

## A THEORY OF THE UNIVERSE.\*

THE problem of the universe has always been one of surpassing interest to the student of philosophy and science. Especially is it of interest to New-Churchmen, by reason of the light thrown upon it by the teachings of Swedenborg. In recent years several notable works have appeared having for their object the explanation of the various and complex phenomena of the universe and of man's relation thereto, but among them none more noteworthy has appeared, as it seems to the writer, than the one bearing the title, "Man's Place in the Universe," by Alfred Russel Wallace. It is the first attempt to explain, by purely scientific methods, the position of man in nature, not only with regard to his own world, but in relation to the universe at large. As claimed by the author in his preface, it is founded upon the most recent discoveries of the New Astronomy, together with those of modern physics, chemistry, and biology. The conclusion reached, that "our earth is the only inhabited planet, not only in our solar system, but in the whole stellar universe," is both novel and startling, and we would be inclined to dismiss it at once as incredible, were it not for the eminent position which the author occupies in the scientific world. His many and varied contributions of recognized importance to natural history, as well as to philosophical speculation, entitle him to a respectful hearing. To reduce the problem to its lowest terms, to strive to bring the stupendous facts of creation within the grasp of human intelligence by setting limits to the creative power itself, such is the burden of the present work. But a man-made universe is a large undertaking, as our author has evidently found it to be, and one that is foreordained to meet with but indifferent success.

\* *Man's Place in the Universe.* By ALFRED RUSSEL WALLACE. LL.D., D. C. L., F. R. S. New York: McClure, Phillips, & Co. 1904.

We would not wish to convey the impression that Dr. Wallace is in any sense a materialist. On the contrary he is ever ready to admit that there are phenomena unexplainable without some higher clue than that afforded by natural science alone. For example, although a believer in the doctrine of the origin of species by natural selection, of which doctrine he is credited with being the co-discoverer with Darwin, he denies that this process is able to effect the transition to man from the anthropoid apes, but claims that "just as man is, in his mental and moral nature, his capacities and aspirations, so infinitely raised above the brutes, so his origin is due to distinct and higher agencies than such as have effected their development." \* While it is safe to say that no work of similar character has appeared which has brought together such a vast array of facts gleaned from the most recent researches in astronomy, physics, geology, and biology in support of the theory advanced, yet it is one that must fall far short of convincing any intelligent, rational mind. Nor does the author himself seem altogether satisfied with his own conclusions. Although it is claimed by him that the discussion has nothing to do with problems of infinity, problems which he declares to be almost unthinkable and altogether above and beyond the questions discussed, still the spectre of the infinite will not down. That the key-note of the whole work is one of despair is shown by the poetical quotation which follows the preface:—

The wildered mind is tost and lost,  
O sea, in thy eternal tide;  
The reeling brain essays in vain,  
O stars, to grasp the vastness wide!  
The terrible, tremendous scheme  
That glimmers in each glancing light,  
O night, O stars, too rudely jars  
The finite with the infinite! —*J. H. Dell.*

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\*In his essay on "Darwinism" Dr. Wallace generously gives the whole credit of this discovery to Darwin, assuming none for himself.

Again, at the close of the volume, we find this almost pathetic confession : —

Of infinity in any of its aspects, we can really know nothing, but that it exists and is inconceivable. It is a thought that oppresses and overwhelms. Yet many speak of it glibly as if they knew what it contains, and even use that assumed knowledge as an argument against views that are unacceptable to themselves. To me its existence is absolute but unthinkable — that way madness lies.

We commend to any one troubled with similar doubts and perplexities the reading of the paragraphs in "The True Christian Religion," by Emanuel Swedenborg, "Concerning the Infinity of God," and "Concerning the Creation of the Universe." The rational and lucid explanation therein unfolded of these perplexing themes will not fail to bring comfort to his distressed mind, and free it of any thought that can oppress and overwhelm.

It would be difficult to abbreviate Dr. Wallace's arguments in support of his main thesis that our earth is the only abode of the human race in the whole universe, and that our sun is the central, dominant figure in that universe, so fortified are they with the accumulated facts of modern science. To abbreviate is to greatly detract from their forcefulness. The first six chapters of the book contain an epitome of that marvelous body of facts discovered by what is known as the New Astronomy, and they alone make it a book not only "worth writing," as the author claims, but one worth reading as well. In the analysis of it which is here attempted, the effort will be made to present the main arguments as far as possible in the author's own words, and as fully as necessary brevity will permit.

