

## THE ASTRONOMY OF MILTON

BY JOHN A. PATERSON

THE grandeur of an earthly palace is measured by its distance from east to west and from north to south but the grandeur of a poem is measured by its nearness to heaven. Sublimity of thought and nobility of language are the very embodiment of "Paradise Lost;" the poem is a great poem, and, apart from its theme, the uplift is to the very heaven of heavens, and the outlook is vast as Eternity itself.

"Three poets in three distant ages born,  
Greece, Italy and England did adorn,  
The first in loftiness of mind surpassed.  
In majesty in both the last,  
The force of nature could no further go,  
To make the third she joined the former two."

and thus blind Milton, shut in "from sight of vernal bloom or summer rose, or flocks or herds or human face divine," sung of "things unattempted yet in prose or rhyme," and made the ages eloquent with that song that swept at large through the compass of the whole universe and through all heaven beyond it, and surveyed all periods of time from before the creation to the consummation of all things. We are not, however, to speak to-night of him as a poet, well called "that mighty arc of song—the divine Milton," but rather of his astronomical knowledge, what he knew of the starry heavens and what purposes he worked out by that knowledge in the exercise of his powers of imagination and description. Young in his "Night Thoughts" says,— "the undevout astronomer is mad," and we might venture to express the correlate of that thought by saying that the devout man who knows not something definite of astronomy is also mad, in that he fails to cultivate as he should those faculties that God gave him, whereby His worship would be advanced. Is it too strong

a statement to make that an average scientist knows a greater and more puissant God than an average Christian? Of an unlettered man it is said, —

“ A primrose by a river’s brim,  
A yellow primrose was to him,  
And it was nothing more.”

And of a purely scientific botanist it is added, —

“ A primrose by a river’s brim,  
Only a *dicotyledon* is to him,  
But that — and nothing more.”

Such men see nothing but the shells and husks of things, and know not what the essences of things are.

To many an intelligent man, as it was to Hamlet, (but for another reason), “ This brave o’er-hanging firmament, this majestical roof fretted with golden fire is naught but a foul and pestilent congregation of vapors ; ” but to Milton, as he uplifted his sightless eyes to the firmament, it was not so. To the eye of his soul all was radiant, and in such spirit he breaks forth in that noble apostrophe, —

“ These are thy glorious works, Parent of good,  
Almighty ! thine this universal frame,  
Thus wondrous fair : Thyself how wondrous then !  
Unspeakable.”

Milton was one of the most, if not the most, deeply read men of his day. His mind was saturated with classics, learned in French, Italian and Hebrew, and in science and philosophy ; in general learning he was regarded as the foremost scholar of the University of Cambridge. His travels in Italy, where he met the distinguished literati of the day, gave breadth and polish to his robust intellect. In the opinion of Addison there is an unnecessary ostentation of learning in Milton, while Homer and Virgil exhibited theirs less intrusively. He seemed by his theological excursions into free-will and predestination, and running up the by-paths of astronomy, architecture, geography and mythology, to be anxious to assure his readers that he was acquainted with the whole round of arts and sciences. He uses

technical terms to a fault, such as "larboard" as a seaman would, and encrusts his lines with "doric pillars," pilasters," "cornice," "frieze and architrave," and as an astronomer tells of ecliptic and eccentric, "the trepidation," stars dropping from zenith, rays culminating from the equator — but perfect beauties often have a mole. Nothing in literature can be conceived greater than his description of embattled deities, the Majesty of Messiah, the counsels of the Eternal, the flight of Satan. What can be more terrible than Pandemonium, Sin and Death, as he has them personified? They are as hideous as reptiles crawling in a stagnant pool or weltering in a hideous ooze. And what more beautiful than unfallen Adam and Eve, Paradise, Angels, Heaven? They are as rich garlands of flowers festooned in some noble palace.

When Milton wrote this great poem the basis of astronomical knowledge was shifting. The *Almagest* of Ptolemy, which taught the geocentric theory had been the text book of science, falsely so called, for more than fourteen centuries. The older Greek astronomers had conceived the heliocentric motions of the planets, but the ingenious Ptolemy had flattered the egotism of man by brushing aside this theory, and explained the motions of the planets and sun and moon by a cumbrous mechanism of cycles and epicycles around the central earth, and as all that corresponded so well with the old legends and myths and had thus become interwoven with the literature and the religion of these centuries, the Ptolemaic system sat enthroned, but on a foundation of clay, which the then Church tried in vain to maintain. Dante had built his Hell, Purgatory and Paradise on some poetic deductions from the theory of Ptolemy. He had put his friends in his ten divisions of Paradise, his critics in his ten divisions of Purgatory and his enemies in his ten divisions of Hell, and who could object to such a convenient use of the Ptolemaic theory? Literature, therefore, maintained it. The common people would accept nothing else, for how could the earth move without throwing everything off? The Church stood by it, for did not Joshua command the Sun to stand still? And, therefore,

