be predicated of them. Thus a muscle is a compound substance, and is a series of motive fibres, and is in a series, viz., in the integral or common series of the body; its essence consists in the form or construction of the fibres in and amongst themselves (n. 503);

consequently, in the nature, by which it determines itself according to the form: its attributes are the forces or powers of acting that exist in the fibres, or, if taken collectively, in the muscle: its accidents are modes: its modes, taken either successively or simultaneously, are the action, of which, according to the variety and relation of the modes, quality is predicated. Therefore, since a muscle is viewed as a series, the forces and modes, with the action thence resulting, are also viewed as series, which receive their quality according to the form and the nature of the action thence resulting belonging to the muscle itself. (n. 586.)

621. *Of the adjuncts, that some are more or less simple, prior, superior, interior, universal and perfect, compared with others; just as is the case with the substances in which they are, and from which they flow.* Thus as the simple motive fibres in a muscle are its first and supreme substances, etc.; as the white motive fibres are its posterior and inferior substances in respect to those which are supreme, but its prior and superior in respect to the fleshy motive fibres made up of the vessels of the red blood, which are its posterior and inferior substances; so likewise are these posterior and inferior substances prior and superior in respect to the entire muscle, or to all the muscles of the same common series, which are the most compound motive fibres, consequently the last or lowest in respect to all those which are prior and superior. The case is the same with the forces, modes and actions resulting from them.

622. *It may be predicated further, that the superior enter by influx into the inferior, and vice versa, according to the mode in which the substances are formed, and in which they communicate by connection with each other.* For the forces and modes themselves may be compared with fluids, since fluids resemble the forces of active nature. (n. 66, 67, 100, 171-172, etc.) Whence also the forces are said to be modified; wherefore forces, viewed abstractedly from substances, may be said *to flow*, and *to be influent*; or *influx* may be predicated of them; just as substances may be said *to be connected*, and by connection, *to act* mutually on each other. Thus, in a muscle, the power or force of a simple motive fibre flows into that of a compound motive fibre, according to the order in which the substances act on each other.

623. *But those which occupy a superior place are incomprehensible, and to the sensory of things inferior appear as continuous.* For one muscle may consist of a myriad of fleshy motive fibres:

one fleshy motive fibre may consist of a myriad of white or mediate motive fibres; and one white or mediate motive fibre, of a myriad of simple motive fibres. The sensory, therefore, which discerns only the degrees and moments of the entire muscles amongst each other, cannot distinguish the degrees and moments of the motive fleshy fibres amongst each other, still less of the simple fibres; wherefore the forces and modes of the latter appear as destitute of degrees and moments, consequently as incomprehensible and continuous.

624. *Whilst those which occupy an inferior place are comprehensible, and appear to the sensory of things superior as contiguous.* For the sensory itself cannot judge distinctly of the sensible impressions of which it is the subject, since it conceives only a general notion of them, that is, of the general action of the forces and modes. Hence, to judge of what belongs to an inferior power, a superior power is required. For the superior distinguishes and discerns, in the inferior, the essences, attributes, accidents, and qualities, as compounded of their more simple principles, but entering into them in a general manner, consequently as distinguished into degrees and moments; whence comes the perception of what is simultaneous and of what is successive, consequently of space and time.

625. *Yet such is the coestablished harmony of all things in the same series, that they mutually correspond to each other, without any difference but that of perfection according to degrees.* Thus the simple moving fibre acts precisely in the same manner as both the white and the fleshy one. (n. 472, 570.) For in order that one may be an acting cause productive of the action of another, there must exist a harmony, not only between the coordinates in the same degree, but also between the subordinates in several degrees; otherwise one cause could not act upon another, and make a compound action, in which it should be the cause and beginning: since if the two did not correspond, collision and error would ensue.

626. *Wherefore the inferior regard the superior as their analogues and eminences; because they are incomprehensible (n. 623), and yet mutually corresponding to each other. (n. 625.)* Therefore, the proximately superior may be called the *analogue* of the proximately inferior; that which is still superior, may be called the *eminent* of the inferior; and that which is still superior, may be called its *supereminent*; and so on.

627. What has now been said respecting the forces and modes of acting of the muscular motive fibres, is to be understood also respecting sensations, regarded as forces and modes. For if the organs themselves be considered as series, and these series as compound substances, which sustain accidents both intrinsic and extrinsic; or if they be considered as subjects of the sensation of the things which befall them; in this case the organs, according to their kind, have sensation of those things, and impart their sensations to the brain, according to the kind of connection intervening between the two. Again, *vice versa*, the brain, which is the common sensory of the organs of the body, has sensation according to its quality or kind, and causes the organs to sense according to the kind or quality of the connection intervening between them and itself. (n. 622.) Therefore, from the connection of the substances, we may form a judgment concerning the influx of sensations. What is the harmony coestablished in the brain for this purpose, will be seen in n. 641-648.

VII.

628. Aggregate entities of the same degree and series have reference to their units, as to their most simple parts, with which they are homogeneous. From the form, nature, and mode of acting of these aggregates, are discoverable the form, nature, and mode of acting of the parts. Consequently, a general and particular experimental knowledge of the things which at any time reach any sensory, will point out the essence of the most minute things of the same degree, as also of the corresponding things of the still more simple or superior degrees. Wherefore we are led into the inmost knowledge of natural things by the doctrine of series and degrees conjoined with experience.

