totality. Elaborate preparations were made by scientists all over the world to view the eclipse and points on the line of totality were selected all along the line from Norway to the Black Sea. Most of the parties had started on their journeys to these stations and their instruments were on the way when a difficulty, which they certainly had not calculated on, occurred. War broke out on the 4th August 1914 just 17 days before the eclipse. The risk of bad weather had been carefully examined and allowed for by choosing the best places available. The unexpected happened, and just as every one was on the move to their stations for observation, the mobilization began and caught the scientists in its meshes. Several of the English Astronomers, who were soldiers, had their thoughts transferred by telegram from science to war, and went Home again to duty by the shortest routes. Others whose presence was not so necessary in England or their own countries, stayed on. The German party, if report says true, were taken prisoners by the Russians and their instruments confiscated! War put an almost complete stop to many of the observations. We are therefore extremely fortunate in having obtained the slides, so kindly given us by Mr. Slater as well as his letter. Although he did not get his instruments for use at the eclipse, he was not altogether denied the object of his visit to Sweden, and he was probably rather glad he had selected that country to go to for the purpose. Some oft he parties in Russia were successful and an interesting account of the one at Minsk will be found in the *Observatory* for October 1914.

The Corona was of the intermediate type—that is to say there were no long streamers. The Corona was very bright. No shadow bands appear to have been seen.

I attach Mr. Slater's letter which give interesting details of his observations.

The Nebulæ and their Relation to Cosmic Evolution.

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The Nebulæ are masses of shining diffused matter, shreds and balls of cloudy stuff distributed here and there throughout the immensities of space. The most notable of the Astronomers who have given special attention to the discovery and study of these celestial objects are Messier, the two

Herschels, Lord Rosse, the Bonds and the brothers Struve. Under insufficient telescopic power it is impossible to distinguish between a nebula and a star cluster, because the individual stars of a star cluster cannot then be separated. The Cluster Præsæpe to the naked eye looks exactly as if it were a nebula, although a very small telescopic power will reveal individual separate stars. Herschel showed with his large telescopes that many objects which had hitherto been taken for nebulæ were really clusters of stars. It was erroneously thought that all nebulæ could probably be resolved into star clusters if the telescopic power were sufficiently great, and that there was no real difference between the two. It was even reported that Lord Rosse's telescope had resolved the Orion nebula. This was not true, for we now know that the Orion nebula is wholly gaseous. Speaking of nebulæ Lardner, writing in 1853, says : " There are star clusters, of which the component stars are indistinguishable only by reason of their remoteness." But the spectroscope has shown us that there are multitudes of nebulæ that are not star clusters at all, but immense masses of glowing gas. This important discovery was made by W. Huggins in 1864. It is not unlikely, however, that nebulæ and star clusters shade into each other as it were by insensible gradations. The first historical record we possess of the discovery and recognition of such a thing is in Huygens' " Systema Saturnium." Writing in 1659 he says : " There is one phenomenon among the fixed stars worthy of mention, which, as I believe, hath hitherto been noticed by no man, and indeed cannot well be observed but with large telescopes. In the sword of Orion seven stars shone through a nebula, or small bright cloud, such that the space around them seemed far brighter than the rest of the heavens ; so that it appeared as an opening in the sky, through which could be glimpsed the glory of the empyrean." A great advance in our knowledge the nebulæ has been achieved by the invention of the photographic dry plate. The first photograph of a nebula was produced by Dr. Draper in 1880. Eye observations and drawings cannot at all compete with the photograph. The photograph has revealed important and essential features of nebulæ never recognized before by the largest telescopes, as for example the concentric rings of the Andromeda nebula, which so greatly resemble the rings of Saturn. With the visual telescope very little of the nebula can be seen at the same time, since the field of an eyepiece is very small. Thus in the case of Andromeda visible even to the naked eye, drawings left us in ignorance of this very essential feature, namely that the dark rifts are curved and not straight, a fact