the Sun moved and not the earth. Kepler's three laws and Galileo's discoveries shook, but did not overthrow the hoary theory of ages, but not till God said "Let Newton be!" was it completely overthrown and the *Almagest* cast to the rubbish heap. Students of prehistoric man trace the advancing history of our race by the records of the kitchen middens—the refuse of the food of primeval man, and they lie in *strata* now uncovered. And so we may to-day read the intellectual and scientific history of our race when we lay bare the *strata* of old doctrines and exploded theories, the debris of ages, the middens of old libraries.

Milton lived and thought and wrote in the hot-lit foreground of the controversy. Galileo had been silenced by the strident voice of authority and four years before he died, in the year 1638, when the Italian philosopher was tottering with the weight of seventy-four years, after his imprisonment for the cause of truth, the English poet, a young man of thirty, visited him. Galileo Galilei was even then in his sorrow-stricken old age a prisoner for having taught scientific doctrines which were adjudged heretical. To save his life he had solemnly recanted his error, but as he did he turned from his judges and struck the earth with his foot, and muttered "*Tamen illa movet.*" Two years before Milton saw him he had become totally blind, and thus the inventor of the telescope, the discoverer of Jupiter's satellites which showed a Copernican system in miniature in the sky, was compelled to relinquish his favorite pursuit. His friend, Castelli, writes, "the noblest eye is darkened which nature ever made, an eye so privileged and gifted with such rare qualities that it may with truth be said to have seen more than all of those eyes who are gone, and to have opened the eyes of all who are to come." Galileo endured his affliction with rare fortitude, and thus writes,—"Alas, your dear friend and servant,, Galileo, has become totally blind, so that this heaven, this earth, this universe, which with wonderful observations I had enlarged a hundred and a thousand times beyond the belief of by-gone ages, henceforward for me is shrunk into the narrow sphere which I myself fill in it. So it pleases God, it shall then please me also."

We know not the details of that interview between the astronomer and the poet, who afterwards immortalized his name in heroic verse, and who, in his own old age, suffered as the astronomer did, and to which he alludes so pathetically in these lines,—

“ Thee I revisit safe,  
And feel thy sovran vital lamp; but thou  
Revisit'st not these eyes that roll in vain  
To find thy piercing ray, and find no dawn,  
So thick a drop serene hath quenched their orbs  
Or dim suffusion veiled.”

\* \* \* \* \*

“ nor sometimes forget  
Those other two equalled with me in fate,  
So were I equalled with them in renown,  
Blind Thamyras and blind Maeonides,  
And Tiresias and Phineus, prophets old.  
Then feed on thoughts, that voluntary move  
Harmonious numbers; as the wakeful bird  
Sings darkling and in the shadiest covert hid  
Tunes her nocturnal note.”

Milton has not given us any account of this memorable visit, yet it was one which made a lasting impression on his mind and was never afterwards forgotten by him. “There it was,” he writes, “I found and visited the famous Galileo grown old, a prisoner of the Inquisition, for thinking in astronomy otherwise than the Franciscan and Dominican licensers thought.” Twenty years or more afterwards when Milton, himself grown old and blind, sat down to compose “Paradise Lost” the remembrance of the great Italian rushed to his mind and the great epic embalms his memory in these lines, speaking of Satan’s Shield, see,—

Book I., line 286-291,  
and Book III., line 588-590,  
and Book V., line 261-263.

That was a remarkable meeting of two remarkable men—the great Italian of the same land as Virgil, who wrote the greatest Latin epic, and the Cambridge scholar, who was yet to write the greatest English epic.

Ulyses, that wild rover over land and sea, said, — “ I am a part of all that I have met,” — and so with Milton—this meeting with Galileo touched his nature. There is a veritable communion of saints on this earth, outside the Apostles Creed, a communion of men devoted to truth, and holy because so devoted. They were apostles of truth these men ; one revealed to us the physical heavens and solved for us the riddle of the universe ; the other lifted us in contemplation to the great Creator’s Throne, and we heard the symphonies of creation and learned that though “ death came into this world and all our woe ” yet a greater Man was foreshadowed “ to regain the blissful seat.” “ Great men,” says Carlyle, “ are the inspired speaking and acting texts, whereof a chapter is completed from epoch to epoch and by some named history.” Galileo was, indeed, an inspired text, read to mankind from the manuscripts of God. Milton too was an inspired text that sang to mankind such rhymes of the universe that all stood enthralled by their melody.

