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The Constitution of the Earth

FEW of the mysteries of Nature are wrapped in more profound obscurity than those which relate to the condition of the Earth's interior. Vaguely some of us, accustomed to credit Science with an almost unlimited wealth of knowledge, may suppose that Geology deals with the physical constitution of the globe on the surface of which we stand. Sir Archibald Geikie in his *Text-book of Geology* recognises that geologists "investigate" the history of the Earth from the earliest beginnings of its separate existence, and "through its various stages of growth," but when the question arises: What is the present condition of the interior of the Earth?—Geologists have to confess that "the mere outside skin of our planet is all with which direct acquaintance can be expected." With regard to its interior, they can only consider the claims of various theories that have from time to time been propounded with the view of dealing by conjecture with the unapproachable enigma beneath our feet.

Of such theories Geikie says there are only three that merit serious consideration.

1. That the Earth consists of a solid crust beneath which lies a molten interior.

2. That with the exception of local vesicular spaces, the globe is solid and rigid to the centre.

3. That while the great mass of the globe is solid, there lies a liquid substratum beneath the crust.

The first, the old-fashioned theory, held its own almost unchallenged till the middle of the last century, when calculations at last showed that the figure of the Earth could not be maintained under the influence of the attractive forces around, if it were a molten globe with a relatively thin crust. In the beginning, as scientific students are always reluctant to revolutionise previous beliefs, it was argued that the solid crust could not be less than 800 to 1,000 miles thick (instead of only twenty-five or thirty miles as had formerly been suggested). That would be the least thickness that would resist the distorting effect of the Moon's attraction. Later on Lord Kelvin maintained that the rigidity of the whole globe could not be less than it would be if it were one solid ball of cold steel or glass. The second and third theories are still available in explanation of some of the phenomena concerned, but are modified by considerations connected with heat and pressure. Great pressure raises the melting point of all bodies: that is to say, rock which would be liquid at some given temperature on the surface of the Earth, when subject to no greater pressure than that of the atmosphere, would remain solid at a much higher temperature when subject to the great pressure it would experience at a depth of several miles below the surface. Sir Archibald Geikie thus leans to the belief that while the interior heat is enormous, the pressure, continually augmenting as lower depths are reached, keeps the body of the Earth solid throughout. A bit of evidence tending to support this view is to be found in the fact that while the density of the Earth as a whole, ascertained by experiments on its gravitating energy, is shown to be five and a half times that of water, the specific gravity, or density, of the heaviest rocks known to geologists at the surface, is only three times that of water. But the hint in question does not prove a high internal temperature, as cold rock under enormous pressure, or rock that had solidified and cooled under enormous pressure, would naturally acquire a

higher density than that of similar rock on or near the surface.

Mining and boring operations do not afford very much evidence of a kind to illuminate the conditions of the Earth's interior. The deepest would not represent more than the thickness of a sheet of thin paper on a globe two feet in diameter, and all they tell us is that as a rule the heat of the rock pierced increases as we go down at the rate of one degree Fahrenheit for every fifty feet. The rate is by no means uniform in all parts of the world, nor is it uniform throughout the same boring in all cases, but it is so general as to promote the conclusion that at a depth of twenty or thirty miles the temperature reached would be such as to fuse all the rocks and most of the metals that we know of, subject to the consideration that increased pressure raises the melting point.

Brief as this summary of existing scientific knowledge has been, it really includes nearly all that can be stated with any degree of certainty on the subject in hand. And looking at the problem from the point of view of occult students, it will be recognised as extremely improbable that mere physical investigation will ever interpret the mystery more precisely. There is only one instrument of research that can be successfully employed to grapple with such problems as those which the Earth's interior holds for us, and that is not yet appreciated by the current science of the age. Clairvoyance is the only faculty which defies the embarrassments of the situation when we are in search of information concerning the condition, as regards its interior, of the world we live *on*—but are debarred hopelessly from living ***in.*** Nor indeed would clairvoyance of any but a very exalted kind be equal to the task of discerning the interior conditions of the Earth. To elaborate that last statement completely would involve a protracted attempt to elucidate the motives which induce the spiritual authorities by whom the

evolution of the human race is guided, to guard some natural secrets from premature discovery even while willing to let some forecast of future discovery leak out here and there. As far as we can gather at present it would not be possible for any natural clairvoyant, however beautifully gifted, to explore the Earth's interior and describe the various evolutions going on there. There may be many people among us able to exercise even that superior sort of clairvoyance involved in being able to function freely on the astral plane and to bring back to the waking physical brain a full recollection of all experiences gathered in that way. But it would be only those among such persons who were actually invested with the powers accruing from advanced Initiation, who would be able to extend astral wanderings in the direction we are now talking about. For the present in reference therefore to problems connected with the Earth's constitution, we can only benefit by any information that may come to us from initiated teachers, without expecting just yet to be able to verify such teaching by personal investigation.

In that same way, however, in the first instance the foundations of all our theosophic knowledge were laid. In 1883 all that was then put in circulation concerning the astral and manasic planes, the conditions of reincarnation, the working of the law of karma, the early root races and so on, was *ex cathedra* teaching, wonderfully though all that has been verified since, by those whose faculties have undergone the appropriate development. So at present the information contained in this paper concerning the interior conditions of the Earth, is *ex cathedra* teaching, of a kind that can only be appreciated at its true value by those who have followed the stream of theosophic literature from its source. For some readers, perhaps, the statements I am about to put forward, in spite of their extraordinary interest, will seem too entirely out of touch with any previous body of knowledge to command even provisional belief. To others there will be some-

thing in the conception we are now enabled to form of the processes through which the planet itself was evolved before the evolution of the earliest living kingdoms began upon its surface, that appeals to the inner understanding as satisfactory. But in any case I may perhaps reasonably assume that readers in the Theosophical Society will remember that a good deal of teaching concerning the higher mysteries of Nature has reached them in the first instance in the shape of writings which I, by virtue of communication with exalted sources of information, have been enabled to put forward, and will be slow to suppose that I am now putting forward the very wonderful story which this paper includes, without having received it myself under conditions that, for me, at all events, guarantee its accuracy.

