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# HARMONY

OF THE

DISCOVERIES OF MODERN SCIENCE

WITH

REVEALED RELIGION.

BY

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## THE HARMONY OF THE DISCOVERIES OF MODERN SCIENCE WITH REVEALED RELIGION.

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IN the world on which we dwell—small as it is compared with some of the celestial orbs—we are presented with a diversified and expansive scene of Divine operation. The globe assigned us as our habitation, exhibits over all its surface a combination of variety, beauty, and sublimity, which is highly delightful both to the eye and to the imagination. Here spread the wide plains and fertile fields, adorned with fruits and verdure; there, the hills rise in gentle slopes, and the mountains rear their snowy heads to the clouds, distilling from their sides the brooks and rivers which enliven the plains through which they flow. Here, the lake stretches itself into a smooth expanse in the bosom of the mountains; there, the mighty rivers, in perpetual flow, convey their watery treasures to the expansive ocean. On the one hand, we behold immense continents, diversified with lakes, seas, bays, isthmuses, and peninsulas; and on the other, oceans still more spacious, diversified with thousands of islands of every form and size. When we penetrate within the surface of the globe, we find an immense variety of fossils, stones, and minerals of every description, and the indication of changes, revolutions, and the agency of powers which surpass our comprehension. Around this terraqueous mass an atmosphere is thrown, which is endowed with many admirable properties, which is the medium of light and sound, and is essentially requisite to the comfort and existence of everything that lives.

If we lift our eyes to the spaces of the firmament, we behold the sun shedding light over the world by day,

the moon cheering the shades of night, and the planets, each in its respective sphere, running their ample and solemn rounds. We perceive a thousand stars diversifying the vault of heaven, and, with the telescope, ten thousand times ten thousand more—directing our views to the remote regions of infinite space, displaying the wonders of Omnipotence, and the boundless extent of the Creator's empire. When we descend into the minute parts of creation, we perceive the most exquisite mechanism, and the most delicate contrivances in the structure of animals and vegetables; thousands of living beings swimming at large in a drop of water, or within the compass of a visible point, and all nature teeming with animated existence in every variety of size and shape.

All these and other parts of nature are the workmanship of God, in which the glory of his perfections is displayed; they are the subjects of scientific investigation; they are worthy of the study and contemplation of every rational and religious enquirer; and to such objects the word of God frequently directs our attention. "Hearken unto this, stand still, and consider the wonderful works of God."\*—"Lift up thine eyes on high and behold, who hath created these orbs."†—"He hath made the earth by his power, he hath established the world by his wisdom, he hath stretched out the heavens by his understanding."‡

It is one of the chief objects of science to investigate these works of the Almighty—to ascertain their nature and properties—the laws by which they are directed in all their movements and combinations—and the relation in which they stand to each other as parts of one grand system, contributing to the happiness of every rank of sensitive and intelligent existence. It ought likewise to be one of the objects of scientific investigation to display the unsearchable wisdom of the Creator, his boundless beneficence, and his Almighty power, as exhibited in the economy and arrangements of the material world. Now, as the Author of revelation and the Author of the system of nature is one and the same almighty Being, there must be a complete harmony between *truth* in the one department and *fact* in the other, so that, whatever

\* Job xxxvii. 14.

† Isa. xl. 26.

‡ Jer. x. 12.



discoveries may be made in the progress of scientific investigation, must be in full accordance with the declarations of the Sacred Oracles when fairly translated and rationally interpreted. For the illustration of this point, I shall, in this lecture, offer only a few miscellaneous remarks, as the full elucidation of this subject would afford matter to fill a large volume.

One main object which I intend briefly to illustrate is this: That *the declarations of Scripture, in relation to natural facts, and especially in reference to the attributes of the Deity, are in full accordance with the real discoveries of science, and the facts which are found to exist in the material world.*

I. The first topic to which I shall advert is this—That the motion of the earth on its axis and round the sun, is not repugnant to any expressions contained in Scripture, when interpreted in consistency with the general scope of the inspired writers.

This is a topic which might, perhaps, have been omitted, were it not that there are still some religious characters, even in the present day, who deny the motion of the earth, on the ground that they conceive it repugnant to the dictates of inspiration. It is not many years ago, since I heard a clergyman express himself very strongly on this point, and who charged one of his brethren with impugning divine revelation, because he attempted by certain cogent arguments to prove the motion of the earth; and it is not above eight or nine years ago since I heard a clergyman of a similar description declare from the pulpit, "that all the stars of heaven derive their light from the sun."

That the earth is a moving body, is a position which cannot be called in question by any one who has the least knowledge of astronomy; and the admission of this truth is necessary, in order to give us clear ideas of the wisdom and intelligence of the Deity in his arrangements of the material world. If the earth were supposed to be at rest in the centre of the universe, and to have no diurnal motion, the sun, in his daily course, behoved to move round a circuit of 597,000,000 of miles, which is at the rate of 414,000 miles every minute. The nearest fixed star, on account of its remote distance from the earth, would pass every day over a circle of more than

125 *billions* of miles in circumference—that is, at the rate of *one thousand four hundred and fifty millions of miles* in the space of *one second*, or the interval which elapses between the vibrations of a common pendulum clock. Those stars which are a thousand times more distant would move with a thousand times greater velocity, and the most distant stars and nebulæ which are seen through our best telescopes, would move with a velocity which numbers would scarcely be able to express. For all the bodies in the heavens—whether sun, moon, planets, or comets, the most distant fixed stars, and the thousands of clusters of nebulæ, all *apparently* move round our globe every 24 hours; and if such a prodigiously rapid motion could be conceived as *real*, it would soon shatter the universe and all the bodies it contains to atoms, although they had been composed of materials harder than platinum or adamant. But all such apparent motions are satisfactorily accounted for by a simple rotation of the earth round its axis, from west to east, every 24 hours, as is found to be the case in regard to Jupiter, Saturn, and other planetary bodies.