When Milton met Galileo, Copernicus had been dead nearly one hundred years, and yet the Ptolemaic theory, by which it was believed that the earth was the immovable centre of the universe and round it all the heavenly bodies circled in a daily revolution, still retained its ascendancy over the men of learning and science. These were the days when the Church taught its own astronomy and biology, and arrogated to herself to dictate theories of cosmogony. She was infallible, and to her was revealed in the written Scriptures all truth, scientific and theological, and woe to the man who declined to accept her teachings. If the eternal scriptures of the sky revealed other teachings which to her propagandists contradicted their narrow views of Holy Scripture, then so much the worse for the unaccommodating teachings of Nature. The Copernican theory, by which the Sun is assigned the central position in our system, with the earth and planets revolving in orbits around him, obtained the support of a few persons of advanced views and high scientific attainments. The new theory had difficulties to surmount. It carried with it some of the errors of Ptolemy. It clung to the theory of

circular orbits, and in order to explain the phenomena it was compelled to keep to some extent to the cumbrous mechanism of cycles and epicycles, until Kepler came and discovered the ellipticity of the planetary orbits. Then, also, it antagonized the cosmogonical theories of the Church, which read Genesis as making the earth the enthroned centre of the starry universe, to whom the great host of heaven paid court. All the traditions of the past presented an embattled front to the new teaching. "What is truth?" said jesting Pilate, while Truth stood before him personified, and truth is always hard to recognize and impossible for some ever to recognize, even if a God reveals her. Milton had read science at Cambridge and afterwards along the lines of current belief, and had assimilated the Ptolemaic beliefs so far as a true soul could assimilate error. His studies in Dante, whom he absorbed, had also fastened on him the Ptolemaic cosmology. According to the Ptolemaic system, the earth, the immovable centre of the Universe was surrounded by ten crystalline spheres or heavens arranged in concentric circles, the larger enclosing the smaller ones, and within these was situated the cosmos or mundane universe, usually described as the "heavens and the earth." To each of the first seven spheres there was attached a heavenly body, which was carried around the earth by the revolution of the crystalline sphere.

First sphere, that of the Moon

Second sphere, that of Mercury

Third sphere, that of Venus

Fourth sphere, that of the Sun (called by Shakespeare, in *Troilus and Cressida*, "that glorious planet Sol")

Fifth sphere, that of Mars

Sixth sphere, that of Jupiter

Seventh sphere, that of Saturn

Eighth sphere, that of fixed stars,

this was called the firmament as it gave steadiness to the inner spheres. Ptolemy made this last his boundary. He answered the questions which centuries afterwards Young in his "Night Thoughts" asked,—



“Where ends this mighty building? Where begin  
 The suburbs of Creation? Where the wall  
 Whose battlements look o’er into the vale  
 Of none existence! Nothing’s strange abode!  
 Say at what point of space Jehovah dropp’d  
 His slackened line and laid his balance by,  
 Made worlds, and measured Infinite no more?”

But after he of Alexandria had settled the Cosmos and pronounced the plan of the great world builder unrolled, some discrepancies and difficulties arose. The precession of the equinoxes, discovered by Hipparchus in the second century, B.C., had to be dealt with as this phenomenon very ungraciously disturbed the harmony and insisted on being explained; and so later astronomers put, so to speak, another story on the building, an extra sphere or two was always at hand, and so they added as an evidence of good faith, and to stop all awkward objections, a ninth sphere, which they called the Crystalline, which accounted for the precession of the equinoxes. Thereafter, in order to demonstrate the inexhaustibility of their resources, a tenth sphere was added, which they called *Primum Mobile* or First Moved, which brought about the alteration of day and night by carrying all the other spheres around the earth once in every twenty-four hours. Thus was evolved the Alphonsine system, as having been adopted and taught by the famous King and Astronomer Alphonso X., of Castile, A.D. 1252-1284. Beyond this last sphere there was believed to exist a boundless chaotic region of immeasurable extent, called the Empyrean, or heaven of heavens, where the Deity was enthroned, the place of eternal mysteries, which was to the mind unfathomable and to the imagination inconceivable. Thus the Cosmogony remained until Copernicus and Kepler and Galileo shook the structure with swift and mighty blows, and Newton with the sledge-hammer force of his great principle of universal gravitation laid it low, and the heliocentric theory took its niche in the temple of Eternal Truth. Since the *Principia*, we have looked upon the law of gravitation as one so well founded that even the gates of hell could not prevail against it, and so did the students of Ptolemy for centuries believe too in



their geocentric theory. Some irregularities in the Moon's motions, some hitches in the eternal fitness of things, have led some deep-thinking scholars to whisper some doubt as to the perfection of Newton's law. Is there to arise some yet greater seer, who will reveal to us some other mystery of dame Nature, and read to this or to some future generation some modification of the law of the inverse square of the distance?