We shall not, it is true, be able with our present stock in trade of physical knowledge, to realise every step of the process to be described. The Earth was formed partly by the activity of natural laws we fully understand and can observe in operation to-day, but partly also by the intervention of forces with which we are not yet familiar. Those agents of Divine Will who guide and control such undertakings as the formation of a planet, carry out their work by methods which they have no wish to disguise or conceal. On the contrary, their desire—so we are assured—is to work in a way that will be intelligible to those who are following them in the pathways of the higher evolution. Thus we find natural law bringing about results which at an earlier stage of human thought were credited to miracle, but the wide extension of scientific knowledge concerning natural law which the last century has witnessed, has now led popular impression rather too far in the opposite direction. We are inclined to expect an interpretation along the lines of natural laws *already comprehended,* of everything that occurs in the Universe. We calculate the density of the Sun and the thermal value of his rays, and figure out the probable duration

of their activity. We observe the effect of diffused carbon in a gas flame, and assign the luminosity of the photosphere to a precisely similar cause. We take note of the rate at which the rivers of the world carry down sediment to the sea, and measure the future life-period of continents on the same scale. Physicists have been able to account for so much in Nature, by the application of the laws they have unravelled, that they ignore the possible existence of other laws which link the phenomena of physical nature with higher planes of manifestation, the very existence of which is unsuspected by the students of ordinary science. But when we have to deal with explanations of some mysteries of nature that at present can only be derived from the *ex cathedra* teaching of initiated instructors, we find that the laws commonly understood at this period of human knowledge will not suffice to interpret all that takes place. At some stages of the world's evolution we shall see events occurring that will seem miraculous in the light even of our advanced familiarity with the laws of matter. This will not really mean that the agents of Divine Will were breaking through their rule of working along methods susceptible of comprehension, but simply that some of the methods they have to employ in such grand enterprises involve the use of forces at present quite outside the catagory of those we have been able so far to study.

On the other hand, astronomical research has done a great deal to render the broad course of planetary evolution intelligible to ordinary thinking. The nebular "hypothesis," as it used to be called, has ceased to be hypothetical, just as the luminiferous ether, which was hypothetical less than fifty years back, is now as definitely recognised as the atmosphere. Concerning both the ether and the nebular explanation of the origin of solar systems, there is much yet to be learned, but the broad principles are intelligible. In the vast space assigned to the organisation of a new solar system a cloud of celestial matter billions of miles

in diameter is aggregated together, and this gradually condenses under the influence of laws that we know nothing about as yet, rising to a temperature exceeding any that we know of on earth at present, till the central mass becomes the Sun of the new system, while the rings of nebulous matter that separate off as the condensation proceeds provide the matter from which its planets are to be formed. We are not depending merely on guesswork in developing these ideas. They were elaborated in the first instance by the sheer intelligence or intuition of astronomers, but the heavens have since then vindicated the brilliant conjecture. Now that celestial photography has been so perfected as to give us clear pictures of objects that could never have been perceived by mere telescopic observation, we have been able to accumulate photographs of a large number of nebulae in different stages of growth. It is of no use to watch any one in the hope of discerning its progress, but by arranging our collection in an order which obviously corresponds with their age and development, we get a complete life history of a nebula, and can actually follow the growth of the planetary rings and perceive the beginnings of planetary formation in the substance of these rings.

So far unaided science paves the way for the explanations on which we are about to enter and indeed will afford collateral confirmations as we proceed of some among the statements I am in a position to lay before the reader. But it will be necessary before we go much further to part company with the inferences of physical science, and frankly to set forth the teaching I have received on its own merits, offering it without specific credentials to those who may be inclined, with me, to accept it respectfully, while remaining quite indifferent to the probability that others will be indisposed to do this in the absence of collateral guarantees that I am not in a position to furnish.

During the life of our solar system so far, other planets besides

those now visible in the sky have been in existence for a time and have since been broken up. Every theosophical student familiar with the teaching concerning the progress of the manvantaras will have realised long ago that this must have been the case. And so in the future, planets now in existence will be disintegrated long before the activities of the system as a whole are exhausted, and others will be formed in their stead. For example, it has already been shown in other theosophical writings that during the last manvantara of our planetary scheme the Moon—then a much larger planet than it is at this moment—was the home of the evolution to which we belong, and in some former writings of my own I have been able to describe how when the Earth was in process of formation it drew over a large portion of the matter that had previously belonged to the Moon (see *Growth of the Soul,* p. 280). But the bulk of the matter used for the building up of the Earth was derived from the meteoric matter circulating in the orbit of our scheme, or rather in the central orbit of our scheme, for in this manvantara we are concerned with three orbits in reference to which I shall presently have something further to say. The word "orbit" of course simply means the path of a planet through space considered with reference to the Sun, but each of the paths identified with the known planets is filled with miscellaneous matter in excess of that actually used up by the existing planet of the orbit. This is available for the construction of a new planet when required, the old one by that time having completed its life-bearing period and being ready to surrender its volatile ingredients to its successor.

When the idea just set forth is fully appreciated the reader may ask how long this successive formation, breaking up, and re-formation of planets has been going on in our orbit? Ordinary astronomy has assumed as a matter of course that the planetary scheme we now belong to has directly ensued from the first con-

densation of the nebula out of which our solar system was developed. This is an erroneous conception, and we should come nearer the truth if we entertained the idea that a protracted series of planetary schemes has been evolved around the Sun since the beginning of the whole system. But I am not at present in a position to attempt a complete history of the system from the beginning, and this last suggestion must remain a mere hint along a line of inquiry which after all has little to do with the actual problem before us for the moment. The London Lodge Transaction of April, 1896, "The System to which we Belong" (the substance of which is embodied in *The Growth of the Soul)* will give a sufficiently complete view of the existing condition of the system, to pave the way for the correct comprehension of what now follows. Confining our attention for the moment to our own orbit and the evolutions that have gone on within that great pathway, the Moon when in full activity during the last or Lunar manvantara of this scheme was the first physical planet brought to perfection *in this orbit,* since the solar system began to assume manifestation. Certainly there were earlier conditions of non-physical planetary growth within the orbit. The reader will remember that the successive manvantaras of a planetary scheme are associated with different degrees of relationship to the physical plane. We are now going through the fourth manvantara of our scheme and three physical planets are concerned with the activities of this period. In the last or Lunar manvantara there was only one physical planet in activity—our present Moon. In the manvantara before that there were no physical planets at all in association with the process—then carried on exclusively on Astral and Manasic globes. The course and character of successive manvantaras would afford a theme for wide-reaching speculation growing out of the knowledge we already possess, but I need not diverge into that pathway of speculation just now. It is enough for our present pur-

pose to realise the broad fact that though processes preparatory to a more advanced evolution were already going on in this orbit before the formation of the Moon, that planet had no full-fledged predecessor in the orbit. And yet it would not be quite true to say that it was the first planet put together (so to speak) within the orbit! There were early attempts at planetary formation (in our orbit) before the Moon was formed. These were discarded as failures, and were disintegrated.