The admission of the *annual* motion of the earth round the sun is no less necessary in order to vindicate the wisdom of the Deity. For although the diurnal motion existed—if the earth were supposed to be stationary in one point, the whole of the motions of the planetary system would appear an inextricable mass of confusion. The planets would then be found sometimes to move backwards, sometimes forwards, at other times to stand still, and to present, on the whole, a scene of irregularity and disorder, altogether incompatible with the idea of a Being of infinite intelligence, who always proportionates one thing to another, and selects the most proper *means* in order to accomplish important *ends*. In short, were we to suppose the earth at rest in the centre of creation, and the whole universe revolving around it every day, with the immense velocities to which I have adverted, it would display a piece of folly as great as if the inhabitants of Edinburgh were to attempt to construct machinery to make the whole city move round in a circle, carrying a lamp in the centre to throw light and heat over a ball of one inch diameter, when the same purpose would have been easily effected by making the ball itself turn round its axis. If the

annual motion of the earth be admitted, we are carried forward through the ethereal regions, by this motion, at the rate of one million six hundred thousand miles every day; and, consequently, during the short time which has elapsed since we assembled together in this place, we have been transported at least 10,000 miles from the place we then occupied; and it is probable we shall never again occupy the same point of absolute space, during all the succeeding ages of eternity.

Now, it has been supposed by some religionists, that the admission of such motions of the earth runs counter to the declarations of sacred Scripture. Such passages as the following are generally brought forward in proof of this position:—"The sun ariseth, and the sun goeth down, and hasteneth to its place where it arose."\* "The sun is as a bridegroom coming out of his chamber, and rejoiceth as a strong man to run a race. His going forth is from the ends of the heavens, and his circuit to the ends of them."† These and similar scriptural expressions are evidently to be understood as spoken in reference to the *general aspect* of the scenery of nature as it *appears* to the eye of a common observer. The inspired writers, when alluding to the phenomena of nature, in almost every instance, accommodate themselves to the obvious appearances of things, and the conceptions of the great bulk of mankind. In conformity with this practice, philosophers, who all admit the motion of the earth, still use the same expressions and say, "the sun rises and sets;" and all our almanacks, and astronomical ephemerises uniformly speak of "the rising and setting of the sun, moon, and planets." There is no other mode by which such phenomena can be expressed, without using a circumlocution which would not be understood by the great bulk of mankind. Had the sacred writers said, that "the earth rose and set," or that "it turned its different sides towards the sun at different times," such language could not have been understood by the great body of the people they addressed, and would have appeared almost ridiculous. Even in the present day, such language is never used, in reference to the appearance of the sun or moon, either by divines, poets, or philosophers.

\* Eccles. i. 5.

† Psalm xix. 5, 6.

But some may be disposed to maintain, that since the sacred writers were guided by the Spirit of inspiration, their language must always correspond with the true state and nature of things, whether referring to the physical or the moral world. To this I may reply, in the first place, that the great object of divine revelation being of a moral and spiritual nature, it was not necessary that the inspired writers should enter into any learned disquisitions in reference to the system of the material universe, but that they should confine themselves merely to the plain and obvious appearances of things, when alluding to the scenes of the visible world. It was not their intention to instruct mankind in the nicer points of mathematics, astronomy, or philosophy,—which may be acquired without the aid of revelation, by the natural exercise of the human faculties; but to counteract the principles of moral evil—to instruct mankind in the knowledge of the true God, and of his moral dispensations towards our world, and to point out to them the path which leads to true happiness here, and to eternal felicity hereafter.

But, in the next place, the sacred writers, in many other instances, use expressions, not according to the *real* state of things, but according to their *apparent* aspects. Thus the moon is represented to be a greater light when compared with the stars, although it can be proved that this nocturnal luminary is 46,000 times less than the planet Saturn, which appears only like a star of the second or third magnitude. The sun and moon are both called “great lights,” in comparison of the starry orbs, although there are some of the stars undoubtedly larger than them both: and all of them taken together are incomparably larger and more splendid than the sun and moon. But they are called “two great lights,” because they *appear* the greater luminaries to our eyes, and because even the moon itself transmits more light to the earth than what proceeds from all the stars in the firmament. Again, in the account given of the “molten sea,” which Solomon constructed for the temple service, we are told that “it was ten cubits from the one brim to the other, and a line of thirty cubits did compass it round about;”\* whereas, from the known properties of a circle, we

\* 1 Kings vii. 23; 2 Chron. iv. 2.

know that, if the diameter of the brazen sea was ten cubits, the circumference behaved to be thirty-one cubits, and about two-fifths of a cubit. From this it is evident that the inspired writers did not consider it necessary, at all times, to speak in accordance with the exact language of mathematicians, but sometimes use the nearest round numbers for the whole, as in the present case, and because the circumference of a circle is vulgarly reckoned to be about three times the diameter.