629. *Aggregate entities of the same degree and series have reference to their units, as to their most simple parts, with which they are homogeneous.* By units I do not mean the monads of Morinus; or the homœomeriæ of Anaxagoras of Clazomene; or the atoms of Epicurus, Democritus, Leucippus the Elean, or of Mochus the Phœnician; nor the primitive and simple elements of other philosophers, considered as incapable of being further resolved; but by units I mean the most minute constituents in each degree of any

series. For in a series of three degrees there are three distinct units, or three distinct quantities of units; or, should any one prefer another mode of expressing it, in a series of three degrees, there are three substances or simple forces to be considered as units; one of which is more simple than another, yet having a mutual relation to each other; thus the other things composed of them, are as numbers composed of such units, each of which is homogeneous to its own unit. (n. 156.) Thus in the animal kingdom there are three successive fluids to be considered as quantities, viz., the red blood, the intermediate blood, and the spirituous fluid, each of which has reference to its own unit as the most simple particle of its own degree. (n. 115, 156.) The case is the same in other instances: as in that of the blood-vessels and fibrils of the nerves; in that of the motive fibres of the muscles, and of the simple pores and vesicles of the glands. It is the same also in the vegetable and mineral kingdoms, thus in every species of metal, mineral, earth, stone, salt, water, oil, and spirit, in every degree of composition of which there are particles, which are the units of their quantities. So again in the circumfluent or atmospheric world; the air, ether, and higher auras are all composed of such parts. Consequently, as this is the case with substances, so is it the case with their essences, attributes, accidents, and qualities. (n. 619-627.) If these be viewed as the matter of the things belonging to them, their units are the parts or elements of such matter, with which all other things of the same degree maintain a homogeneity. It is here to be observed, that matter, parts, and elements are predicated of things considered as abstracted from their substances, or of the adjuncts of their substances: so that these units are the parts and elements of philosophical matter. The degrees also and moments themselves, when considered differentially in regard to each other, are each equivalent to their unit. (n. 155, 156, 158-161.)

630. It is important to have a distinct idea of units or parts, and of the quantities and qualities thence resulting, in order that we may have a distinct idea of degrees in the progression of things; for from these ideas flow a distinct notion of series, its form, nature, composition, change, and divisibility. For every series of things simultaneous, or in other words, every aggregate of things coordinate, admits of being divided till you arrive at its unit; beyond which you cannot proceed further, and yet leave a unit, or a part

of that degree; for if this unit be resolved, there no longer remains a unit of its own degree, but of a superior degree. For a unit itself is a series of several other units, because it is itself in the series of the universe; nor can anything be conceived as not being a series, except the first substance of all. (n. 586.) Consequently, a superior unit, and the proximately inferior unit of the same series, are to each other in a triplicate ratio; that is, the one bears the same ratio to the other as a root to its cube; the case is the same with regard to the rest. Thus they are not homogeneous to each other; neither are the units of different series, unless they are contained under the same genus. For to the production of all the variety that exists in the universe, it is requisite that there be distinct series, viz., one within another, one in juxtaposition with another, and one for the sake of another; yet all wonderfully connected with each other, and all having reference to the first series of the universe. Units thus considered are either of a determined or certain quantity or quality, as in all terrestrial things; or of one that is undetermined or varying, as in the auras of the world, amongst the parts of which therefore there is a harmonious variety (n. 604–606); parts which nevertheless, in respect to their own ratios, are determinate. The Pythagorean philosophy seems to have acknowledged similar units, having their harmonies and concords, which it compares with the units of numbers.

631. *From the form, nature, and mode of acting of these aggregates, are discoverable the form, nature, and mode of acting of the parts.* For aggregates are nothing but a number of their units or parts, which does not carry with it any peculiar nature of its own, but merely that of its units. This may be illustrated by the instance of the air or ether, the greater volumes of which are circumstanced, in all their modes of acting, exactly like their lesser volumes, and their lesser like their least or their particles: for there is nothing in such a pure volume, which is proper to it, but what it has received from its parts; as elasticity, expansibility, compressibility, modificability, fluidity; with the distinguishing quality belonging to each, and by reason of which it is such as it is. So likewise in regard to the fluids of the animal kingdom; each of which, in its largest volume, represents its least volume; consequently, any one part is the type of the whole. (n. 105, 156, 159, 306.) The case is the same with everything else which at any time becomes an object of sensation and perception. But the aggregates of units,

or of parts, are no longer of one and their own degree, when, by other intermediate or accessory units, they form a compound unit; for then, of what was before an undetermined aggregate of units, a determined single one is formed, which acquires the name of a substance subsisting by itself. (n. 589). From these remarks it follows as a consequence, *That a general and particular experimental knowledge of the things which at any time reach any sensory, will point out the essence of the most minute things of the same degree.*

632. *As also of the corresponding things of the still more simple or superior degrees.* For according to the theorem in n. 625, such is the coestablished harmony of all things in the same series, that they mutually correspond to each other, without any difference but that of perfection; and the inferior regard the superior as their analogues or eminences. (n. 626 and 252.) There is nothing in any series which does not contain the cause of all that is subsequent to it, and refer itself to all that is antecedent. Thus the nature of the efficient cause is made manifest from a careful examination of the effect. Hence by reflection alone on perceptible phenomena, only adding to them the degree of perfection which our rules direct, and investigating the origin which is proper to their nature, we arrive at the knowledge of things superior; but only of those which are in series of the same species, in which everything that occurs illustrates and declares, in its own way and manner, what is the quality of each particular. Nay, from these we may even arrive at the knowledge of what there is in the others, if the connection and relation between them be given, and their specific and particular differences. *Wherefore we are led into the inmost knowledge of natural things by the doctrine of series and degrees conjoined with experience.*

VIII.

633. The most simple and the only substance of the animal kingdom is the spirituous fluid; which is most perfectly determined by the first aura of the world; whence it obtains such a nature, as to be a substance capable of forming its own body; and to have in it life and consequently soul, which is the principle of the things existing in the whole of that series.

634. *The most simple and the only substance of the animal kingdom is the spirituous fluid.* This we have often shown in our preceding remarks. It is the all in every part, and the only substance which lives, all the rest being derived from it, through the interjection of elements borrowed from the earth, which are accessories, by means of which it passes into the inferior fluids, through these into the material body, and thus into the ultimate world.