With this statement of the Ptolemaic spheres before us, remembering they are not solid globes but great concentric envelopes, we understand better what is meant by the "music of the spheres" and also Milton's expression in his "Ode to the Nativity," "Ring out ye crystal spheres," and also in the same Ode, where he speaks of meek-eyed Peace coming softly sliding down through the turning sphere. When Shakespeare makes the ghost in Hamlet speak of "stars starting from their spheres" as if in terror, he means these Ptolemaic spheres. Similarly the word "sphere" in our old poetry from Chaucer down has generally this meaning. Indeed, it retains this meaning in many of our current expressions as,—"This is not my sphere," "You are out of your sphere"—not a globe, that would be nonsense, but a great circumference. Our language is often inaccurate; it is traditional. In this case it starts from Ptolemy of Alexandria, and his teaching, who lived and died in the second century after Christ.

When Milton returned to England from the Continent, he lived in London, and undertook the education of his two nephews, John and Edward Phillips, and other sons of his intimate acquaintances. Amongst other subjects of a polite education, he taught Astronomy from a text book "*De Sphæra Mundi*," which was an epitome of Ptolemy's *Almagest*. This book was written in the thirteenth century and was so popular that it went through forty editions. When Milton taught his pupils the principles of astronomy from it, that text book was four hundred years old. Do you know of any school or university now which has on its curriculum of science books four hundred years old, or indeed, even forty years old, save perhaps, Newton's *Prin-*

*cipia*, but Newton's *Principia* is sacred, it is the Bible of mathematical truth. This was, however, in the darkness of the middle ages and the lamp of knowledge burned dimly. We shall find that Milton's knowledge of astronomy was comprehensive and accurate. He was familiar with its technicalities and ready with all the arguments in support of the old and the new theory from both scientific and theological points of view. He had a mind which, notwithstanding all his early and later manhood training in the Alphonsine theory, was not shackled by tradition, but was open to the sunbeams of truth. If he had lived in later days, he would have made an intelligent and reverent higher critic both scientifically and theologically. "Custom," says the Chelsea philosopher, "makes dotards of us all" — it made no dotard of John Milton. Most men are too anxious to get truth on their own side, rather than to get themselves on the side of truth. It is pitiful and unprofitable for a man to try and force lovely Truth from her sacred pedestal and to soil her beauty by accommodating herself to lowly and sordid surroundings, but it is a far different thing for a man to rise to the level of truth, and like a true worshipper clasp her sacred knees. Astronomy enters largely into the composition of "*Paradise Lost*." Indeed, it is difficult to understand how such a poem could have been written without a knowledge of the heavens and celestial orbs and the theory of the Universe. In Book VIII. Milton introduces a scientific discussion between Raphael, the angel, and Adam upon the respective merits of these different theories. The configuration of celestial and terrestrial orbs and the great circles by which they are circumscribed he also knew. The causes which bring about the change of the seasons — the obliquity of the ecliptic — the zodiacal constellations through which the Sun travels and the periods of the year in which he occupies them, are embraced in Milton's knowledge of the science of astronomy. The motions of the earth, including the precession of the equinoxes, the number and distinctive appearances of the planets, their direct and retrograde courses, and their satellites are also described by him. Milton too is familiar with the constellations and their relative

positions, the principal stars, the star groups and clusters and the Galaxy, and in the elaboration of his poem all these bear their part. The names of fourteen of the constellations are mentioned in *Paradise Lost*,—Andromeda, Aries, Astrea, Centaurus, Cancer, Capricornus, Gemini, Leo, Libra, Ophiuchus, Orion, Scorpio, Taurus and Virgo. Milton in his fourth book introduced a lofty and poetical conception of the means whereby the Almighty made His will known when Gabriel, the warrior angel, discovered Satan in *Paradise* whispering temptation into the ear of Eve. He thus refers to Libra, (see Book IV., line 995-1005.)