which makes all the difference in estimating their meaning. Photography moreover captures objects which are far too faint to be seen by the eye, and the sensitive plate never tires like the eye, but will receive more and more impressions the longer the exposure. A very faint, dim light with long exposure will give as clear an impression as a brighter light with shorter exposure. The photograph however does not give the relative brightnesses accurately, since the exposure necessary to bring out faint details is far too great for the brighter parts. However this defect can be mostly remedied by taking several negatives of different length of exposures. There are about 10,000 nebulæ already catalogued. Herschel was the first to go systematically into the question of the nature and number of the nebulæ. Since his time Huggins has been the greatest discoverer by means of the spectroscope. He proved thereby that the light of true nebulæ proceeds from luminous gas. They give a spectrum of six or seven bright lines, namely F Hydrogen, HJ Hydrogen, H Hydrogen, D2 Helium and another Helium and two other unknown and unidentified lines, called provisionally "Nebulium." Lockyer thought it indicated the presence of magnesium, but this was an error. All gaseous nebulæ give this same spectrum, except that if too faint, only the brighter lines appear. Photography of late has proved very useful in the study of nebular spectra. By its means we now have a list of as many as 70 lines photographed in the spectra of gaseous nebulæ. 55 lines have been detected in the Orion nebula alone. The nebulæ do not all give a gaseous spectrum. Those that do so are all of the same greenish tint. The white nebulæ, such as Andromeda, give a perfectly continuous rainbow spectrum with no lines. This means that the white nebulæ are either composed of gases under high pressure, or of solids or liquids heated to incandescence. They are probably composed of partially cooled matter. Like the green nebulæ however they withstand all attempt at resolution into star clusters. Photography with an ordinary portrait lens at the focus of the telescope has revealed the fact that vast regions of the sky are veiled in faint, diffused nebulous matter. These delicate veils are invisible to the eye even through the best telescopes. It has been conjectured that possibly with long enough exposure, the whole sky might prove to be veiled over with nebulosity. The distribution of the nebulæ is not uniform over the sky. They are wholly absent from some regions, and crowded in great profusion in others. Thus there is a cluster of nebulæ in Coma Berenicis, and more than a hundred nebulæ are crammed here into a space less than that occupied by the Full

Moon, or 31 minutes diameter. They seem to avoid the Galaxy and have a preference for the galactic poles. Their tendency is to avoid the regions where stars abound. There seems to be some "relation of contrariety" between the nebulæ and the stars. Perhaps the stars devour them, appropriating the surrounding nebulosity. W. Herschel made an extensive survey of the northern hemisphere, and his son, J. Herschel, at the Cape Observatory of the southern, and between them catalogued 4,000 nebulæ. J. Herschel says nearly a third of all the nebulæ are congregated in an irregular patch which stretches from Ursa Major to Virgo. Since then Dreyer has catalogued 10,000, and Keeler estimates there are 120,000 nebulæ within reach of the Crossley reflector. Cleveland Abbe has shown that in a belt of 30 degrees wide including the milky way, which means three quarters of the celestial globe, only one-tenth of the number of the nebulæ are found within this belt. Up to the present time no parallax has yet been discovered for any of the nebulæ, nor is it likely that their distances will ever be found by this method. Being, indeed, of so indefinite and hazy an outline it would be very difficult to measure any parallactic displacement with the micrometer. And yet they are so associated with stars that it is impossible to doubt that they are at the same order of distance. For example in the Pleiades, star is connected with star by wisps of nebulosity. The longer the exposure, the more nebulosity is revealed amongst the stars of the Pleiades, each star having its own nebulous veil more brilliant than the region between the stars, whilst the entire group is bound together in a vast net of nebulosity, extending far out on all sides into space. When our Sun is eclipsed, we then see his nebulous envelope which we call his Corona. The stars of the Pleiades also have their Coronæ only on a vastly larger scale than the Sun's Corona. Again in the Orion nebula, four groups of lines in the spectrum of the nebula coincide with corresponding lines in the spectrum of the neighbouring stars, which makes it probable that the stars are of the same composition as th nebula and lie within it. And again the dark space, in which the stars of the Trapezium lie, points to the fact that the nebulous matter in their proximity had been used up as it were in forming them. If it is true that any nebula and its adjacent stars are at the same distance, then it would be possible to find the distance of the nebula so long as a parallax for the star could be found. As yet no parallax for any nebulous star has been found. The spectroscope has shown that the radial motions of nebulæ are of the same order as those of the stars. In 1890 Keeler