635. *Which is most perfectly determined by the first aura of the world.* This follows as a consequence, if the parts of this fluid are a series, and in the series of the universe; since nothing is prior, superior, more universal, more perfect, than the aura immediately formed from the first substances, from which it possesses all its potency—a potency which is scarcely more expressible than is that of the parent substance itself, on which, as their first principle, the principles of natural things are impressed by the Deity. (n. 591.) For the first aura is the veriest form of the forces of the created universe, to which the qualities of the inferior auras can be ascribed only by way of eminence; such as determinability, modifiability, fluidity, elasticity, with several others; for this aura is the very and most perfect force of nature in form. But whether the individual particles of the spirituous fluid are formed by the determination of that aura, so as to be the first and most perfect series of the animal kingdom, can only be concluded from the knowledge of effects, or seen as it were by reflection in a mirror; for the mind [*mens*] cannot be elevated into the knowledge of things which are above itself; hence it must aim at the higher by beginning from the lowest; consequently, it must begin with the phenomena which indicate in what manner the inferior auras flow into the life of an animal;—as first, in what manner the air flows in, next, in what manner the ether, then in what manner the superior aura, and lastly, the supreme: for that there are four in order is shown in

various parts of our Work. (n. 53–58, 65–68, 584.) With regard to the *air*, it expends all the natural potency and force it possesses in sustaining the animal body. It exercises, for instance, the potency and force of pressure on its surface, that the parts may be held together in connection with the whole: its potency and force of fluency upon the lungs, that they may respire, and enable the parts of the body, in connection one with the other, to live: its potency and force of producing modifications upon the wind-pipe, larynx, and tongue: its potency and force of receiving modifications upon the ear, the whole structure of which most artfully corresponds to its modes or modulations; nay, it also assists in the composition of the red blood. (n. 43–45, 50–52, 91, 92.) With regard to the *ether*, or more eminent air, this also employs its potencies and forces in holding together in connection, and in giving animation to, the parts corresponding adequately to its nature; as might be proved by numerous examples which it is not necessary here to adduce. I will mention only, that this ether modifies its own organ, or the eye, whence comes vision as the analogue of hearing: it produces also modifications in those animals that spontaneously excite for themselves light in darkness, as cats, dormice, etc.; beside which it contributes to the existence of the purer or middle blood. (n. 53–57.) With regard to the *superior ether*, that it supplies to the purer organs similar aids for their activity and life, is sufficiently evinced by the subordination of the organs and sensations of the body to those of the brain,—a subordination, which, on comparing the instincts of the higher with those of the more imperfect or brute animals, whose spirituous fluid is determined by this ether, is seen to be different in different species. With regard to the human spirituous fluid, this is determined by an aura still more eminent and celestial, all things in which are inexpressible, because incomprehensible, and as it were continuous, to the inferior sensory. (n. 623, 624.) Thus as by a ladder composed of so many steps, we in a manner ascend from the sphere of visible effects or comprehensible determinations, to the supreme sphere; and this, according to the maxims of the old philosophers, who have asserted that superior things do not suffer themselves to be known, except by reflection, and in effects, as their mirror. The Chaldæan, Egyptian, Greek, and Latin philosophers, were of opinion that there are several heavens, by which they meant the circumfluent universe. Mercurius Trismegistus, Plato, Jamblicus,

and Alcinous, believed those heavens to be alive and animated; and Origen conceived them to have reason, together with virtuous and vicious inclinations. Aristotle says, indeed, that they are animated (*De Cælo*, lib. ii., cap. ii.), but he attributes to them an assistant soul without intellect;* exactly according to our meaning in this theorem.

636. *Whence it obtains such a nature, as to be a substance capable of forming its own body; a faculty and virtue which have been treated of in Chapter III. By the nature of a thing, I mean, according to the definition of the philosopher [Aristotle], its principle of motion and rest,—a nature in which it is of itself, and not by its accidents (Natural. Auscult., lib. ii., cap. i.). According to the same author, there are three principles to everything, viz., matter, form, and privation,⁸ from which exists its nature, so as to be the cause of the things in its series. The first aura is therefore the matter from which other things are derived; from the determination of this aura results its form; to this matter and form may be added the third principle, or that of privation, to the end that a substance may exist which subsists by itself, having in it a nature which is its principle of motion and rest, in which nature it is of itself, and not by its accidents. Thus the same philosopher says, that by natural things he means a body resulting from the union and composition of matter and of form.⁹*

637. *And to have in it life, and consequently soul, which is the principle of the things existing in the whole of that series. Of this subject we have treated in Chapter III. Aristotle defines the soul to be the first perfection of the natural organic body, having life and potency (De Anima, lib. ii., cap. i.); also, as the principle by which we first live, feel, are moved, and understand (Ibid., cap. i.); but that its extraction is more noble and exalted. He further affirms, that soul and form are the first perfection of body, and that its second are the functions and operations which depend upon the first.* These things are further treated in n. 647.*

638. *Materiality cannot be ascribed to the human spirituous fluid. For when we speak of form, and the matter or *materia ex qua*, in*

* Unverified reference.

⁸ See edition of Aristotle, Paris, 4 vols. fol., 1654; vol. i., p. 64, in the *Synopsis Anal. Doct. Peripatet.*: also Aristotle, *Natural. Auscult.*, lib. i., cap. vii.

⁹ See the same *Synopsis, Ibid.*

qua et circa quam [Wolff, *Ontol.*, n. 949], to which matter are assigned its parts, which are such that quantity cannot be predicated of them, we mean, with the ancients, some things in opposition to no things; in which sense, the philosopher says, that matter is the first subject from which all things subsist, which are born originally of themselves, and not through the medium of another; and that it is the ultimate part into which things are resolved, and in which they terminate: wherefore also amongst principles he reckons matter and form. But the same term, applied to substances, is at this day applicable to compounds, as having *vis inertie* and extension. Wolff says: "Matter is an extense endowed with *vis inertie*; it is modified by variation of figure; and is that which is determined in a compound entity." (*Cosmol.*, § 140, 146; *Ontol.*, § 948.) This very fluid itself, in which is life, is determined from the most eminent aura of the world, and has nothing in it of inertness; because that aura is the most perfect force of nature in a form, and knows nothing either of resistance, or of weight, and its correlative lightness; for it is itself the first principle of weight and lightness, consequently of inertness. The heavens, says Aristotle, have neither weight nor lightness: wherefore all materiality, as being inert and a terrestrial phenomenon, must be abstracted from force as the first principle of weight, consequently from the first aura, and from its most noble determinate. Thus active and living force answers to gravity, as its analogue, or fellow by way of eminence. But alas! how difficult it is for the understanding to exercise such a degree of abstraction, as not to retain, in thinking of first principles, notions which it has conceived from the entire effect. (n. 650.) Owing to this cause it is that the very mind itself, whose activity in its body is in no case pure, is often at variance both with itself and with others: and thus that one and the same thing, when not similarly conceived as in the succession of things dependent on it, gives rise to great disagreement, especially if derived from things which are said to be included in the principles.

IX.