Again, the Scriptures speak of the *ends* of the earth, and "the ends of heaven," as in these passages: "All the ends of the world shall remember and turn to the Lord." "Look unto me and be ye saved, all the ends of the earth." "His going forth is from the ends of heaven, and his circuit to the end thereof."\* But we know that the earth, being in the form of a globe, can have no *ends* or extremities; nor can the heavens be said, in strict language, to have any ends or boundaries. But such expressions are evidently borrowed from the *general appearances* of things. When we stand on the top of a mountain, and take a survey of the objects all around, we perceive a circle where the heavens and the earth seem to meet, and which forms the boundary of our sight. Now, at first view, the bulk of mankind, who are unacquainted with the globular figure of the earth, would be apt to imagine that those places which lay beyond the boundary of their sight, were towards the ends or extremities of the earth; and it is, doubtless, in allusion to such conceptions that the sacred writers use the expressions now quoted.

From these and other instances, which might have been quoted, it is evident that the inspired writers not unfrequently speak of the common phenomena of nature, not with philosophical exactness, but in accommodation to the general opinions and apprehensions of mankind; and consequently, that their using such expressions as "the rising and setting of the sun," cannot be supposed in the least repugnant to the philosophical idea of the motion of the earth. But when the sacred penmen give intimations, from the nature of the subject, that they are speaking according to the true nature of things, their language will be uniformly found in per-

\* Psal. xix. 6; xxii. 27. Isaiah xlv. 22.

fect harmony with the discoveries of science, as I shall endeavour to show in the sequel of this Lecture.

II. The next topic to which I shall advert, is with regard to *the origin of rivers, and the sources whence they are supplied*.—a subject which appeared involved in considerable difficulties in the infancy of science. On this point Solomon informs us, that “All the rivers run into the sea, and yet the sea is not full; to the place from whence the rivers came, thither do they return to flow again.”\* It appears, at first view, somewhat unaccountable, that the ocean has not long ere now overflowed all its banks, and the sources of the rivers been dried up, when we consider that so many majestic streams, such as the Amazon and the La Plata, whose mouths are more than a hundred miles broad—are incessantly pouring their waters into its abyss. It has been calculated, that all the large rivers on the globe carry along with them into the caverns of the ocean, no less than *twenty-six thousand cubical miles* of water every year; and they have been flowing in this manner, without intermission, for thousands of years. How then do these waters return again to their source? or, if they do not, why is not the whole surface of the dry land by this time overflowed? Some expositors of Scripture have attempted to explain this circumstance, by telling us that the waters of the ocean *percolate* through the earth, and, in some way or other, arrive at the sides or near the tops of mountains where springs generally abound. It is only a few years ago that I heard a reverend doctor of divinity maintain this position, and endeavour to illustrate by it a certain topic, in a speech on the subject of missions, which he was then delivering. But such a supposition is not only highly improbable, when we consider the vast mass of earth and rocks, several hundreds of miles in thickness, through which the waters would have to percolate, but *directly contrary* to the known laws of nature; for *no fluid can rise in a tube above the level of its source*, which in this case it behoved to do.

Modern investigations and experiments, however, have satisfactorily accounted for this fact on the principle of *evaporation*. Evaporation is a process by which water

\* Eccles. i. 7.

and other liquids are converted into vapour. *Caloric*, or the principle of heat, combining with water, renders it specifically *lighter*, by which means it rises and mixes with the atmosphere, where it remains either invisible, or assumes the appearance of clouds—in which state it occupies a space 1600 times greater than in its ordinary liquid state, and consequently is much lighter than the atmospheric air into which it rises. It has been found, by calculation and experiment, that from the whole surface of the ocean and of the land, there arise, *every day*, no less than 30,320,500,000,000, or more than *thirty billions* of cubic feet of water, or about 206 cubic miles—which is nearly three times the quantity of water sufficient to replenish the sources of all the rivers in the world. The evaporation thus raised, is carried by the winds, in the form of clouds, or of invisible vapour, over every region of the globe, and falls down in rains to carry on the various processes of nature. One part falls back into the sea, another on the low lands, and the remaining part is sufficient to replenish the sources of all the rivers;—so that the assertion of Solomon is strictly and philosophically correct, that “to the place whence the rivers come, thither they return to flow again.” They first pour their waters into the ocean; a portion of these waters is then raised by evaporation into the atmosphere; this portion of vapour, after traversing the regions of the air, in various forms, falls down in rain, mists, and dews, and supplies the numerous springs, “which run among the hills.” The waters of the ocean do not force themselves back through the earth and rocks, contrary to the laws of nature, but make a circuit through the atmosphere to the sources of the rivers, according to the established arrangements of the physical world.

This process is particularly alluded to in other parts of Scripture, as in the prophecy of Amos, where the prophet, when describing the majesty and operations of God, declares, “He calleth for the waters of the sea, and ponreth them out upon the face of the earth.”\* This description is literally realized in the process we have now described. “He calleth for the waters of the sea” to ascend to the higher regions, by subjecting them

\* Amos v. 8; ix. 6.

to the wonderful transformation of becoming 1600 times specifically lighter than they were before, and thus being capable of continually ascending and diffusing themselves throughout the higher portions of the atmosphere. After undergoing various changes in this state, they are again "poured out on the face of the whole earth," in rain and dews, to supply the sources of the rivers, and to refresh and fertilize every region of the globe. The prophet Jeremiah, when describing the characteristics of Jehovah, in opposition to the idols of the heathen, refers to this admirable process of nature, as under the direction and superintendence of the Most High. "When he uttereth his voice, there is a multitude of waters in the heavens, and *he causeth the vapours to ascend from the ends of the earth;*"\* and, in allusion to God's superintendence of this process, the question is put to Job, "Canst thou lift up thy voice to the clouds, that abundance of waters may cover thee."†