Passing over the preliminary chapters in which are reviewed the early history of astronomy and the modern ideas regarding the habitability of planets other than the earth, as shown in various publications by eminent astronomers and others, most of whom are acknowledged to be in opposition to his own hypothesis — passing over also the chapters

which describe the facts of the New Astronomy, we come to the seventh chapter which marks the beginning of the main body of evidence and of argument in support of the author's theory. "Are the stars infinite in number?" is the question which forms the caption of this chapter. That the stellar universe is in reality limited in extent, and the stars therefore limited in number, is claimed to be the view supported by such astronomers as have given especial attention to this subject. One of these is cited as saying that the probability amounts almost to a certainty that star-strewn space is of measurable dimensions; and from another, Prof. Simon Newcomb, is quoted the statement, "That collection of stars we call the universe is limited in extent." Those statements are said to be based upon certain well-known laws of optics, the discussion of which would be out of place here. The line of argument is as follows: Were the stars infinite in number and uniformly scattered through space, "the whole heavens would be filled with a blaze of light as bright as the sun"; but the whole light given out by the stars is estimated at from only one-fortieth to one-twentieth that of moonlight, while the sun gives as much light as three hundred thousand full moons, so that star-light is only equivalent to one six-millionth part of sun-light.

Next we are asked to consider the telescopic evidence of the limits of the star system. When our larger telescopes first came into use, their increase of power and light-giving qualities added so greatly to the number of stars that it was assumed that this increase would go on indefinitely with each new increase in the power of the telescope. The application of photography to the mapping of the heavens also added vast numbers of stars to the field of vision, stars that were invisible to the telescope. Says Mr. J. E. Gore, as quoted by the author:—

Those who do not give the subject sufficient consideration, seem to think that the number of stars is practically infinite, or at least, that the

number is so great that it cannot be estimated. But this idea is totally incorrect, and due to complete ignorance of telescopic revelations. It is certainly true that, to a certain extent, the larger the telescope used in the examination of the heavens, the more the number of the stars seems to increase; but we now know that there is a limit to this increase of telescopic vision. And the evidence clearly shows that we are rapidly approaching this limit. Although the number of stars visible in the Pleiades rapidly increases at first with increase in the size of the telescope used, and although photography has still further increased the number of stars in this remarkable cluster, it has recently been found that an increased length of exposure — beyond three hours — adds very few stars to the number visible on the photographs taken at the Paris Observatory in 1885, on which over two thousand stars can be counted. Even with this great number on so small an area of the heavens, comparatively larger vacant spaces are visible between the stars, and a glance at the original photograph is sufficient to show that there would be ample room for many times the number actually visible. I find that if the whole heavens were as rich in stars as the Pleiades, there would only be thirty-three millions in both hemispheres.

The strength of the above testimony seems somewhat weakened when we consider the fact of a limit to the penetrating power of the telescope, upon optical grounds, as it is at present constructed. It is well known that certain obstructions to the clear vision of a telescope, due to optical and atmospheric conditions, are increased when the magnifying power of the instrument is increased, and that owing to these conditions the limit to its power of penetration will finally be reached, unless some new principle of construction shall be found. Says Professor Newcomb, in his "Astronomy": "After a certain limit we see nothing more by increasing the power of the telescope, vision becoming indistinct in proportion as the power is increased." In other words, the failure to add to the number of stars when the magnifying power of the telescope is still further increased, is due not to the absence of stars but to the imperfection of the instrument. The application of photography to the interpretation of the heavens is of comparatively recent date, and further improvements will doubtless bring added results. In

the February number of *Popular Astronomy* of the present year, Mr. H. H. Turner calls attention to the possibilities of this method:—

In future the sensitiveness of plates may be increased so that the sensitiveness of the eye may be surpassed, even as in the past there was a time that the sensitiveness of the plate was so small that the longest exposure could not compete with the eye. We are yet only on the threshold of revelations still to be made in this direction.