639. If we would explore the efficient, rational, and principal causes of the operation and effects existing in the animal body, it will be necessary first to inquire what things, in a superior degree, correspond to those which are in an inferior degree, and by what name they are to be called; which is a work demanding both a knowledge of facts and skill in judging of them. For in proportion as nature ascends by her degrees, so she raises herself from the sphere of particular and common expressions to that of universal and eminent ones; till, at length, in the supreme region of the animal kingdom, where the human soul is, there is no corporeal language which can adequately express its nature, and much less the nature of things still superior. Wherefore a mathematical philosophy of universals must be invented, which, by characteristic marks and letters, in their general form not very unlike the algebraic analysis of infinites, may be capable of expressing those things which are inexpressible by ordinary language. Such a philosophy, if well digested, will be, in a manner, the one science of all the natural sciences, because it is the complex of all.

640. Before proceeding to an explication of this part of our subject, it will be necessary to premise a brief description of the brain and its substances. For to deduce, *a priori*, the mode in which the soul flows into its mind, and the mind into its body, would be to act like an augur who should utter his predictions before he had inspected the entrails of the victim; or, if I may use the simile, would be like describing, from the egg, the body which has yet to be formed, instead of taking the description from the body itself after it has been already formed.

641.¹⁰ From the two brains, of which one differs from the other in size and function, and of which one is called the *cerebrum*, the other the *cerebellum*, flow and are derived the two *medullæ*; the superior of which having a common connection with both the brains, and distinctly deriving its origin from each, is called the *medulla oblongata*; and the inferior, which is a continuation of the superior, is called the *medulla spinalis*. From the two medullæ flow and are derived the *nerves*, and from the nerves all the tex-

¹⁰ The paragraphs from n. 641 to 646 are marked in the original by inverted commas: which perhaps implies that they are extracted from the author's great Work on the Brain.—(Tr.)

ture of the adjoined *body*. The connection and composition of the body are such, that the body acts and suffers according to the impulse, and at the pleasure, of the brains; and the connection and composition of the brain are such, that the brain knows whatever is passing in the body, so that everything which occurs in the latter may be under its regulation, and that everywhere there may be unanimity and concord in performing the several offices resulting from the several divisions of labor. For this reason the superior medulla, as to a great part of it, appears to be a continuation, appendix, and offspring of the brains; the inferior medulla to be a continuation, appendix, and offspring of the superior; the nerves to be a continuation, appendix, and offspring of the medullæ; and the body to be a continuation, appendix, and offspring of the nerves.

642. Each brain and each medulla is encompassed with its coats and membranes, which are called *matres* and *meninges*. That which forms the outermost surface, and lines the inside of the skull, is the *dura mater*, or *crassa meninx*; that which occupies the place next to the brains, is the *pia mater*, or *tenuis meninx*. Another covering also intervenes, of a reticular form, called the *arachnoid*, which, like a lymphatic duct projected into a plane, encloses the better lymph, or nervous juice, and dispenses and distributes it into the beginnings of the nerves, wherever there is need of it. These membranes, *matres*, or *meninges*, as common coverings, accompany the nerves, which, on leaving the medullæ, gradually assume and superinduce from them a coat as a sheath: and thus clad, as they proceed into the provinces of the body, and descend into its hollows and valleys, they gradually lay their coats aside again. The nerves themselves, with their membranes, become finer and finer in their progress, till they attain their extremities and the inmost parts of the viscera, where at length they are possessed of such a delicacy, form, face, and expansion, that they are affected by the slightest modes, changes, and differences, answering to similar ones in the brains to which they return. Thus the brain, in its first principle, is made sensible of whatever is transacting in all the extremities of its kingdom.

643. Each brain and each medulla consists principally of three *substances*; the first of which, when occupying the outermost region of the brains, is called the *cortical substance*, and when occupying the inner region, as in the medullæ, is called the *cineritious substance*. The second is called the *medullary* or *white substance*,

and is always in continuity with the cortical or cineritious. The third is produced from the minute arteries, which, accompanying the meninx, penetrate into the brain, and unfold themselves everywhere in its minute spaces.

644. The cortical substance, either when lying proximately beneath the pia mater, and watered, nourished, and cherished by the purer blood, or when, under the name of the cineritious substance, it occupies various tracts more remote from the surface, may, by the naked eye, and more plainly still by the help of glasses, be seen to consist entirely of minute spherules nearly approaching to an oval form. The cerebrum and cerebellum themselves, also approach nearly to the spherical and oval form, and thus assume a shape like that of their parts. Hence these minute organic substances, inasmuch as they are like their whole, and have the same potency individually, which, conjointly and aggregately, is exercised in the compound, merit the name of *cerebellula*. The eye, also, by artificial aid, is enabled to discover that these forms, spherules, or cerebellula, are clothed with, and enclosed in, a membrane or meninx, much in the same manner as the brain itself, except that their membrane or meninx deserves the title of pia in the superlative degree, and that they are distinguished from their neighboring and associate spherules of the same kind. It may also be discerned, that these most delicate coats are composed of villi and capillary shoots, of most minute arteries, in multitude innumerable, in determination wonderful, and in order most beautiful; which diffuse in all directions a volatile and spirituous fluid, educed from the blood, and conceived by eminent generation in their most pure wombs. These cerebellula appear to be the internal sensories, which receive impressions and modifications from the external sensories, and which convey them afterwards higher up to the judgment-seat of the mind. These cerebellula being again collected into tori or masses of different forms, and encompassed by a complication of minute vessels, construct and constitute a kind of second dimension of organic parts.

645. When, therefore, animal nature, in this last and first end of its arteries, nerves, and tunics, has first moulded its organic elements into spheres of the most perfect form, so that from these, as from its summits or centers, it can survey whatever is passing within the range of its appendages; it next becomes necessary, in order for it to contemplate the state of its economy in and from

these organic elements, to emit radii into the whole circumference of its dominion: it therefore puts forth minute fibrils from each of these conglomerated spherules, by means of which it continues itself to all the ultimates of its kingdom; much in the same manner as the brain, which is the complex of all the spherules, continues itself, on a larger scale, into its medulla oblongata and medulla spinalis, and thence into the nerves. Those cineritious particles clothe the fibrils emitted from themselves, with coats, in an order similar to that in which the brain at large clothes its medullæ and emissary nerves. Hence, whatever of a fibrillary nature is visible in the medullary or white substance, is derived from the cortical and cineritious substance, as its parent. Many of these minute fibrils collected into a fascicle, and clothed in like manner with a membrane, originate a second dimension of fibril, corresponding to a collection of the same number of cortical spherules. In the same manner is originated also a third dimension enveloped with tunics; to which answers the brain itself, which, with these, proceeds through the foramen magnum of the occiput into the cavity formed by the vertebræ, down to the os sacrum and os coccygis; and which from this cavity, through the vertebral holes and notches, proceeds onward, to excite and strengthen the whole machinery of determinations, which the formative substance aims at forming according to the exact mode and law of its own power and representation.

