

OF THE PLURALITY OF WORLDS.

CHAPTER I.

Astronomical Discoveries.

‘WHEN I consider the heavens, the work of thy fingers,
the moon and the stars, which thou hast ordained ;
What is man, that thou art mindful of him ? and the son of
man, that thou visitest him ?’

I These striking words of the Hebrew Psalmist have been made, by an eloquent and pious writer of our own time, the starting point of a remarkable train of speculation. Dr Chalmers, in his *Astronomical Discourses*, has treated the reflexion thus suggested, in connexion with such an aspect of the heavens and the stars, the earth and the universe, as modern astronomy presents to us. Even from the point of view in which the ancient Hebrew looked at the stars ; seeing only their number and splendour, their lofty position, and the vast space which they visibly occupy in the sky ; compared with the earth, which lies dark, and mean, and perhaps small in extent, far beneath them, and on which man has his habitation ; it appeared wonderful, and scarcely credible, that the maker of all that array of luminaries, the lord of that wide and magnificent domain, should occupy himself with the concerns of men : and yet, without a belief in His fatherly care and goodness to us, thoughtful and religious persons, accustomed to turn their minds constantly to a Supreme

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Governor and constant Benefactor, are left in a desolate and bewildered state of feeling. The notion that while the heavens are the work of God's fingers, the sun, moon, and stars ordained by him, He is *not* mindful of man, does not regard him, does not visit him, was not tolerable to the thought of the Psalmist. While we read, we are sure that he believed that, however insignificant and mean man might be, in comparison with the other works of God,—however difficult it might seem to conceive, that he should be found worthy the regards and the visits of the Creator of All,—yet that God *was* mindful of him, and *did* visit him. The question, 'What is man, that this is so?' implies that there is an answer, whether man can discover it or not. '*What* is man, that God is mindful of him?' indicates a belief, unshaken, however much perplexed, that man is *something*, of such a kind that God *is* mindful of him.

2 But if there was room for this questioning, and cause for this perplexity, to a contemplative person, who looked at the skies, with that belief concerning the stars, which the ancient Hebrew possessed, the question recurs with far greater force, and the perplexity is immeasurably increased, by the knowledge, concerning the stars, which is given to us by the discoveries of modern astronomy. The Jew probably believed the earth to be a region, upon the whole, level, however diversified with hills and valleys, and the skies to be a vault arched over this level;—a firmament in which the moon and the stars were placed. What magnitude to assign to this vault, he had no means of knowing; and indeed, the very aspect of the nocturnal heavens, with the multitude of stars, of various brightness, which come into view, one set after another, as the light of day dies away, suggests rather the notion of their being scattered through a vast depth of space, at various distances, than of their being so many lights fastened to a single vaulted surface. But however he

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might judge of this, he regarded them as placed in a space, of which the earth was the central region. The host of heaven all had reference to the earth. The sun and the moon were there, in order to give light to it, by day and by night. And if the stars had not that for their principal office, as indeed the amount of light which they gave was not such as to encourage such a belief,—and perhaps the perception, that the stars must have been created for some other object than to give light to man, was one of the principal circumstances which suggested the train of thought that we are now considering;—yet still, the region of the stars had the earth for its center and base. Perhaps the Psalmist, at a subsequent period of his contemplations, when he was pondering the reflexions which he has expressed in this passage, might have been led to think that the stars were placed there in order to draw man's thoughts to the greatness of the Creator of all things; to give some light to his mental, rather than to his bodily eye; to shew how far His mode of working transcends man's faculties; to suggest that there are things in heaven, very different from the things which are on earth. If he thought thus, he was only following a train of thought on which contemplative minds, in all ages and countries, have often dwelt; and which we cannot, even now, pronounce to be either unfounded or exhausted; as we trust hereafter to shew. But whether or not this be so, we may be certain that the Psalmist regarded the stars, as things having a reference to the earth, and yet not resembling the earth; as works of God's fingers, very different from the earth with its tribes of inhabitants; as luminaries, not worlds. In the feeling of awe and perplexity, which made him ask, 'What is man that thou art mindful of him?' there was no mixture of a persuasion that there were, in those luminaries, creatures, like man, the children and subjects of God; and therefore, like man,

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requiring his care and attention. In asking, 'What is man, that thou visitest him?' there was no latent comparison, to make the question imply, 'that thou visitest *him*, rather than those who dwell in those abodes?' It was the multitude and magnificence of God's works, which made it seem strange that he should care for a *thing* so small and mean as man; not the supposed multitude of God's intelligent creatures inhabiting those works, which made it seem strange that he should attend to every *person* upon this earth. It was not that the Psalmist thought that, among a multitude of earths, all peopled like this earth, man might seem to be in danger of being overlooked and neglected by his Maker; but that, there being only one earth, occupied by frail, feeble, sinful, shortlived creatures, it might be unworthy the regards of Him who dwelt in regions of eternal light and splendour, unsullied by frailty, inaccessible to corruption.

