

"MAN'S PLACE IN THE UNIVERSE."*

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DR. WALLACE has not been long in fulfilling his promise to supplement his articles on the above subject in the March and September numbers of the *Fortnightly Review* with a fuller exposition of his views in book form. Appearing so soon after the discussion to which the first of those essays gave rise, the public interest has not had time to subside, and the book ought, and beyond doubt will, attain an exceptionally wide circulation. Should this be the case, as we trust it will be, the success of the book will be due to the extraordinary energy and promptitude of its venerable author. For an octogenarian to have produced, in barely half a year, so large a volume dealing with so wide a range of intricate subjects, and involving so large an amount of reading and reference, is in itself a remarkable achievement.

Dr. Wallace's great object is to prove,—or, at any rate, to show that it is exceedingly probable,—that this earth upon which we live is the only inhabited world in the universe. For this purpose it is necessary to bring forward some form of reasoning which shall not only show that our earth is the only planet within the solar system capable of sustaining life, but—a far more difficult proposition—to show that no sun other than our own could have a life-bearing planet amongst its attendants. From the nature of the case we cannot see a single planet of any star whatsoever, not even as a mathematical point of light. The only mode, therefore, by which the necessary argument can be constructed is by bringing out some point of difference between our sun and all other suns. If the system, of which it is the centre and luminary, is the only one in which intelligent life has a place, then it is indeed special, peculiar, unique. And if—and this is Dr. Wallace's fundamental assumption—this speciality of our sun is the necessary outcome of its physical properties and conditions, then these must be wholly and entirely different in some most important characteristics from those of any other of the untold millions of stars.

The problem, therefore, is, in effect, "Is our sun unique amongst the stars?" "Have we been able to detect any difference between it and all the host of its brethren?" And, if so, "Is this difference one which would affect the suitability of its planetary cortège for the origin and maintenance of life?"

Dr. Wallace's answer to these questions, as given in his first paper in the March number of the *Fortnightly Review*, was that our sun does differ from all others. It differs in position. It is in the very centre of the universe, and nowhere else than in that centre could life have been maintained sufficiently long to develop intelligence. He claimed that the whole trend of modern astronomica

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discovery tended to reverse the Copernican view of the earth, if we may use that expression, and to restore the Ptolemaic, that our solar system, in which this earth is by far the most favoured planet, was the central system of the entire sidereal universe; central not merely as to position in space, but in fundamental importance. "We ourselves are" the "sole and sufficient result," the "adequate reason why such an universe should have been called into existence." And "nowhere else than near the central position in the universe which we occupy could that result have been attained."

These are strong and far-reaching expressions, and oblige us to interpret Dr. Wallace's description of the sun as occupying the centre of the sidereal universe with a greater rigidity than he cared to admit. But we must bear in mind that the whole point, to demonstrate which he has directed his energies, is this: that there neither is, nor can be, any other inhabited world beside our own. "We ourselves are the sole and sufficient" cause why the universe has "been called into existence." And in his first paper the one physical condition upon which he relied to establish the improbability of life arising elsewhere than here, was the position of our sun in the centre of a cluster of suns, and that cluster situated, not only precisely in the plane of the Galaxy, but also centrally in that plane. If there was another sun that was nearer to that centre than we were, or even substantially as near, his argument, such as it was, was vitiated in its essential condition. No expression, therefore, however rigid and precise, could have so inexorably bound him down to the idea that our system was exactly and permanently central, as the exigencies of his argument did. This was a position which it was not possible for astronomers to allow to pass unchallenged. It was not warranted by the course of astronomical discovery, and if it should be widely accepted, it would tend to hamper our progress in the future. The immense problem of the true form and structure of the sidereal system—a problem in which a progress has been made of late years, which Dr. Wallace has either overlooked or ignored—will only yield, so far as its solution is possible, very slowly and gradually to patient, painful and continuous research. But if we are to assume at the outset that we occupy the exact centre of that universe, and invest that assumption with a quasi-theological authority, we shall have conjured ourselves back some three centuries or more into the position held by those who resisted and oppressed Galileo, and free enquiry into the greatest of physical problems will have come to an end.