The view of Nature embodied in the last sentence is full of interest. In studying the sublime phenomena of astronomy along ordinary lines of thought and with the help of no better data than physical plane observation can afford, we get into the habit of supposing that "Creation" is in the nature of an easy outcome of Omnipotence, the progress of which, though veiled from us as regards its earlier stages, must have been as faultless in its operation as the laws of chemistry or physics at the present day. The theory of Creation, on the other hand, which theosophical study begins to reveal, shows us a condition of things which is much more *vraisemblable* than the crude imaginings of ignorant faith, and really, at the same time, one calculated to enhance rather than diminish our admiration for the Powers and Agencies we sum up under the term "Nature." There is no credit due for the wonderful results of Creation, if we suppose it the fruit of Omniscience *plus* Omnipotence. Indeed to the critical mind the question why evolution has been attended with suffering presents itself with disagreeable persistence in connection with the old-fashioned idea of Creation, derived from mediæval religion. But when we recognise that the work of Nature is carried on by specific *Beings*—certainly of awfully sublime rank in the Hierarchies of the Universe but still Agents of the ever-mysterious Divine Supremacy behind all, then it seems to me the results accomplished, despite shortcomings, overwhelm the mind with awe in a greater degree than is possible along the other line of thinking. They are not Omniscient and Omnipotent in the mathematical sense of those words—the sublime Agents of Divinity who control such undertakings as the growth of planets—but they do not launch a planet on its career as a life-bearer until they are satisfied with it as a piece of physical plane manifestation. Thus there were, as a matter of fact, some other planets in existence before the Moon but they did not satisfy their Authors and were suffered to relapse again into the condition of raw material.

And now I may return to the main stream of the information I have to set forth, and to that stage of the planetary evolution to which we belong, which has to do with the development of our own Earth.

Only in the very earliest planetary evolutions in any given orbit, can the process of condensation be direct from the original nebula. By the time the Earth was wanted to carry on the work of our present manvantara, all the nebulous matter of this orbit had condensed either into the then active planet of the orbit, or into the form of relatively small masses of solid matter such as those that constitute meteor streams. But such matter is just as easily available for planetary construction as the original nebulous matter.

Just as in the case of a new solar system more than one method of accomplishing the required result is available for adoption by the agents of Divine Will, so also with the business of planetary formation we may assume that more than one method might be available for selection, but it is not difficult to imagine that a method recognised by ordinary science is at any rate sometimes adopted. The clashing together of meteor streams in space has been thought of as a condition sufficient to account for the sudden appearance of a new star in a distant constellation. That meteor streams are flowing about through the system to which we belong, is plainly evidenced by meteoric

displays, often arising from what is probably a mere touch with the outskirts of some such stream. It is easy to understand that when a new planet is required the full force of some considerable stream is directed against a corresponding mass of planetary matter in the orbit of the occurrence, and the heat so engendered would resolve the matter of the clashing streams into a planetary nebula. Its condensation as time went on would provide the nucleus of a new planet.

I say "the nucleus" rather than the planet itself because I now approach a statement for which ordinary scientific observation has not prepared us, although the condition of things I have to describe is more or less clearly foreshadowed in the admirable work on the Nebula Theory which we owe to Mr. William Ford Stanley. This is an orthodox scientific treatise, and I quote it not to corroborate the fragment of occult science I am privileged to put forward, the claims of which on my own belief would be quite sufficient even if it were quite out of touch with previous scientific thinking, but it is always interesting to find the farthest-reaching conjectures of ordinary science tending in the direction of the ampler knowledge derived from occult research. Mr. Stanley recognises the possibility that the planets were not formed by a single operation but perhaps by successive condensations of ring-matter in the very way I am about to describe. He writes: "Very probably the planet-forming ring was never perfect, or if perfect it is improbable that it should have condensed entirely at once into a single planet." He distinctly recognises that an orbit may contain a young planet and a great mass of meteoric matter as well. "If of the same period they would maintain their *vis viva* and not be detected by any calculation in the variation in the Earth's mean course or by telescopic observation." He also says: "Neither is it necessary to assume in all cases a single ring of a perfect ring system: there may have been many imperfect or partial rings detached before these

formed a single planet, these being united afterwards by variation of time orbits and crossings of perihelia through eccentricity or by drifting in spiral lines inwards."

The actual fact I understand to be that the planet on which we are at present living was the result of several condensations of nebulous matter, and the constitution of the Earth at this mature period of its existence is only to be understood by reference to this method of development. The nucleus having been formed in the first instance in the way already described, a considerable time was allowed to elapse before the second deposition of matter took place. In this interval the surface of the nucleus had time to solidify and cool down to temperatures in which all but its more volatile ingredients assumed, on the surface, the solid state. Then another clash of meteoric streams surrounded the young Earth with a huge envelope of fresh nebulous matter. I say "nebulous" because the heat engendered by the collision of the meteor streams would resolve the meteoric matter back again into its primitive state. It is necessary, indeed, that such a return should be included in the process in order to provide the growing Earth with the varied materials required in its composition. Meteoric matter for the most part is simple in its composition, and very largely made up of certain metals of which iron is the most abundant. But a planet consisting almost entirely of iron would not be a suitable home for the evolutions it might be destined to bear. Occult teaching in reference to the constitution of matter comes in here to relieve us of the embarrassment this thought suggests. Thrown back into the nebulous condition by the intense heat of the meteoric collision the matter of the meteor streams, even if it had all been iron to begin with, would be once more in the etheric state—in that state in which Sir William Crookes has called it "protyle" in connection with his extremely admirable and occultly justified theory of "the Genesis of the Elements."

From that state it would be capable of rearranging its atoms in the varied forms of the many chemical elements required for the service of a life-bearing planet.

The new envelope of nebulous matter is destined to condense into a complete solid shell surrounding the original nucleus and here it is for the first time in the course of this explanation necessary to interpolate an idea for which we are not fully prepared by any ordinary habits of scientific thought. When the outer shell has been completely solidified, the condition of things we find to exist is this: The volatile ingredients in the composition of the original nucleus have not been, as expectation might have led us to expect, squeezed through the newly deposited shell of solid matter but have been confined within that at an enormous pressure and at a corresponding temperature. At the stage of the Earth's growth we have reached in imagination, we have an interior globe of solid matter, the central portions of which are still at an enormously high temperature while the outer crust is relatively cool. But on the surface of that crust there exists a stratum of compressed gaseous matter, largely consisting of water in its gaseous form, at the temperature, or even exceeding through contraction the temperature of the nebula which condensed upon it. We cannot expect at this stage of our knowledge to understand precisely how the condensation is so effected as to keep the gaseous matter within the new shell, but no extravagant amount of intellectual modesty is required to induce us to recognise that there may be laws of nature which come into play when new planets are being constructed, the full details of which are missing as yet from our present catalogue of such laws.