His poet soul recognized Orion, as Job had done centuries before. The rising of Orion was believed to be accompanied by stormy and tempestuous weather, and so we find these lines,—

“When with fierce winds Orion armed  
Hath vexed the Red Sea coast, whose waves o’erthrew  
Busiris and his Memphian chivalry.”

Andromeda is described as being borne by Aries, and in “Ophiuchus huge” Milton locates a comet which extends the whole length of the constellation.

Milton adopted the Ptolemaic theory as the ground work of his cosmogony, not so much from conviction, but because it provided a more convenient working plan for localizing those regions of space, wherein the chief incidents of his poem enter, namely, Heaven or the Empyrean, Chaos, Hell and the Mundane Universe. All space above the Universe newly created and the *Primum Mobile* was known as Heaven or the Empyrean—a region of light, glory and joy—the dwelling place of the Deity, who, though omnipresent here, was visibly revealed to myriads of angels veiling their faces with their wings and hymning Him throughout Eternity. Underneath there existed a vast illimitable region called Chaos, occupied by embryo elements of matter that with incessant turmoil struggled in battle array,—

“The womb of nature and perhaps her grave.”

The lower portion of this region was divided off, and embraced the locality known as Hell, the place of torment, where the rebellious angels were driven and shut in after their expulsion from Heaven,—

“As far removed from God and the light of Heaven  
As from the centre thrice to the utmost pole.”

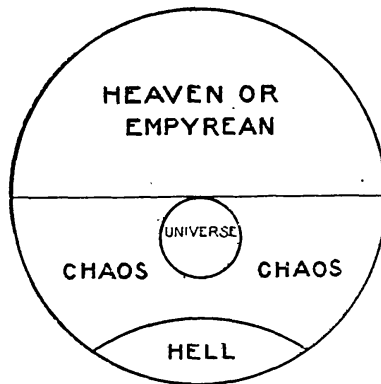


DIAGRAM ILLUSTRATING MILTON'S COSMOGONY

The new universe which included the earth and all the orbs of the firmament, known as the starry heavens, was created out of Chaos and hung as if suspended by a golden chain from the Empyrean above, and although its magnitude and dimensions were inconceivable, yet, according to the Ptolemaic theory, it was enclosed by the tenth sphere, or Primum Mobile. This is beautifully described as a climax to that magnificent conception of Milton, “The Flight of Satan,” who is described as searching through Chaos for the newly created universe. For a while in calm chaotic space, poised on outspread wings, he floats; the sight breaks in on him and there stands revealed

“Far off the empyreal Heaven extended wide,  
In circuit undetermined square or round,  
With opal towers, and battlements adorned  
Of living sapphire, once his native seat,  
And fast by hanging in a golden chain  
This pendent World, in bigness as a star  
Of smallest magnitude, close by the moon,  
Thither full fraught with mischievous revenge,  
Accurst, and in a cursed hour, he hies.”

Care must be taken not to misinterpret this passage for, as the lamented Professor Masson, of Edinburgh University, has pointed out, even Addison is confused by it. He speaks of Satan's distant discovery of the "earth that hung close by the moon" as one of the most wonderfully beautiful and poetical passages of the poem. But it far surpasses Addison's thought, for, as even a correct reading of the passage by itself would have shown, the "pendent World," which Satan here sees, is not the earth at all but the entire starry universe, hung drop-like by a golden touch from the Empyrean above it. "In proportion to this Empyrean at the distance whence Satan gazes, even the starry universe pendent from it is but a star of smallest magnitude seen on the edge of the full or crescent moon."

In his description of the creation the earth is formed first, then the Sun, followed by the Moon and afterwards the stars, all of which are described as being in motion round the earth. In this he closely follows the traditional understanding of the Mosaic cosmogony. Allusion is made to this ancient system in several prominent passages, and in the following lines there is a distinct reference to the various revolving spheres,--

"They pass the planets seven, and pass the fixed,  
And that Crystalline sphere whose balance weighs  
The trepidation talked, and that first moved."—(Book III., 481.)

The seven planetary spheres are mentioned, then the eighth sphere, that of the fixed stars, then the ninth or Crystalline, which is believed to cause a shaking or trepidation to account for some irregularities in the motion of the stars, and lastly, the tenth sphere or Primum Mobile, called the "First Moved," because it set the other spheres in motion.

