

**WILLIAM
WHEWELL**

THE
PLURALITY OF
WORLDS

William Whewell

The Plurality of Worlds

«Public Domain»

Whewell W.

The Plurality of Worlds / W. Whewell — «Public Domain»,

Содержание

PREFACE	6
INTRODUCTORY NOTICE TO THE AMERICAN EDITION	7
CHAPTER I	10
CHAPTER II	16
CHAPTER III	19
CHAPTER IV	22
CHAPTER V	31
Конец ознакомительного фрагмента.	37

William Whewell, Edward Hitchcock

The Plurality of Worlds



51 Messier



99 Messier

*On Nature's Alps I stand,
And see a thousand firmaments beneath!
A thousand systems, as a thousand grains!
So much a stranger, and so late arrived,
How shall man's curious spirit not inquire
What are the natives of this world sublime,
Of this so distant, unterrestrial sphere,
Where mortal, untranslated, never strayed?*

NIGHT THOUGHTS.

PREFACE

Although the opinions presented in the following Essay are put forwards without claiming for them any value beyond what they may derive from the arguments there offered, they are not published without some fear of giving offence. It will be a curious, but not a very wonderful event, if it should now be deemed as blamable to doubt the existence of inhabitants of the Planets and Stars, as, three centuries ago, it was held heretical to teach that doctrine. Yet probably there are many who will be willing to see the question examined by all the light which modern science can throw upon it; and such an examination can be undertaken to no purpose, except the view which has of late been generally rejected have the arguments in its favor fairly stated and candidly considered.

Though Revealed Religion contains no doctrine relative to the inhabitants of planets and stars; and though, till within the last three centuries, no Christian thinker deemed such a doctrine to be required, in order to complete our view of the attributes of the Creator; yet it is possible that at the present day, when the assumption of such inhabitants is very generally made and assented to, many persons have so mingled this assumption with their religious belief, that they regard it as an essential part of Natural Religion. If any such persons find their religious convictions interfered with, and their consolatory impressions disturbed, by what is said in this Essay, the Author will deeply regret to have had any share in troubling any current of pious thought belonging to the time. But, as some excuse, it may be recollected, that if such considerations had prevailed, this very doctrine, of the Plurality of Worlds, would never have been publicly maintained. And if such considerations are to have weight, it must be recollected, on the other hand, that there are many persons to whom the assumption of an endless multitude of Worlds appears difficult to reconcile with the belief of that which, as the Christian Revelation teaches us, has been done for this our World of Earth. In this conflict of religious difficulties, on a point which rather belongs to science than to religion, perhaps philosophical arguments may be patiently listened to, if urged as arguments merely; and in that hope, they are here stated, without reserve and without exaggeration.

All speculations on subjects in which Science and Religion bear upon each other, are liable to one of the two opposite charges;—that the speculator sets Philosophy and Religion at variance; or that he warps Philosophy into a conformity with Religion. It is confidently hoped that no candid reader will bring either of these charges against the present Essay. With regard to the latter, the arguments must speak for themselves. To the Author at least, they appear to be of no small philosophical force; though he is quite ready to weigh carefully and candidly any answers which may be offered to them. With regard to the amount of agreement between our Philosophy and Religion, it may perhaps be permitted to the Author to say, that while it appears to him that some of his philosophical conclusions fall in very remarkably with certain points of religious doctrine, he is well aware that Philosophy alone can do little in providing man with the consolations, hopes, supports, and convictions which Religion offers; and he acknowledges it as a ground of deep gratitude to the Author of all good, that man is not left to Philosophy for those blessings; but has a fuller assurance of them, by a more direct communication from Him.

Perhaps, too, the Author may be allowed to say, that he has tried to give to the book, not only a moral, but a scientific interest; by collecting his scientific facts from the best authorities, and the most recent discoveries. He would flatter himself, in particular, that the view of the Nebulæ and of the Solar System, which he has here given, may be not unworthy of some attention on the part of astronomers and observers, as an occasion of future researches in the skies.

INTRODUCTORY NOTICE TO THE AMERICAN EDITION

It is an interesting feature in the literature of our day, that so many minds are turning their attention to the bearings of science upon religion. With a few honorable exceptions, Christian scholars have regarded this as a most unpromising field, which they have left to the tilting and gladiatorship of scepticism. But we owe it mainly to the disclosures of geology, that the tables are beginning to be turned. For a long time suspected of being in league with infidelity, it was treated as an enemy, and Christians thought only of fortifying themselves against its attacks. But they are finding out, that if this science has been seen in the enemy's camp, it was only because of their jealousy that it was compelled to remain there; like captives that are sometimes pushed forwards to cover the front rank and receive the fire of their friends. Judging from the number of works, some of them very able, that appear almost monthly from the press, in which illustrations of religion are drawn from geology, we may infer that this science is beginning to be recognized by the friends of religion as an efficient auxiliary.

"The Plurality of Worlds," now republished, is the most recent work of this description that has fallen under our notice. We can see no reason why an Essay of so much ability, in which the reasoning is so dispassionate, and opponents are treated so candidly, should appear anonymously. True, the author takes ground against some opinions widely maintained respecting the extent of the inhabited universe, and seems to suppose that he shall meet with little sympathy; and this may be his reason, though in our view quite insufficient, for remaining incognito. We think he will find that there are a secret seven thousand, who never have bowed their understandings to a belief of many of the doctrines which he combats, and he might reasonably calculate that his reasoning will add seven thousand more to the number. We confess, however, that though we have long been of this number to a certain extent, we cannot go as far as this writer has done in his conclusions.

All the world is acquainted with Dr. Chalmers' splendid Astronomical Discourses. Assuming, or rather supposing that he has proved, that the universe contains a vast number of worlds peopled like our own, he imagines the infidel to raise an objection to the mission of the Son of God, on the ground that this world is too insignificant to receive such an extraordinary interposition. His replies to this objection, drawn chiefly from our ignorance, are ingenious and convincing. But the author of the Plurality of Worlds doubts the premises on which the objection is founded. He thinks the facts of science will not sustain the conclusion that many of the heavenly bodies are inhabited; certainly not with moral and intellectual beings like man. Nay, by making his appeal to geology, he thinks the evidence strong against such an opinion. This science shows us that this world was once certainly in a molten state, and very probably, at a still earlier date, may have been dissipated into self-luminous vapor, like the nebulae or the comets. Immense periods, then, must have passed before any organic structures, such as have since peopled the earth, could have existed. And during the vast cycles that have elapsed since the first animals and plants appeared upon the globe, it was not in a proper condition to have sustained any other than the inferior races. Accordingly, it has been only a few thousand years since man appeared.

Now, so far as astronomy has revealed the condition of other worlds, almost all of them appear to be passing through those preparatory changes which the earth underwent previous to man's creation. What are the unresolvable nebulae and most of the comets also, but intensely heated vapor and gas? What is the sun but a molten globe, or perhaps gaseous matter condensed so as to possess almost the density of water? The planets beyond Mars, also, (excluding the asteroids,) appear to be in a liquid condition, but not from heat, and therefore may be composed of water, or some fluid perhaps lighter than water; or at least be covered by such fluid. Moreover, so great is their distance from the sun, that his light and heat could not sustain organic beings such as exist upon the earth. Of the inferior

planets, Mercury is so near the sun that it would be equally unfit for the residence of such beings. Mars, Venus, and the Moon, then, appear to be the only worlds known to us capable of sustaining a population at all analogous to that upon earth. But of these, the Moon appears to be merely a mass of extinguished volcanos, with neither water nor atmosphere. It has proceeded farther in the process of refrigeration than the earth, because it is smaller; and in its present state, is manifestly unfit for the residence either of rational or irrational creatures. So that we are left with only Mars and Venus in the solar system to which the common arguments in favor of other worlds being inhabited, will apply.

But are not the fixed stars the suns of other systems? We will thank those who think so, to read the chapter in this work that treats of the fixed stars, and we presume they will be satisfied that at least many of these bodies exhibit characters quite irreconcilable with such an hypothesis. And if some are not central suns, the presumption that the rest are, is weakened, and we must wait till a greater perfection of instruments shall afford us some positive evidence, before we know whether our solar system is a type of any others.

Thus far, it seems to us, our author has firm ground, both geological and astronomical, to stand upon. But he does not stop here. He takes the position that probably our earth may be the only body in the solar system, nay in the universe, where an intellectual, moral and immortal being, like man, has an existence. He makes the "earth the domestic hearth of the solar system; adjusted between the hot and fiery haze on one side, and the cold and watery vapor on the other: the only fit region to be a domestic hearth, a seat of habitation." He says that "it is quite agreeable to analogy that the solar system should have borne but one fertile flower. And even if any number of the fixed stars were also found to be barren flowers of the sky, we need not think the powers of creation wasted, or frustrated, thrown away, or perverted." He does not deny that some other worlds may be the abodes of plants and animals such as peopled this earth during the long ages of preadamic history. But he regards the creation of man as the great event of our world. He looks upon the space between man and the highest of the irrational creatures, as a vast one: for though in physical structure they approach one another, in intellectual and moral powers they cannot be compared. He does not think it derogatory to Divine Wisdom to have created and arranged all the other bodies of the universe to give convenience and elegance to the abode of such a being; especially since this was to be the theatre of the work of redemption.

Now we sympathize strongly in views that give dignity and exaltation to man, and not at all with that debasing philosophy, so common at this day, that looks upon him as little more than a somewhat improved orang. But we cannot admit that man is the only exalted created being to be found among the vast array of worlds around us. Geology does, indeed, teach us, that it is no disparagement of Divine Wisdom and benevolence to make a world—and if one, why not many—the residence of inferior creatures; nay to leave it without inhabitants through untold ages. But it also shows us, that when such worlds have passed through these preparatory changes, rational and immortal beings may be placed upon them. Nay, does not the history of our world show us that this seems to be the grand object of such vast periods of preparation. And is it not incredible, that amid the countless bodies of the universe, a single globe only, and that a small one, should have reached the condition adapted to the residence of beings made in the image of God? Of what possible use to man are those numberless worlds visible only through the most powerful telescopes? Surely such a view gives us a very narrow idea of the plans and purposes of Jehovah, and one not sustained in our opinion by the analogies of science.

There is another principle to which our author attaches, as we think, too little importance in this connection. When we see how vast is the variety of organic beings on this globe, and how manifold the conditions of their existence; how exactly adapted they are to the solid, the liquid, and the gaseous states of matter, can we doubt that rational and intelligent beings may be adapted to physical conditions in other worlds widely diverse from those on this globe? May not spirits be connected with bodies much heavier, or much lighter, than on earth; nay, with mere tenuous ether; and those bodies,

perhaps, be better adapted to the play of intellect than ours; and be unaffected by temperatures which, on earth, would be fatal? It does seem to us that such conclusions are legitimate inferences from the facts of science; and if so, we can hardly avoid the conclusion that there may be races of intelligent beings upon other worlds where the condition of things is widely different from that on earth. Yet there is a limit to this principle; and when we can prove another world to be in a similar condition to our earth, when it was inhabited by preadamic races, or not at all inhabited, the presumption is strong, that such a world has inhabitants of a like character, or none at all.