In short, this process of evaporation is exhibited in Scripture as a ground of our thanksgiving and praise. In Psalm cxxxv. the servants of God are exhorted to "praise the name of Jehovah;" and in the sequel of the psalm, various *reasons* are assigned why we should engage in this exercise. One of these reasons is, "He causeth the vapours to ascend from the ends of the earth." Some religious persons who may read this portion of sacred poetry, might be apt to overlook the circumstance now stated, as an argument for thanksgiving of very inferior importance. But if we examine the subject attentively, we shall find, that this physical operation of the Almighty is not only very wonderful in its nature; but that upon it most of our comforts, and even our *very existence*, depend. If this admirable and extensive process of nature were to cease, we might wash our clothes, but centuries of years would not be sufficient to dry them; for it is evaporation alone that produces this effect;—there could be no rains nor dews to fertilize our fields, and the consequence would be, the earth would be parched, and the vegetable productions which afford us subsistence would wither and decay; the rivers would swell the ocean, and cause it to overflow the land; while, at the same time, their sources

\* Jerem. x. 13.

† Job xxxviii. 35.



would soon be completely exhausted, and their channels dried up. In such a state of things, the whole system of terrestrial nature would be deranged, and man, with all the other tribes of animated nature, deprived of those comforts which are essential to their existence, would in a short time sink into inaction, and perish from the earth. So that it forms a powerful and impressive motive to excite us to praise the name of Jehovah, when we call to remembrance that it is He "who causeth the vapours to ascend from the ends of the earth," and thus preserves the harmony of nature, and secures to all living creatures the blessings they now enjoy.

III. The next topic which I shall very briefly illustrate is this, That the structure of the heavens, and their vast extent, as ascertained by modern astronomical discoveries, is in full accordance with the descriptions given in Scripture of the *omnipotence* and *grandeur* of the Deity.

In consequence of the progress of mathematical investigations, the improvements of the telescope, the unwearied observations of modern astronomers, and the general advancement of all the arts and sciences connected with astronomy, scenes have been laid open to our view, calculated to raise the mind to the highest pitch of admiration—scenes which are absolutely incomprehensible by finite minds, and which confound and overwhelm all our faculties—scenes which must astonish the minds even of angels, archangels, and all the other orders of intelligent existence, wherever existing throughout creation. When we contemplate the planetary system, of which we form so very small a part, and consider that there are bodies in it, which to our eye appear only like small specks of light, and yet are found to be 900 times larger than the world in which we dwell—when we behold another of these orbs 1400 times larger than the earth, carrying along with it four other magnificent globes in its swift career around the sun—when we perceive a splendid ring, 600,000 miles in circumference, surrounding one of these planets—a ring sufficiently capacious to enclose 500 globes as large as our world—when we consider that the sun, which enlightens our day, is 520 times larger than the earth and all the planets taken together, and that our world is only the *two thousand four hundred and eightieth*

part of the bulk of the other planets—when we consider, further, that these bodies are flying through the immensity of space with astonishing velocity—some of them at the rate of 30,000, others at the rate of 80,000, and some with the velocity of more than 100,000 miles every hour—when we consider such vast bodies, and such astonishing motions, we perceive a most striking display of the omnipotence and the energies of Him whose power is illimitable and uncontrollable. But, when we raise our views still farther, and contemplate the innumerable host of stars which the telescope enables us to descry throughout every region of the firmament—when we consider that every one of these luminaries is a SUN, no less splendid and spacious than ours, and doubtless surrounded by a retinue of revolving worlds—when we advert to the incalculable number of these magnificent globes—that there are at least 10,000,000 of them within the limits of the milky way, and more than 100,000,000 throughout the heavens within the range of our best telescopes—when we consider that, besides all these, there are above 3000 *nebulae*, or starry systems, invisible to the naked eye, some of which are calculated to contain at least ten or twenty thousand stars,—in short, when we consider that all this immense assemblage of suns and systems, which lie within the boundaries of mortal vision, may be no more, in comparison with what lies beyond our view in the unexplored regions of immensity, than as a drop to the ocean, or as a single particle of vapour to all the matter contained within the solar system—we feel almost lost, and confounded, and completely bewildered amidst the immensity of worlds and beings dispersed throughout the boundless empire of Jehovah! All that is already seen and known may be as nothing compared with what will always be beyond the limits of our vision; for we ought never for a moment to surmise that the operations of Almighty power are exhausted at the point where our telescopic vision terminates; nor should we ever suppose that man—placed on such a diminutive ball as the earth, and furnished with powers of so limited a nature as those he now possesses—will ever be able to grasp the dominions of Him who fills immensity with his presence, and “whose ways are past finding out.”

Great and marvellous, however, as these objects appear in the eyes of the frail beings that inhabit our world, the extent and the grandeur of Jehovah's empire, and the omnipotence which it displays, are nothing more than what the inspired writers would lead us to expect from the descriptions they give of the character and attributes of the Divinity. The following are a few of the descriptions to which I allude, "Great is our Lord, and of great power, his understanding is infinite." "Who can utter the mighty operations of Jehovah; who can show forth all his praise?" "Canst thou by searching find out God; canst thou find out the designs of the Almighty to perfection?" "By the word of the Lord were the heavens made, and all the host of them by the breath of his mouth." "He meteth out the heavens with a span, and holdeth the ocean in the hollow of his hand. All nations before Him are as nothing, and they are accounted by him less than nothing and vanity." "By his Spirit he hath garnished the heavens. The pillars of heaven tremble and are astonished at his reproof. Lo, these are only parts of his ways; they convey but a whisper of his glory, but the THUNDER of his power (or the full extent of his omnipotence) who can understand?" "Can any thing be too hard for Jehovah?" "He is the high and lofty One who inhabiteth eternity." "He is glorious in power; He dwells in light unapproachable and full of glory. He is the everlasting God, the Creator of the ends of the earth, who stretched out the heavens by his power, and there is no searching of his understanding." "The Lord hath *prepared his throne in the heavens*, and his kingdom ruleth over all." "He doth great things past finding out, and wonders without number." "Thine, O Lord, is the greatness, and the glory, and the majesty; for all that is in heaven and earth is thine. Thou art exalted above all; thou reignest over all, and in thy hand is power and might. Great things dost thou which we cannot comprehend."