It is much to be doubted if Milton's clear mind with that poetic instinct that discerns truth, ever accepted the Ptolemaic theory, although adopted as a poetic convenience. As if he were watchful of his reputation, and to keep himself right with posterity, we find that he first makes an incidental allusion to the theory of Copernicus in Book IV., 590-8, and further on in the eighth book he introduces a discussion between Adam and

Raphael, and we may, with good reason, take it that Adam's reasoning represented Milton's own view. By a bold poetic liberty he endows Adam, the first of men, (according to the traditional belief) with a prophetic insight which stretched through many future centuries in propounding, as he did, the Copernican cosmogony. Hear Milton argue the case. See Book VIII., 15-38. Note the words "This earth a spot," "Nature, wise and frugal," "Sedentary earth," "Sumless journey."

The angel, after listening to Adam's argument, expresses approval of his desire to obtain knowledge, but answers him dubiously and at the same time criticises in a severe and adverse manner the Ptolemaic theory. (See Book VIII., 66-122.) The angel then lucidly describes the Copernican system in lines,—121-158. Note "Three different motions move," that is daily, annual and the precession of the equinoxes. At this time the law of gravitation was unknown, for it had not yet leaped, Minerva-like, fully armed, from the brain of the Jupiter of natural philosophy, Isaac Newton. Although the elliptical orbits of the planets had been discovered by Kepler, the nature of the motive force which guided and retained them in their paths still remained a mystery. It was believed that the planets were whirled around the sun as if by the action of magnetism, a natural attractive influence having been supposed to exist between them and the orb similar to that of the opposite poles of magnets. Milton alludes to this theory in the following lines,—

"they, as they move  
Their starry dance, in numbers that compute  
Days, months and years towards his all cheering lamp,  
Turn swift their various motions, or are turned  
By his magnetic beam."

"Magnetic beam" Milton may have builded better than he knew, may have written more wisely than he dreamed. The Sun's "magnetic beam" in the light of our new Astronomy has a meaning past Milton's ken. Milton describes the position of the planets in the sky as

"Now high, now low, then hid,"

and their motions

“Progressive, retrograde or standing still.”

It is evident that Milton was familiar with the apparent irregular paths pursued by the planets when observed from the earth. He knew of their stationary points, and also their backward turnings traced out by them on the surface of the sphere. Galileo imagined he discovered with his telescope on the face of the Moon continents and seas, and that, therefore, the Moon might be the abode of intelligent life, and so Milton (See Book VIII., line 145) presents this possibility. Since then the Moon has been more closely studied, and we have now the theory of the Moon being a ruined world, a burnt out cinder, a derelict in space, acting as the Sun's deputy tide-raiser, and filling the office of a large reflector for the solar lamp, for lovers to swear by and then forswear themselves and by which almanac-mechanics prophesy the wind and rain. One would almost believe that in Milton's day the study of lunar possibilities was in the same condition as is now the study of Martian possibilities. Percival Lowell is supposed to have as conclusively settled to-day the habitability of Mars as Galileo settled the habitability of Luna 300 years ago. Some “mute inglorious Milton” of to-day may loosen his pen and write an epic on Mars, based on the investigations of Flagstaff Observatory, and some cold soulless being in future years may criticise the science of that epic as I am now daring to criticise Milton's line that speaks of

“Rain producing fruits upon her softened soil.”

It is possible that we need not wait long for a critic, for has not Dr. A. R. Wallace already spoken in unsympathetic language of the doctrine of planetary habitation? but let me forbear—Milton must not be trifled with.

“and other suns, perhaps,  
With their attendant moons thou wilt descry  
Communicating male and female light.”

Milton in these lines refers to Jupiter and Saturn and their satellites, which had been recently discovered,—four of those of



the former by Galileo, and four of those of the latter by Gassendi. The existence of the male and female light was an idea entertained by the ancients, and which is mentioned by Pliny. The Sun was regarded as a masculine star and the Moon as a feminine, the light emanating from each being similarly distinguished and possessing different properties. Here again may we say Milton wrote nearer the truth than he thought for have we not systems of double suns, physical doubles, flashing out different colors and revolving about a common centre of gravity? In that demonstrated truth lies a close parallel to male and female light. Milton was, no doubt, a Copernican. In the third book he describes the Sun as occupying a supreme position in the system, having the planets with their satellites,—

“That from his lordly eye keep distance due.”—(Book III., 578).

circling in majestic orbits round him, acknowledging his controlling powers, and being held by some strong arm that Newton afterwards proved was not only strong but gravitating.