Our author makes but a slight allusion to some most important statements of revelation, that seem to us to bear strongly upon the hypothesis which he adopts. We refer to the existence of angels, holy and unholy. In the history of the latter, we learn that *they kept not their first estate, but left their own habitation*. Have we not here an example of other rational creatures, more exalted than man, who, like him, have fallen from their first estate; and does not the presumption hence arise, that there may be similar examples in other worlds? And is there not a probability, that holy angels now in heaven, may be rational intelligences who have passed a successful probation in other worlds? It does seem to us, that these biblical facts make the hypothesis of our author respecting man extremely improbable.

But though we must demur as to some of the views of this work, we can cordially recommend its perusal to intelligent and reasoning minds. It is an effort in the right direction, and we think will do much to correct some false notions respecting the Plurality of Worlds. And even the author's peculiar hypothetical views are sustained with much ability. He states the facts of geology and astronomy with great clearness and correctness, and seems quite familiar with mathematical reasoning. Nor does he advance opinions that come into collision with natural or revealed religion; though, as already stated, we think his favorite notions narrow our conceptions of the Divine plans and purposes. We predict for the work an extended circulation among scientific men and theologians; and commend it with confidence to all readers—and in our country they are numerous—who are fond of tracing out the connection between science and religion.

E. H.

Amherst College, April, 1854.

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?"

1. 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 reflection thus suggested, in connection 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 splendor, 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 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 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 centre and base. Perhaps the Psalmist, at a subsequent period of his contemplations, when he was pondering the reflections 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 show 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 show. 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, 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, short-lived creatures, it might be unworthy the regards of Him who dwelt in regions of eternal light and splendor, 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 reflection, 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 reflection 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 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 inhabitants 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 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 8,000 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.¹ 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 centre of the Solar System, why should not Sirius, (one of the brightest of the fixed stars,) be the centre 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 inhabitants of the solar system: this number being, according to all the analogies, very many fold 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

¹ 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.

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 reflection: "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 reflection. 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 improvement 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: *Nebulae*, 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 quite round the sky; "A circling zone, powdered with stars;" as Milton calls it. But the nebulae 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 nebulae 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 neighborhood, 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 nebulae which we see. Perhaps, he adds, some of those other nebulae are beds and masses of stars not less numerous than those which compose our galaxy, and which occupy a larger portion of the sky, only because we are immersed in the interior of the crowd. And thus, a minute speck of nebulous light, discernible only by a good telescope, may contain not only as many stars as occupy the sky to ordinary vision, but as many as is the number into which the most powerful telescope resolves the milky light of the galaxy. And of such resolvable nebulae the number which are discovered in the sky is very great, their forms being of the most various kind; so that many of them may be, for aught we can tell, more amply stocked with stars than the galaxy is. And if all the stars, or a large proportion of the stars, of the galaxy, be suns attended by planets, and these planets peopled with living creatures, what notion must we form of the population of the universe, when we have thus to reckon as many galaxies as there are resolvable nebulae! the stock of discoverable nebulae being as yet unexhausted by the powers of our telescopes; and the possibility of resolving them into stars being also an operation which has not yet been pursued to its limit.

9. For, (and this is the last step which I shall mention in this long series of ascending steps of multitude apparently infinite,) it now begins to be suspected that not some nebulae only, but *all*, are resolvable into separate stars. When the nebulae were first carefully studied, it was supposed that they consisted, as they appeared to consist, of some diffused and incoherent matter, not of definite and limited masses. It was conceived that they were not stars, but Stellar Matter in the course of formation into stars; and it was conceived, further, that by the gradual concentration of such matter, whirling round its centre while it concentrated, not only stars, that is, suns, might be formed, but also systems of planets, circling round these suns; and thus this *Nebular Hypothesis*, as it has been termed, gave a kind of theory of the origin and formation of systems, such as the solar system. But the great telescope which Lord Rosse has constructed, and which is much more powerful than any optical instrument yet fabricated, has been directed to many of the nebulae, whose appearance had given rise to this theory; and the result has been, in a great number of cases, that the nebulae are proved to consist entirely of distinct stars; and that the diffused nebulous appearance is discovered to have been an illusion, resulting from the accumulated light of a vast number of small stars near to each other. In this manner, we are led to regard every nebula, not as an imperfectly formed star or system, but as a vast multitude of stars, and, for aught we can tell, of systems; for the apparent smallness and nearness of these stars are, it is thought, mere results of the vast distance at which they are placed from us. And thus, perhaps, all the nebulae are, what some of them seem certainly to be, so many vast armies of stars, each of which stars, we have reason to believe, is of the nature of our sun; and may have, and according to analogy has, an accompaniment of living creatures, such as our sun has, certainly on the earth, probably, it is thought, in the other planets.

10. It is difficult to grasp, in one view, the effect of the successive steps from number to number, from distance to distance, which we have thus been measuring over. We may, however, state them again briefly, in the way of enumeration.

From our own place on the earth, we pass, in thought, as a first step, to the whole globe of the Earth; from this, as a second step, to the Planets, the other globes which compose the Solar System. A third step carries us to the Fixed Stars, as visible to the naked eye; very numerous and immensely distant. The transition to the Telescopic Stars makes a fourth step; and in this, the number and the space are increased, almost beyond the power of numbers to express how many there are, and at what distances. But a fifth step:—perhaps all this array of stars, obvious and telescopic, only make up our Nebula; while the universe is occupied by other Nebulae innumerable, so distant that, seen from them, our nebula, though including, it may be, stars of the 20th magnitude, which may be 20 times or 2,000 times more remote than Sirius, would become a telescopic speck, as their nebulae are to us.

11. Various images and modes of representation have been employed, in order to convey to the mind some notion of the dimensions of the scheme of the universe to which we are thus introduced. Thus, we may reckon that a cannon-ball, moving with its usual original velocity unabated, would describe the interval between the sun and the earth in about one year. And this being so, the same missile would, from what has been said, occupy more, we know not how much more, than 200,000 years in going to the nearest fixed star: and perhaps a thousand times as much, in going to other stars belonging to our group; and then again, 200,000 times so much, or some number of the like order, in going from one group to another. When we have advanced a step or two in this mode of statement, the velocity of the cannon-ball hardly perceptibly affects the magnitude of the numbers which we have to use.

And the same nearly is the case if we have recourse to the swiftest motion with which we are acquainted; that of Light. Light travels, it is shown by indisputable scientific reasonings, in about eight minutes from the sun to the earth. Hence we can easily calculate that it would occupy at least three years to travel as far as Sirius, and probably, three thousand years, or a much greater number, to reach to the smallest stars, or to come from them to us. And thus, as Sir W. Herschel remarked, since light is the only vehicle by which information concerning these distant bodies is conveyed to us, we do, by seeing them, receive information, not what they are at this moment, but what they were, as to visible condition, thousands of years ago. Stars may have been created when man was created, and yet their light may not have reached him.² Stars may have been extinguished thousands of years ago, and yet may still be visible to our eyes, by means of the light which they emitted previous to their extinction, and which has not yet died away.

12. So vast then are the distances at which the different bodies of the universe are distributed; and yet so numerous are those bodies. In the vastness of their distances, there is, indeed, nothing which need disturb our minds, or which, after a little reflection, is likely to do so: for when we have said all that can be said, about the largeness of these distances, still there is no difficulty in finding room for them. We necessarily conceive *Space* as being infinite in its extent: however much space the heavenly bodies occupy, there is space beyond them: if they are not there, space is there nevertheless. That the stars and planets are so far from each other, is an arrangement which prevents their disturbing each other with their mutual attractions, to any destructive extent; and is an arrangement which the spacious, the infinite universe, admits of, without any difficulty.

13. But we are more especially concerned with the *Numbers* of the heavenly bodies. So many planets about our sun: so many suns, each perhaps with its family of planets: and then, all these suns making but one group: and other groups coming into view, one after another, in seemingly endless succession: and all these planets being of the nature of our earth, as all these stars are of the nature of our sun:—all this, presents to us a spectacle of a world—of a countless host of worlds—of which, when we regard them as thus arranged in planetary systems, and as having, according to all probability, years and seasons, days and nights, as we have, we cannot but accept it as at least a likely suggestion, that they have also inhabitants;—intelligent beings who can reckon these days and years; who subsist on the fruits which the season brings forth, and have their daily and yearly occupations, according to their faculties. When we take, as our scheme of the universe, such a scheme as this, we may well be overwhelmed with the number of provinces, besides that in which man dwells, which the empire of the Lord of all includes; and, recurring to the words of the Psalmist, we may say with a profundity of meaning immeasurably augmented—"Lord, what is man?"

It was this view, I conceive, which Dr. Chalmers had in his thoughts, in pursuing the speculations which I have mentioned, in the outset of this Essay.

² This thought is, however, older. Young expresses it in his *Night Thoughts*, Night IX., (published in 1744): How distant some of these nocturnal suns! So distant (says the sage) 'twere not absurd To doubt if beams, set out at nature's birth, Are yet arrived at this so foreign world.

CHAPTER II

THE ASTRONOMICAL OBJECTION TO RELIGION

1. Such astronomical views, then, as those just stated, we may suppose to be those to which Chalmers had reference, in the argument of his *Astronomical Discourses*. These real or supposed discoveries of astronomers, or a considerable part of them, were the facts which were present to his mind, and of which he there discusses the bearings upon religious truths. This multiplicity of systems and worlds, which the telescopic scrutiny of the stars is assumed to have disclosed, or to have made probable, is the main feature in the constitution of the universe, as revealed by science, to which his reflections are directed. Nor can we say that, in fixing upon this view, he has gone out of his way, to struggle with obscure and latent difficulties, such as the bulk of mankind know and care little about. For in reality, such views are generally diffused in our time and country, are common to all classes of readers, and as we may venture to express it, are the *popular* views of persons of any degree of intellectual culture, who have, directly or derivatively, accepted the doctrines of modern science. Among such persons, expressions which imply that the stars are globes of luminous matter, like the sun; that there are, among them, systems of revolving bodies, seats of life and of intelligence; are so frequent and familiar, that those who so speak, do not seem to be aware that, in using such expressions, they are making any assumption at all; any more than they suppose themselves to be making assumptions, when they speak of the globular form of the earth, or of its motion round the sun, or of its revolution on its axis. It was, therefore, a suitable and laudable purpose, for a writer like Chalmers, well instructed in science, of large and comprehensive views with regard both to religion and to philosophy, of deep and pervasive piety, and master of a dignified and persuasive eloquence, to employ himself in correcting any erroneous opinions and impressions respecting the bearing which such scientific doctrines have upon religious truth. It was his lot to labor among men of great intellectual curiosity, acuteness, and boldness: it was his tendency to deal with new views of others on the most various subjects, religious, philosophical, and social; and, on such subjects, to originate new views of his own. It fell especially within his province, therefore, to satisfy the minds of the public who listened to him, with regard to the conflict, if a conflict there was, or seemed to be, between new scientific doctrines, and permanent religious verities. He was, by his culture and his powers, peculiarly fitted, and therefore peculiarly called, to mediate between the scientific and the religious world of his time.