carefully observed many of the nebulæ in order to discover radial motion with a spectroscope of high dispersive power. He found that, like star motion, their motions away and towards us ranged from zero up to 40 miles per second. No motion in rotation has yet been visually observed, although it is certain that nebulæ must possess such a motion. The velocity of rotation of any system varies inversely as the square root of its moment of inertia, and therefore also of its density. Hence a very light and large mass would have a very slow rotation. And, further, according to the laws of dynamics, the inner particles in order to preserve their equilibrium will have to rotate more rapidly than the outer. Hence the distinct spiral or whirling appearance of most of the nebulæ. Again, the gravitation towards the axis of rotation varies as the distance. And centrifugal force also varies as the distance, whatever the velocity. Hence a whole sphere may rotate in accordance with these laws, so that no change in the relative distances of the particles will disturb the equilibrium. Again, the expansiveness of gases varies inversely as the space in which they are confined. This would account for the particles not falling into the equatorial plane. Again, the expansiveness of gases varies inversely as their volume. Thus as the radius increases, the expansiveness would diminish inversely as the cube of the radius, whereas the attraction would only diminish as its square. Hence there is a definite bounding-surface to a nebula. Nebulæ are of very varied character and forms. There are Annular, Ring, Planetary and Spiral, and Irregular nebulæ. Most nebulæ, however, have a more or less marked condensation at the centre thinning off towards the extremities. The largest nebulæ are the irregular ones, such as Orion, which is now known from photographs of long exposure to include nearly the whole area occupied by the constellation. It seems probable that certain changes in the form of some of the nebulæ have been detected from the comparison of drawings made at different dates. Especially is this the case with Eta Argus, and the "trifid" nebula in Sagittarius, and the Omega nebula. The nebula in Sagittarius has near its centre a curious dark rift. In the middle of this rift Herschel says the triple star was placed, which is now placed not in the middle but at the confines of the nebula. The star has not moved relatively to the neighbouring stars, and therefore it is concluded that the nebula must have changed its form and position. Again, in the case of the Omega nebula, it certainly does not any longer retain any resemblance to that letter. Professor Holden thinks that although the shapes of nebulæ suffer

little or no change, the relative brightnesses of their parts are continually, though gradully changing. Too great reliance however must not be placed upon the evidence we have in favour of change in the nebulæ. The evidence rests chiefly upon mere eye drawings of the nebulæ, and it is notorious how very differently two men will delineate the same nebula at the same time. They are exceedingly hazy and indefinite objects to make eye drawings of, and the question of change cannot be settled until not drawings but photographs shall have been composed and discussed for a period of many years to come. It is certain, however, that some nebulæ vary in brightness. Epsilon Tauri is a good example of a variable nebula. It can sometimes be seen with quite a small telescope, and at others not with the largest. The change seems to have no regular periodicity. The larger and brighter and more irregular of the nebulæ generally stretch out streamers on all sides, and contain dark rifts or "lanes," such as the "fish-mouth" of Orion, and the circular rifts of Andromeda. The enormous size of some of the nebulæ may be roughly estimated from comparisons of their angular measurements with the apparent distance of Neptune from the Sun as seen from Alpha Centauri, the nearest star. The diameter of Neptune's orbit would appear to be only one minute of arc as seen from Alpha Centauri. The angular diameter of the Orion nebula as seen from the earth is several degrees. And it is certain the nebula is vastly further away from us than is Alpha Centauri. Therefore the central portion alone of the Orion nebula must occupy a space at least many thousands of times greater than the orbit of Neptune, whose radius is thirty times greater than the 93,000,000 miles radius of the Earth's orbit. If our Sun were enveloped in such a nebula, its tentacles would reach out to Polaris which is forty-four light years' distant. It is probable that the thickness or depth of the Orion nebula is not so great as its breadth or visible extension. The next largest nebula is in Andromeda. It is often mistaken for a comet by the uninitiated. It is a very long oval 2½ degrees of arc in length, and over a degree in breadth. It is sown over with multitudes of stars, 200 of which are found within 20 minutes of diameter. It is one of the regular or spiral nebulæ. It appears to be an enormously magnified edition of the Saturnian system, except that the nucleus is not globular, but merges into the rings. Its thickness or depth must be hundreds of millions of miles, and yet we can see through it. The smaller nebulæ are more regular and generally elliptical and almost circular in shape. The most regular in shape are called "planetary" nebulæ from their close