Inasmuch as the arteries of the brain continually divide themselves, until they become most minute capillary tubes and filaments, and are continued into all the cortical substance; the cortical and cineritious substances depend from the shoots of their minute arteries, like mulberries and elderberries from the tender stalks of their boughs, or like clusters from the branches of the vine, or else like other forms according to the different species of the animals, so that they seem to be similar to the ultimate effects in shrubs, and to resemble, as it were, the little seeds, in which the most precious juice, issuing from a rich vein, terminates and concentrates itself; just as in citron and other precious fruit-trees, in which one citron or other fruit perpetually comes to its birth as another drops off, that it may always have something from which to begin anew, and in which to enclose and transmit its alkahest and most highly refined essence; and also that it may represent most purely what is the quality of the whole, and at what quality it aims while tending from its first principle to its last effect.

646. Thus the brain is so determined from, and constructed of, little vessels and fibres, as to contain the principles or beginnings of the things existing in the body in so active and living a state, as from its hemispheres to enlighten as it were every particular part, and compel it to action whenever it pleases: these parts being thus subject to the brain, refer to it every one of their changes, so that, from consciousness and foresight, there may be determination to action. Nay, the human brain is endowed with intelligence, or the power of examining, consulting, and judging, previous to acting; as likewise with the power of restraining from action, until reason persuades and occasion requires.

The brain has, in general, two offices to perform: the first, to will what it knows, and to know what it wills; the second, to transmit into the blood, contained in the sinuses at its base, a certain most noble fluid, elaborated in its cortical spherules. To the first kind of these offices are appointed all the organic parts which encompass and constitute the surface like a cortex or bark. To the second are appointed its members, which, taken collectively, form a sort of chemical laboratory, of which we have spoken in n. 360, 361, 556. These members of the brain, or, if the reader prefer the term, these chemical organs, ought to be carefully distinguished from its sensitive and intellectual organs; they are moreover so separated by an intervening septum or fence, that one cannot enter into the province of the other, except by a most general mode of acting.

If, however, we would see how, by a most wonderful contrivance, all things are arranged in their respective order, we must conceive of the whole brain as formed in motion and for motion, or represent it to ourselves as having an animation; that is, an alternate expansion and contraction. For thus we shall see what is the function, cause, and mode of acting, proper to each part; since the individual parts are so arranged in reference to each other, under the more general, and these under the most general, that whilst the whole draws its breath, there is no part but is drawing its breath at the same time, or contributing to the animation of the whole; for which reason, we have been led to say, that all the parts of the brain are situated in the stream of its motion. (n. 219, 258, 281, 287, 557.)

The brain is constructed with a view to reciprocate the alterations of its animation in so orderly a manner, that whenever it

spirates and respirates, it refers itself from its surfaces to its planes, from its planes to its axes, and from its axes to its centers.

For its *surfaces* are several. Its outermost is constituted by the dura mater or crassa meninx; the next by the thin membrane called the pia mater; and the next by the membrane called the arachnoid. Under this threefold surface is deposited the cortical substance; which being the part that encompasses the centrum ovale or medullary nucleus, discharges as a sort of cortex the office of a surface.

The common or general *planes* are those which are called the processes. One of these divides the cerebrum into two hemispheres: it is called the first, the vertical, the longitudinal, and the faciform process, or falx: proceeding from the crista galli, or rather from the spina coronalis, it runs under the longitudinal sinus, and over the corpus callosum, as far as the fourth sinus. The second is the horizontal plane, or the transverse or second process of the dura mater, which is continued near the fourth sinus from the superior process, descends to the cerebrum between it and the cerebellum, and proceeds sideways, in each direction, to the opposite regions of the cranium. It thus involves the cerebrum, and divides it from the cerebellum, so that both may discharge their offices conjointly and separately.

There are also two *axes*. One of these, which is the transverse, descends from the highest region of the cranium, where the canals of the sinuses meet in the occipital bone above the cerebellum, and passes midway between the cerebrum and the cerebellum, down to the isthmus of the ancients, or the region of the pineal gland, the nates, and testes. This axis is constituted by the fourth sinus itself, or the torcular Herophili, and is supported by the isthmus. The sinus seems to terminate in the third ventricle; for it is there taken up by a vein which is sometimes double, and runs across the ventricle: but when it descends there into the chemical laboratory, it is immediately continued from the infundibulum into the pituitary gland; a gland which thus occupies the other extremity of this axis. The second, or the longitudinal axis, begins in the crista ethmoides, where it is divided; but is continued, through the cleft of the septum lucidum, under the fornix, across the third ventricle and the aqueduct, and so through the fourth ventricle and the calamus scriptorius, till it reaches beyond into the spina dorsa. It makes its appearance on separating the hemispheres

and taking out the corpus callosum; and its continued progression is seen on raising up the isthmus and the cerebellum. It is thus a common or general canal, surrounded and shut in on every side with banks, which have here and there intervening creeks.

The *centers* are formed by the pineal gland and the base of the fornix, placed at the two extremities of the third ventricle. There are two of them, because, as observed above, the brain has two general offices. One of these centers, or the base of the fornix, acts as a peduncle to the chemical laboratory, to collect and transmit its medullary substance; whence, in a certain sense, it may be called the center of rest, the other being the center of motion.