The outer shell having in its turn had time to cool down so that its least volatile ingredients are solid, and its more volatile ingredients in the atmospheric state around it, a third process

sets in. Again there is a clash of meteor streams, another vast nebulous sheath is condensed around the growing globe and in time this forms a second shell with a stratum of confined gaseous matter between it and the interior shell. Further operations of a similar character are carried on at later stages of the planet's growth until it arrives at maturity, and consists as at present of six concentric spheres or shells surrounding a central nucleus, with strata of hot gaseous matter intervening between each sphere and its neighbours. The outer shells are of considerably greater thickness than those immediately surrounding the nucleus, and the outermost of all, with which we are concerned, is much the thickest of all, as will be seen by reference to the diagram at the end of this paper, which shows a section of the Earth and gives what I am assured is an approximately correct idea of the proportions of the different parts. I have not on this drawing endeavoured to represent the shallow stratum of heated matter which does actually exist at a depth of about twenty-five or thirty miles below the surface. It is of a wholly different character from the interstitial spaces of hot condensed gases. It is simply a portion of the Earth's solid shell which is hot by reason of the fact that it was an extra nebulous condensation superimposed upon the otherwise completely finished planet, with an end in view no doubt which I do not as yet exactly understand, but which I believe to have related in some way to the ultimate development of the vegetable kingdom. The surface layer of hot matter (as it may be called by comparison with the interstitial layers far down in the depths of the globe), was a kind of "top dressing," to use an agricultural expression, which seems to have been provided for as regards the actual material used up, by the disintegration of the two outer shells of the Moon. Some forecast of this condition of things has been already embodied in theosophic writings as mentioned above, but the present explanations will advance our comprehension of the

matter to some extent. Leaving over for the moment the fuller interpretation of the statement just made about the two outer shells of the Moon, let us keep to the Earth's history till that is further developed. The final "top-dressing" was not designed to form a new shell separate in any way from the great crust already formed. It did not operate to confine between itself and the established surface any atmospheric gases. It was simply a hot layer of physical matter, the more volatile portions of which remained in the atmosphere of the globe already formed, while the solid portions settled down and beginning to cool from the outside, eventually established the conditions now prevailing. Of course at first the whole new layer of physical matter twenty-five miles thick was incandescent, but the cooling and solidification of the surface prepared the way for the establishment thereon of the geological deposits with which we are familiar, and eventually for the development of the vegetable and animal kingdoms.

The direction of rotation of all the concentric spheres is the same, and the axis of rotation identically the same, but the rapidity of rotation increases from within outwards. Each new shell deposited as the growth of the planet proceeds rotates with an increased velocity compared with its predecessor. I cannot give figures in this connection with exactitude, but the third globe going inwards has a rate of rotation equal to about half the rapidity of our outer shell, making one turn in forty-eight hours and the innermost central globe makes only one turn in about half that time, or say in ninety-six hours. The intervening spheres move at intervening rates.

Critics of this present statement will no doubtask to what forces I assign the task of establishing these rates of-rotation in the first instance, or that of keeping them up in spite of the friction which the varying rates concerned must engender. We will come to that directly, but for theosophical students I do not

recommend to their acceptance the explanations I am now giving, as susceptible of justification at every point by reference to known laws, but simply because they come to me under conditions which entitle me to regard them as invested with high occult authority. Again I must emphasise the idea that much was done in connection with the early growth of this world and indeed much is being done to-day in connection with the maintenance of its planetary life, that involves the use of natural forces of which at present modern science knows nothing whatever. The intelligence of the human race as it advances in the path of evolution —at any rate the intelligence of the last developed races which constitute its advanced guard—is steadily overtaking occult teaching and will at a later date interpret with exactitude phenomena we can as yet merely recognise without pretending to understand them. But meanwhile there must be a margin of tolerance in the minds of occult students eager to rush on in advance of current knowledge for statements that it is impossible as yet to fit in with the limited body of natural law so far catalogued and indexed.

I have been interested in finding since I have been at work upon this interpretation of the Earth's constitution, that in other schools of oriental occultism besides that with which my own opportunities have chiefly brought me into contact, the Earth is described as resembling in its constitution "the skins of an onion." The subject has not hitherto been treated in any western expositions of theosophic teaching, but the main ideas of the present explanation are vaguely in circulation already among the pupils of some eastern occultists, even though the onion with its skins would not constitute a satisfactory analogy for the western scientific mind once directed to the problems of the Earth's constitution.

It has been vaguely known by occult students for a long time

that in the neighbourhood of the North Pole there is a natural orifice in the ground penetrating to inconceivable depths. This wonderful shaft has been regarded as fulfilling some mysterious need of the Earth, analogous to breathing, and it has been supposed that a similar shaft connects the South Pole with the interior, though this is even more impenetrably guarded by the ice of the Antarctic region from the curiosity of humanity than the orifice of the North. I have no information that would enable me to attempt an interpretation of the purpose in nature which these great polar shafts fulfil, but I have indicated their position on the diagram appended to this paper, because I know that they play an enormously important though very mysterious part in the economy of the whole planet and are associated with the activities of the Mighty Being who presides over its growth and health. This reference impinges on a branch of the great subject with which I am dealing to which I will shortly direct attention, but meanwhile it is unnecessary for us to exaggerate the difficulties of the problem presented to us by the question of friction.

To begin with it will be obvious that friction will be enormously greater at the equatorial regions of the internal spheres than in the neighbourhood of the poles. But at the equatorial region the thickness of the gaseous stratum is at the maximum. The interstitial space contracts as it approaches the polar regions and the adjacent spheres are in close contact in the region immediately around the central shaft already spoken of. The friction at such surfaces of contact would be extremely small, areas that need not be thought of as more than a few hundred yards in diameter, revolving against each other in periods considerably exceedingly twenty-four hours. For if the internal shell which is the next neighbour of this outermost one on which we live revolves, say at a speed of thirty-two hours, it would take three days and not twenty-four hours for the complete revolution of

the two polar surfaces in contact. The same principle would hold good with emphasised force as we go inward in imagination, for the smaller the interior globes would be the less need be the areas of surface in contact, in view of the purpose for which such contact seems mainly designed,—that is to say for the purpose of confining the highly compressed gases of the interstitial spaces within their proper limits. If there were no surfaces of contact at the polar regions, these gases would rush out into the central shaft and speedily exhaust all their energies, while the shafts in question would, as long as the tremendous process lasted, be volcanoes of unimaginable violence. That is not their function, which has to do with the circulation of forces within the interior, of which at present we can form but very imperfect conceptions. That they are related with solar influences seems clear, but it is useless to attempt just yet to elucidate this branch of the colossal subject under examination.