Such are some of the sublime descriptions given by the sacred writers, of the character and perfections of the Deity. Now, supposing we had known nothing more of the Divinity than what these descriptions imply—supposing we had known nothing of his works but what we see around us, in this lower world,—reasoning

*a priori*, from the cause to the effect, we ought naturally to have concluded, that his works are as great and magnificent, and his kingdom as glorious and expansive as the discoveries of science have now demonstrated them to be. Since the Divine Being is described as "the lofty One who inhabiteth eternity"—since "he fills heaven and earth with his presence"—since the sphere in which he operates is absolutely BOUNDLESS—since he is "the Lord God omnipotent," whose power is uncontrollable—since "his wisdom is unsearchable, and his understanding absolutely INFINITE," it must appear in the highest degree improbable that such a Being would limit his perfections to the creation and superintendence of such a world as that in which we dwell, which is only a mere point in the immensity of space. It must appear far more reasonable to conclude that his Almighty energy is exerted throughout the boundless regions of space, and that he has launched into existence millions of worlds; for such a conclusion is nothing more than what the idea of an infinite and omnipotent intelligence would naturally lead us to deduce. The Scriptures, then, having declared to us the character of the true God, and the wonderful nature of his operations—the discoveries of astronomy afford us an abundant variety of striking proofs and illustrations of these declarations; so that the revelations communicated to us by the sacred oracles, and by the system of the material universe, perfectly harmonize, and the one throws a lustre upon the other.

This circumstance forms a strong presumptive evidence for the truth of revelation; for, if we search the mythology of the pagan world, and examine all the writings which have been handed down to us from antiquity, we shall find no description of the character of the Divine Being, either in the shasters of the Hindoos, in the sacred books of the Chinese, or in the writings of the ancient Greeks and Romans, which at all correspond with the majesty of an infinite and omnipotent Being, and the sublime discoveries which have been made in the regions of the firmament. It is in the Bible alone that the character of Jehovah is so exhibited as to correspond with the immensity and grandeur of his operations throughout the universe.

IV. The Deity is represented in the Scriptures as "the only wise God;" and it is declared that "his wisdom and understanding are unsearchable," and that he is "wonderful in counsel and excellent in working"—and these characteristics are strikingly displayed in the order and arrangement of the material creation.

I might illustrate this topic by a detail of the arrangements connected with the different parts of our terrestrial system—the mountains, rivers, lakes and seas—the functions of the atmosphere—the refraction and reflection of *light*—the variety of vegetable productions, and the relation which all these and other objects bear to the comfort of man, and of every species of animated existence. I might illustrate the same position from the admirable order which appears among the heavenly bodies—from the constancy and regularity of their motions, every one keeping its appointed path, and finishing its revolutions in its appointed period with undeviating exactness—from the accurate balancing and proportioning the magnitudes, motions, and distances of the planetary orbs—from the nice adjustment of the projectile velocity to the attractive power—from the wonderful simplicity of the physical laws on which so much beauty and harmony depend, as is apparent in the planetary system—and particularly, from the wonderful contrivance displayed in the construction of the *rings of Saturn*. That these rings should be separated 30,000 miles from the body of the planet; that they should, notwithstanding, accompany the planet in its revolution round the sun, preserving invariably the same distance from it; that they should revolve round the planet every ten hours, at the immense velocity of more than a thousand miles in a minute; and that they should never fly off to the distant regions of space, nor fall down upon the planet—are circumstances which required adjustments far more exquisite and intricate than we can conceive, and demonstrate, that the Almighty Contriver of that stupendous appendage to the globe of Saturn is, indeed, "Great in counsel, and mighty in operation."\*

But, without entering on such an extensive field of illustration, I shall present only two or three instances

\* Jerem. xxxii. 19.

of Divine mechanism as displayed in the *minute* parts of creation. There is perhaps nothing which so strikingly displays the wonders of Divine mechanism and intelligence, as the *extreme minuteness* of certain portions of animated nature. In a single drop of certain liquids, thousands of living beings are beheld, swimming at large, like small fishes in a pond, and furnished with all the organical parts requisite for animal life. Such creatures are of all sizes, from the  $\frac{1}{100}$  to the  $\frac{1}{100000}$  part of an inch in length. Some of them are ten thousand, and even ten hundred thousand times smaller than a *mite*, or the least visible point. They are of all shapes and forms: some of them appear like minute atoms, some like globes and spheroids, some like hand-bells, some like wheels turning on an axis, some like cylinders, some have numerous horns, some resemble eels and serpents, some are like long hairs, 150 times as long as they are broad, some like spires and cupolas, some like fishes, and some like animated vegetables. As to *size*, some of them are almost visible to the naked eye, and some of them so small that millions of millions of them might be contained within the compass of a square inch. Were the *number* of these creatures, throughout all the regions of earth, air, and sea, to be estimated, it would amount to a sum which, to our view, would seem to approximate to infinity.

