Scientific Progress and Endeavor

MAN'S PLACE IN THE UNIVERSE

Dr. Alfred Russell Wallace's remarkable article, Man's Place in the Universe, in the March Fortnightly Review, has attracted the attention of the scientific world. Dr. Wallace seeks to prove in this monograph that the earth or solar system is the physical center of the stellar universe. In discussing our position in space, he declares:

The result so far reached by astronomers as the direct, logical conclusion from the whole mass of facts accumulated by means of powerful instruments of research, which have given us the new astronomy, is that our sun is one of the central orbs of a globular star cluster, and that this star cluster occupies nearly the central position in the exact plane of the Milky Way; but I am not aware that any writer has taken the next step and, combining these two conclusions, has stated definitely that our sun is thus shown to occupy a position very near if not actually at the center of the whole visible universe, and therefore, in all probability, in the center of the whole material universe.

This conclusion, no doubt, is a startling one, and all kinds of objections will be made against it, yet I am not acquainted with any great inductive result of modern science that has been arrived at so gradually, so legitimately, by means of so vast a mass of precise measurements and observations, and by such wholly unprejudiced workers. It may not be proved with minute accuracy as regards the actual mathematical center. That is not of the least importance; but that it is substantially correct there seems to be no good reason to doubt, and I

therefore hold it right and proper to have it so stated and provisionally accepted until further accumulations of evidence may show to what extent it requires modification.

This completes the first part of our inquiry, but an equally important part remains to be considered — our position in the solar system itself as regards adaptability for organic life. Here, too, I am not aware that the whole facts have been sufficiently considered, yet there are facts that indicate our position in this respect to be as central and unique as that of the sun in the stellar universe.

Professor Pickering of the Harvard Observatory, does not agree with Dr. Wallace's theory in regard to the earth's position in the Milky Way, and he seeks in The Independent to refute Dr. Wallace's contention as follows:

With regard to our position in the exact center of the Milky Way, Mr. Wallace seems to have been led into error by the accuracy of the figures given by Sir John Herschel. Many astronomers, especially in former times, were in the habit of giving their numerical results in very small fractions of the second of arc, whereas, in point of fact, they could not measure the given distance perhaps within several minutes. This seems to be the case in the present instance. If the Milky Way were merely a hazy uniform band of light, we might locate its medial line with some approach to accuracy. A close examination, however, shows that it is on the contrary a branching structure of most irregular form and brilliancy, sometimes one side being the brighter and sometimes the other, and it would not be possible for any two observers, or indeed for any single observer working on different nights, to agree within as much as a degree as to where the medial line should properly be drawn. As to locating it accurately within one minute of arc (one-thirtieth of the moon's diameter), a mere glance at the object on any clear night will show the reader the absolute futility of such an undertaking.

Admitting for the sake of argument that we are located within one degree of the medial plane of the Milky Way, there is no evidence whatever that we are located within ten per cent. of the radius of the central position in that plane.

From Paris also, where the science of astronomy has been so well studied, come more attacks upon the theory advanced by the great English scientist. Flammarion, Berthelot and Loewy, scientists of distinction, disagree radically with the findings of Dr. Wallace. M. Berthelot says:

This theory is puerile and no man of science will take it seriously. It reminds me of an anecdote about Charles V, who, on being asked where the center of the earth was, planted his sword in the ground and said "The center is here; it is where I am."

The universe being infinite, composed of a multitude of stars, suns and planets, its center is nowhere. Our mind is so formed that we cannot conceive of the universe otherwise than as infinite. The theory in question is the reawakening of an old biblical theory, according to which God, having created man in His own image and likeness, manufactured a world to suit him. The Greeks had analogous ideas. They said that "man is the measure of things." The aphorism is pretty, but it is false if taken from an absolute point of view.

Besides making a strong plea for the earth as the center of the stellar universe, Dr. Wallace deduces a fascinating theory on the limitation of the universe of luminous stars:

But perhaps the most striking proof of the limited extent of the universe of luminous stars is that dependent on the laws of light. This has been long known to astronomers, and it has been very clearly and briefly stated by Professor Simon Newcomb, one of the profoundest of mathematical astronomers. He tells us to imagine a series of concentric spheres, each of the same distance apart from the first, which includes only the stars visible to the naked eye. The space between each pair of these spheres will be in extent proportional to the squares of the diameters of the sphere that limit it; and as the light we receive from each star is inversely proportional to its distance from us, it follows that if each region were equally strewn with stars of the same average brightness then we should receive the same amount of light from each region, the diminution of light from each star being exactly compensated by the vastly greater numbers in each successively larger sphere. Hence it follows that if these concentric spheres were infinite, we should receive an infinite amount of light from them, and even if we make an ample allowance for stoppage of light by intervening dark bodies, or by cosmic dust, or by imperfect transparency of the ether, we should at least receive quite as much light from them as the sun gives us at noonday. But the amount we actually receive is so immensely less than this as to prove that the concentric spheres of stars beyond those visible to the naked eye cannot be very numerous. For the total light of all the stars is estimated to be not more than about one-fortieth of moon-light, which is itself only about one five-hundred-thousandth of sunlight. This proof of the limited extent of the stellar universe is therefore a very forcible one, and taken in connection with that afforded by telescopic research, as already described, is altogether conclusive.

In opposition to this, M. Loewy gives his views, which are vastly different:

Dr. Wallace's assertion that the latest discoveries in astronomy and accepted theories regarding the proportion of light tend to prove that the stars are limited in number is doubly false. In certain parts of the heavens we do not see any stars, but it would be madness to conclude that the end of the universe had been reached. It would be as if a shortsighted man were to claim that there were no stars except those which he could see.

In regard to light, it is an admitted theory that luminous waves from a source of light are transmitted without losing anything of their intensity. Therefore, it is said, if the stars were infinite in number and equally distributed throughout the universe, it would be as light by night as by day. These arguments are not embarrassing. First of all, it appears certain that the stars are not regularly distributed, but are grouped in masses in vast agglomerations.

And as for the light theory, it has only been verified over relatively small distances, but light, which travels at the rate of 77,000 leagues a second,

takes 100,000 years to come from some stars to the earth. It is quite possible that, over such vast space, it is diminished much in intensity.

The earth is by no means in a privileged situation nor is the sun the center of the universe. There are so many stars bigger than the sun that not a single astronomer will dream for a moment of defending any such hypotheses which are in contradiction and are mere fruits of the imagination.