The criticism offered by astronomers has had a good effect upon Dr. Wallace's book. It has induced him to give up the attempt to establish the unique character of our sun on the lines of a supposed central position. In his article in the *Fortnightly Review* for September he withdrew most of the advantages which he had suggested might accrue to our system from that position. In his book he gives up the position itself. He no longer plants the sun in the centre of the hypothetical solar cluster, but near its circumference (p. 304). He no longer places the sun in the exact geometrical centre of the Milky Way, but about one-twelfth of the diameter of the ring to one side (p. 162). He admits implicitly that many other stars are as well or perhaps better situated, and suggests that the advantage of the central position which they all thus share is that, being far within the circuit of the Milky Way, they may possibly be protected by it from certain supposed emanations. Now, just as it was necessary to lodge a protest when Dr. Wallace claimed for the sun a central position that was absolutely unique, so now there can be as little hesitation in declaring that he has at last read rightly his authorities—Sir John Herschel, Sir Norman

Lockyer, and others. It is true in this very loose sense that the sun is central in the central plane of the Milky Way. It was most emphatically not true in the sense in which Dr. Wallace first used it.

The differentiation between our sun and other stars is now sought to be brought about in a much more legitimate way. He gives just prominence to Mr. Herbert Spencer's remarkable essay on the nebular hypothesis. It is true that the trend of more recent discovery has tended to weaken rather than support Spencer's argument. He could not write to-day "scarcely any nebulae lie near the Galactic circle," but still the immense probability remains that the vast majority of all the celestial objects which we see are members of but a single structure. Whether we are acquainted with any aliens, and, if so, what proportion they form of the entire celestial host, we are not at present able to decide. Broadly speaking, stars, nebulae and Galaxy, may reasonably be regarded as portions of one and the same building.

His next step is to point out that stars differ in their spectra; consequently our sun is marked off from all stars not of its own type. Further, even amongst stars of the solar type, there may be points of difference, and Dr. Wallace lays great stress on the discovery of spectroscopic binaries, already numerous, and quotes Prof. Campbell who believes that "the star that is not a spectroscopic binary will prove to be the rare exception." For both these statements Dr. Wallace has full and ample authority. Nay, more, it is highly probable that we need not stop here, but that, as our knowledge increases, we may find that no two stars are exactly alike, that each has some characteristic special to itself, some mark of individuality. But the inference which Dr. Wallace would draw is certainly unwarrantable, that all these differences necessarily imply unsuitability for life-bearing planets. On the contrary, since he accepts Sir Norman Lockyer's view that spectrum type means simply the factors of time and temperature, we are, on this hypothesis, in a position to assert with confidence that solar stars have existed in a stable condition, like our own sun, for a sufficient length of time for intelligent life to have developed somewhere within their attendant system. To reason otherwise is to beg nakedly the very question which it is desired to prove. And in effect this is all that his present argument comes to. Though it is a great improvement on the original argument, yet when the crucial step has to be taken from the ascertained facts to the wished-for conclusion, it amounts simply to assuming the very thing that has to be proved.

This is the point where the great argument of the book fails. In other parts it is much more successful. In chapters X., XI., XII., and XIII., where Dr. Wallace is dealing with the "Essential Characters of a living Organism," with "Essential life Conditions," and with "The Earth in its Relation to Life," he is treating of subjects upon which we have direct experimental knowledge, and many of which he has made largely his own. Here it is possible to follow him with much of both admiration and assent. And in chapter XIV., in which he claims to prove that "The Earth is the only habitable Planet of the Solar System," applying the lessons which he has drawn in the four preceding chapters, his argument is a strong one. Astronomers who have suffered much of late from having such absurdities fattered on them as the theory that the "canals" on Mars are evidence of the presence there of skilled engineers, and that the white spots occasionally seen on its terminator are the signals by which they are endeavouring to communicate with us, will welcome the clearness with which he has treated this part of his subject. I am personally exceedingly glad to see that Dr. Wallace argues that we have no real reason