The thickness of the gaseous stratum between our outermost shell and the next concentric sphere is thus about two to three hundred miles around the equator, diminishing to nothing at the poles. At the equatorial region the friction is distributed throughout the stratum, the gases in actual contact with each revolving surface moving no doubt at different speeds with each surface. The friction is therefore to be sought for entirely in the gaseous mass. Such friction would obviously be exceedingly small if the gaseous mass were as rarefied as gases on the surface at our atmospheric pressures. It will be much greater when the pressure is such as to bring the gases concerned to something like the densities of rock. But still, owing to the conditions of temperature far above the critical points of any that may be present, they will still be gaseous, and this must be borne in mind in any conjectures concerning the friction problems arising from the exposition I am venturing to put forward.

I must now endeavour to interpret as far as that may be pos-

sible the expression used above, "the Mighty Being who presides" over the growth and health of the planet. In some earlier theosophic writings vague reference has been made to "the Spirit of the Earth." There is such a Spirit, belonging to an evolution quite apart from our own, who is in the first instance an emanation from the stupendous life of the Sun. And such an emanation is the first step taken in connection with the creation of *any* planet of the system. It is by his power that the meteor streams are guided in the paths of those tremendous collisions which give rise to the successive nebulous clouds required for the construction of the successive concentric spheres. The nucleus-globe remains to the end of the planet's life his great workshop—if the phrase may be allowed—and storehouse of those incomprehensible energies which maintain the physical health of the planet. It is by virtue of forces emanating from that central globe and passing up the polar shafts that the exact harmony of the axial rotation of the concentric spheres is maintained. Probably indeed, when the parallelism of their axial rotations is once established, no very great force is required to maintain this, for within our own knowledge the plane of rotation of a revolving body is not easily disturbed, but so extremely minute a disturbance would be sufficient in this case to block the central shafts that means are employed to guard against even such a slight disturbance.

The heat of the interior of the central globe far exceeds any temperature maintained in the interstitial spaces, and a vast army of Elemental Agencies is employed there, under the direction of the Spirit of the Earth, on tasks the nature of which is utterly beyond the range of our present comprehension. But our world somehow depends for its continued life on the activities carried on in the central globe, and they are never relaxed until the planet concerned has fulfilled its destiny and the time has come for its decease or disintegration.

Let us now consider how far the explanations already given fit in with some of the physical phenomena of the Earth's surface in reference to which scientific speculation—familiar as the phenomena in question are—is still almost entirely helpless. For example, will the concentric sphere arrangement enable us to interpret the eruptions of volcanoes more satisfactorily than this has been done by geological guesswork up to the present time?

If we turn to the best books on the subject we shall find an enormous mass of detail concerning the external characteristics of volcanic eruptions. The nature of the ejected matter has been studied with great care, and the chemical composition of the lavas and volatile substances thrown out has been examined with the closest attention, but when the question is: What combination of forces in the earth's interior gives rise to the eruption itself? we get little or no satisfaction from the specialists who have devoted themselves to this subject. Some relation is assumed to exist between volcanic eruptions and the stratum of highly heated matter supposed to lie at a depth of about twenty-five to thirty miles below the surface, but no suggestion is made as to why such a stratum should exist, if below that again there is rigid solidity instead of that complete globe of molten matter talked of at an earlier stage of human knowledge. I need not recapitulate the various ideas that have been thrown out by some writers in the hope of reconciling incompatible conditions. All theories on the subject are in turn reviewed and rejected by the best authorities. Professor Bonney's work on *Volcanoes* is the most recent treatise on the subject as a whole, and he in turn refers to Professor Judd's interesting book with the same title as still up to date though now some twenty years old. From neither of these books do we get any coherent theory of volcanoes, which remain for ordinary science an unsolved enigma. Certainly it is held with considerable confidence that sea-water

percolates to hot regions, and there producing explosive steam, may have something to do with eruptions, but even that idea is not entirely exempt from embarrassment, for as soon as the inflowing stream reached the hot region and became steam, it would exercise a backward pressure against the further inflow. One does not quite see how sea-water can account for the immense abundance of steam that is emitted from volcanoes during their activity.

It is very important to appreciate the extent to which steam is emitted from volcanoes in eruption. Professor Bonney says: "M. Fouqué, who studied an eruption of Etna in 1865, made a number of observations in order to measure the quantity of water which was discharged from the vent in the form of steam. Each explosion, he estimated, ejected about seventy-nine cubic yards of water in this condition, and one of these occurred on an average every four minutes for about a hundred days. That is to say the discharge amounted to 2,829,600 cubic yards of water." This, Professor Bonney goes on to explain, would be rather more than the contents of a lake two and a quarter miles long, 700 yards across and thirty feet deep. It is very difficult to imagine such a mass of water getting down into the hot region from the sea-bed. It would have to work its way through fissures in the rock for twenty-five or thirty miles against the pressure created by its own expansion when converted into steam. And yet the enormous volumes of steam above referred to are invariably emitted during eruptions, and the torrential rains in the neighbourhood to which they afterwards give rise are sometimes regarded by the inhabitants of volcanic region as among the most dangerous features of an outbreak. And looking at the problem from another point of view, the theory which assigns the steam of a volcanic eruption to the inflow of sea-water would not explain the floods of molten rock in the condition of lava which are emitted from the volcano in action as well as the steam.

Grant the inflow of sea-water and the existence of a chimney connecting the region to which it should find access with the surface, and still we do not account for the uprush of molten rock. It would be a very extravagant hypothesis to assume that the sea-water first got underneath the interior reservoirs of molten rock, waited till it was well in that position to become steam, and then blew up the lava through the chimney—some twenty-five or thirty miles long! If volcanoes emitted nothing but steam and rough fragments of relatively cold rock torn off the chimney in its upward passage, the theory under notice might deserve a little more attention, but as things stand the sea-water, even if it plays some part in the development of a complete eruption, cannot be its main spring—so to speak. Nor do we find in the theory of the hot stratum twenty-five miles down, any explanation of an expansive force inherent in that stratum which would tend to account for the uprush of molten rock. Of course, to begin with, there is absolutely no theory in circulation that pretends to account for the existence of the hot stratum compatibly with the modern theories of the earth's general constitution. But granting its existence without even seeking to account for it, molten rock would have no expansive energy that could drive any portion of its substance to the surface. Summing up the whole case as it presents itself to ordinary scientific speculation, there is, in fact, no current explanation of volcanic disturbances that approaches a solution of the problem.