2. The scientific doctrine which he especially deals with, in the work to which I refer, is the multiplicity of worlds;—the existence of many seats of life, of enjoyment, of intelligence; and it may be, as he suggests also, of moral law, of transgression, of alienation from God, and of the need, and of the means, of reconciliation to Him; or of obedience to Him and sympathy with Him. That if there be many worlds resembling our world in other respects, they may resemble it in some of these, is an obvious, and we may say, an irresistible conjecture, in any speculative mind to which the doctrine itself has been conveyed. Nor can it fail to be very interesting, to see how such a writer as I have described deals with such a suggestion; how far he accepts or inclines to accept it; and if so, what aspect such a view leads him to give to truths, either belonging to Natural or to Revealed Theology, which, before the introduction of such a view, were regarded as bearing only upon the world of which man is the inhabitant.

3. The mode in which Chalmers treats this suggestion, is to regard it as the ground of an objection to Religion, either Natural or Revealed. He supposes an objector to take his stand upon the multiplicity of worlds, assumed or granted as true; and to argue that, since there are so many

worlds beside this, all alike claiming the care, the government, the goodness, the interposition, of the Creator, it is in the highest degree extravagant and absurd, to suppose that he has done, for this world, that which Religion, both Natural and Revealed, represents him as having done, and as doing. When we are told that God has provided, and is constantly providing, for the life, the welfare, the comfort of all the living things which people this earth, we can, by an effort of thought and reflection, bring ourselves to believe that it is so. When we are further told that He has given a moral law to man, the intelligent inhabitant of the earth, and governs him by a moral government, we are able, or at least the great bulk of thoughtful men, on due consideration of all the bearings of the case, are able, to accept the conviction, that this also is so. When we are still farther asked to believe that the imperfect sway of this moral law over man has required to be remedied by a special interposition of the Governor of the world, or by a series of special interpositions, to make the Law clear, and to remedy the effects of man's transgression of it; this doctrine also,—according to the old and unscientific view, which represents the human race as, in an especial manner, the summit and crown of God's material workmanship, the end of the rest of creation, and the selected theatre of God's dealings with transgression and with obedience,—we can conceive, and, as religious persons hold, we can find ample and satisfactory evidence to believe. But if this world be merely one of innumerable worlds, all, like it, the workmanship of God; all, the seats of life, like it; others, like it, occupied by intelligent creatures, capable of will, of law, of obedience, of disobedience, as man is; to hold that this world has been the scene of God's care and kindness, and still more, of his special interpositions, communications, and personal dealings with its individual inhabitants, in the way which Religion teaches, is, the objector is conceived to maintain, extravagant and incredible. It is to select one of the millions of globes which are scattered through the vast domain of space, and to suppose that one to be treated in a special and exceptional manner, without any reason for the assumption of such a peculiarity, except that this globe happens to be the habitation of us, who make this assumption. If Religion require us to assume, that one particular corner of the Universe has been thus singled out, and made an exception to the general rules by which all other parts of the Universe are governed; she makes, it may be said, a demand upon our credulity which cannot fail to be rejected by those who are in the habit of contemplating and admiring those general laws. Can the Earth be thus the centre of the moral and religious universe, when it has been shown to have no claim to be the centre of the physical universe? Is it not as absurd to maintain this, as it would be to hold, at the present day, the old Ptolemaic hypothesis, which places the Earth in the centre of the heavenly motions, instead of the newer Copernican doctrine, which teaches that the Earth revolves round the Sun? Is not Religion disproved, by the necessity under which she lies, of making such an assumption as this?

4. Such is, in a general way, the objection to Religion with which Chalmers deals; and, as I have said, his mode of treating it is highly interesting and instructive. Perhaps, however, we shall make our reasonings and speculations apply to a wider class of readers, if we consider the view now spoken of, not as an objection, urged by an opponent of religion, but rather as a difficulty, felt by a friend of religion. It is, I conceive, certain that many of those who are not at all disposed to argue against religion, but who, on the contrary, feel that their whole internal comfort and repose are bound up indissolubly with their religious convictions, are still troubled and dismayed at the doctrines of the vastness of the universe, and the multitude of worlds, which they suppose to be taught and proved by astronomy. They have a profound reverence for the Idea of God; they are glad to acknowledge their constant and universal dependence upon His preserving power and goodness; they are ready and desirous to recognize the working of His providence; they receive the moral law, as His law, with reverence and submission; they regard their transgressions of this law as sins against Him; and are eager to find the mode of reconciliation to Him, when thus estranged from him; they willingly think of God, as near to them. But while they listen to the evidence which science, as we have said, sets before them, of the long array of groups, and hosts, and myriads, of worlds, which are brought to our knowledge, they find themselves perturbed and distressed. They would willingly think of God as

near to them; but during the progress of this enumeration, He appears, at every step, to be removed further and further from them. To discover that the Earth is so large, the number of its inhabitants so great, its form so different from what man at first imagines it, may perhaps have startled them; but in this view, there is nothing which a pious mind does not easily surmount. But if Venus and Mars also have their inhabitants; if Saturn and Jupiter, globes so much larger than the earth, have a proportional amount of population; may not man be neglected or overlooked? Is he worthy to be regarded by the Creator of all? May not, must not, the most pious mind recur to the exclamation of the Psalmist: "Lord, what is man, that thou art mindful of him?" And must not this exclamation, under the new aspect of things, be accompanied by an enfeebled and less confident belief that God *is* mindful of him? And then, this array of planets, which derive their light from the Sun, extends much further than even the astronomer at first suspected. The orbit of Saturn is ten times as wide as the orbit of the earth; but beyond Saturn, and almost twice as far from the sun, Herschel discovers Uranus, another great planet; and again, beyond Uranus, and again at nearly twice *his* distance, the subtle sagacity of the astronomers of our day, surmises, and then detects, another great planet. In such a system as this, the earth shrinks into insignificance. Can its concerns engage the attention of him who made the whole? But again, this whole Solar System itself, with all its orbits and planets, shrinks into a mere point, when compared with the nearest fixed star. And again, the distance which lies between us and such stars, shrinks into incalculable smallness, when we journey in thought to other fixed stars. And again, and again, the field of our previous contemplation suffers an immeasurable contraction, as we pass on to other points of view.

5. And in all these successive moves, we are still within the dominions of the same Creator and Governor; and at every move, we are brought, we may suppose, to new bodies of his subjects, bearing, in the expansion of their number, some proportion to the expanse of space which they occupy. And if this be so, how shall the earth, and men, its inhabitants, thus repeatedly annihilated, as it were, by the growing magnitude of the known Universe, continue to be anything in the regard of Him who embraces all? Least of all, how shall men continue to receive that special, persevering, providential, judicial, personal care, which religion implies; and without the belief of which, any man who has religious thoughts, must be disturbed and unhappy, desolate and forsaken?

6. Such are, I conceive, the thoughts of many persons, under the influence of the astronomical views which Chalmers refers to as being sometimes employed against religious belief. Of course, it is natural that the views which are used by unbelievers as arguments against religious belief, should create difficulties and troubles in the minds of believers; at least, till the argument is rebutted. And of course also, the answers to the arguments, considered as infidel arguments, would operate to remove the difficulties which believers entertain on such grounds. Chalmers' reasonings against such arguments, therefore, will, so far as they are valid, avail to relieve the mental trouble of believers, who are perplexed and oppressed by the astronomical views of which I have spoken; as well as to confute and convince those who reject religion, on such astronomical grounds. It may, however, as I have said, be of use to deal with these difficulties rather as difficulties of religious men, than as objections of irreligious men; to examine rather how we can quiet the troubled and perplexed believer, than how we can triumph over the dogmatic and self-satisfied infidel. I, at least, should wish to have the former, rather than the latter of these tasks, regarded as that which I propose to myself.

I shall hereafter attempt to explain more fully the difficulties which the doctrine of the Plurality of Worlds appears to some persons to throw in the way of Revealed Religion; but before I do so, there is one part of Chalmers' answer, bearing especially upon Natural Religion, which it may be proper to attend to.

CHAPTER III

THE ANSWER FROM THE MICROSCOPE

1. It is not my business, nor my intention, to criticize the remarkable work of Chalmers to which I have so often referred. But I may say, that the arguments there employed by him, so far as they go upon astronomical or philosophical grounds, are of great weight; and upon the whole, such as we may both assent to, as scientifically true, and accept as rationally persuasive. I think, however, that there are other arguments, also drawn from scientific discoveries, which bear, in a very important and striking manner, upon the opinions in question, and which Chalmers has not referred to; and I conceive that there are philosophical views of another kind, which, for those who desire and who will venture to regard the Universe and its Creator in the wider and deeper relations which appear to be open to human speculation, may be a source of satisfaction. When certain positive propositions, maintained as true while they are really highly doubtful, have given rise to difficulties in the minds of religious persons, other positive propositions, combating these, propounded and supported by argument, that they may be accepted according to their evidence, may, at any rate, have force enough to break down and dissipate such loosely founded difficulties. To present to the reader's mind such speculations as I have thus indicated, is the object of the following pages. They can, of course, pretend to no charm, except for persons who are willing to have their minds occupied with such difficulties and such speculations as I have referred to. Those who are willing to be so employed, may, perhaps, find in what I have to say something which may interest them. For, of the arguments which I have to expound, some, though they appear to me both very obvious and very forcible, have never, so far as I am aware, been put forth in that religious bearing which seems to belong to them; and others, though aspiring to point out in some degree the relation of the Universe and its Creator, are of a very simple kind; that is, for minds which are prepared to deal with such subjects at all.

2. As I have said, the arguments with which we are here concerned refer both to Natural Religion and to Revealed Religion; and there is one of Chalmers' arguments, bearing especially upon the former branch of the subject, which I may begin by noticing. Among the thoughts which, it was stated, might naturally arise in men's minds, when the telescope revealed to them an innumerable multitude of worlds besides the one which we inhabit, was this: that the Governor of the Universe, who has so many worlds under his management, cannot be conceived as bestowing upon this Earth, and its various tribes of inhabitants, that care which, till then, Natural Religion had taught men that he does employ, to secure to man the possession and use of his faculties of mind and body; and to all animals the requisites of animal existence and animal enjoyment. And upon this Chalmers remarks, that just about the time when science gave rise to the suggestion of this difficulty, she also gave occasion to a remarkable reply to it. Just about the same time that the invention of the *Telescope* showed that there were innumerable worlds, which might have inhabitants requiring the Creator's care as much as the tribes of this earth do,—the invention of the *Microscope* showed that there were, in this world, innumerable tribes of animals, which had been all along enjoying the benefits of the Creator's care, as much as those kinds with which man had been familiar from the beginning. The telescope suggested that there might be dwellers in Jupiter or in Saturn, of giant size and unknown structure, who must share with us the preserving care of God. The microscope showed that there had been, close to us, inhabiting minute crevices and crannies, peopling the leaves of plants, and the bodies of other animals, animalcules of a minuteness hitherto unguessed, and of a structure hitherto unknown, who had been always sharers with us in God's preserving care. The telescope brought into view worlds as numerous as the drops of water which make up the ocean; the microscope brought

into view a world in almost every drop of water. Infinity in one direction was balanced by infinity in the other. The doubts which men might feel as to what God could do, were balanced by certainties which they discovered, as to what he had always been doing. His care and goodness could not be supposed to be exhausted by the hitherto known population of the earth, for it was proved that they had not hitherto been confined to that population. The discovery of new worlds at vast distances from us, was accompanied by the discovery of new worlds close to us, even in the very substances with which we were best acquainted; and was thus rendered ineffective to disturb the belief of those who had regarded the world as having God for its governor.