There is also a similar order and arrangement in every subdivided part of the brain; as in all that which constitutes its cortex, and is composed of conglomerated cortical substances; for every conglomeration has respect, from its proper surface, to its planes, from its planes to its axes, and from its axes to its peduncles, as to its centers; much as is the case with the brain in general. Even the pia mater, which is the common surface, everywhere insinuates and enfolds itself among the serpentine anfractuosities, much as the falx does between the hemispheres; by which means there are insinuated as many planes as there are congeries formed of such substances. Along these planes there also everywhere descend arterial sinuli, just as the fourth sinus descends between the cerebrum and cerebellum; and these, by their descent, form a species of axes. These arterial sinuli, soon running out into ramifications, at length determine themselves into the individual cortical spherules, as into so many centers; from which are educed fibrils compacted into peduncles, which then enter the medullary globe. But it is not so easy to discover what representation of the processes and centers is exhibited in the surface itself of these congeries or tori of the cortical substance, except by comparing them with the cerebellum, which is the greatest cortical congeries or torus, and an effigy of which, in miniature, is afforded by these of the brain; for when they are dissected and examined as to their inmost structure, we find a shadowing forth of the same arboreal ramification as in the cerebellum.

Now as the above mentioned cortical tori are most regularly formed in motion and for motion, so also are the individual cortical spherules, which are composed of vessels divaricated into the most delicate fibers: and as they are most perfect forms and organic

parts, it may be inferred without doubt, from the regularity of the parts compounded of them, that they also have a most distinct relation, from their piissimæ matres to their planes, from their planes to their axes, and from these to their centers. For they are so mutually discriminated one from the other, and so perpetually conjoined, as to be enabled to act as the beginnings of determinations. For one spherule, by general and particular contact and connection, has respect to another as the companion of its task: so also have the fibres produced from them, which, being bound together to form a certain particular texture under the general one, cause the brain, from its most particular individual parts, to conspire to one common animation; cause each at its pleasure to flow into its alternations, and by its mutual relations one to the other readily to suffer itself to be excited into its prescribed mode of acting.

647. From an attentive consideration of the organic structure of the brain, it is very manifest that the spirituous fluid, in which is life, has not an immediate communication with the operations of its body, but that its communication is effected through various organic substances; the first of which are those which we have called cerebellula, namely the minute spherules of the cortical and cineritious substance, which prevail in the brains and the medullæ, and are the first determinations of the spirituous fluid by its fibres, or the subdetermining substances of the brain, to which correspond the subdetermining substances of the body. (n. 287, 505, 557, 561, 598.) These spherules in the brain are so coordinated, as to be enabled to be excited into action either separately or conjointly; for the purest fibrils of all, or the ultimate divarications of the minute arteries, are dedicated to form the contexture of that substance. Thus there is no influx of the soul into the ultimate operations of its body, except mediately, by these most exquisitely organic substances. Nor does that influx take place by and from these immediately; for even these are associated and collected together into congeries, clusters, and cortical tori, which being encompassed and interwoven with minute vessels of the purer blood, as their determining fibres, constitute a further degree of organic substances, which are so arranged as to be capable of being elevated, of exercising an animation, and of being modified, both separately and conjointly. (n. 287, 505, 561.) Finally, to these succeeds the whole brain as the common sensory and complex of all, in which each par-

ticular part keeps itself most distinct from every other. Yet there is a continuous connection of them all by the fluids, and their vessels, filaments, and fibres, or by their determining substances; for a blood-vessel, divided into similar degrees, is continued from the whole brain into its cortical tori, and from these tori into the cortical spherules, and from these spherules into the medullary fibres, consequently into the nerves. Thus there exists a COESTABLISHED HARMONY. Thus also we see what are the channels which this spirituous fluid prepares for itself, in order that it may descend by degrees into the effects of its body; we see that its capability of acting on the body depends on the state of its organic substances, and on their connection; consequently, that although these substances may suffer changes, lesion, privation of their fluid, or remain without culture, still the soul lives in the state of its own intelligence, as in embryos, infants, and idiots. (n. 265–269.) Thus we perceive how the soul, according to Aristotle, has no immediate communication with the operations of its body (*Ibid.*, cap. i.); how, together with form, it is the first perfection of the natural body, having life and potency; and how the second perfection consists in the functions and operations which depend on the first (*Ibid.*, cap. i.). (n. 637.)

648. *If we would explore the efficient, rational, and principal causes of the operations and effects existing in the animal body, it will be necessary first to inquire what things, in a superior degree, correspond to those which are in an inferior degree, and by what name they are to be called.* In other words, what things in one and the same series mutually succeed each other, are dependent on and have respect to each other by degrees; for so separate from each other do they appear, that without the most internal and analytic rational intuition, it seems impossible that the things of a superior degree should be recognized and acknowledged as the superior forms of things inferior; for to the sensory of the inferior forms, they are incomprehensible, and appear as in continuity with them. (n. 623–626.) In other words, unless the things of the inferior degree were distinct from those of the superior, they could not be compared with a substance which subsists by itself (n. 589), but would be the same things with the superior ones, taken in the aggregate, or collectively. (n. 629, 630.) In order then to ascertain and to know what that is in a superior degree which corresponds to its proper inferior, rules must be discovered

to guide us in pointing it out, which we are enabled to do under any of the following circumstances. 1. In case in the several things, which are beneath any given one, and not only in the one proximately beneath, but in all which follow, it be found to be the common and universal reigning principle. 2. In case it be so distinct from the superior that it subsists by itself; or is able not only to subsist together with the other, but separately by itself without it. 3. In case it be unknown whether it be its superior correspondent, except by way of analogy and eminence; and we are ignorant of its quality except by reflection, or by the knowledge of inferior things, as in a mirror. 4. Hence in case it has to be marked by an entirely different name. 5. In case there be a connection between the two, otherwise the superior and inferior entity of that series would have no dependence on each other, or mutual relation. "By reflection and abstraction alone," says Wolff, "universal notions are not made complete and determinate. For reflection is wholly occupied in the successive direction of the attention to general principles; nor is anything obtained by abstraction, except that those general principles are seen to be different from the objects of perception in which they exist. . . . Thus it does not hence appear, whether those general principles contain more of fewer particulars than are sufficient to . . . distinguish the things of that genus or species from those of another. . . . Therefore, it is unknown whether they are complete and determinate." (*Psychologia Rationalis*, 401.) The making of the discovery, therefore, is a work demanding both a knowledge of facts and skill in judging of them: for if we rely either on reason without facts, or on facts without reason, our endeavor to find what we seek will be to no purpose.