3 This, we can have no doubt, or something resembling this, was the Psalmist's view, when he made the reflexion, which we have taken as the basis of our remarks. And even in this view, (which, after all that science has done, is perhaps still the most natural and familiar,) the reflexion is extremely striking; and the words cannot be uttered without finding an echo in the breast of every contemplative and religious person. But this view is, as most readers at this time are aware, very different from that presented to us by Modern Astronomy. The discoveries made by astronomers are supposed by most persons to have proved, or to have made it in the highest degree probable, that this view of the earth, as the sole habitation of intelligent subjects of God's government; and of the stars, as placed in a region of which the earth is the centre, and yet differing in their nature from this lower world; is altogether erroneous. According to astronomers, the earth is not a level space, but a globe. Some of the stars which we see in the vault of

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heaven, are globes, like it ; some smaller than the earth, some larger. There are reasons, drawn from analogy, for believing that these globes, the other planets, are inhabited by living creatures, as the earth is. The earth is not at rest, with the celestial luminaries circulating above it, as the ancients believed, but itself moves in a circle about the sun, in the course of every year ; and the other planets also move round the sun in like manner, in circles, some within and some without that which the earth describes. This collection of planets, thus circulating about the sun, is the SOLAR SYSTEM : of which the earth thus forms a very small part. Jupiter and Saturn are much larger than the earth. Mars and Venus are nearly as large. If these be inhabited, as the Earth is, which the analogy of their form, movements and conditions, seems to suggest, the population of the earth is a very small portion of the population of the solar system. And if the mere number of the subjects of God's government could produce any difficulty in the application of his providence to them, a person to whom this view of the world which we inhabit had been disclosed, might well, and with far more reason than the Psalmist, exclaim, ' Lord, what is man, that thou art mindful of him ? the inhabitant of this Earth, that thou regardest him ?'

4 But this is only the first step in the asserted revelations of astronomy. Some of the stars, are, as we have said, planets of the kind just described. But these stars are a few only :—five, or at most six, of those visible to the unassisted eye of man. All the rest, innumerable as they appear, and numerous as they really are, are, it is found, objects of another kind. They are not, as the planets are, opaque globes, deriving their light from a sun, about which they circulate. They shine by a light of their own. They are of the nature of the sun, not of the planets. That they appear mere specks of light, arises from their being at a vast

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distance from us. At a vast distance they undoubtedly are ; for even with our most powerful telescopes, they still appear mere specks of light ;—mere luminous points. They do not, as the planets do, when seen through telescopes, exhibit to us a circular face or disk, capable of being magnified and distinguished into parts and features. But this impossibility of magnifying them by means of telescopes, does not at all make us doubt that they may be far larger than the planets. For we know, from other sources of information, that their distance is immensely greater than that of any of the planets. We can measure the bodies of the solar system ;—the earth, by absolutely going round a part of it, or in other ways ; the other bodies of the system, by comparing their positions, as seen from different parts of the earth. In this manner we find that the earth is a globe 8000 miles in diameter. In this way, again, we find that the circle which the earth describes round the sun has, in round numbers, a radius about 24,000 times the earth's radius ; that is, nearly a hundred millions of miles. The earth is, at one time, a hundred millions of miles on one side of the sun ; and at another time, half a year afterwards, a hundred millions of miles on the other side. Of the bright stars which shine by their own light,—the *fixed stars*, as we call them, (to distinguish them from the planets, the *wandering stars*,)—if any one were at any moderate distance from us, we should see it change its apparent place with regard to the others, in consequence of our thus changing our point of view two hundred millions of miles : just as a distant spire changes its apparent place with regard to the more distant mountain, when we move from one window of our house to the other. But no such change of place is discernible in any of the fixed stars : or at least, if we believe the most recent asserted discoveries of astronomers, the change is so small as to imply a distance in the star, of more

than two hundred thousand times the radius of the earth's orbit, which is, itself, as we have said, one hundred millions of miles*. This distance is so vastly great, that we can very well believe that the fixed stars, though to our best telescopes they appear only as points of light, are really as large as our sun, and would give as much light as he does, if we could approach as near to them. For since they are thus, the nearest of them, two hundred thousand times as far off as he is, even if we could magnify them a thousand times, which we can hardly do, they would still be only one two-hundredth of the breadth of the sun; and thus, still a mere point.

5 But if each fixed star be of the nature of the sun, and not smaller than the sun, does not analogy lead us to suppose that they have, some of them at least, planets circulating about them, as our sun has? If the Sun is the center of the Solar System, why should not Sirius, (one of the brightest of the fixed stars,) be the center of the *Sirian System*? And why should not that system have as many planets, with the same resemblances and differences of the figure, movements, and conditions of the different planets, as this? Why should not the Sirian System be as great and as varied as the solar system? And this being granted, why should not these planets be inhabited, as men have inferred the other planets of the solar system, as well as the earth, to be? And thus we have, added to the population of the universe of which we have already spoken, a number (so far as we have reason to believe) not inferior to the number of

* It is quite to our purpose to recollect the impression which such discoveries naturally make upon a pious mind.