resemblance to planetary disks; most of them are in the southern hemisphere. In some cases the disk shows a uniform surface, in others what Herschel calls a "mottled" or "curdled" appearance. These planetary nebulæ are of various colours or tints, of great beauty. Others are very elongated ellipses with every variety of eccentricity, others hardly more than slender wisps or streaks of light, probably denoting that they are seen edgewise. They generally are condensed towards the centre and often have a star at the centre of the condensation. The true forms of these nebulæ are probably grobular. There are thousands of "nebulous stars," or stars surrounded by an envelope of nebulous mist. There are a comparatively few nebulæ which are not condensed in the centre, but on the contrary are dark or nearly dark in the centre and brighter at the circumference. Only a few dozen have so far been discovered. These are the Annular or Ring nebulæ, such as the famous nebula between Beta and Gamma Lyræ. Such nebulæ are probably of a flat disk shape. There are also double nebulæ, suggesting the idea of double stars in the making. It is almost certain that such clusters of nebulæ must be physically connected, and it is very probable that they move round each other or rather round their common centre of gravity like binary stars. Their apparent motion owing to their immense distance and comparatively low density is so slow that it could not be visually detected probably for thousands of years. But the most universal and characteristic form of nebula is the Spiral nebula. These were first discovered by Lord Rosse. They have the form of a mop when it is being wrung out, with curved arms issuing from a central condensed nucleus, presenting the appearance of rapid rotation about the nucleus as centre. The Spiral nebula is hence often called the whirlpool form of nebula. The forms of nebulæ appear to vary greatly with different telescopic powers, just as small objects change in appearance when seen under a microscope, from what they appeared as seen by the naked eye. Thus what used to be considered a double nebula and was called the Dumb-bell nebula has now been by larger telescopic power shown to be of the spiral form. The apparent form, it must be remembered, of any object in the heavens is that of a cross section of the real form, made by a plane at right angles to the line of vision. If the mass had a rotational motion such as the planets have, their exact form could then be mathematically deduced. But the nebulæ present no such rotational motion, and therefore their true shape can only be guessed from their structural appearance. The intrinsic light of nebulæ

must be vastly less than that of the Sun. For if the Sun subtended an arc in diameter of only 1 minute, its light would at that distance yet exceed that of 750 Full Moons, whereas the nebulæ which in many cases have an arc of diameter much greater than 1 minute cannot even be seen at all with the naked eye. Arago propounded the view that nebulæ shone with reflected light from stars hidden away in their centres, but this somewhat fantastic view is now quite discredited. It is certain they shine by their own intrinsic brightness, they are luminous gases of the most elemental type, less dense than any vacuum that could be produced on Earth. It is, indeed, a mystery how such tenuous objects can assume and retain such clear and sharp outlines as they exhibit in their photographs. In most cases it looks as though the gas were in violent rotational motion, but how and when the force is impressed to produce such motion is an unsolved mystery. Much information regarding the connection of stars and nebulæ was afforded by the "new star" of 1901 in Perseus. In February there seemed to be no nebulosity in connection with the star, but in September a photograph revealed two wisps of nebulosity extending from the star. In November the Spiral nebula around the star seemed to have extended outwards, at a rate of 11 minutes of arc in a year. Now the question is, did the nebulous matter really travel out from the star at that rate, or was the phenomenon not rather due to the light from the outbursting central star travelling towards the edges of the nebula that was already there? The latter seems to be far the more probable hypothesis of the two. If so, it means that light took one year to travel over the eleven minutes of arc as seen from our distance, and consequently judging from the velocity of light, the new star and nebula in Perseus would be distant from us three hundred light years. The outburst must then have actually occurred just when Galileo first directed his "optic tube" towards the heavens, the news of which has only reached us in 1901. The inference can also be drawn that the nebula that was thus gradually lighted up must be 26 millions of millions of miles in circumference, or over eight millions of millions of miles in diameter.

A treatise on nebulæ would be incomplete if no mention were made of the connection between nebulæ and the important theory of the origin and evolution of the Universe known as the "Nebular hypothesis." The study of such a nebula as that of Andromeda and the knowledge lately gained regarding its formation seems to strongly corroborate and confirm the truth of the nebular hypothesis. Here we have