3. This is a striking reflection, and is put by Chalmers in a very striking manner; and it is well fitted to remove the scruples to which it is especially addressed. If there be any persons to whom the astronomical discoveries which the telescope has brought to light, suggests doubts or difficulties with regard to such truths of Natural Religion as God's care for and government of the inhabitants of the earth, the discoveries of the many various forms of animalcular life which the microscope has brought to light are well fitted to remove such doubts, and to solve such difficulties. We may easily believe that the power of God to sustain and provide for animal life, animal sustenance, animal enjoyment, can suffice for innumerable worlds besides this, without being withdrawn or distracted or wearied in this earth; for we find that it does suffice for innumerable more inhabitants of this earth than we were before aware of. If we had imagined before, that, in conceiving God as able and willing to provide for the life and pleasure of all the sentient beings which we knew to exist upon the earth, we had formed an adequate notion of his power and of his goodness, these microscopical discoveries are well adapted to undeceive us. They show us that all the notions which our knowledge, hitherto, had enabled us to form of the powers and attributes of the Creator and Preserver of all living things, are vastly, are immeasurably below the real truth of the case. They show us that God, as revealed to us in the animal creation, is the Author and Giver of life, of the organization which life implies, of the contrivances by which it is conducted and sustained, of the enjoyment by which it is accompanied, —to an extent infinitely beyond what the unassisted vision of man could have suggested. The facts which are obvious to man, from which religious minds in all ages have drawn their notions and their evidence of the Divine power and goodness, care and wisdom, in providing for its creatures, require, we find, to be indefinitely extended, in virtue of the new tribes of minute creatures, and still new tribes, and still more minute, which we find existing around us. The views of our Natural Theology must be indefinitely extended on one side; and therefore we need not be startled or disturbed at having to extend them indefinitely on the other side;—at having to believe that there are, in other worlds, creatures whom God has created, whom he sustains in life, for whom he provides the pleasures of life, as he does for the long unsuspected creatures of this world.

4. This is, I say, a reflection which might quiet the mind of a person, whom astronomical discoveries had led to doubt of the ordinary doctrines of Natural Religion. But, I think, it may be questioned, whether, to produce such doubts, is a common or probable effect of an acquaintance with astronomical discoveries. Undoubtedly, by such discoveries, a person who believes in God, in his wisdom, power, and goodness, on the evidence of the natural world, is required to extend and exalt his conceptions of those Divine Attributes. He had believed God to be the Author of many forms of life;—he finds him to be the Author of still more forms of life. He had traced many contrivances in the structure of animals, for their sustentation and well-being; his new discoveries disclose to him (for that is undoubtedly among the effects of microscopic researches) still more nice contrivances. He had seen reason to think that all sentient beings have their enjoyments; he finds new fields of enjoyment of the same kind. But in all this, there is little or nothing to disturb the views and convictions of the Natural Theologian. He must, even by the evidence of facts patent to ordinary observation, have been led to believe that the Divine Wisdom and Power are not only great, but great in a degree which we cannot fathom or comprehend;—that they are, to our apprehension, infinite: his new discoveries only confirm the impression of this infinite character of the Divine Attributes. He had before believed the

existence of an intelligent and wise Creator, on the evidence of the marks of design and contrivance, which the creation exhibited: of such design and contrivance he discovers new marks, new examples. He had believed that God is good, because he found those contrivances invariably had the good of the creature for their object: he finds, still, that this is the general, the universal scheme of the creation, now when his view of it is extended. He has no difficulty in expanding his religious conceptions, to correspond with his scientific discoveries, so far as the microscope is the instrument of discovery; there is no reason why he should have any more difficulty in doing the same, when the telescope is his informant. It is true, that in this case the information is more imperfect. It does not tell him, even that there are living inhabitants in the regions which it reveals; and, consequently, it does not disclose any of those examples of design which belong to the structure of living things. But if we suppose, from analogy, that there are living things in those regions, we have no difficulty in conceiving, from analogy also, that those living things are constructed with a care and wisdom such as appear in the inhabitants of earth. It will not readily or commonly occur to a speculator on such subjects, that there is any source of perplexity or unbelief, in such an assumption of inhabitants of other worlds, even if we make the assumption. It is as easy, it may well and reasonably be thought, for God to create a population for the planets as to make the planets themselves;—as easy to supply Jupiter with tenants, as with satellites;—as easy to devise the organization of an inhabitant of Saturn, as the structure and equilibrium of Saturn's ring. It is no more difficult for the Universal Creator to extend to those bodies the powers which operate in organized matter, than the powers which operate in brute matter. It is as easy for Him to establish circulation and nutrition in material structures, as cohesion and crystallization, which we must suppose the planetary masses to possess; or attraction and inertia, which we know them to possess. No doubt, to our conception, organization appears to be a step beyond cohesion; circulation of living fluids, a step beyond crystallization of dead masses:—but then, it is in tracing such steps, that we discern the peculiar character of the Creator's agency. He does not merely work with mechanical and chemical powers, as man to a certain extent can do; but with organic and vital powers, which man cannot command. The Creator, therefore, can animate the dust of each planet, as easily as make the dust itself. And when from organic life we rise to sentient life, we have still only another step in the known order of Creative Power. To create animals, in any province of the Universe, cannot be conceived as much more incomprehensible or incredible, than to create vegetables. No doubt, the addition of the living and sentient principle to the material, and even to the organic structure, is a mighty step; and one which may, perhaps, be made the occasion of some speculative suggestions, in a subsequent part of this Essay; but still, it is not likely that any one, who had formed his conceptions of the Divine Mind from its manifestations in the production and sustentation of animal, as well as vegetable life, on this earth, would have his belief in the operation of such a Mind, shaken, by any necessity which might be impressed upon him, of granting the existence of animal life on other planets, as well as on the earth, or even on innumerable such planets, and on innumerable systems of planets and worlds, system above system.

5. The remark of Chalmers, therefore, to which I have referred, striking as it is, does not appear to bear directly upon a difficulty of any great force. If astronomy gives birth to scruples which interfere with religion, they must be found in some other quarter than in the possibility of mere animal life existing in other parts of the Universe, as well as on our earth. That possibility may require us to enlarge our idea of the Deity, but it has little or no tendency to disturb our apprehension of his attributes.

CHAPTER IV

FURTHER STATEMENT OF THE DIFFICULTY

1. We have attempted to show that if the discoveries made by the Telescope should excite in any one's mind, difficulties respecting those doctrines of Natural Religion,—the adequacy of the Creator to the support and guardianship of all the animal life which may exist in the universe,—the discoveries of the Microscope may remove such difficulties; but we have remarked also, that the train of thought which leads men to dwell upon such difficulties does not seem to be common.

But what will be the train of thought to which we shall be led, if we suppose that there are, on other planets, and in other systems, not animals only, living things, which, however different from the animals of this earth, are yet in some way analogous to them, according to the difference of circumstances; but also creatures analogous to man;—intellectual creatures, living, we must suppose, under a moral law, responsible for transgression, the subjects of a Providential Government? If we suppose that, in the other planets of our solar systems, and of other systems, there are creatures of such a kind, and under such conditions as these, how far will the religious opinions which we had previously entertained be disturbed or modified? Will any new difficulty be introduced into our views of the government of the world by such a supposition?

2. I have spoken of man as an Intellectual Creature; meaning thereby that he has a Mind;—powers of thought, by which he can contemplate the relations and properties of things in a general and abstract form; and among other relations, moral relations, the distinction of *right* and *wrong* in his actions. Those powers of thought lead him to think of a Creator and Ordainer of all things; and his perception of right and wrong leads him to regard this Creator as also the Governor and Judge of his creatures. The operation of his mind directs him to believe in a Supreme Mind: his moral nature directs him to believe that the course of human affairs, and the condition of men, both as individuals and as bodies, is determined by the providential government of God.

3. With regard to the bearing of a merely *intellectual* nature on such questions, it does not appear that any considerable difficulty would be *at once* occasioned in our religious views, by supposing such a nature to belong to other creatures, the inhabitants of other planets, as well as to man. The existence of our own minds directs us, as I have said, to a Supreme Mind; and the nature of Mind is conceived to be, in all its manifestations, so much the same, that we can conceive minds to be multiplied indefinitely, without fear of confusion, interference, or exhaustion. There may be, in Jupiter, creatures endowed with an intellect which enables them to discover and demonstrate the relations of space; and if so, they cannot have discovered and demonstrated anything of that kind as true, which is not true for us also: their Geometry must coincide with ours, as far as each goes:—thus showing how absurdly, as Plato long ago observed, we give to the science which deals with the relations of space, a name (*geometry*), borrowed from the art of measuring the earth. The earth with its properties is no more the special basis of geometry, than are Jupiter or Saturn, or, so far as we can judge, Sirius or Arcturus and their systems, with their properties. Wherever pure intellect is, we are compelled to conceive that, when employed upon the same objects, its results and conclusions are the same. If there be intelligent inhabitants of the Moon, they may, like us, have employed their intelligence in reasoning upon the properties of lines and angles and triangles; and must, so far as they have gone, have arrived, in their thoughts, at the same properties of lines and angles and triangles, at which we have arrived. They must, like us, have had to distinguish between right angles and oblique angles. They may have come to know, as some of the inhabitants of the earth came to know, four thousand years ago, that, in a right-angled triangle, the square on the larger side is equal to the sum of the squares on the other two

sides. We can conceive occurrences which would give us evidence that the Moon, as well as the Earth, contains geometers. If we were to see, on the face of the full moon, a figure gradually becoming visible, representing a right-angled triangle with a square constructed on each of its three sides as a base; we should regard it as the work of intelligent creatures there, who might be thus making a signal to the inhabitants of the earth, that they possessed such knowledge, and were desirous of making known to their nearest neighbors in the solar system, their existence and their speculations. In such an event, curious and striking as it would be, we should see nothing but what we could understand and accept, without unsettling our belief in the Supreme and Divine Intelligence. On the contrary, we could hardly fail to receive such a manifestation as a fresh evidence that the Divine Mind had imparted to the inhabitants of the Moon, as he has to us, a power of apprehending, in a very general and abstract form, the relations of that space in which he performs his works. We should judge, that having been led so far in their speculations, they must, in all probability, have been led also to a conception of the Universe, as the field of action of a universal and Divine Mind; that having thus become geometers, they must have ascended to the Idea of a God who works by geometry.