Now, all these animated beings, however minute, are furnished with numerous organs, as well as the larger animals; in some of them their internal movements are distinctly visible; their motions are evidently voluntary, and some of them appear to be possessed of a considerable degree of sagacity. For any thing we know to the contrary, some of them may have as many distinct parts and organs as the human body; and our bodies, we know, consist of 445 muscles, 246 bones, besides several thousands of veins and lymphatic vessels, and numerous other parts and functions. Lyonet has demonstrated, by actual dissection, that there are 3941 muscles, or nine times the number in the human body, to be found in a certain caterpillar, only two inches in length, and the other parts of it proportionably numerous. How wonderfully minute, then, beyond imagination, must be the internal parts and functions of these animalculæ, when their whole bodies are so exceedingly small! What

must be the minuteness of their veins, arteries, muscles, and the particles of their blood! It exceeds all human comprehension.

In the formation of these minute living beings, then, we perceive a sensible demonstration, that the wisdom and intelligence of God are "*unsearchable*," and that he is, indeed, "**WONDERFUL IN COUNSEL AND EXCELLENT IN WORKING.**" Could we ever have conceived, unless the microscope had unfolded such objects to our view, that such a number of diversified organs of sensation, and such a profusion of the richest ornaments could have been concentrated in a single point, or rather in a space ten thousand times less than the smallest visible point? Could we have imagined that joints, muscles, a heart, a stomach, entrails, veins, arteries, a diversity of forms, and a multiplicity of other parts and functions, could have existed in breathing atoms? Could we ever have surmised that, descending from a visible point to thousands of degrees beyond it, an invisible world exists, peopled with tribes of every form and size, the extent of which, and how far it verges towards infinity *downwards*, mortals have never yet explored, and perhaps will never be able to comprehend? The existence of such objects forms, in my opinion, one of the most sensible and striking evidences of the existence of a supreme and intelligent Divinity. For, let us suppose the original atoms of matter to be moving throughout infinite space, in any direction whatever that Epicureans or atheists may suppose, it is impossible to conceive that, by any combination of elementary atoms, such minute living beings as those to which we have adverted, could ever have been formed.

The wonders of Divine mechanism might also have been exemplified in many other minute objects. For example, in the eyes of flies, beetles, butterflies, and other insects. In the eye of a common fly, two or three thousand minute globules may be counted, every one of them beautifully rounded and polished, and as capable of forming an image of an object, as a common optical lens, although the whole eye does not exceed  $\frac{1}{30}$ th of an inch in diameter. In the eyes of a silk-worm, 6234 of such globules have been found; and in the two eyes of a dragon-fly, no less than 27,000. The scales of fishes likewise present a variety of the most delicate and

beautiful pieces of mechanism. We find some of them ornamented with a prodigious number of concentric flutings, traversed by others proceeding from the centre of the scale, appearing like a fine piece of needlework, and new beauties appearing in proportion as the magnifying power is increased. The vegetable kingdom, likewise, presents an immense variety of such admirable pieces of mechanism. A transverse section of a plant, not more than a quarter of an inch in diameter, displays such beauties and varieties, as cannot be conceived without ocular inspection. I have counted in a section of this description, no less than one million, two hundred and fifty thousand pores, (or rather tubes cut off), all beautifully arranged in radii and concentric circles. But there would be no end in specifying objects of this description. All that I have now alluded to, and ten thousand times more of a similar description, are evident proofs and exemplifications of the character of the Most High as delineated in Scripture, that "his wisdom is unsearchable," that he is "wonderful in counsel, and excellent in working," and that "his ways" in creation and providence "are past finding out."

V. The discoveries which have been made in the heavens, in modern times, have led to the conclusion, *that myriads of other worlds, besides our own, exist throughout the empire of God.*

This is a conclusion which cannot be resisted, unless we suppose that the Deity has exerted his omnipotence, in creating and arranging the most stupendous system of *means*, without an *end* in view, corresponding to the magnitude and magnificence of such means—a supposition which would go far to undermine the idea of his wisdom and intelligence. The idea of an infinity of worlds existing throughout the universe, however, is so far from being repugnant to Scripture, that it is embodied in various passages of the sacred writers. At any rate, it is certain, that there is no proposition to be found within the whole range of the sacred records, which asserts, that there is only one world, or one race of intelligent beings in the universe. The language of the inspired penmen is, in all cases, perfectly consistent with the idea of myriads of worlds existing throughout the range of the empire of God; and, although the Scrip-



tures never directly or explicitly treat of this subject, yet I conceive, that the doctrine of a plurality of worlds is taken for granted, and *embodied in many passages of the sacred writings*. As the passages to which I allude are more numerous than what may be generally supposed, I shall select only two or three of them as exemplifications of the position now stated.

The first passage to which I shall advert, is recorded in the eighth Psalm. "When I consider thy heavens, the work of thy fingers, the moon and the stars which thou hast ordained; what is man that thou art mindful of him! or the son of man that thou visitest him!" Now, there could be no propriety or emphasis in this exclamation, if the inhabitants of our globe were the only, or the principal, rational beings that people the material universe. For, if man be the principal inhabitant of creation, it could be no matter of wonder and astonishment that God should be "mindful of him," and should exercise towards him a special regard, and a superintending care. Such attention and regard are nothing more than what might naturally have been expected. But, if the immensity of space be diversified by ten thousand times ten thousand worlds, replenished with rational inhabitants, as both science and reason demonstrate—if the whole race of Adam appear no more in proportion to the beings that people the amplitudes of creation, than as a drop to the ocean,—then the divine condescension appears truly wonderful and astonishing—that, from the summit of his glory in the heavens, the Most High should look down with an eye of complacency, on the sinful and puny inhabitants of the earth, and regard them with a Father's attention and care. This is evidently the leading idea which the pious exclamation of the Psalmist is intended to convey; and, therefore, if this globe were the only or the principal residence of rational beings, such language would be either without meaning, or something approaching to bombast.