Thus some new principle applied to the telescope and improved methods in photography may reasonably be expected to bring new fields of stars into view. There is no reason to believe that the limit of capacity has been reached in either of these methods of investigation. Continuing his argument, our author quotes Sir John Herschel as saying that, even in the Milky Way, where the stars are most thickly clustered, dark spaces are to be found “completely void of every star even of the smallest telescopic magnitude.” And again: “Extremely minute stars, though never altogether wanting, occur in numbers so moderate as to lead us inevitably to the conclusion that in these regions we see fairly through.” Like one who has been lost in a forest, but now rejoices to see the trees becoming more and more scattered, and spaces here and there appear looking out into the open, so does our author seem to take comfort in the appearance of these “lanes and holes” in the starry expanse, for they promise escape from the bewildering maze of stars, clusters, and nebulae, and there is a vision of clear space beyond. We have now a well-defined and limited universe, the stars of which may be numbered and the “full knowledge of whose form, structure, and extent is not beyond the possibility of attainment by the astronomers of the future.” The form of the starry heavens is described as that of a greatly flattened sphere or disc, having the Milky Way in the plane of its circumference, and near its center, our own solar system in the midst of a cluster of brilliant stars, our own sun being the central, dominant figure—the ruler of the universe—and

our earth the only inhabited planet. Beyond extend the boundless realms of space. That this space should be void is inconceivable. Dr. Wallace himself admits as much when he says :—

Of course there may be, and probably are, other universes, perhaps of other kinds of matter and subject to other laws, perhaps more like our conceptions of the ether, perhaps wholly non-material, and what we can only conceive of as spiritual.

Then he adds :—

Unless these universes, even though each of them were a million times vaster than our stellar universe, were also infinite in number, they could not fill infinite space, which would extend on all sides beyond them, so that even a million million such universes would shrink to imperceptibility when compared with the vast beyond.

This statement seems mathematically correct, at least within the familiar three dimensions of space, but there is no reason why it should disturb our equanimity. Time and space, metes and bounds, are human concepts which can never rise to the level of the Divine idea of creation. It is only a matter of the point of view, for undoubtedly had we been placed in any other part of the created universe the same conditions would surround us, the same perplexities confront us.

It is not necessary to go abroad to find examples of the practically endless extent of created forms. Physiology tells us that a single germinal vesicle, found in every egg, however minute, contains a million of millions of organic molecules, while the number of molecules in a single cubic inch is expressed by the figure one followed by fifty ciphers. Again, geology teaches that the various formations on the earth's surface are but the debris of former rocks and strata, which in turn become reduced by erosion and other agencies to the materials out of which new rocks and strata are formed. So the process goes on indefinitely. The meteoritic hypothesis of the origin of worlds, now maintained by

many astronomers, assumes that all the heavenly bodies are of meteoric origin, the meteors themselves being but fragments of former worlds, the process having gone on indefinitely in the past and to continue in all probability for an indefinite future. This reasoning in a circle is doubtless an advance over the straight-line method which demands a beginning and an end, but it falls far short of those mental processes which ascend from lower to higher planes of thought, from what is posterior to what is prior, from effect to cause. By the latter method alone may we hope to reach any satisfactory solution of the mystery of the infinite. There is an infinite which is but the exaggeration of the finite, and an infinite which partakes of the quality of the Divine. We find in the present volume a seeming lack of recognition of the distinction to be made between these two. So clearly is this distinction shown by Swedenborg in the work called "Divine Love and Wisdom," that we cannot forbear quoting in full a paragraph bearing upon this subject:—

There are two things proper to nature—space and time. All of man's thoughts, while he is in the natural world, and therefore his whole understanding, are based upon the conception of these two elements. If he remains in those ideas, not elevating his mind above them, he can never acquire any perception of things spiritual and divine: for he confounds these things with ideas based upon space and time, and just so far as he does this, his intellectual light becomes merely natural; and to think, reasoning from this, of things spiritual and divine, is like studying in nocturnal darkness things which are visible only in the light of day. This is the origin of naturalism. But he who knows how to raise his mind above thoughts based upon space and time, passes from darkness into light, comprehends spiritual and divine things, and at length sees whatever is in them and from them. By that light he dispels the darkness of natural thought, and banishes its illusions from the center to the circumference. Any man possessed of an understanding, can by thought transcend those two properties of nature, and actually does so; and then he will always affirm and see that the divine, because omnipresent, is not in space; and he can also affirm and see the truth of what has been said above. But if he denies the divine omnipresence, and ascribes every-

thing to nature, then he is unwilling to be elevated, though he may be. (Divine Love and Wisdom, 69.)