4. But yet, by such a supposition, on further consideration, we find ourselves introduced to views entirely different from those to which we are led by the supposition of mere animal life, existing in other worlds than the earth. For, not to dwell here upon any speculations as to how far the operations of our minds may resemble the operations of the Divine Mind;—a subject which we shall hereafter endeavor to discuss;—we know that the advance to such truths as those of geometry has been, among the inhabitants of the earth, gradual and progressive. Though the human mind have had the same powers and faculties, from the beginning of the existence of the race up to the present time, (as we cannot but suppose,) the results of the exercise of these powers and faculties have been very different in different ages; and have gradually grown up, from small beginnings, to the vast and complex body of knowledge concerning the scheme and relations of the Universe, which is at present accessible to the minds of human speculators. It is, as we have said, probably about four thousand years, since the first steps in such knowledge were made. Geometry is said to have had its origin in Egypt; but it assumed its abstract and speculative character first among the Greeks. Pythagoras is related to have been the first who saw, in the clear light of demonstration, the property of the right-angled triangle, of which we have spoken. The Greeks, from the time of Socrates, stimulated especially by Plato, pursued, with wonderful success, the investigation of this kind of truths. They saw that such truths had their application in the heavens, far more extensively than on the earth. They were enabled, by such speculations, to unravel, in a great degree, the scheme of the universe, before so seemingly entangled and perplexed. They determined, to a very considerable extent, the relative motions of the planets and of the stars. And in modern times, after a long interval, in which such knowledge was nearly stationary, the progress again began; and further advances were successively made in man's knowledge of the scheme and structure of the visible heavens; till at length the intellect of man was led to those views of the extent of the Universe and the nature of the stars, which are the basis of the discussions in which we are now engaged. And thus man, having probably been, in the earliest ages of the existence of the species, entirely ignorant of abstract truth, and of the relations which, by the knowledge of such truth, we can trace in nature, (as the barbarous tribes which occupy the greater part of the earth's surface still are;) has, by a long series of progressive steps, come into the possession of knowledge, which we cannot regard without wonder and admiration; and which seems to elevate him in no inconsiderable degree, towards a community of thought with that Divine Mind, into the nature and scheme of whose works he is thus permitted to penetrate.

5. Now the knowledge which man is capable, by the nature of his mental faculties, of acquiring, being thus blank and rudimentary at first, and only proceeding gradually, by the steps of a progress, numerous, slow, and often long interrupted, to that stage in which it is the basis of our present speculations; the view which we have just taken, of the nature of Intellect, as a faculty always of the same kind, always uniform in its operations, always consistent in its results, appears to require

reconsideration; and especially with reference to the application which we made of that view, to the intelligent inhabitants of other planets and other worlds, if such inhabitants there be. For if we suppose that there are, in the Moon, or in Jupiter, creatures possessing intellectual faculties of the same kind as those of man; capable of apprehending the same abstract and general truths; able, like man, to attain to a knowledge of the scheme of the Universe; yet this supposition merely gives the capacity and the ability; and does not include any security, or even high probability, as it would seem, of the exercise of such capacity, or of the successful application of such ability. Even if the surface of the Moon be inhabited by creatures as intelligent as men, why must we suppose that they know anything more of the geometry and astronomy, than the great bulk of the less cultured inhabitants of the earth, who occupy, really, a space far larger than the surface of the Moon; and, all intelligent though they be, and in the full possession of mental faculties, are yet, on the subjects of geometry and astronomy, entirely ignorant;—their minds, as to such a knowledge, a blank? It does not follow, then, that even if there be such inhabitants in the Moon, or in the Planets, they have any sympathy with us, or any community of knowledge on the subjects of which we are now speaking. The surface of the Moon, or of Jupiter, or of Saturn, even if well peopled, may be peopled only with tribes as barbarous and ignorant as Tartars, or Esquimaux, or Australians; and therefore, by making such a supposition, we do little, even hypothetically, to extend the dominion of that intelligence, by means of which all intelligent beings have some community of thought with each other, and some suggestion of the working of the Divine and Universal Mind.

6. But, in fact, the view which we have given of the mode of existence of the human species upon the earth, as being a progressive existence, even in the development of the intellectual powers and their results, necessarily fastens down our thoughts and our speculations to the earth, and makes us feel how visionary and gratuitous it is to assume any similar kind of existence in any region occupied by other beings than man. As we have said, we have no insuperable difficulty in conceiving other parts of the Universe to be tenanted by animals. Animal life implies no progress in the species. Such as they are in one century, such are they in another. The conditions of their sustentation and generation being given, which no difference of physical circumstances can render incredible, the race may, so far as we can see, go on forever. But a race which makes a progress in the development of its faculties cannot thus, or at least cannot with the same ease, be conceived as existing through all time, and under all circumstances. Progress implies, or at least suggests, a beginning and an end. If the mere existence of a race imply a sustaining and preserving power in the Creator, the progress of a race implies a guiding and impelling power; a Governor and Director, as well as a Creator and Preserver. And progress, not merely in material conditions, not merely in the exercise of bodily faculties, but in the exercise of mental faculties, in the intellectual condition of a portion of the species, still more implies a special position and character of the race, which cannot, without great license of hypothesis, be extended to other races; and which, if so extended, becomes unmeaning, from the impossibility of our knowing what is progress in any other species;—from what and towards what it tends. The intellectual progress of the human species has been a progress in the use of thought, and in the knowledge which such use procures; it has been a progress from mere matter to mind; from the impressions of sense to ideas; from what in knowledge is casual, partial, temporary, to what is necessary, universal, and eternal. We can conceive no progress, of the nature of this, which is not identical with this; nothing like it, which is not the same. And, therefore, if we will people other planets with creatures, intelligent as man is intelligent, we must not only give to them the intelligence, but the intellectual history of the human species. They must have had their minds unfolded by steps similar to those by which the human mind has been unfolded; or at least, differing from them only as the intellectual history of one nation of the earth differs from that of another. They must have had their Pythagoras, their Plato, their Kepler, their Galileo, their Newton, if they know what we know. And thus, in order to conceive, on the Moon or on Jupiter, a race of beings intelligent like man, we must conceive, there, colonies of men, with histories resembling more or less the histories of human colonies; and indeed resembling the history

of those nations whose knowledge we inherit, far more closely than the history of any other terrestrial nation resembles that part of terrestrial history. If we do this, we exercise an act of invention and imagination which may be as coherent as a fairy tale, but which, without further proof, must be as purely imaginary and arbitrary. But if we do not do this, we cannot conceive that those regions are occupied at all by intelligent beings. Intelligence, as we see in the human race, in order to have those characters which concern our argument, implies a history of intellectual development; and to assume arbitrarily a history of intellectual development for the inhabitants of a remote planet, as a ground of reasoning either for or against Religion, is a proceeding which we can hardly be expected either to assent to or to refute. If we are to form any opinions with regard to the condition of such bodies, and to trace any bearing of such opinions upon our religious views, we must proceed upon some ground which has more of reality than such a gratuitous assumption.

7. Thus the condition of man upon the earth, as a condition of intellectual progress, implies such a special guidance and government exercised over the race by the Author of his being, as produces progress; and we have not, so far as we yet perceive, any reason for supposing that He exercises a like guidance and government over any of the other bodies with which the researches of astronomers have made us acquainted. The earth and its inhabitants are under the care of God in a special manner; and we are utterly destitute of any reason for believing that other planets and other systems are under the care of God in the same manner. If we regarded merely the existence of unprogressive races of animals upon our globe, we might easily suppose that other globes also are similarly tenanted; and we might infer, that the Creator and Upholder of animal life was active on those globes, in the same manner as upon ours. But when we come to a progressive creature, whose condition implies a beginning, and therefore suggests an end, we form a peculiar judgment with respect to God's care of that creature, which we have not as yet seen the slightest grounds to extend to other possible fields of existence, where we discern no indication of progress, of beginning, or of end. So far as we can judge, God is mindful of man, and has launched and guided his course in a certain path which makes his lot and state different from that of all other creatures.

8. Now when we have arrived at this result, we have, I conceive, reached one of the points at which the difficulties which astronomical discovery puts in the way of religious conviction begin to appear. The Earth and its human inhabitants are, as far as we yet know, in an especial manner the subjects of God's care and government, for the race is progressive. Now can this be? Is it not difficult to believe that it is so? The earth, so small a speck, only one among so many, so many thousands, so many millions of other bodies, all, probably, of the same nature with itself, wherefore should it draw to it the special regards of the Creator of all, and occupy his care in an especial manner? The teaching of the history of the human race, as intellectually progressive, agrees with the teaching of Religion, in impressing upon us that God is mindful of man; that he does regard him; but still, there naturally arises in our minds a feeling of perplexity and bewilderment, which expresses itself in the words already so often quoted, What is man, that this should be so? Can it be true that this province is thus singled out for a special and peculiar administration by the Lord of the Universal Empire?

9. Before I make any attempt to answer these questions, I must pursue the difficulty somewhat further, and look at it in other forms. As I have said, the history of Man has been, in certain nations, a history of intellectual progress, from the earliest times up to our own day. But intellectual progress has been, as I have also said, in a great measure confined to certain nations thus especially favored. The greater part of the earth's inhabitants have shared very scantily in that wealth of knowledge to which the brightest and happiest intellects among men have thus been led. But though the bulk of mankind have thus had little share in the grand treasures of science which are open to the race, their life has still been very different from that of other animals. Many nations, though they may not have been conspicuous in the history of intellectual progress, have yet not been without their place in progress of other kinds—in arts, in arms, and, above all, in morals—in the recognition of the distinction of right and wrong in human actions, and in the practical application of this distinction. Such a progress

as this has been far more extensively aimed at, than a progress in abstract and general knowledge; and, we may venture to say, has been, in many nations and in a very great measure, really effected. No doubt the imperfection of this progress, and the constant recurrence of events which appear to counteract and reverse it, are so obvious and so common as to fill with grief and indignation the minds of those who regard such a progress as the great business of the human race; but yet still, looking at the whole history of the human race, the progress is visible; and even the grief and the indignation of which we have spoken are a part of its evidences. There has been, upon the whole, a moral government of the human race. The moral law, the distinction of right and wrong, has been established in every nation; and penalties have been established for wrong-doing. The notion of right and wrong has been extended, from mere outward acts, to the springs of action, to affection, desire, and will. The course of human affairs has generally been such, that the just, the truthful, the kind, the chaste, the orderly portion of mankind have been happier than the violent and wicked. External wrong has been commonly punished by the act of human society. Internal sins, impure and dishonest designs, falsehood, cruelty, have very often led to their own punishment, by their effect upon the guilty mind itself. We do not say that the moral government which has prevailed among men has been such, that we can consider it complete and final in its visible form. We see that the aspect of things is much the contrary; and we think we see reasons why it may be expected to be so. But still, there has existed upon earth a moral government of the human race, exercised, as we must needs hold, by the Creator of man; partly through the direct operation of man's faculties, affections, and emotions; and partly through the authorities which, in all ages and nations, the nature of man has led him to establish. Now this moral progress and moral government of the human race is one of the leading facts on which Natural Religion is founded. We are thus led to regard God as the Moral Governor of man; not only his Creator and Preserver, but his Lawgiver and his Judge. And the grounds on which we entertain this belief are peculiarly the human faculties of man, and their operation in history and in society. The belief is derived from the whole complex nature of man—the working of his Affections, Desires, Convictions, Reason, Conscience, and whatever else enters into the production of human action and its consequences. God is seen to be the Moral Governor of man by evidence which is especially derived from the character of Man, and which we could not attempt to apply to any other creature than man without making our words altogether unmeaning. But would it not be too bold an assumption to speak of the Conscience of an inhabitant of Jupiter? Would it not be a rash philosophy to assume the operation of Remorse or Self-approval on the planet, in order that we may extend to it the moral government of God? Except we can point out something more solid than this to reason from, on such subjects, there is no use in our attempting to reason at all. Our doctrines must be mere results of invention and imagination. Here then, again, we are brought to the conviction that God is, so far as we yet see, in an especial and peculiar manner, the Governor of the earth and of its human inhabitants, in such a way that the like government cannot be conceived to be extended to other planets, and other systems, without arbitrary and fanciful assumptions; assumptions either of unintelligible differences with incomprehensible results, or of beings in all respects human, inhabiting the most remote regions of the universe. And here, again, therefore, we are led to the same difficulty which we have already encountered: Can the earth, a small globe among so many millions, have been selected as the scene of this especially Divine Government?