for supposing "that the moon was once inhabited, and that Jupiter will be inhabited in some remote future." This has always been my own opinion, and I think that his method of treating this particular question is very forcible. Up to the present time geologists have been disposed to claim a much longer duration for the maintenance of the present solar radiation than astronomers have been inclined to allow. Without endeavouring to adjust this difference between the two sciences, the inference is but reasonable and fair that no planet in the system differing very greatly in size from our earth, and therefore differing greatly from it in rate of cooling, could have passed through the same geological and biological epochs. There are two small points in this chapter which are stated too positively; these are: "The small size and mass of Mars being such that it cannot retain aqueous vapour; and the fact that Venus rotates on its axis in the same time as it takes to revolve round the sun." These two statements ought not to have been made without some caution to the reader that these "stated facts . . . are by no means demonstrated, because founded upon assumptions which may be quite erroneous."

The promptitude with which the book has been brought out has had its drawbacks, for there are several indications of undue haste. Some of these are misprints, as "W. W. Turner," on page 142, for "H. H. Turner," and "Barnham" for "Burnham" on page 123, and again in the index. Some seem to be due to misapprehension of the authorities quoted, or more probably to carelessness in expression due to hasty writing. Thus, for example, on pages 59 and 60, our author says that to the naked eye no extensive region of the heavens is very conspicuously deficient or superior in the number of the stars which it displays; on page 123, that all the variable stars are to be found among the spectroscopic binaries; and on page 106, that "sunspots are of such enormous size that, when present, they can easily be seen with the naked eye," as if this were always the case. More curious are his inconsistencies. On pages 91-93 he gives a brief account of the determination of the sun's movement through space. This is in one of the first six chapters written specially "for the general educated body of readers," . . . who are not "fairly acquainted with modern astronomical literature." He states there that the motion of the sun is probably about $12\frac{1}{2}$ miles a second. Later on, in chapter VIII, he devotes some pages to showing that Prof. Turner and myself "made demonstrably baseless statements," when we simply called attention to this very solar motion. On page 143 he objects to my quoting Sir Robert Ball on the existence of dark stars, but on page 172 he quotes an exactly parallel passage from Sir Robert Ball to support himself when he finds it convenient to assume that dark stars are immensely numerous. On page 50 he quotes Sir John Herschel's description of the Milky Way "because he, of all the astronomers of the last century, had studied it most thoroughly." On page 162 he contemptuously puts on one side Sir John Herschel's remark "that the greater brightness of the southern Milky Way conveys strongly the impression of greater proximity"; this on the ground of a feature of the beautiful charts by the late Mr. Sidney Waters. It escaped Dr. Wallace's notice that the feature in question was a necessary result of the projection employed. Whilst it surely was a great mistake to argue as if the Milky Way shone in the same manner as an illuminated surface (see page 162). These are but a few of many similar oversights or inconsistencies.

Still, with all its drawbacks, the book is a wonderful one to have been produced in so short a time by a man who has devoted his fourscore years to a science which is not the one which forms the major part of the book.

With all its want of precision, it is full of interest and charm, especially when we come to the chapters dealing with the biological side of the question.

Upon that question as a whole—the question whether life-bearing planets can exist in other solar systems than our own—the answer of science is clear and distinct. It is precisely the same which Prof. Newcomb recently gave concerning the possible inhabitants of Mars: "The reader knows just as much of the subject as I do, and that is nothing at all." Within our solar system we can indeed form some crude estimate of probabilities; beyond it, nothing. All the amazing progress of modern science, all the revelations made by the spectroscope or by photography, all the advance in biology, have not brought us one step nearer an answer to the question, "Is this the only inhabited world?" We stand essentially where Whewell and Brewster did half a century ago; or we might, indeed, say where Galileo and Capoano were three hundred years ago. We can, indeed, spin out the discussion at greater length than our predecessors, and can introduce a far larger number of more or less irrelevant facts, but of serious argument, either for or against, we are entirely destitute.