There remains to discuss the main thesis of the present work, to which the foregoing facts of astronomy are but contributory, "that our central position in the universe has a meaning and a purpose in connection with the development of life upon this earth, and so far as we know, here only." In the author's scheme of the universe, above described, we find our sun with his attendant star cluster near the center of the disc-shaped mass of stars. Most of the stars in the solar cluster are stated to have spectra similar to that of our own sun, to be of the same chemical constitution and in about the same stage of evolution. And yet to these stars, most of which are vastly greater than our sun, is denied the power of sustaining life even in a single one of the group of planets which undoubtedly surrounds each one of them. To state the arguments in full which are brought forward to support this theory would require too extended a space. It must suffice to give but a mere outline of them. Vast numbers of the stars of smaller magnitudes are nearer to us than the majority of the stars of the first and second magnitudes; hence it is probable that these, together with a large proportion of the smaller telescopic stars, are really of small dimensions. Many of the brighter stars are doubtless much larger than our sun, but there are probably ten times as many that are much smaller. Now the past light and heat-giving duration of our sun has been just sufficient for the development of life upon the earth, and as the duration of a sun's heat-giving power will depend mainly upon its mass, it follows that suns much smaller than ours would be unsuited to give adequate light and heat for a sufficient time and with sufficient uniformity for life-development upon planets, even if placed at the right distance and possessing the nicely adjusted conditions that have been shown to be necessary. The Milky Way, with its myriads of stars, is ruled out of consideration, for on account of the extensive forces there in ac-

tion, it is crowded with matter undergoing change and is therefore not sufficiently stable for long periods to be at all likely to possess habitable worlds.

The question then narrows itself down to those stars, far within the Milky Way, forming our solar cluster and estimated to contain, perhaps, a few hundred, at most a few thousand stars—a very small number compared with the hundreds of millions in the stellar universe. But of these only a portion are probably suitable for sustaining life, and some eminent astronomers have concluded that the stars in general have a much smaller mass, in proportion to the light they give, than our sun possesses, and thus that the even brighter stars are much less dense than our sun. In consequence of this smaller density they cannot give out heat and light for so long a period—a period which has only been just sufficient for our own sun to support planetary life. Moreover these suns, while in the process of formation, would be subject to such fluctuations of temperature that during the whole of this period—“perhaps by far the largest portion of their existence”—they must be left out of the account of planet-producing suns. It is only when a sun is nearly completed and its heat has attained a maximum, that the epoch of life-development is likely to begin upon any of its planets, suitably distant and with other requisite conditions. Again the number of spectroscopic binary stars—that is pairs of stars which are so close together as to appear like a single star in the most powerful telescope—is constantly being added to. In fact, these binary stars are so alarmingly on the increase that they are said to quite startle astronomers. Professor Campbell of the Lick Observatory is quoted by the author as having predicted that, as accuracy of measurement increases, their discovery will go on, “until the star that is not a spectroscopic binary will prove to be a rare exception.” But these close-revolving star systems, says the author, are generally admitted to be out of the category of life-producing suns. The

logical conclusion from the above line of argument, which I have endeavored to give as far as possible in the author's own words, would be that, as our sun is a single star, and is the only single star capable of supporting planetary life, then, by the method of exclusion, the question becomes narrowed down to the habitability of other earths than ours in our own solar system. In the words of the author:—

When we find that enormous classes like the gaseous stars of small density, the solar stars, while increasing in size and temperature, the stars which are much smaller than our sun, the nebulous stars, probably all of the stars of the Milky Way, and lastly, that enormous mass of spectroscopic doubles—veritable Aaron's rods which threaten to swallow up all the rest—that all these are for various reasons, unlikely to have attendant planets adapted to develop life, then the probabilities seem to be enormously against there being any considerable number of suns possessing habitable earths. . . . It may, and I believe will, turn out that of all the myriad stars, the more we learn about them, the smaller and smaller will become the scanty residue which, with any probability, we can suppose to illuminate and vivify habitable earths. And when, with this scanty probability, we combine the still scantier probability that any such planet will possess simultaneously, and for a sufficiently long period, all the highly complex and delicately balanced conditions known to be essential for a full development, the conception that on this earth alone has such a development been completed, will not seem so wildly improbable a conjecture as it has hitherto been held to be.