10. That when we attempt to extend our sympathies to the inhabitants of other planets and other worlds, and to regard them as living, like us, under a moral government, we are driven to suppose them to be, in all essential respects, human beings like ourselves, we have proof, in all the attempts which have been made, with whatever license of hypothesis and fancy, to present to us descriptions and representations of the inhabitants of other parts of the universe. Such representations, though purposely made as unlike human beings as the imagination of man can frame them, still are merely combinations, slightly varied, of the elements of human being; and thus show us that not only our reason, but even our imagination, cannot conceive creatures subjected to the same government to

which man is subjected, without conceiving them as being men of one kind or other. A mere animal life, with no interest but animal enjoyment, we may conceive as assuming forms different from those which appear in existing animal races; though even here, there are, as we shall hereafter attempt to show, certain general principles which run through all animal life. But when in addition to mere animal impulses, we assume or suppose moral and intellectual interests, we conceive them as the moral and intellectual interests of man. Truth and falsehood, right and wrong, law and transgression, happiness and misery, reward and punishment, are the necessary elements of all that can interest us —of all that we can call *Government*. To transfer these to Jupiter or to Sirius, is merely to imagine those bodies to be a sort of island of Formosa, or new Atlantis, or Utopia, or Platonic Polity, or something of the like kind. The boldest and most resolute attempts to devise some life different from human life, have not produced anything more different than romance-writers and political theorists have devised *as* a form of human life. And this being so, there is no more wisdom or philosophy in believing such assemblages of beings to exist in Jupiter or Sirius, without evidence, than in believing them to exist in the island of Formosa, with the like absence of evidence.

11. Any examination of what has been written on this subject would show that, in speculating about moral and intellectual beings in other regions of the universe, we merely make them to be men in another place. With regard to the plants and animals of other planets, fancy has freer play; but man cannot conceive any moral creature who is not man. Thus Fontenelle, in his *Dialogues on the Plurality of Worlds*, makes the inhabitants of Venus possess, in an exaggerated degree, the characteristics of the men of the warm climates of the earth. They are like the Moors of Grenada; or rather, the Moors of Grenada would be to them as cold as Greenlanders and Laplanders to us. And the inhabitants of Mercury have so much vivacity, that they would pass with us for insane. "Enfin c'est dans Mercure que sont les Petites-Maisons de l'Univers." The inhabitants of Jupiter and Saturn are immensely slow and phlegmatic. And though he and other writers attempt to make these inhabitants of remote regions in some respects superior to man, telling us that instead of only five senses, they may have six, or ten, or a hundred, still these are mere words which convey no meaning; and the great astronomer Bessel had reason to say, that those who imagined inhabitants in the Moon and Planets, supposed them, in spite of all their protestations, as like to men as one egg to another.³

12. But there is one step more, which we still have to make, in order to bring out this difficulty in its full force. As we have said, the moral law has been, to a certain extent, established, developed, and enforced among men. But, as I have also said, looking carefully at the law, and at the degree of man's obedience to it, and at the operation of the sanctions by which it is supported, we cannot help seeing, that man's knowledge of the law is imperfect, his conviction of its authority feeble, his transgressions habitual, their punishment and consequences obscure. When, therefore, we regard God, as the Lawgiver and Judge of man, it will not appear strange to us, that he should have taken some mode of promulgating his Law, and announcing his Judgments, in addition to that ordinary operation of the faculties of man, of which we have spoken. Revealed Religion teaches us that he has done so: that from the first placing of the race of man upon the earth, it was his purpose to do so: that by his dealing with the race of man in the earlier times, and at various intervals, he made preparation for the mission of a special Messenger, whom, in the fulness of time, he sent upon the earth in the form of a man; and who both taught men the Law of God in a purer and clearer form than any in which it had yet been given; and revealed His purpose, of rewards for obedience, and punishments for disobedience, to be executed in a state of being to which this human life is only an introduction; and established the means by which the spirit of man, when alienated from God by transgression, may be again reconciled to Him. The arrival of this especial Messenger of Holiness, Judgment, and Redemption, forms the great event in the history of the earth, considered in a religious view, as the abode of God's servants. It was attended with the sufferings and cruel death of the Divine

³ Populäre Vorlesungen über Wissenschaftliche Gegenstände, p. 31.

Messenger thus sent; was preceded by prophetic announcements of his coming; and the history of the world, for the two thousand years that have since elapsed, has been in a great measure occupied with the consequences of that advent. Such a proceeding shows, of course, that God has an especial care for the race of man. The earth, thus selected as the theatre of such a scheme of Teaching and of Redemption, cannot, in the eyes of any one who accepts this Christian faith, be regarded as being on a level with any other domiciles. It is the Stage of the great Drama of God's Mercy and Man's Salvation; the Sanctuary of the Universe; the Holy Land of Creation; the Royal Abode, for a time at least, of the Eternal King. This being the character which has thus been conferred upon it, how can we assent to the assertions of Astronomers, when they tell us that it is only one among millions of similar habitations, not distinguishable from them, except that it is smaller than most of them that we can measure; confused and rude in its materials like them? Or if we believe the Astronomers, will not such a belief lead us to doubt the truth of the great scheme of Christianity, which thus makes the earth the scene of a special dispensation.

13. This is the form in which Chalmers has taken up the argument. This is the difficulty which he proposes to solve; or rather, (such being as I have said the mode in which he presents the subject,) the objection which he proposes to refute. It is the bearing of the Astronomical discoveries of modern times, not upon the doctrines of Natural Religion, but upon the scheme of Christianity, which he discusses. And the question which he supposes his opponent to propound, as an objection to the Christian scheme, is:—How is it consistent with the dignity, the impartiality, the comprehensiveness, the analogy of God's proceedings, that he should make so special and pre-eminent a provision for the salvation of the inhabitants of this Earth, where there are such myriads of other worlds, all of which may require the like provision, and all of which have an equal claim to their Creator's care?

14. The answer which Chalmers gives to this objection, is one drawn, in the first instance, from our ignorance. He urges that, when the objector asserts that other worlds may have the like need with our own, of a special provision for the rescue of their inhabitants from the consequences of the transgression of God's laws, he is really making an assertion without the slightest foundation. Not only does Science not give us any information on such subjects, but the whole spirit of the scientific procedure, which has led to the knowledge which we possess, concerning other planets and other systems, is utterly opposed to our making such assumptions, respecting other worlds, as the objection involves. Modern Science, in proportion as she is confident when she has good grounds of proof, however strange may be the doctrines proved, is not only diffident, but is utterly silent, and abstains even from guessing, when she has no grounds of proof. Chalmers takes Newton's reasoning, as offering a special example of this mixed temper, of courage in following the evidence, and temperance in not advancing when there is no evidence. He puts, in opposition to this, the example of the true philosophical temper,—a supposed rash theorist, who should make unwarranted suppositions and assumptions, concerning matters to which our scientific evidence does not reach;—the animals and plants, for instance, which are to be found in the planet Jupiter. No one, he says, would more utterly reject and condemn such speculations than Newton, who first rightly explained the motion of Jupiter and of his attendant satellites, about which Science *can* pronounce her truths. And thus, nothing can be more opposite to the real spirit of modern science, and astronomy in particular, than arguments, such as we have stated, professing to be drawn from science and from astronomy. Since we know nothing about the inhabitants of Jupiter, true science requires that we say and suppose nothing about them; still more requires that we should not, on the ground of assumptions made with regard to them, and other supposed groups of living creatures, reject a belief, founded on direct and positive proofs, such as is the belief in the truths of Natural and of Revealed Religion.

15. To this argument of Chalmers, we may not only give our full assent, but we may venture to suggest, in accordance with what we have already said, that the argument, when so put, is not stated in all its legitimate force. The assertion that the inhabitants of Jupiter have the same need as we have, of a special dispensation for their preservation from moral ruin, is not only as merely

arbitrary an assumption, as any assertion could be, founded on a supposed knowledge of an analogy between the botany of Jupiter, and the botany of the earth; but it is a great deal more so. There may be circumstances which may afford some reason to believe that something of the nature of vegetables grows on the surface of Jupiter; for instance, if we find that he is a solid globe surrounded by an atmosphere, vapor, clouds, showers. But, as we have already said, there is an immeasurable distance between the existence of unprogressive tribes of organized creatures, plants, or even animals, and the existence of a progressive creature, which can pass through the conditions of receiving, discerning, disobeying, and obeying a moral law; which can be estranged from God, and then reconciled to him. To assume, without further proof, that there are, in Jupiter, creatures of such a nature that these descriptions apply to them, is a far bolder and more unphilosophical assumption, than any that the objector could make concerning the botany of Jupiter; and therefore, the objection thus supposed to be drawn from our supposed knowledge, is very properly answered by an appeal to our really utter ignorance, as to the points on which the argument rests.

16. This appeal to our ignorance is the main feature in Chalmers' reasonings, so far as the argument on the one side or the other has reference to science. Chalmers, indeed, pursues the argument into other fields of speculation. He urges, that not only we have no right to assume that other worlds require a redemption of the same kind as that provided for man, but that the very reverse maybe the case. Man maybe the only transgressor; and this, the only world that needed so great a provision for its salvation. We read in Scripture, expressions which imply that other beings, besides man, take an interest in the salvation of man. May not this be true of the inhabitants of other worlds, if such inhabitants there be? These speculations he pursues to a considerable length, with great richness of imagination, and great eloquence. But the suppositions on which they proceed are too loosely connected with the results of science, to make it safe for us to dwell upon them here.

17. I conceive, as I have said, that the argument with which Chalmers thus deals admits of answers, also drawn from modern science, which to many persons will seem more complete than that which is thus drawn from our ignorance. But before I proceed to bring forward these answers, which will require several steps of explanation, I have one or two remarks still to make.

18. Undoubtedly they who believe firmly both that the earth has been the scene of a Divine Plan for the benefit of man, and also that other bodies in the universe are inhabited by creatures who may have an interest in such a Plan, are naturally led to conjectures and imaginations as to the nature and extent of that interest. The religious poet, in his Night Thoughts, interrogates the inhabitants of a distant star, whether their race too has, in its history, events resembling the fall of man, and the redemption of man.