The next passage I shall notice is Isaiah xl. 15-17. "Behold the nations are as the drop of a bucket, and are counted as the small dust of the balance." "All nations before Him are as nothing, and they are accounted by him as less than nothing and vanity." In these passages a comparison is drawn,—not between

“all nations” and Jehovah as an abstract being, whose perfections are infinite;—for in this respect no comparison can be made—but it must be considered as drawn between this earth with all its inhabitants, and the innumerable globes which are scattered throughout the regions of immensity. In other words, the contrast is drawn between “all nations,” and the *manifestation* Jehovah has given of his power, wisdom, and grandeur in the scenes of the universe, as might be shown from various expressions connected with the context. This comparison, too, may be considered as drawn more particularly between the *inhabitants*, or the “*nations* of the earth,” and the *innumerable orders of beings* that people the universe,—plainly implying, in my apprehension, that unnumbered intelligences occupy the celestial worlds, in comparison of which all who now dwell upon the earth, or have ever occupied its surface since time began, are only as a drop to the ocean. The passage before us may therefore be considered as almost a direct intimation of a plurality of worlds; and if it could be proved that no other worlds existed, I should scarcely consider the strong language here used as the dictate of inspiration. The most enlightened astronomer, after his boldest excursions into the illimitable tracts of creation, could devise no language to express his emotions, and the contrast that subsists between this globe and the immensity of the heavens, more appropriate than the passage before us,—where our earth and all its inhabitants are represented as “a drop” of water to the mighty ocean, or as a few particles of dust to the most spacious continents,—when compared with the grandeur and immensity of creation; yea, to complete the contrast, it is “counted as nothing, and less than nothing and vanity.”

The next passage I shall adduce as corroborative of the same position, is Nehemiah ix. 6. “Thou, even thou art Lord alone; thou hast made heaven, the HEAVEN OF HEAVENS with all their host; the earth, and all things that are therein; the seas, and all that is therein; and thou preservest them all; and the HOST OF HEAVEN worshippeth thee.” By the term “heaven” is here undoubtedly to be understood, the visible firmament, with all the stars and planets perceptible by the human eye, which is the sense in which the word *heaven* is general-

ly taken, when God is represented as its Creator. The "HEAVEN OF HEAVENS" is an expression which evidently includes in it an idea far more extensive and sublime than what most readers attach to it. It evidently intimates that, far beyond the visible starry heavens which we behold, there are unnumbered firmaments, composed of other stars and systems, stretching out towards infinity on either hand, and which mortals in their present state will never be able fully to descry. We have already attained some glimpses of such firmaments. More than a hundred millions of stars, in addition to those distinguishable by the naked eye, are within the reach of our telescopes, if all the regions of the sky were thoroughly explored. We behold several thousands of *nebulæ* in different spaces of the heavens, each of them consisting of thousands of stars, which would form a firmament as glorious and expansive, as that which appears to a common observer in the midnight sky; so that, were we removed from those of one *nebulæ* to another, we should behold, at every stage, a new firmament composed of luminaries altogether different from what we had seen before, or what we perceive in the firmament which is visible from our globe. These facts—while they display the grandeur of the Divinity,—serve likewise to illustrate many of the declarations of his word, and particularly, such expressions as that under consideration—the "heaven of heavens," the boundless empire of the "King eternal and invisible," in which he reigns over unnumbered intelligences.

By "THE HOST OF HEAVEN" is doubtless to be understood the *inhabitants* of those numerous worlds, here designated by the most emphatical expression which could be selected, "the heaven of heavens," intimating, that the same Almighty Being who launched them into existence, has also replenished them with countless orders of intelligent existence, capable of enjoying his bounty, and offering to him a tribute of adoration. Hence, it is here declared, "the host of heaven WORSHIPETH thee," evidently implying, that these inhabitants of "the heaven of heavens" are endowed with capacious powers of intellect—that their numbers correspond with the amplitude of the regions which they occupy—that most, if not all of them, are invested with the attribute of moral perfection—that they employ their

faculties in contemplating the perfections of their Creator—and that they adore him, in the loftiest strains, as the source of all their felicity. All which appears to be implied in the passage, “the host of heaven worshippeth thee.” For no being can, with propriety, be said to worship Jehovah, unless such as are endowed with moral and intellectual powers capable of appreciating his perfections, as displayed in the universe, and of perceiving that he is worthy of all homage and adoration.

Several other passages might have been brought forward as embodying sentiments of the same description, such as, “The Lord hath prepared his throne in the heavens; and his kingdom ruleth over all.”\* Such passages evidently imply, that the HEAVENS form the principal part of the divine empire, compared with which this earth is but as a point, and “all its inhabitants reputed as nothing.” Jehovah is represented as “*having established his THRONE in the heavens,*” to intimate, that it is in those higher and more expansive regions that the principal arrangements of his government have been made, that the beneficence and rectitude of his character are manifested, and that the grandeur of his moral administration is most extensively displayed. For it is evident, that where there are no intellectual beings, there can be no moral government; and therefore, if the Almighty has a government in the heavens, these heavens must be peopled with beings endowed with moral and intellectual faculties, capable of being the subjects of a moral administration. To suppose a government without *subjects*, is evidently preposterous and absurd. And, when it is said, “*his kingdom ruleth over all,*” it likewise evidently implies, that however numerous the worlds and systems dispersed throughout the sidereal heavens, they are all under the superintendence and sway of the Divine government, which extends its moral energies over the remotest regions of the universe. But as there can be no kingdom without rational and moral subjects, therefore, wherever the kingdom of Jehovah extends throughout the illimitable spaces of immensity, there must be myriads of beings endowed with rational and moral natures. The same things are intimated in such passages as the following. “His kingdom is an

\* Psalm ciii. 19.

everlasting kingdom.”—“His dominion is an everlasting dominion.”—“He doth according to his will *in the army of heaven*, and among the inhabitants of the earth.” All which, and similar passages, imply *rule* and *dominion* over the inhabitants of the heavens, and consequently that rational inhabitants actually exist in the remote regions of creation.