This is indeed a "tremendous generalization," as the author himself admits. In order to pass upon its merits an appeal to common sense would seem to be all-sufficient. We have only to fare forth beneath the evening sky and stand at gaze before the splendid vision there displayed. Surely all this is not a mere piece of celestial fire-works, a vain show given for our delusion.

"Are these stars in any way beneficial to us?" is the pertinent question next discussed. Are they, in fact, anything more than flitting ghosts, mere will-o'-the-wisps set in the heavens for the amusement of astronomers? We are answered that, besides an appreciable, though minute amount

of heat, given out by them, there are evidences of electrical and other radiations which affect the sensitive surfaces of photographic plates and would also be likely to affect the sensitive protoplasmic products in the living organisms upon our earth; that this action would be especially influential upon plants, owing to their extensive leaf surface. The highly complex processes that go on in plants would be helped by these radiations coming from every direction in the whole heavens, so that "the rays from the stars would be able to reach and act upon every leaf of the densest masses of foliage." Thus we are asked to believe that these far-away suns are capable of contributing to the growth of plant life upon our earth, but are impotent as regards those earths which immediately surround them.

We pass over the mass of proof, brought forward by the author, concerning the uniformity of matter and of its chemical and physical laws throughout the universe, and of the essential characteristics of living organisms, about which there is no dispute. The conditions necessary for the support of life upon our planet are next discussed, and the delicate and complex adjustments needed to maintain these conditions unchanged throughout the vast periods of time during which they have been in operation. It is claimed that none of the other planets in our solar system combine all these complex conditions in such a way as to make them capable of supporting life. On the Moon life would be impossible by reason of its small mass, rendering it incapable of retaining any of the atmospheric gases, including watery vapor, upon which life depends. For a like reason Mercury and Mars would also be uninhabitable. It is asserted that the polar snows upon the latter planet are formed from carbonic acid gas and not from watery vapor, without which the higher organisms could not exist. While it is admitted that Venus possesses an atmosphere of even greater density than that of the earth, yet the recently discovered fact that this planet, like our Moon, possesses the peculiarity of always keeping

one face toward the Sun during the period of its revolution, renders it unfit for the support of organic life. As regards the outer group of planets — Jupiter, Saturn, Uranus, and Neptune — their great distance from the Sun and their low densities make any form of life upon them impossible. These objections to the habitability of other planets than our own are well met by the English astronomer, Proctor, when discussing the extreme conditions under which life is known to exist upon our earth. The following quotation from Mr. Proctor's writings upon this subject is made by Dr. Wallace, as being the strongest word that can be said in support of this argument, although not accepted by him. Says Mr. Proctor :—

When we consider the various conditions under which life is found to prevail (on our earth), that no difference of climatic relations, or of elevation of land, or of air, or of water, of soil on land, of freshness or saltiness in water, of density in air, appears (so far as our researches have extended) to render life impossible, we are compelled to infer that the power of supporting life is a quality which has an exceedingly wide range in nature.

We may infer from this the extreme probability also that the same laws of adaptability to environment that are manifest upon our earth, prevail in other planets, an argument to which the author of "Man's Place in the Universe" seems to have given too little weight. The evidence of modern astronomical discovery is, however, accumulative in this direction. The recent investigations of Prof. W. H. Pickering, of Harvard University, upon the Moon,\* are full of interest in this connection. These investigations were made at the Observatory of Harvard University at Arequipa, Peru, located within sixteen degrees of the equator, at a high altitude where the atmosphere is remarkably pure. By means of photographic appliances careful and minute observations of the Moon's surface were made, confined to small areas, even

\* *The Moon*. By W. H. PICKERING, Harvard University. New York: Doubleday, Page, & Co.