The explanation which occult information affords us concerns itself very little if at all with the heated stratum at the twenty-five mile level. That has a real existence and is due, as already explained, to the last deposition of nebulous matter which finally dressed the surface of the outermost concentric sphere. The thickness of that sphere is enormously greater than the twenty-five miles in question, and is to be measured in

hundreds of miles. I am encouraged to regard the outermost shell on which we live as about seven hundred miles in thickness. The interior spheres are by no means so thick, and we may allow a diameter of about two thousand miles for the central nucleus. The interstitial strata of heated gases are each at the equatorial region about three-quarters of the thickness of the next interior sphere, and I have endeavoured to put these dimensions into a diagrammatic shape in the annexed sectional representation of the earth's interior. But let us now return to the problems of volcanic action on the earth's surface.

The main point to be understood is that the energy displayed by volcanic eruptions is derived from the compressed gases of the nearest interstitial space and not in any way from the shallow stratum of heated rock at the twenty-five mile level.

It is generally recognised and quite correctly that a relationship exists in most cases between volcanic displays and earthquakes. It is not necessary to suppose that every eruption from an established volcanic vent is preluded by an earthquake, but probably no such volcanic vent has ever been established in the first instance without the agency of an earthquake. The earthquake itself is quite correctly assigned by ordinary scientific speculation to the crumpling and fracture of rock strata owing to the contraction as it gradually cools of the outer concentric sphere—or the Earth's crust as geology would more vaguely put it. When such fracture occurs on a large scale a fissure is established reaching right down to the first interstitial layer of hot compressed gases. These as I have said chiefly consist of water in the gaseous state or steam (though other ingredients are freely mingled with the steam), but the word "steam" inadequately conveys to ordinary thinking any correct idea of the state in which that substance exists in the interstitial layers. Probably its heat exceeds the temperature of the electric furnace.

The pressure it exercises would be hardly calculable in terms with which we are familiar. But when it finds an upward vent in the fissure established by a rock fracture, it not alone has energy enough to force its way to the surface, but heat enough to melt the rock surfaces between which it rushes up. In passing through the heated stratum at the twenty-five mile level it carries with it some of the molten matter which it finds there, but a larger part of the lava ejected from active volcanoes actually comes from immense depths, and the enormous volumes of *steam* pouring forth from volcanoes in eruption have actually come from many hundred miles below the surface and not from the neighbouring seas. The sea-water may contribute in a minor degree to the effect by finding its way into the fissure somewhere near the surface and by meeting the upward current of superheated steam and molten rock from below, but it is quite a subordinate factor in the whole undertaking.

The reader will see at once how remarkably this explanation of volcanic action fits in with the well-known fact that ancient eruptions were on a much larger scale than any with which we have to do in the present state of geology. At earlier stages of its life the cooling of the outer sphere involved much more frequent and violent contractions than are going on at the present day. Huger fissures than any that could be produced by the milder earthquakes of this period, allowed of far more tremendous emissions of interstitial energy than are likely to be renewed at the present day. Indeed it seems obvious that all the volcanoes of the present day are due to the partial reopening, at special points of weakness, of old fissures established by the colossal earthquakes of prehistoric periods. This thought is one of considerable interest because it gives us the clue to an understanding of a little difficulty that may occur to some critics of this explanation. Why do the volcanoes of the present day take the shape of chimneys or spouts instead of that of longitudinal rents

in the surface, as one would expect to be the arrangement if they are assigned to fractures of the rock strata? At a very much earlier period of the world's history than that which has been covered by familiar records, volcanic action actually did take the shape of fissure emissions. The geology of North America especially shows us manifest examples of such volcanic eruptions in very remote epochs. And the common distribution of modern volcanoes along lines on the earth's surface—volcanic zones as they are sometimes called—is significant of the manner in which these zones were originally established. Look at such a great chain, for instance, as that of the Andes and one can easily imagine that it may have been the product of a stupendous rent in the surface created by one of the gigantic rock fractures of a period when the contraction of the outer shell by cooling was very much more violent than it is now. Then follow periods of quiescence when the fissure as a whole is sealed up by the operation of forces we do not as yet fully comprehend. A more profound acquaintance with these forces than I have been privileged as yet to obtain, would be required for the complete elucidation of the way volcanic vents are stopped up when eruptions come to an end, but as I have already said the inquiry we are concerned with deals with the methods adopted for its construction by the great agencies employed in the building of the Earth, some of which lie within the area of our present comprehension, while others are at present outside it. The laws of nature that we do comprehend—the laws of heat and pressure—account for a great deal that takes place but not for all. When some great volcanic eruption has served its purpose in the economy of nature, whatever that may be, there appears to be a means of arresting its further progress which we must be content as yet to recognise without fully understanding it.

But it is quite intelligible that when a fissure eruption has come to an end the closed up fissure has regions of strength and

points of weakness. A comparatively slight earthquake in the neighbourhood of some such point, might be enough to start a new eruption at that point. Then a mountain forms around the new vent and a modern volcano is established, subject to occasional resumptions of activity as the ages proceed.

Everyone will see that in their upward passage from the interstitial space the expansive or explosive gases must pass through the heated stratum near the surface, the twenty-five mile level. No doubt they bring up some of the heated ingredients of the eruption from that stratum, but it seems clear that the main quantity of lava in the case of an eruption giving rise to large emissions of that substance is brought up from the walls of the main fissure melted by the passage of the hot gas. And certainly almost all the vast volumes of steam streaming all the time from any volcano in activity must come from the low-lying level.

Some writers have been inclined to attach importance to barometric conditions, and others to aspects of the Sun and Moon, in seeking for the explanation of earthquakes and volcanic displays. And though the effects for most of us will seem out of proportion to such relatively insignificant causes, there is no doubt about the significance of solar-lunar aspects establishing attractive strains, considered in reference to certain seismological and volcanic phenomena. It would be indeed absurd to assign the phenomena in question to atmospheric and tidal conditions as a complete cause, but the idea may find a place in the whole theory, where it need not look ridiculous when we regard the small influence as a process analogous to pulling a trigger. If we have in the volcanic shaft a condition of unstable equilibrium, and in the adjacent rock strata a tendency to a slip, the special attraction of a conjunction of the Sun and Moon or even an abnormal atmospheric wave might just start the disturbance. After all, the difference of an inch of Mercury in the