The following passage may also be considered as embodying a similar idea, “The Lord is good to all; and *his tender mercies are over all his works*;”<sup>\*</sup> implying that, throughout the whole range of the material system, however far it may extend, the beneficence of the Deity is displayed to numerous ranks of his sensitive and intelligent offspring; for, unless such beings exist throughout all places of his vast dominions, there could be no scope for the universal exercise of his benevolence, and, of course, it could not be said with propriety to extend “**OVER ALL** his works.”

A variety of other passages might have been quoted, but I shall now conclude this lecture by remarking

VI. That the *divine faithfulness* is illustrated by the economy of nature.

The faithfulness of God is that perfection of his nature which leads him to perform with punctuality his promises and declarations. It is on this attribute of the Divine Being that the Christian relies for all the blessings he expects to enjoy in the present life, and for the nobler enjoyments to which he looks forward in the life to come. Now this perfection of the Divinity is illustrated in the system of nature. This is intimated in the prophecy of Jeremiah, chap. xxxi. ver. 35, 36. “Thus saith the Lord, who giveth the sun for a light by day, and the ordinances of the moon and of the stars for a light by night; who divideth the sea when the waves thereof roar—the Lord of hosts is his name. If those ordinances depart from before me, saith the Lord, then the seed of Israel also shall cease from being a nation before me for ever;”—which implies, that if these celestial orbs shall continue to run their destined rounds, and fulfil the offices assigned them, then the promises are secure to all the spiritual seed of Israel. And, have not

\* Psalm cxlv. 9.

these "ordinances" continued in existence for more than 2400 years, since the time when the prophet uttered this declaration? Have they ever stopped in their motions, or run lawless through the wilds of immensity? No: not one faileth to perform its functions in the great system of the universe. While every thing here below is in perpetual agitation and change; while rocks are crumbling down, and the caverns of the ocean filling up; while man and other animated beings are continually dropping into the grave; while mighty cities have been razed to their foundations, and scarcely a trace of their ancient glory now remains; while vast empires have been swept with the besom of destruction, and their memorials have perished with them—these luminaries of the sky still continue to shine with undiminished lustre, as at their first creation. So that "the faithfulness of God is established in the very heavens," and the sun, the moon, and the starry orbs, in their apparent diurnal revolutions round our world, bear witness to the truth and faithfulness of Jehovah.

It is further declared in the same prophecy,\* "if the heavens above can be measured, or the foundations of the earth be searched out beneath, I will also cast off all the seed of Israel, saith the Lord;"—which implies, that, if these things be impossible to be effected, then the promises of God will most certainly be accomplished in the case of all those who put their trust in his holy name. Now, notwithstanding all the discoveries of modern astronomy, it is still as true as it was in the days of Jeremiah, that the heavens above cannot be measured. Astronomers have measured the distance of the moon with so much precision, that it is as accurately determined as the distance between Edinburgh and Glasgow. The distance of the sun from the earth has been ascertained to a very near approximation, at least, within a hundredth part of the whole distance. The distances of the planets, even those which are removed from the earth no less than 1700 millions of miles, have been determined; but the distances of the nearest stars have never yet been ascertained—much less the distances of those which are removed several thousands of times further in the remote regions of space, and

\* Jer. xxxi. 37.

which can be perceived only by the best telescopes. As the discoveries of astronomy have increased, the impossibility of measuring the exact distance of the more distant luminaries of the sky has been demonstrated; and, there are bodies beyond the reach of mortal vision, which doubtless lie beyond the limits of angelic investigation. So that it is a demonstrable truth that "the heavens above cannot be measured" by mortal men, or by any intelligence less than the Divinity himself. We can demonstrate that some of the stars are not *within* a certain distance, but how far they may lie beyond that distance no astronomer will undertake to determine.

And, as heaven above cannot be measured, it is equally impossible to "search out the foundations of the earth beneath," or to determine the objects which exist near the centre of our globe, 4000 miles beneath its surface. Some have conjectured that a vast mass of waters exists in the interior of the earth; others, that it consists of the densest materials, and others, that a central fire of vast extent is continually burning. But these are all mere hypotheses, which can never be proved or substantiated; and it may be considered as a certain truth, that mortals will never be able to determine what actually exists, a thousand or even a hundred miles beneath the place where we now stand. So that every thing in nature conspires to verify the declarations of the inspired prophets of the Lord. It would have been a bold and rash attempt in Jeremiah's time for any one to have made the declarations to which we have now adverted, had he not been guided in his predictions by the Spirit of inspiration; and such declarations, so accurately according with facts and discoveries in the system of nature, are corroborative evidences of the truth of revelation.

On the whole, it is of importance to the Christian to study the works of the Creator, in connection with his word. "The works of the Lord are great, and they are investigated by all those who have pleasure therein." They display his character; they adumbrate his perfections; they exhibit the glory and magnificence of his kingdom, and they tend to invigorate and expand the faculties of the soul. They open to our view a magnificent display of the omnipotence of the Creator, of his







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