649. *For in proportion as nature ascends by her degrees, so she raises herself from the sphere of particular and common expressions to that of universal and eminent ones.* For example: I. The red blood is a substance of an inferior degree: to this, in a superior degree, corresponds the purer blood; and to this latter the spirituous fluid, which is the common and universal substance, reigning in the inferior ones. Of this universal substance we may thus predicate what is affirmed in the rules, viz., that those sanguineous fluids are distinct, so that they may subsist together, and separately by themselves; and that it is unknown whether the superior be the correspondent of the inferior, except by way of analogy and emi-

nence; as that the spirituous fluid is blood eminently, or blood by analogy; that its quality is unknown except by reflection, or by a knowledge of the substances inferior to it; that it ought to be expressed by a quite different name; that there is an intervening connection between them, whence they have a mutual dependence and relation to each other: all which subjects have been frequently treated of above. II. *An artery* is a vessel of an inferior degree: to which, in a superior degree, corresponds a vessel of the purer blood; and, in the supreme degree, a medullary or simple nervous fibre. III. *A muscle* is that to which corresponds in a superior degree the motive fleshy fibre; to the motive fleshy fibre, the motive white fibre; and to the motive white fibre, in the supreme degree, the motive nervous fibre. IV. The *sensations* belong to the organs of the body: to these, in a superior degree, corresponds the imagination; to the imagination, the thought: for if we ask the simple question, what is imagination eminently? the notion spontaneously presents itself, that by it is meant thought, to which therefore images and ideas are attributed by way of eminence: but to thought in a superior degree corresponds a representation of that which is universal, or the intuition of ends. V. *To the body*—as far as regards the looks of its countenance, the arrangements and states of the parts belonging to it, and its powers [*potentiæ*] of acting and forms of action—in the proximately superior degree corresponds the animal or external mind [*animus*]; to this, the intellectual mind [*mens*]; and to this, the soul; wherefore, according to the rules proposed in n. 648, the soul is the common and universal principle which reigns in all things beneath it (n. 270), and all these, singly, so subsist and live one amongst another, that they can act separately, and also conjointly. That they can act *separately*, is evident, since the superior is frequently in combat with the inferior, or the interior with the exterior, and *vice versa*, as with something alien and diverse from itself; nay, they evidently act each by itself. That they can act *conjointly*, is also evident; for they do so in every determination which comes forth from that which is inmost: for the state of the external mind [*animus*] is usually effigied in the countenance, in the forms of the actions and speech. In the external mind [*animus*], also, the intellectual mind [*mens*], though less manifestly, has its image; consequently the soul, likewise, is effigied in the intellectual mind [*mens*], although of the soul, as being most remote, it is impossible to form a judg-

ment. The soul, then, is an intellectual mind [*mens*] by way of eminence. Now, since the soul does not flow into the actions of its body, except by intermediates (n. 611, 647); nor by a continuous medium, but as it were by a ladder divided into steps; there can be no such thing as Occasionality of Causes and Physical Influx. For if the state proper to the soul be called a moral state, in which is found the beginning of reason, or the principle from which reason originates; and if the state proper to the intellectual mind [*mens*] be called a rational state, in which is found the beginning of affections and impulsive causes, or the principle from which these originate; and if the state proper to the external mind [*animus*] be called a physical state, in which are found affections as the impulsive causes of the actions of the body; and if the state proper to the body be called a mechanical state; it then follows that there can be no influx from the moral state into the mechanical state of the body, except by the rational state, and thence by the physical, or by two intermediates (n. 611), and this also, for the most part, not by direct determinations, but by a mode of concurrence or consent; by reason that the powers and faculties are distinct, whence results liberty (n. 610): according also to the rule in n. 648, connection is requisite, whence result dependence and mutual relation. (n. 587, 601, 608, 618, 622, etc.) Consequently, there can be no such thing as Preestablished Harmony. Hence the more an inferior principle derives from a superior one, the more the inferior partakes of its state, or of the perfection of its state; for instance, either more of morality, or more of rationality, or more of sollicitation from the affections as impulsive causes. Thus there is a Co-established Harmony. VI. *To actions* correspond forces [*vires*]; to forces, potencies [*potentiæ*]; to potencies, in the supreme degree, the force of forces, that which is principally the living force, which, in an animal, is life. VII. *To sensual pleasure* [*voluptas*] seems to correspond, in the next superior degree, animal desire [*cupido*]; to animal desire, the desire [*desiderium*] of something future, whence results will; and finally, to this, the representation of ends in self-preservation. VIII. *To sexual intercourse* corresponds love considered as an enticement and animal desire; to this, a purer love which wants a proper name, conjoined with the presentation of another person in one's self, and of one's self in another, or of a certain most intimate connection; and to this, in the supreme degree, the representation of one's self in the preservation of one's

own kind for the sake of more universal ends. IX. *To laughter*, as a gesticulation, corresponds gladness [*laetitia*]; to gladness, contentment; and lastly, in the supreme degree, a good conscience. According to our rule in n. 648, one of these may subsist both separately without the other, and conjointly with it. That they may subsist *separately*, is evident; for laughter may exist without gladness, as in the case of actors, mimics, and little children who are compelled to laugh whilst they weep, etc.: moreover to exhibit gladness without a contented mind, is an art most common at the present day in the world of compliment and politics, and one which we continue to learn, and to which we accustom ourselves from childhood; for to wear a serene countenance, and display a cheerful external mind [*animus*] under circumstances which the intellectual mind [*mens*] regards as most adverse, is an attainment esteemed above all others as necessary for those who live in civil society. To enjoy a contented intellectual mind without a good conscience, is also not uncommon among those who either know or care nothing about what conscience is. There can be no doubt also that they may exist *conjointly*; and gladness itself, with its free expression in laughter, is the more perfect, in proportion as it proceeds from a contented intellectual mind, and this again from a good conscience: and when a good conscience reigns in the various things which follow beneath it in succession, nothing in the whole world can be more full of a sense of enjoyment and delight. Thus it is that we attain the *summum bonum*—the supreme good. In the mean time, the gladness which naturally flows from the active state of a contented mind, acknowledges as its efficient cause the harmonious series of things, or order perceived with its degrees and connection; this order, however, is not perceived except by relation to its opposites, and by reflection, either direct or indirect, upon others and upon one's self: hence such gladness as gives birth to laughter cannot exist, except in a subject capable of perceiving such things, that is, in man; and more largely in men of empty minds [*mens*], and in such as are possessed by the love of themselves, etc. X. *To pride*, considered as appertaining to the body, answers haughtiness and swelling of mind [*animus*]; to this, ambition of mind [*mens*]; in the supreme degree, eminent ambition, or the ambition of ambition, which seeks to be above all; spurious, if it thus descends from what is highest into the things of its own body; legitimate, if it ascends into the things of the soul, and con-