barometer means a difference of a million tons pressure on every square mile. Such a difference might conceivably be enough in some cases to set the adjusted machinery of an eruption in motion. Modern seismology—the science of earthquakes—though only a few years old already helps us to a bit of evidence that seems as far as it goes to corroborate the explanations embodied in this paper. Experience has shown that any considerable earthquake in any part of the world sends a tremor through the whole body and can be recorded anywhere. Thus at the seismological observatory at Shide in the Isle of Wight, Professor Milne, the leading expert in the new branch of science, can get tracings on his instruments that show the occurrence of earthquakes as far off as South America or Japan. Now it always happens when the pencil of a recording instrument gives a signal—in the shape of a wriggle in an otherwise continuous line on the revolving drum—that this signal is followed a little later on by a second wriggle identical in character with the first, but very much more vehement. Then after a considerable interval—if in the case of a Japan earthquake the first signal had been followed by the second at an interval of say a quarter of an hour, the third signal would follow about three-quarters of an hour later still—the self-same wriggle is repeated with an intermediate character of amplitude. Now it is obvious that each of these signals relates to the same earthquake and how is it that the same original vibration causes the successive signals? The conventional explanation is in the main quite satisfactory. The original centre of disturbance sends forth vibrations in all directions. Some travel straight through the body of the Earth in a straight line from the point of departure to the distant observatory. Others travel through the rocks on the Earth's surface, those coming the short way round manifesting themselves first, and later on those that come the long way round. But why are the amplitudes so different ? The conventional

answer is that the direct wave is deadened by the extra density of the rocks through which it passes, while the more elastic rocks on the surface respond more freely to the wave. This answer seems to me unsatisfactory. Test the idea by thinking of a sound wave. That would certainly be transmitted with greater energy by a bar of steel than by a bar of india-rubber. But the phenomena of sound waves show us that when a wave is made to traverse media of different densities in its course, the amplitude is deadened. Now on the theory of the Earth's constitution that the present explanation sets forth, the direct earthquake wave has to pass in its direct course through strata of very varying density. It first goes through the outer sphere, then through the interstitial stratum of condensed gases, then through the solid mass of the first interior sphere and out again through the gas stratum and the solid crust of the external sphere. These transitions would have just the deadening effect on the wave that is actually observed. The first signal is weak, the second coming round the short way, *via* the external crust, is emphatic, the third is unimpeded by different densities, but somewhat weakened by having to make a long journey. The seismological records therefore as a whole are distinctly in favour of the concentric sphere arrangement.

I understand that life exists in the Earth's interior, even in the intensely hot regions of the interstitial spaces, and startling as the idea may seem at the first glance, it is only for the cramped understandings of people brought up to regard the conditions around them as the only kind compatible with consciousness, that the conception will be seriously embarrassing. Flesh and blood designed to be the vehicle of consciousness on the surface of the external sphere and at temperatures familiar to human life would not be adapted to temperatures at which platinum would be a mobile liquid, but every occult student is well aware that his consciousness, his

life, can go on just as freely when he is in an astral vehicle or body as when he is animating flesh and blood. And in the astral vehicle, physical temperature is a condition that does not affect him one way or the other. In an astral body he could live as comfortably in the heart of a furnace or in the midst of arctic ice-floes as in the meadows of an English farm in the summer. It is not even necessary to assume that the bodies of the beings who inhabit the interstitial spaces of the earth are entirely of astral matter. That intervening condition of matter which is called etheric would, perhaps, furnish the material adapted to provide vehicles of consciousness for the beings in question. However this may be arranged, this closely packed earth of ours is made use of throughout. Not merely in the heated spaces that constitute the surface of each interior globe but within the substance of each concentric sphere there are forms of life adapted to the conditions around. For in the cool and solid depths of each mighty crust there are great cavernous spaces in which beings exist who are going through evolutions of their own, and are scarcely in touch at all with the supreme evolution—supreme as far as this Earth is concerned—to which the human race belongs. Very little information relating to these interior races has reached me, and it would be useless to speculate as to the purpose in the whole economy of the system served by the involvement of any part of the Supreme consciousness, in forms and in the midst of conditions that do not appear favourable to spiritual or any other kind of growth. But the varieties of condition under which life is carried on, in and around the world we share with so many other tenants, is all but infinite. Nor is the life of the Earth's interior confined to the more or less intelligent beings or entities established there. Wild as the notion may strike one at the first glance, there is something analogous to a vegetable kingdom on the white hot surfaces of the interior globes—actual plants with leaves and a

kind of granular circulation analogous to the sap of plants on the outer surface. If difficulties present themselves to the mind as we endeavour to realise the scenes of these strange worlds within our own, that is merely due to the false system on which the average mind of the nineteenth century has been educated. The tendency has been not merely to encourage the idea that "what I know not is not knowledge" but to invest the victims of our educational system with a conviction that what they do not understand cannot exist. We do know something of the relationship in space and magnitude between the habitable portions of the Earth's surface and the Universe at large. And yet the nineteenth century mind has been only half inclined to admit that there may be intelligent beings in other worlds than ours—always assuming that some of these may be adequately provided with water, food and sunshine, without which we know life is impossible! The contrast afforded by the brilliant intellectual achievements of the nineteenth century mind along some lines of activity and investigation, with the imbecile silliness of its habitual limitations, is equally irritating and amusing to the occult student who has got outside those limitations. But even for many such students, familiar though they may be with the idea of superior planes of Nature and faculties of a wider reach than those of the physical brain, the explanation here given of the real condition of the Earth's interior may be received with a kind of gasping surprise. We were not prepared for so complex an organisation in the body of our planet, any more than the physiologists of, say, the Elizabethan period were prepared to find so much in the human body as later research has disclosed. But in all likelihood the sketch here given errs in its omissions to a far greater extent than in its positive statements. It is a mere broad outline of the story that might be told by those thoroughly conversant with the facts. The interest from the mere scientific point of

view of further detail if we could obtain it would be intense, but for the present we must remain, if not content, unsatisfied as regards the multitude of questions that naturally arise in the mind. To what extent does the incombustible vegetable kingdom of the interior surfaces cover the whole glowing landscape? Are there forests of white hot trees, and is there an appropriate animal kingdom associated with the others of the inner worlds? The beings in more or less astral bodies already referred to, would be the relatively human kingdom in each case, the head evolution of the series to which it belonged, but it is more than probable that it would be surrounded by satellite evolutions, as our own on the outer surface is so surrounded.