The angel in bringing to a conclusion his conversation with Adam deems it inadvisable to grant him a decisive reply to his inquiry regarding the motions of celestial bodies and in the following line gives a beautifully poetical summary of this elevated and philosophical discussion. (See Book VIII., 150-167). Raphael was, doubtless, a good angel, but he was a bad philosopher. We have read that “fools rush in where angels fear to tread.” We are thankful that a chosen band of Adam’s descendants in later years — and their names has been legion — declined to take Raphael’s advice but had greater courage and “that they did solicit thoughts with matters hid,” and that by their laborious investigations they have made for the world a galaxy of truth and held vigorously to the principle that the search for truth is the noblest occupation of man, and its publication a duty. And so wise men walked where Raphael feared to tread,—“Felix qui petit cognoscere causas omnium rerum,”—and in our own humble way, whether we are only plain members of the Royal Astronomical Society of Canada or whether we have become

exalted to the dazzling eminence of being Fellows of the same, let us investigate and reflect. It is not what we are called that counts, but it is what we know and what we do with what we know. "Great truly is the actual" as Carlyle puts it.

But to return to the broad highway. Milton had, like all learned men of his day, some belief in and knowledge of astrology and this he weaves into the theme of his poem. The inauspicious influence of the heavenly bodies is described by him as contributing to the general disarrangement of the happy condition of things that existed before the Fall. He calls Nature to his aid to account for the adverse physical changes that occurred as a consequence of the Fall, and the change of the course of the seasons he explains by a change of the position of the earth's axis, a necessary part of the Copernican theory, in other words the obliquity of the ecliptic. "The poles of earth twice ten degrees and more." (See Book X., 668-679). In the same passage notice the allusion to the Pleiades,—“The Seven Atlantic Sisters”—that beautiful cluster that is believed from time immemorial to have shed happy influences upon the earth, and which, by its close association with human destinies, have been rendered objects of sacred interest among the different races of mankind. There is one other allusion to the Pleiades in “Paradise Lost.” In describing the path of the newly created Sun, Milton introduces them as indicative of the joyfulness associated with the birth of the Universe.

“First in his east the glorious lamp was seen,  
 Regent of day, and all the horizon round,  
 Invested with bright rays jocund to run  
 His longitude through heaven's high road; the gray  
 Dawn and the Pleiades before him danced,  
 Shedding sweet influence.”—(Book VII., 370.375.)

Milton has many beautiful allusions to the starry firmament, as what poet would not? He never appears, however, to have realized the idea that the stars were suns, centres of planetary systems.

In the line quoted above,—

“and other suns, perhaps,  
And their attendant moons thou wilt descry,”

I have already observed he does not mean stars, but Jupiter and Saturn with their newly discovered satellites. What impressed him most was their number and brilliancy. The following passages bear witness to his lofty appreciation,—

“About him all the sanctities of heaven  
Stood thick as stars.”—(Book III., 60-61).

“And sowed with stars the Heavens thick as a field.”—(Book VII., 358).

“Amongst innumerable stars, that shone,  
Stars distant, but nigh hand seemed other worlds.”—(Book III., 564-5).

Referring to the Moon,—

“her reign,  
With thousand lesser lights, dividual holds  
With thousand thousand stars that then appeared  
Spangling the hemisphere.”—(Book VII., 381-4).

The pages of his poem rival the arch of the firmament in glory—gems of literary beauty here—myriads of glowing sapphires there. Many most beautiful allusions to the glories of the Sun and Moon nourish the poetic thought of every student of “Paradise Lost.” The poem is a very paradise of poetic imagery, but we cannot stop to gather them; they are like flowers in the meadow—so we hasten. Milton knew the phases of Venus and that sometimes she is a crescent, and so he writes, referring to the Sun as a great source,—

“And hence the morning planet gilds her horns.”

Milton introduces several allusions to comets and expresses the ideas of dread that were formerly associated with these objects in his day and in Shakespeare's. In describing the hostile meeting between Satan and Death before the gates of Hell, he writes,—

“on the other side,  
Incensed with indignation, Satan stood  
Unterrified, and like a comet burned  
That fires the length of Ophiuchus huge  
In the Arctic sky, and from his horrid hair  
Shakes pestilence and war.”—(Book II., 706-11).

Again near the end of the poem when the cherubim descended to take possession of the garden, prior to the removal of Adam and Eve,

“high in front  
The brandished sword of God before them blazed,  
Fierce as a comet.”—(Book XII., 632-6).

Milton was wonderfully happy in his descriptions of ordinary natural phenomena. His felicity of thought and the splendour of his poetic genius transcended all, especially when dealing with the heavenly bodies. No poet has given the world a more beautiful description of evening, and by his allusion to the celestial orbs, has added such finished grace to the picture. (See Book IV., 598-609).