Enjoy your happy realms their golden age?
And had your Eden an abstemious Eve?
Or, if your mother fell are you redeemed?
And if redeemed, is your Redeemer scorned?

And such imaginations may be readily allowed to the preacher or the poet, to be employed in order to impress upon man the conviction of his privileges, his thanklessness, his inconsistency, and the like. But every form in which such reflections can be put shows how intimately they depend upon the nature and history of man. And when such reflections are made the source of difficulty or objection in the way of religious thought, and when these difficulties and objections are represented as derived from astronomical discoveries, it cannot be superfluous to inquire whether astronomy has really discovered any ground for such objections. To some persons it may be more grateful to remedy one assumption by another: the assumption of moral agents in other worlds, by the assumption of some operation of the Divine Plan in other worlds. But since many persons find great difficulty in conceiving such an operation of the Divine Plan in a satisfactory way; and many persons also

think that to make such unauthorized and fanciful assumptions with regard to the Divine Plans for the government of God's creatures is a violation of the humility, submission of mind, and spirit of reverence which religion requires; it may be useful if we can show that such assumptions, with regard to the Divine Plans, are called forth by assumptions equally gratuitous on the other side: that Astronomy no more reveals to us extra-terrestrial moral agents, than Religion reveals to us extra-terrestrial Plans of Divine government. Chalmers has spoken of the *rashness* of making assumptions on such subjects without proof; leaving it however, to be supposed, that though astronomy does not supply proof of intelligent inhabitants of other parts of the universe, she yet does offer strong analogies in favor of such an opinion. But such a procedure is more than rash: when astronomical doctrines are presented in the form in which they have been already laid before the reader, which is the ordinary and popular mode of apprehending them, the analogies in favor of "other worlds," are (to say the least) greatly exaggerated. And by taking into account what astronomy really teaches us, and what we learn also from other sciences, I shall attempt to reduce such "analogies" to their true value.

14. The privileges of man, which make the difficulty in assigning him his place in the vast scheme of the Universe, we have described as consisting in his being an *intellectual, moral, and religious* creature. Perhaps the privileges implied in the last term, and their place in our argument, may justify a word more of explanation. Religion teaches us that there is opened to man, not only a prospect of a life in the presence of God, after this mortal life, but also the possibility and the duty of spending this life as in the presence of God. This is properly the highest result and manifestation of the effect of Religion upon man. Precisely because it is this, it is difficult to speak of this effect without seeming to use the language of enthusiasm; and yet again, precisely because it is so, our argument would be incomplete without a reference to it. There is for man, a possibility and a duty of bringing his thoughts, purposes, and affections more and more into continual unison with the will of God. This, even Natural Religion taught men, was the highest point at which man could aim; and Revealed Religion has still more clearly enjoined the duty of aiming at such a condition. The means of a progress towards such a state belong to the Religion of the heart and mind. They include a constant purification and elevation of the thoughts, affections, and will, wrought by habits of religious reflection and meditation, of prayer and gratitude to God. Without entering into further explanation, all religious persons will agree that such a progress is, under happy influences, possible for man, and is the highest condition to which he can attain in this life. Whatever names may have been applied at different times to the steps of such a progress;—the cultivation of the divine nature in us; resignation; devotion; holiness; union with God; living in God, and with God in us;—religious persons will not doubt that there is a reality of internal state corresponding to these expressions; and that, to be capable of elevation into the condition which these expressions indicate, is one of the especial privileges of man. Man's soul, considered especially as the subject of God's government, is often called his *Spirit*; and that man is capable of such conformity to the will of God, and approximation to Him, is sometimes expressed by speaking of him as a *spiritual creature*. And though the privilege of being, or of being capable of becoming, in this sense, a spiritual creature, is a part of man's religious privileges; we may sometimes be allowed to use this additional expression, in order to remind the reader, how great those religious privileges are, and how close is the relation between man and God, which they imply.

15. We have given a view of the peculiar character of man's condition, which seem to claim for him a nature and place unique and incapable of repetition, in the scheme of the universe; and to this view astronomy, exhibiting to us the habitation of man as only one among many similar abodes, offers an objection. We are, therefore, now called upon, I conceive, to proceed to exhibit the answer which a somewhat different view of modern science suggests to this difficulty or objection.

For this purpose, we must begin by regarding the Earth in another point of view, different from that hitherto considered by us.

CHAPTER V

GEOLOGY

1. Man, as I trust has been made apparent to the consciousness and conviction of the reader, is an intelligent, moral, religious, and spiritual creature; and we have to discuss the difficulty, or perplexity, or objection, which arises in our minds, when we consider such a creature as occupying an habitation, which is but one among many globes apparently equally fitted to be the dwelling-places of living things—a mere speck in the immensity of creation—an atom among such a vast array of material structures—a world, as we needs must deem it, among millions of other objects which appear to have an equal claim to be regarded as worlds.

2. The difficulty appears to be great, either way. Can the earth alone be the theatre of such intelligent, moral, religious, and spiritual action? On the other hand, can we conceive such action to go on in the other bodies of the universe? If we take the latter alternative, we must people other planets and other systems with men such as we are, even as to their history. For the intellectual and moral condition of man implies a *history* of the species; and the view of man's condition which religion presents, not only involves a scheme of which the history of the human race is a part, but also asserts a peculiar reference had, in the provisions of God, to the nature of man; and even a peculiar relation and connection between the human and the divine nature. To extend such suppositions to other worlds would be a proceeding so arbitrary and fanciful, that we are led to consider whether the alternative supposition may not be more admissible. The alternative supposition is, that man is, in an especial and eminent manner, the object of God's care; that his place in the creation is, not that he merely occupies one among millions of similar domiciles provided in boundless profusion by the Creator of the Universe, but that he is the servant, subject, and child of God, in a way unique and peculiar; that his being a spiritual creature, (including his other attributes in the highest for the sake of brevity,) makes him belong to a spiritual world, which is not to be judged of merely by analogies belonging to the material universe.

3. Between these two difficulties the choice is embarrassing, and the decision must be unsatisfactory, except we can find some further ground of judgment. But perhaps this is not hopeless. We have hitherto referred to the evidence and analogies supplied by one science, namely, astronomy. But there are other sciences which give us information concerning the nature and history of the earth. From some of these, perhaps, we may obtain some knowledge of the place of the earth in the scheme of creation—how far it is, in its present condition, a thing unique, or only one thing among many like it. Any science which supplies us with evidence or information on this head, will give us aid in forming a judgment upon the question under our consideration. To such sciences, then, we will turn our attention.

One science has employed itself in investigating the nature and history of the earth by an examination of the materials of which it is composed; namely, Geology. Let us call to mind some of the results at which this science has arrived.

4. A very little attention to what is going on among the materials of which the earth's surface is composed, suffices to show us that there are causes of change constantly and effectually at work. The earth's surface is composed of land and water, hills and valleys, rocks and rivers. But these features undergo change, and produce change in each other. The mountain-rivers cut deeper and deeper into the ravines in which they run; they break up the rocks over which they rush, use the fragments as implements of further destruction, pile them up in sloping mounds where the streams issue from the mountains, spread them over the plains, fill up lakes with sediment, push into the sea great deltas.

The sea batters the cliffs and eats away the land, and again, forms banks and islands where there had been deep water. Volcanoes pour out streams of lava, which destroy the vegetation over which they flow, and which again, after a series of years, are themselves clothed with vegetation. Earthquakes throw down tracts of land beneath the sea, and elevate other tracts from the bottom of the ocean. These agencies are everywhere manifest; and though at a given moment, at a given spot, their effect may seem to us almost imperceptible, too insignificant to be taken account of, yet in a long course of years almost every place has undergone considerable changes. Rivers have altered their courses, lakes have become plains, coasts have been swept away or have become inland districts, rich valleys have been ravaged by watery or fiery deluges, the country has in some way or other assumed a new face. The present aspect of the earth is in some degree different from what it was a few thousand years ago.

5. But yet, in truth, the changes of which we thus speak have not been very considerable. The forms of countries, the lines of coasts, the ranges of mountains, the groups of valleys, the courses of rivers, are much the same now as they were in ancient times. The face of the earth, since man has had any knowledge of it, may have undergone some change, but the changeable has borne a small proportion to the permanent. Changes have taken place, and are taking place, but they do not take place rapidly. The ancient earth and the modern earth are, in all their main physical features, identical; and we must go backwards through a considerably larger interval than that which carries us back to what we usually term *antiquity*, before we are led, by the operation of causes now at work, to an aspect of the earth's surface very different from that which it now presents.

6. For instance, rivers do, no doubt, more or less alter, in the course of years, by natural causes. The Rhine, the Rhone, the Po, the Danube, have, certainly, during the last four thousand years, silted up their beds in level places, expanded the deltas at their mouths, changed the channels by which they enter the sea; and very probably, in their upper parts, altered the forms of their waterfalls and of their shingle beds. Yet even if we were thus to go backwards ten thousand, or twenty, or thirty thousand years, (setting aside great and violent causes of change, as earthquakes, volcanic eruptions, and the like,) the general form and course of these rivers, and of the ranges of mountains in which they flow, would not be different from what it is now. And the same may be said of coasts and islands, seas and bays. The present geography of the earth may be, and from all the evidence which we have, must be, very ancient, according to any measures of antiquity which can apply to human affairs.

7. But yet the further examination of the materials of the earth carries us to a view beyond this. Though the general forms of the land and the waters of continents and seas, were, several thousand years ago, much the same as they now are; yet it was not always so. We have clear evidence that large tracts which are now dry ground, were formerly the bed of the ocean; and these, not tracts of the shore, where the varying warfare of sea and land is still going on, but the very central parts of great continents; the Alps, the Pyrenees, the Himalayas. For not only are the rocks of which these great mountain-chains consist, of such structure that they appear to have been formed as layers of sediment at the bottom of water; but also, these layers contain vast accumulations of shells, or impressions of shells, and other remains of marine animals. And these appearances are not few, limited, or partial. The existence of such marine remains, in the solid substance of continents and mountains, is a general, predominant, and almost universal fact, in every part of the earth. Nor is any other way of accounting for this fact admissible, than that those materials really have, at some time, formed bottoms of seas. The various other conjectures and hypotheses, which were put forward on this subject, when the amount, extent, multiplicity, and coherence of the phenomena were not yet ascertained, and when their natural history was not yet studied, cannot now be considered as worthy of the smallest regard. That many of our highest hills are formed of materials raised from the depths of ocean, is a proposition which cannot be doubted, by any one, who fairly examines the evidence which nature offers.

8. If we take this proposition only, we cannot immediately connect it with our knowledge respecting the surface of the earth in its present form. We learn that what is now land, has been sea; and we may suppose (since it is natural to assume that the bulk of the sea has not much changed) that

what is now sea was formerly land. But, except we can learn something of the manner in which this change took place, we cannot make any use of our knowledge. Was the change sudden, or gradual; abrupt, or successive; brief, or long-continuing?