a central nebula, which seems to have thrown off rings in rotation, some of the substance of which seems to have already conglomerated into rudimentary satellites. These are two distinctly formed and others seem to be in course of formation. Such a general evolution not only for the solar system but for the whole Universe was already thought out by Laplace, over a century before the true formation of the Andromeda and other Spiral nebulæ were even guessed at. The evidence of the modern photograph has illustrated Laplace's theories as facts, much in the same way as the theories of Copernicus regarding planets and satellites were confirmed when Galileo invented his optic tube and actually saw real satellites circulating around Jupiter. Thus the new knowledge we have gained of the nature of the nebulæ, throws a flood of new light on the historical development or evolution of the Universe. The "Nebular hypothesis" was first suggested by the philosopher Kant, but developed and treated in a more vigorously mathematical and scientific manner, as we have said, by the great mathematician Laplace. The theory in spite of modification in detail is still held in the main just as Laplace propounded it. Laplace confined his enquiries chiefly to the origin of the solar system, but the same theory may be extended on a magnified scale to the stellar Universe. According to his theory, the Solar nebula was originally a mass of heated gas. We now believe it was a cloud of cold dust. It can be mathematically shown that the mutual attractions of its particles would cause the nebula to assume a globular form, to start rotating, and to begin to grow hotter. The laws of dynamics tell us that as it contracted, it began to rotate more rapidly, its poles began to get flattened and its equator to bulge out. Finally the centrifugal force at the equator would overcome the centripetal force there, and a ring of nebulous matter would escape. Or as is now thought more probable, denser portions of matter at the equator would be left behind and become the origin of satellites. As the original body still further contracted other rings or globular masses were liberated. These liberated masses would in their turn behave in like manner as the parent nebular mass, and throw off rings or balls of matter as they condensed, and consequently their rotation and centrifugal force became greater. Thus satellites to the planets would be formed. If the ring were of fairly homogeneous density, they might condense into an immense number of small bodies like the asteroids, or the lumps no larger than brick-bats which make up Saturn's rings. The planets and satellites must first have liquified, and then as they grew still cooler, solidified. Small bodies like

the asteroids and satellites quickly lost their heat and are now probably solid throughout. The next larger sized bodies, such as our Earth, Venus, etc., formed a cooler crust whilst retaining in their centre matter at a high temperature. The largest planets, such as Jupiter and Saturn, have still retained their original nebular heat to such an extent that a cool crust has not yet been formed, and they are still in the semi-liquid stage. The huge central nucleus of the original nebula, the Sun, which has retained the vast majority of the primitive mass within himself, will not lose any appreciable heat until he begins to liquify. It used to be thought, when it was first discovered, that the satellites of Uranus and Neptune have a retrograde motion, and that the inner satellite of mass has a shorter period of rotation than its primary, that these facts strongly militated against the acceptance of the "nebular theory." It has now been proved mathematically that they present no real contradiction to the theory. Let us now see what help we can derive from our study of the nebulæ, in solving the riddle of cosmic evolution. Let us see the mutual relation existing between the various orders of bodies in the Universe, tracing the series from the nebulæ through the stars, down to our own solar system. Herschel very aptly compared the denizens of the sky to the trees of a forest, where can be seen plants in every stage of development, from the seedling to the prostrate trunks of the dead and faded old oak. In the heavens in like manner we can see objects in their infancy and in their old age. We have just recounted the theory of the nebular origin and evolution of the solar system as first propounded by Laplace and later improved upon by succeeding generations of Astronomers. Let us now extend our enquiries to the whole stellar Universe as known to us. In the first place, we find vast inchoate masses of elemental or primeval matter scattered in all directions throughout the Universe. Some of the vastest of these nebulæ can only be detected by photography, being too faint to be seen by the eye in the most powerful telescope. Surely, then, we are right in assuming this to be the raw material demanded by nebular evolution theory. Surely, this is the "world-stuff" of the philosophers in its most elementary form. Next look at the great Andromeda nebula. It presents as it were in a living picture the very epitome or summary of the nebular theory. Here we have the central condensing nucleus, the rings of tenuous matter thrown off as the nucleus rotates, and at least two very clearly defined condensed masses beginning to form themselves into dependent globes. Again, if we study the stars in the Trapezium of Orion, we see they are surrounded