It is a strange coincidence, as a stray piece of contemporary history, that, while in the year 1665, Milton, driven out of London by the plague, was in a country house revising and rewriting his “Paradise Lost,” Newton, driven out also by the plague, was, in the same year, 1665, thinking out the theory of gravitation, aroused to inquiry by a well known trivial occurrence in his garden, and was testing his theory by calculating the distance the Moon fell to the earth in one second of time. Thus at the same time and in the same country we have the poet-philosopher Milton dealing with the great problems of creation and eternity and revealing to his fellow-men by the spell of his immortal song the counsels of God from before the beginning, and the mathematical philosopher Newton dealing with the great problems of the universe and revealing also to his fellow-men, in that work of God-given genius, the *Principia*, those eternal, unchangeable and universal methods of God’s government in nature, based, as they were, on adamantine truth and read by him from the shining Scriptures of the sky.

Before closing, something must be said of Milton’s theory of creation. His was the divine-fiat theory, — “Let there be,” — and all things instantaneously were, it was the spectacular method, the traditional theory, taken as the author understood it from

“That Shepherd, who first taught the chosen seed,  
In the beginning, how the heavens and earth  
Rose out of Chaos.”

and it possessed all those elements of majesty that entered into the greatest of great poems, and which most sublimely interpreted a transcendently sublime theme. Milton died a hundred years before Kant or Laplace had suggested the nebular theory of creation, and although evolution had been slowly working out her results, no Darwin yet had sought to interpret her movements, and no Christian philosopher had arisen to point out the good gifts that the truly wise men of modern time were to lay at the feet of our Christ. Tennyson wrote under the sunlight of a later and clearer science,—

“This world was once a fluid haze of light,  
Till toward the centre set the starry tides,  
And eddied into suns, that wheeling cast  
The planets.”

The muses of Poetry and Urania her sister clasped hands and have in all ages sung to the world the sweet rhymes of mother Nature. But Milton's muse did not as beautifully and as fully interpret the teachings of Urania as Tennyson's muse in the *Princess*. When the divine fiat theory is propounded, mankind says,—“what effort!” When the creation theory of growing from more to more under a divine Architect is explained, then mankind says,—“What power and also what wisdom!” Ruskin writes,—“Is not the evidence of ease on the very front of all the greatest works in existence? Do they not say plainly to us, not, ‘there has been a great effort here,’ but, ‘a great power here?’”

In conclusion let me say that changes in human ideas and the rapid advance of science have to a large extent thrown the poem into conflict with present day knowledge of the physical universe. Had Milton's *Astronomy* been more modern and had he clothed its truer principles with that glorious imagery that flowed from him in such “harmonious numbers,” would the poem have been more pleasing because more scientific and equally poetic? It is, I think, reasonably clear that if Milton had

adopted the evolutionary theory of creation, we could have had no "Paradise Lost." It would have lost its dramatic power and its dynamic fervour. Satan was to launch into space and descry a completely created world and to visit and tempt and ruin a completely created man. He could not have been depicted as watching through aeons of time a slowly evolving habitable globe, and waiting for millenniums to visit a prehistoric vertebrate growing into completeness, and then to destroy him morally. The first three chapters of Genesis constitute an oriental poem in prose, teaching deep spiritual truths and not unscientific when properly understood, and Milton has made of all that, an occidental poem in blank verse. The world is all the richer and better for this—but no evolutionary theory would have brought forth such an epic. We know now that this mundane universe of ours is not built up like so many concentric shells, that there is no limit or *Primum Mobile*. We have burst through all that, and we have found no chaos beyond, fenced off on this side by a definite limit. We find what we believe to be chaos within our universe—vast pulps or welters of unformed matter, lying disintegrated, the raw material of new universes, but they are not dead like Milton's Chaos and irresponsive to the thrill and throb of movement and, therefore, of life, but being governed and moved by those laws that pierce the remotest limits of space, are fashioned by the hand of the Divine Architect, according to His eternal plans. Milton's divisions of space are poetic only, but yet they have their own philosophy and teach their own lessons. Is not, after all, our universe a mere drop hung from the Empyrean—Heaven above it and close touching it, an impenetrable gloom all round it, and Hell far beneath it. If Heaven does not closely touch us, then, indeed, we are banished and Paradise is lost, never to be regained. Let life be such that we shall have

"Earth crammed with heaven,  
And every common bush aflame with God."

NOTE--The writer desires to express his indebtedness to other writers of and enquirers into Milton's cosmic philosophy. Their names and references have, however, unfortunately been mislaid.