Oh! rack me not to such extent,
 These distances belong to Thee;
 The world's too little for Thy tent,
 A grave too big for me!

GEORGE HERBERT.

inhabitants of the solar system: this number being, according to all the analogies, very manifold that of the population of the whole earth?

And this is the conclusion, when we reason from one star only, from Sirius. But the argument is the same, from each of the stars. For we have no reason to think that Sirius, though one of the brightest, is more like our sun than any of the others is. The others appear less bright in various degrees, probably because they are further removed from us in various degrees. They may not be all of the same size and brightness; it is very unlikely that they are. But they may as easily be larger than the sun, as smaller. The natural assumption for us to make, having no ground for any other opinion, is, that they are, upon the average, of the size of our sun. On that assumption, we have as many solar systems as we have fixed stars: and, it may be, six or ten, or twenty times as many inhabited globes; inhabited by creatures of whom we must suppose, by analogy, that God is mindful, if he is mindful of us. The question recurs with overwhelming force, if we still follow the same train of reflexion: 'What is man, that God is mindful of him?'

6 But we have not yet exhausted the views which thus add to the force of this reflexion. The fixed stars, which appear to the eye so numerous, so innumerable, in the clear sky on a moonless night, are not really so numerous as they seem. To the naked eye, there are not visible more than four or five thousand. The astronomers of Greece, and of other countries, even in ancient times, counted them, mapped them, and gave them names and designations. But Astronomy, who thus began her career by diminishing, in some degree, the supposed numbers of the host of heaven, has ended by immeasurably increasing them. The first application of the telescope to the skies discovered a vast number of fixed stars, previously unseen: and every improve-

ment in that instrument has disclosed myriads of new stars, visibly smaller than those which had before been seen; and smaller and smaller, as the power of vision is more and more strengthened by new aids from art; as if the regions of space contained an inexhaustible supply of such objects;—as if infinite space were strewn with stars in every part of it to which vision could reach. The small patch of the sky which forms, at any moment, the field of view of one of the great telescopes of Herschel, discloses to him as many stars, and those, of as many different magnitudes, as the whole vault of the sky exhibits to the naked eye. But the magnifying power of such an instrument only discloses, it does not make, these stars. There appears to be quite as much reason to believe, that each of these telescopic stars is a sun, surrounded by its special family of planets, as to believe that Sirius or Arcturus is so. Here, then, we have again an extension, indefinite to our apprehension, of the universe, as occupied by material structures; and if so, why not by a living population, such as the material structures which are nearest to us support?

7 Even yet we have not finished the series of successive views which astronomers have had opened to them, extending more and more their spectacle of the fulness and largeness of the universe. Not only does the telescope disclose myriads of stars, unseen to the naked eye, and new myriads with each increase of the powers of the instrument; but it discloses also patches of light, which, at first at least, do not appear to consist of stars: *Nebulæ*, as they are called; bright specks, it might seem, of stellar matter, thin, diffused, and irregular; not gathered into regular and definite forms, such as we may suppose the stars to be. Every one who has noticed the starry skies, may understand what is the general aspect of such nebulae, by looking at the milky way or galaxy, an irregular band of nebulous light, which runs

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quite round the sky ; ‘ A circling zone, powdered with stars ;’ as Milton calls it. But the *nebulæ* of which I more especially speak, are minute patches, discovered mainly by the telescope, and in a few instances only discernible by the naked eye. And what I have to remark especially concerning them at present is, that though, to visual powers which barely suffice to discern them, they appear like mere bright clouds, patches of diffused starry matter ; yet that, when examined by visual powers of a higher order, by more penetrating telescopes, these patches of continuous feeble light, are, in many instances at least, distinguishable into definite points : they are found, in fact, to be aggregations of stars ; which before appeared as diffused light, only because our telescopes, though strong enough to reveal to our senses the aggregate mass of light of the cluster, were not strong enough to enable us to discern any one of the stars of which the cluster consists. The galaxy, in this way, may, in almost every part, be *resolved* into separate stars ; and thus, the multitude of the stars in the region of the sky occupied by that winding stream of light, is, when examined by a powerful telescope, inconceivably numerous.

8 The small telescopic *nebulæ* are of various forms ; some of them may be in the shape of flat strata, or cakes, as it were, of stars, of small thickness, compared with the extent of the stratum. Now if our sun were one of the individuals of such a stratum, we, looking at the stars of the stratum from his neighbourhood, should see them very numerous and close in the direction of the edge of the stratum, and comparatively few and rare in other parts of the sky. We should, in short, see a galaxy running round the sky, as we see in fact. And hence Sir William Herschel has inferred, that our sun, with its attendant planets, has its place in such a stratum ; and that it thus belongs to a host of stars which are, in a certain way, detached from the other *nebulæ* which