by a dark space eaten out of the surrounding nebulosity, which has been absorbed in their formation. If we examine the spectra of these Trapezium stars we see that it exactly tallies with the spectrum of the surrounding nebula. If we study the planetary nebulæ, we find we can arrange them in an orderly series from those which have only a slight central condensation, through those which exhibit a very clearly defined central nucleus, up to those which may properly be called nebulous stars, rather than planetary nebulæ, the process of solar system formation having been completely accomplished, the nebulosity around the star being the equivalent of our Sun's so-called Corona. Again, if we turn to the Phiades, we find every individual star involved in very distinct nebulosity, and star joined to star by rays of nebulous matter, and when the exposure of the photograph has been sufficiently long, we are amazed to find the whole group buried entirely in one vast nebula, whose dimensions utterly stagger the imagination. Here, then, again we find the closest connection between nebulæ and stars. Again, there are thousands of stars which appear to be enclosed in nebula, and the truth of this is confirmed by their very complicated spectra, as of incandescent solid bodies shining through gaseous envelopes. In fact the stars can be arranged in an orderly series of the spectra, beginning from the least developed planetary nebulæ right up to the most finished star. Turn to our own Earth. The volcano tells us the interior is exceeding hot, the thermometer carried below the surface tells the same tale. The geologist tells us that the granite of our mountains has been scorched by primæval fires, and that marble is but lime-stone transformed by intense heat. The mountains themselves are but the wrinkles of the Earth's contracted crust. Surely if the Earth were heated to incandescense it would give a spectrum similar to that of the stars. If we again turn to the solar system, we find that it is no mere accidental aggregation of bodies. Masses coming haphazard towards the Sun, would move as comets in every degree of inclination and eccentricity, but it is quite otherwise as regards the planets. We know, according to the nebular theory, the outer planets should have been formed from large rings of small density, and the inner rings from small rings of great density. Consequently the outer planets should be large but light and the inner planets small but heavy. And is not this true to fact? Then, again, in strict accordance with the laws of the nebular theory, the planets all rotate in the same direction as the Sun rotates, all nearly in the same plane, and that plane very nearly identical with the plane of the Sun's equator. The satellites also revolve

in the plane of the equators of their respective primaries; which (with two exceptions which can be quite satisfactorily accounted for) are themselves again nearly in the plane of the Sun's equator. Again, if we turn to the Sun, we know that his heat is kept up by continual contraction. In other words he is growing smaller and smaller. Hence in past ages he was much larger than he is now. If we go back in our imagination over immense abysses of past time we see the Sun and his planets as one immense diffuse globular nebula, resembling in every detail the forms of nebulæ which we can, with the aid of powerful instruments, now see as at present existing in the Universe. As regards, however, the vast question of cosmic evolution itself, whilst astronomical science has indeed given us not a few clear and decided answers, there is a vastly greater number of important questions which by means of patient and earnest investigations yet remain to be solved, and other questions regarding this unspeakably immense work of the Creator which are, and always will be, infinitely beyond the capacities of man's finite and somewhat feeble intellect ever to solve. The range of man's powers of research may be likened to that of ephemeral insects, the series of processes which it is in the power of man to watch and to trace back may be likened to the series of events which take place within the limits of one day, which in the case of many insects represents a lifetime. All that can be said with any certainty regarding this cosmic evolution is that a universal process of condensation and aggregation of rarefied masses of matter (such as are the nebulæ) is now going on in obedience to certain dynamical laws of force, that the potential "energy of position" is throughout the Universe being converted into heat, that this generated heat is being in all directions radiated as energy into space, and to surrounding bodies as waves of light and heat, and that, if God does not hereafter decree otherwise, this process will continue until the temperature of all things in this Universe will have been reduced to absolute uniformity and hence to eternal death and stagnation. But further than this it is not in man's power to fathom even as regards merely this part of God's realm which we call the Universe. "Lo! these are but a portion of His ways, they utter but a whisper of His glory." We will conclude in the words of the old German seer: "God called a man into the vestibule of heaven. And to an angel He said: 'Take him, and strip from him his robes of flesh, cleanse his vision, and put a new breath in his nostrils, only touch not with any change his human heart.' It was done, and with a mighty angel for his guide the man stood ready for his infinite voyage. And from the

terraces of heaven, without sound or farewell, at once they wheeled away into endless space. With solemn flight of angel's wings, they passed through zaharas of darkness, through wildernesses of death, that divided the worlds of life, over frontiers which were quickening under prophetic motions from God. Then from a distance which is counted only in heaven, light dawned from a shapeless film. With unutterable swiftness they swept to the light. In a moment the rushing of planets was upon them, in a moment the blazing of Sun was around them. Then came eternities of twilight. Then came mighty constellations built up like triumphal gates, resting by spans that seemed ghostly from infinitude. Without measure or number were the architraves. Within were stairs that scaled the eternities around. Above was as below, below as above, depth was swallowed up in height unsurmountable, height was swallowed up in depth unfathomable. Then the man sighed, and shuddered, and wept, and said thus to the angel: 'O Angel, I will go no farther, for the spirit of man acheth with this infinity. Insufferable is God's glory. Let me lie down and die, and hide me from the persecution of the Infinite, for end I see there is none.'"