to a few square miles. The early astronomers were wont to tell us that the Moon was a desolate, barren globe, a burned-out cinder as it were, utterly destitute of life in any of its forms. The researches of Professor Pickering have demonstrated not only that the Moon possesses an atmosphere, "as shown by the absorption bands seen when the Moon occults a bright planet, such as Jupiter," but also that it may in reality have "a much denser atmosphere than observation would seem at first sight to indicate." Again he says: "Ocular proof that the Moon has an atmosphere was seen at Arequipa, Peru, August 12, 1892." It is also found that not all the volcanoes seen upon the Moon's surface are extinct volcanoes. At the same observatory careful observations made upon several craters give evidence of present activity. It is also observed that many craters are lined with a white substance resembling snow. "The fact is that it gathers at the poles and on the mountain peaks and about the rims of craters. This white deposit gradually diminishes during the lunar day and increases during the lunar night. The latter phenomenon is evidently analogous to that of the changing size of the polar caps of Mars and of our own Earth." Evidences of vegetation were also observed upon the Moon's surface. Markings resembling river beds were discovered on March fifth and seventh, 1902, at the same observatory. In all, thirty-five of these so-called "river beds" had been discovered up to the date of the publication of Professor Pickering's work. But the most remarkable of these discoveries is the one of clearly marked "canals" similar to those of Mars which have excited so much interest, not only in the scientific world but also in the popular mind, as giving evidence of intelligent life upon that planet. Says Professor Pickering:—

The importance of these observations lies prominently in the aid they give us, not only in the interpretation of the real significance of the markings on Mars, but also in exemplifying the tenacity with which life will exist throughout the universe under conditions that seem to us, from

our ignorance, most unfavorable and most essential to it, while from some points of view these observations may have their disappointing side, still it must be remembered that they do not disprove that intelligent life may exist either on Mars or elsewhere. They merely weaken the strongest argument brought forward for the existence of highly intelligent life upon Mars. I do not believe that any astronomer will be tempted to use the inverse argument that we now possess evidence of intelligent life upon the Moon.

The foregoing paragraph is quoted in justice to Professor Pickering, that his own position in regard to the habitability of the Moon may not be misunderstood. But the layman is permitted to draw conclusions from observed facts as well as the astronomer who observes them. When we consider the great advance that has been made in our knowledge of the Moon's surface in recent years, it seems reasonable to predict that future observers, with improved instruments and appliances, will find further evidences of the existence of intelligent life upon our discredited satellite. Certain it is that the trend of modern research is toward and not away from such a supposition.

Thus far we have endeavored to refute the arguments in Dr. Wallace's book by citing such facts in opposition as are afforded by the recent investigations of astronomy. But the New Astronomy is yet in its infancy, and the amount of positive evidence it affords that human life exists upon other worlds than ours, is admittedly scanty. There is, however, direct and convincing proof that the universe is filled with inhabited worlds—*the testimony of a credible witness*. The teachings of Swedenborg regarding the inhabitants of the various planets in our solar system as well as of those of the other earths in the starry heavens, are full and explicit.\*

The beginning of his testimony, continued with amazing detail throughout his work, "Earths in the Universe," is as follows:—

\**The Earths in our Solar System, and the Earths in the Starry Heavens.*  
By EMANUEL SWEDENBORG.

Since by the divine mercy of the Lord, the interiors of my spirit have been opened, and thereby I have been enabled to speak with spirits and angels, both with those who are near our earth and with those who are near other earths, and since I had a desire to know whether there are other earths, and what is their nature and that of their inhabitants, therefore it has been given me by the Lord to speak and converse with spirits and angels from other earths — with some for a day, with some for a week, and with some for months — and to be instructed by them concerning the earths from which and near which they were, and concerning the life, the customs, and the worship of the inhabitants, as well as various other matters worthy of narration; and since it has been granted me to learn those things in this way, I am permitted to describe them from what I have heard and seen.

In answer to his desire Swedenborg was permitted to converse with spirits from the planets Mercury, Jupiter, Mars, Saturn, and Venus, and from the Moon, and also with spirits from other earths in the universe. Many are the things narrated concerning the customs, manners, mode of speech, and of worship of the men of these various earths, but what is of vastly greater importance we have formulated in this work, "Earths in the Universe," for the first time and for all time, a clear, rational, and authoritative theory of the universe, a theory which opens to our vision a universe resplendent with innumerable suns, like our sun, each surrounded with earths, like our earth, with men upon them, to the end that the human race, which is "the seminary of heaven," may exist not only upon our earth, but upon the countless thousands throughout the realms of space.

THOMAS F. MOSES.