nects itself with the soul for the sake of more universal and perfect ends. XI. *To avarice*, considered as the possession of worldly goods, corresponds a lust for the goods to be possessed; to this, the representation by those goods of all possibilities in the world. Avarice does not ascend further, because it is destitute of the representation of universal ends; for it is conjoined with a tacit denial of divine providence and of a life after death; wherefore it is the root and mother of vices. XII. *To heroic action* corresponds intrepidity of mind [*animus*] as its virtue; to this, self-preservation and the preservation of all that belongs to us, and lastly, both of these, with a view to the preservation of society. XIII. There is a gradation of *ends*, as being inferior and superior, consequently more universal and more perfect. The lowest and most entirely natural, common also to the brutes, is self-preservation; a superior end is self-preservation for the sake of society, as for the sake of a man's country etc.; the end superior to this is self-preservation and the preservation of earthly society for the sake of heavenly society, in which the soul exists as a member; and the highest, which is the end of ends, or the most universal of all, is the glory of the Deity. So likewise in all other cases in which ends are assumed as ultimate, though in reality they are intermediate. For there is nothing which does not admit of being elevated to higher degrees; wherefore, if we are incapable of conceiving of their elevation in a suitable manner, and according to the nature of the thing considered, it is in vain to attempt to ascend to the causes of things. As was observed however above, there is need in these cases both of the knowledge of facts, and of skills in judging of them. For it is possible that into any inferior thing several things may enter from divers other series, and sometimes in such numbers, that what forms in it the generally and universally reigning principle may be altogether obliterated, nay, may even perish; thus an effect flowing down from its genuine principles and purest fountain, is frequently so overcharged with imperfection, and so obscured, that it is impossible to recognize it as an emanation from that fountain: to ascertain, therefore, its immediately superior degree, we must often rise above it to one superior still, that by its aid we may discover that which is intermediate.

650. *Till, at length, in the supreme region of the animal kingdom, where the human soul is, there is no corporeal language which can adequately express its nature, and, much less, the nature of*

things still superior. (n. 256, 297.) For when, in proportion to the degrees of elevation, the distinct notions of things perish, the expressions of language significative of these notions must also perish with them; and the more so in proportion as we rise higher, or more remotely from the objects of the sensations to which the words and phrases of language are appropriated; or where occur the universals of apparent universals, and the things above the common ones of those which are usually accounted common. This then is the case in the human soul, to which the most abstruse kind of terms, such as "the intuition of ends," "the representation of that which is universal," "the determining first principle of reason," and the like, are alone suited; and these are terms, of which, as they are destitute of adjunctive, modal, and other forms of the same universality, it is difficult to define the exact signification; and if we attempt to define it by phrases borrowed from lower things, there still remains implied in them a notion similar to that of matter, as was observed above (n. 638) concerning the first aura and its force, so far as it corresponds to the gravity of lower substances. Thus in vain does the intellectual mind [*mens*] boast of its powers, and as it were seek for terms to express its meaning, in terms which leave many things to be understood which are not capable of being expressed; and is unable to find the proper expressions when it aims at ascending above itself. "We cannot," says Wolff, "represent to ourselves universals, except so far as we perceive singulars" (*Psychol. Rat.*, § 429); and "if we point out by words . . . the generals of those singulars that enter a universal notion, the words are not understood, except so far as there is a perception of those generals in individuals." (*Ibid.*, § 428.)

651. *Wherefore a mathematical philosophy of universals must be invented, which, by characteristic marks and letters, in their general form not very unlike the algebraic analysis of infinites, may be capable of expressing those things which are inexpressible by ordinary language.* On this subject Wolff observes: "Among the desiderata of learning, is a science which should deliver the general principles of the knowledge of finite things; a science from which the geometrician might draw his measures, when desirous usefully to exercise his calculations in the mathematical knowledge of nature. . . . And this science would have a better title to the name of *universal mathematics*, than the science of quantities in general, or of indeterminate numbers, since it would deliver the first prin-

ciples of the mathematical knowledge of all things. . . . Thus we might at last obtain the true mathematical principles of natural philosophy and psychology, which might be of use to philosophers in guiding their further discoveries, and in general to all for accurate practice. I wish the learned would turn their attention to it." (*Ontol.*, § 755.) It was for this end that I was here disposed, as a preparatory step, to offer the doctrine of series and degrees, since without a previous knowledge of the general and particular form of nature's government, in vain should we exert the powers and labors of the mind in composing such a philosophy, since it is no other than that of the soul itself. It is that philosophy alone which can put an end to the contest between truths and assumptions, and pave the way to the palace of reason. For *such a philosophy, if well digested, will be, in a manner, the one science of all the natural sciences, because it is the complex of all.*

652. I have now completed the first Part of my *Economy of the Animal Kingdom*. But I am not sure whether on every point I have pursued the truth, as I place no reliance upon myself, but leave the candid reader to form his own judgment. If I have anywhere been betrayed into mistake, the subsequent Parts, in proportion as they are based upon true science, will correct it. But what is truth? Will it be the work of ages to discover it, or of ages to recognize it when discovered? The sound and well-approved opinions of certain ancients, who lived in ages when the rational mind exercised its functions more universally, more distinctly, and less overladen with accessory considerations, are at this day, and after the lapse of thousands of years, disputed by many; as was also, in later ages, the case for a long time with the discovery by the illustrious Harvey of the circulation of the blood, etc. Still, however, that fashion of judging of a work cannot be eternal, which regulates the approbation of the reader not so much by the truth of the writer's sentiments, as by the felicity of his language. The latter is an attainment easy and common among persons belonging to polite society: it is the former that presents the difficulty, which is to be surmounted only by intense mental labor. But, as Seneca observes: "Falsehood is flimsy; on careful inspection it is easily seen through." (*Epist.* lxxix.)