9. To these questions, the further study of the facts enables us to return answers with great confidence. The change or changes which produced the effects of which we have spoken—the conversion of the bottom of the ocean into the centre of our greatest continents and highest mountains,—were undoubtedly gradual, successive, and long continued. We must state very briefly the grounds on which we make this assertion.

10. The masses which form our mountain-chains, offer evidence, as I have said, that they were deposited as sediment at the bottom of a sea, and then hardened. They consist of successive layers of such sediment, making up the whole mass of the mountain. These layers are, of course, to a certain extent, a measure of the time during which the deposition of sediment took place. The thicker the mass of sediment, the more numerous and varied its beds, and the longer period must we suppose to have been requisite for its formation. Without making any attempt at accurate or definite estimation, which would be to no purpose, it is plain that a mass of sedimentary strata five thousand or ten thousand feet thick, must have required, for its deposit, a long course of years, or rather, a long course of ages.

11. But again: on further examination it is found, that we have not merely one series of sedimentary deposits, thus forming our mountains. There are a number of different series of such layers or strata, to be found in different ranges of hills, and in the same range, one series resting upon another. These different series of strata are distinguishable from one another by their general structure and appearance, besides more intimate characters, of which we shall shortly have to speak. Each such series appears to have a certain consistency of structure within itself; the layers of which it is composed being more or less parallel, but the successive series are not thus always parallel, the lower ones being often highly inclined and irregular, while the upper ones are more level and continuous: as if the lower strata had been broken up and thrown into disorder, and then a new series of strata had been deposited horizontally on their fragments. But in whatever way these different sedimentary series succeeded each other, each series must have required, as we have seen, a long period for its formation; and to estimate the length of the interval between the two series, we have, at the present stage of our exposition, no evidence.

12. But the mechanical structure of the strata, the result, as it seems, of aqueous sedimentary deposit, is not the only, nor the most important evidence, with regard to the length of time occupied by the formation of the rocky layers which now compose our mountains. As we have said, they contain shells, and other remains of creatures which live in the sea. These they contain, not in small numbers, scattered and detached, but in vast abundance, as they are found in those parts of the ocean which is most alive with them. There are the remains of oysters and other shell-fish in layers, as they live at present in the seas near our shores; of corals, in vast patches and beds, as they now occur in the waters of the Pacific; of shoals of fishes, of many different kinds, in immense abundance. Each of these beds of shells, of corals, and of fishes, must have required many years, perhaps many centuries, for the growth of the successive individuals and successive generations of which it consists: as long a time, perhaps, as the present inhabitants of the sea have lived therein: or many times longer, if there have been many such successive changes. And thus, while the present condition of the earth extends backwards to a period of vast but unknown antiquity; we have, offered to our notice, the evidence of a series of other periods, each of which, so far as we can judge, may have been as long or longer than that during which the dry land has had its present form.

13. But the most remarkable feature in the evidence is yet to come. We have spoken in general of the oysters, and corals, and fishes, which occur in the strata of our hills; as if they were creatures of the same kinds which we now designate by those names. But a more exact examination of these remains of organized beings, shows that this is not so. The tribes of animals which are found petrified

in our rocks are almost all different, so far as our best natural historians can determine, from those which now live in our existing seas. They are different species; different genera. The creatures which we find thus embedded in our mountains, are not only dead as individuals, but extinct as species. They belonged, not only to a terrestrial period, but to an animal creation, which is now past away. The earth is, it seems, a domicile which has outlasted more than one race of tenants.

14. It may seem rash and presumptuous in the natural historian to pronounce thus peremptorily that certain forms of life are nowhere to be found at present, even in the unfathomable and inaccessible depths of the ocean. But even if this were so, the proposition that the earth has changed its inhabitants, since the rocks were formed, of which our hills consist, does not depend for its proof on this assumption. For in the organic bodies which our strata contain, we find remains, not only of marine animals, but of animals which inhabit the fresh waters, and the land, and of plants. And the examination of such remains having been pursued with great zeal, and with all the aids which natural history can supply, the result has been, the proofs of a vast series of different tribes of animals and plants, which have successively occupied the earth and the seas; and of which the number, variety, multiplicity, and strangeness, exceed, by far, everything which could have been previously imagined. Thus Cuvier found, in the limestone strata on which Paris stands, animals of the most curious forms, combining in the most wonderful manner the qualities of different species of existing quadrupeds. In another series of strata, the Lias, which runs as a band across England from N. E. to S. W., we have the remains of lizards, or lacertine animals, different from those which now exist, of immense size and of extraordinary structure, some approaching to the form of fishes (*ichthyosaurus*); others, with the neck of a serpent; others with wings, like the fabled forms of dragons. Then beyond these, that is, anterior to them in the series of time, we have the immense collection of fossil plants, which occur in the Coal Strata; the shells and corals of the Mountain Limestone; the peculiar fishes, different altogether from existing fishes, of the Old Red Sandstone; and though, as we descend lower and lower, the traces of organic life appear to be more rare and more limited in kind, yet still we have, beneath these, in slates and in beds of limestone, many fossil remains, still differing from those which occur in the higher, and therefore, newer strata.

15. We have no intention of instituting any definite calculation with regard to the periods of time which this succession of forms of organic life may have occupied. This, indeed, the boldest geological speculators have not ventured to do. But the scientific discoveries thus made, have a bearing upon the analogies of creation, quite as important as the discoveries of astronomy. And therefore we may state briefly some of the divisions of the series of terrestrial strata which have suggested themselves to geological inquirers. At the outset of such speculations, it was conceived that the lower rocks, composed of granite, slate, and the like, had existed before the earth was peopled with living things; and that these, being broken up into inclined positions, there were deposited upon them, as the sediment of superincumbent waters, strata more horizontal, containing organic remains. The former were then called *Primitive* or *Primary*, the latter, *Secondary* rocks. But it was soon found that this was too sweeping and peremptory a division. Rocks which had been classed as Primary, were found to contain traces of life; and hence, an intermediate class of *Transition* strata was spoken of. But this too was soon seen to be too narrow a scheme of arrangement, to take in the rapidly-accumulating mass of facts, organic and others, which the geological record of the earth's history disclosed. It appeared that among the fossil-bearing strata there might be discerned a long series of Formations: the term *Formation* being used to imply a collection of successive strata, which, taking into account all the evidence, of materials, position, relations, and organic remains, appears to have been deposited during some one epoch or period; so as to form a natural group, chronologically and physiologically distinct from the others. In this way it appeared that, taking as the highest part of the Secondary series, the beds of chalk, which, marked by characteristic fossils, run through great tracts of Europe, with other beds, of sand and clay, which generally accompany these; there was, below this *Cretaceous Formation*, an *Oolitic Formation*, still more largely diffused, and still more abundant in its peculiar

organic remains. Below this, we have, in England, the *New Red Sandstone Formation*, which, in other countries, is accompanied by beds abundant in fossils, as the *Muschelkalk* of Germany. Below this again we have the *Coal Formation*, and the *Mountain Limestone*, with their peculiar fossils. Below these, we have the Old Red Sandstone or Devonian System, with its peculiar fishes and other fossils. Beneath these, occur still numerous series of distinguishable strata; which have been arranged by Sir Roderick Murchison as the members of the *Silurian* formation; the researches by which it was established having been carried on, in the first place, in South Wales, the ancient country of the Silures. Including the lower part of this formation, and descending still lower in order, is the *Cambrian* formation of Professor Sedgwick. And since the races of organic beings, as we thus descend through successive strata, seem to be fewer and fewer in their general types, till at last they disappear; these lower members of the geological series have been termed, according to their succession, *Palaeozoic*, *Protozoic*, and *Hypozoic* or *Azoic*. The general impression on the minds of geologists has been, that, as we descend in this long staircase of natural steps, we are brought in view of a state of the earth in which life was scantily manifested, so as to appear to be near its earliest stages.

16. Each of these formations is of great thickness. Several of the members of each formation are hundreds, many of them thousands of feet thick. Taken altogether, they afford an astounding record of the time during which they must have been accumulating, and during which these successive groups of animals must have been brought into being, lived, and continued their kinds.

17. We must add, that over the Secondary strata there are found, in patches, generally of more limited extent, another, and of course, newer mass of strata, which have been termed *Tertiary Formations*. Of these, the strata, near and under Paris, lying in a hollow of the subjacent strata, and hence termed the *Paris Basin*, attracted prominent notice in the first place. And these are found to contain an immense quantity of remains of animals, which, being well preserved, and being subjected to a careful and scientific scrutiny by the great naturalist George Cuvier, had an eminent share in establishing in the minds of Geologists the belief of the extinct character of fossil species, and of the possibility of reconstructing, from such remains, the animals, different from those which now live, which had formerly tenanted the earth.

18. We have, in this enumeration, a series of groups of strata, each of which, speaking in a general way, has its own population of animals and plants, and is separated, by the peculiarities of these, from the groups below and above it. Each group may, in a general manner, be considered as a separate creation of animal and vegetable forms—creatures which have lived and died, as the races now existing upon the earth live and die; and of which the living existence may, and according to all appearance must, have occupied ages, and series of ages, such as have been occupied by the present living generations of the earth. This series of creations, or of successive periods of life, is, no doubt, a very striking and startling fact, very different from anything which the imagination of man, in previous stages of investigation of the earth's condition, had conceived; but still, is established by evidence so complete, drawn from an examination and knowledge of the structures of living things so exact and careful, as to leave no doubt whatever of the reality of the fact, on the minds of those who have attended to the evidence; founded, as it is, upon the analogies, offices, anatomy, and combinations of organic structures. The progress of human knowledge on this subject has been carried on and established by the same alternations of bold conjectures and felicitous confirmations of them,—of minute researches and large generalizations,—which have given reality and solidity to the other most certain portions of human knowledge. That the strata of the earth, as we descend from the highest to the lowest, are distinguished in general by characteristic or organic fossils, and that these forms of organization are different from those which now live on the earth, are truths as clearly and indisputably established in the minds of those who have the requisite knowledge of geology and natural history, as that the planets revolve round the sun, and satellites round the planets. That these epochs of creation are something quite different from anything which we now see taking place on the earth, no more disturbs the belief of those facts, which scientific explorers entertain, than the seemingly obvious

difference between the nebulae which are regarded as yet unformed planetary systems, and the solar system to which our earth belongs, disturbs the belief of astronomers, that such nebulae, as well as our system, really exist. Indeed we may say, as we shall hereafter see, that the fact of our earth having passed through the series of periods of organic life which geologists recognize, is, hitherto, incomparably better established, than the fact that the nebulae, or any of them, are passing through a series of changes, such as may lead to a system like ours; as some eminent astronomers in modern times have held. In this respect, the history of the world, and its place in the universe, are far more clearly learnt from geology than from astronomy.

Конец ознакомительного фрагмента.

Текст предоставлен ООО «ЛитРес».

Прочитайте эту книгу целиком, [купив полную легальную версию](#) на ЛитРес.

Безопасно оплатить книгу можно банковской картой Visa, MasterCard, Maestro, со счета мобильного телефона, с платежного терминала, в салоне МТС или Связной, через PayPal, WebMoney, Яндекс.Деньги, QIWI Кошелек, бонусными картами или другим удобным Вам способом.