With intense heat we naturally associate the idea of light, so as regards the inhabitants of the regions I have called the interstitial spaces there is no need to consider the question how these are illuminated. But directly we confront that question we cannot but be struck with the mistaken impulse which prompts it. If the intelligent beings of the inner regions are invested with astral vehicles of consciousness they see with senses altogether unlike those of the physical plane, and are thus quite independent of physical plane light. A very moderate acquaintance with the experiences of super-physical research amongst ourselves will render us familiar with the idea that darkness is more favourable than what we call light to the activities of some beings at all events functioning in astral vehicles of consciousness. So it may easily be that the beings inhabiting the dark interior caverns of the solid crusts may have senses to which that darkness is perfectly luminous. It is apparently held by the authorities of the Earth that the humanity of the outer surface should be effectually cut off from communication with the interior kingdoms, and this may be provided for by the heated stratum at the twenty-five mile depth through which it is

quite impossible that any inquisitive borings on our part should ever penetrate. But knowledge may be gained, as occult students are well aware, in reference to regions quite beyond the reach of physical investigation. And so it is coming to pass that we are learning something of the conditions under which existence is carried on in the deeply buried cavern worlds of the Earth's interior.

All thoughts will turn in connexion with this subject to the beautiful story evolved from Lord Lytton's imagination concerning the magnificent civilisation of his "Coming Race." But though there is just so much actual justification for the tale in question as is embodied in the fact that races do actually exist in vast cavernous spaces in the interior of the outermost and some others of the concentric globes, we must deny ourselves the intellectual luxury of conceiving that the superb Gy-ei of Vrilya will ever ascend to the upper world to set our "Koom-poshes" in order. The interior evolutions are far below the intellectual level of even our present humanity, although they are advanced enough to have something like systems of government, dwelling-places of artificial construction, and to put inscriptions on the walls of their inner world.

Yet a third order of consciousness ranges the interior spaces of the Earth, but this is altogether elemental in its character. I have spoken of the armies of "fire elementals" employed under the Spirit of the Earth on the mysterious tasks carried out in the central globe of all. Elemental evolutions are very difficult to understand, but in some way there is an evolution outwards possible for these fire elementals, and an emergence for them in some cases into the superior elemental life of the external surface of the earth. I can say so little on this subject that it may seem to some readers hardly worth while to have said anything at all, but vague as our information must for the present remain in reference to the interior evolutions, the mere recognition of these

as in progress is calculated to enlarge our view of the Nature of which we form a part. To my mind there is a gulf of difference in the conception of this vast planet on the surface of which we roam about, as a huge lump of inorganic matter serviceable for no other purpose than to bear the minute organisms swarming on its outside, and on the other hand the conception of it as a teeming hive of life and consciousness filled to overflowing with the vital influence of The Logos. The mere physical complexity of its structure as now explained dignifies the whole globe as compared with the crude ideas of its interior condition prevalent in the common imagination hitherto. And although orthodox science—as bigotted in reference to its methods as the Church in reference to its dogmas—will decline any enlightenment that does not come along familiar roads, occult students will be enabled by the explanations now set forth to check some of the speculations concerning the past history of the Earth in which scientific writers allow themselves to indulge. We are constantly told that the manner in which the Moon rotates once on her axis in the same time that she revolves once round the Earth, is the result of tidal action in the remote past. The satellite is assumed to have been cast off from the Earth while this was still in its early molten condition and having thus been flung into space to have settled down to its present habits as the result of tidal retardation while it was still a plastic mass. Tidal friction is very much in favour just now among speculative physicists as an explanation of some phenomena that have taken place (in an entirely different way) and of some others (erroneously) assumed to be in preparation for the future. As the Moon was really in existence for millions of years before the first initial measures were taken for the formation of the Earth, all guesses based upon the idea that it was a bit of the original Earth torn off by an early convulsion of Nature are little likely to find themselves in harmony with the truth. The Moon is

indeed a dead planet now, not because it has never been anything else, as the conventional theory would imply, but because it has fulfilled its part in the economy of the scheme to which it belonged and is in process of disintegration.

For the final return to the bosom of Nature of the materials used in the construction of a planet is accomplished by degrees, just as the planet in the beginning has been built up by degrees. The concentric sphere arrangement is, as I infer from what I have learned, the method of planetary formation adopted throughout the solar system, but at any rate it was the method adopted in the formation of the Moon in the beginning (long before the Earth was thought about) just as in our own case afterwards. And when the active life of the Lunar world was over and its physical body had to be dispersed again—as in the case of each one of us when each life is spent the physical body concerned has to return to dust—the outermost shells disintegrated first. As with their original construction forces are employed that we do not habitually reckon with, so in the processes of disintegration agencies of an unfamiliar kind take the work in hand, but the broad idea is that when the Spirit of the Planet that is outworn has no longer any work to do there he leaves it and decay sets in as naturally as it sets in with a human corpse when the soul has fled away. In its full maturity the Moon must have been a planet about the same size as our own, for as we look at it now we see the surface of what was originally its third concentric sphere going inwards. The two outer ones have been shed, and the matter of which they were composed no doubt largely drawn upon for the final deposit of matter on the outer shell of the Earth. A long time will yet elapse before the four remaining shells and the internal nucleus return to the oceanic store of meteoric matter, but time in these undertakings is spent by Nature with much prodigality. In guess-work concerning the duration of astronomical periods modern science has not yet

been furnished with data on which to proceed with security, and its confidence in the data which it assumes is apt to be misplaced. Thus all calculations relating to the supposed maintenance of the Sun's heat by shrinkage are quite ludicrously wrong, and the forecasts at present in favour as regards the time at which there will be no room for it to shrink any more, and at which consequently the planetary family around it will be frozen to death, will sooner or later be looked back upon by the science of the future as quite on a level with the theory of the tortoise that supports the world. I am little inclined, however, to encourage the flippancy of some occultists who speak disrespectfully of modern science because our information enables us to catch it out here and there in mistakes. The science of the western world is in the van of human intelligence, if we except only the wisdom of Adeptship. Its achievements so far have been beautiful and glorious. It merely needs now to avail itself of the wonderful instruments of research which lie but half hidden in the depths of human faculty, and then it will carry the exquisite discipline of its thought into regions where at present only a few exceptionally gifted explorers are roaming, unprepared by their training for the work they attempt to perform. In times not long gone by, the reconciliation of science and religion was hoped for by enthusiasts as promising, when it should be accomplished, some immense advance in general civilisation. That union is in process of realisation, religion having, so to speak, accorded a grudging consent. But the next great step must be the reconciliation of science and occultism. That, too, must come, though perhaps this time it will be the scientific world that will show some disposition to be sulky as the change forces its way. That will not matter in the long run, and in that long run the state of facts dealt with in this paper will assuredly be the subject of investigations with which future members of the Royal Society will be engaged,

though at the moment the wonderful story I have had to tell may find even some Theosophists incredulous, unless they have intuition enough to feel sure that, all things considered, I should not be likely to put it forward without such assurance of its accuracy as suffices to justify its association with the many other Fragments of Occult Truth which it has been my privilege to set forth.

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