SOME SEVENTEENTH CENTURY COSMIC SPECULATIONS

BY J. V. NASH

NO more fascinating subject of speculation can engage the human imagination than the problem of the existence of life on other planets besides our earth, and the sort of forms that this life may take. Here is a field for the play of fancy, the extent of which is boundless and the romantic possibilities of which far exceed anything to be found in the *Arabian Nights*.

The recent approach of the planet Mars to a distance several millions of miles nearer the earth than it has been for many years or will be again for a long period, has brought the subject of life on other planets again to the fore. So far at least as Mars is concerned, the observations of its surface which have been made recently do not seem to have yielded any particularly significant additions to our knowledge regarding Martian geography and the nature of the life, if any, on that interesting neighbor of the earth.

The verdict of modern science with reference to the possibility of organic life on other planets than the earth, with the exception of Mars, and perchance Venus, is far from favorable. The four larger planets seem quite certainly inhospitable to life, as they are not sufficiently condensed; and even if they were, their immense distance from the sun would not permit sufficient light and heat to reach their surface for the support of life.

Mercury and Venus, on the other hand, are too close to the sun for comfort. Worse still, Mercury is supposed to turn on its axis in exactly the same period as it revolves round the sun, so that the Mercurial day and year are equal; hence the same side is always turned to the sun and the temperature of this side is probably always above the boiling point, while the other side is plunged in

eternal night at a temperature of from 200 to 300 degrees below freezing.

Venus is interesting as being of nearly the same size as the earth, but it is 25,000,000 miles nearer the sun. Its mean temperature is, therefore, much higher than that of the earth. It is a bright planet, long familiar in the heavens as the morning and evening star. Its surface, however, is covered by dense masses of cloud and dust, so that no permanent markings can be discerned through our telescopes, and its period of rotation before unknown. Some astronomers believe that, like Mercury, one side may be constantly turned toward the sun. Interesting experiments are just now being made at Yerkes Observatory of the University of Chicago, in the use of infra-red rays, by means of which it is hoped to pierce the cloud masses which envelope Venus and secure photographs of its surface.

Until comparatively recent years, when the progress of astronomy made available more accurate information as to the conditions prevailing on the various planets, it was easy to jump to the conclusion that they were in a state somewhat similar to that of the earth, and, as a consequence, that they were inhabited by an amazing profusion and variety of life.

One of the earliest and quaintest books devoted to speculations upon the nature of life on other planets was published in London, in the year 1698, under the title *The Celestial Worlds Discover'd Or, Conjectures Concerning the Inhabitants, Planets and Productions of the Worlds in the Planets.* Its author was Christian Huygens, a celebrated Dutchman, who was a brother of the Secretary to King William III of England.

Christian Huygens was born at The Hague in 1629. He was a mathematician, physician, and astronomer. The new International Encyclopaedia gives him a biographical notice of over a column. At the invitation of the French government, Huygens settled in Paris, was made a member of the Academy, and lived in France for a number of years. He was the author of a large number of scientific and philosophical works in Latin. He was the first to apply the pendulum to clocks and his researches in gravity paved the way for the great work of Newton. Huygens also was the first to construct powerful telescopes, and in 1655 he discovered the ring of Saturn.

Another of his notable inventions was the micrometer, which

made possible the accurate measurement of small angles viewed through a telescope. He was likewise the originator of the wave theory of light, and of the theory of polarization. In 1660 he visited England and became a member of the Royal Society. He died in 1695.

Because of Huygens' solid achievements in science, his fantastic speculations in this forgotten little volume are of curious interest. As we are told in the preface, the author did not live to publish the manuscript personally. He left instructions for its publication by his brother, the royal secretary, to whom it was dedicated. But the brother, likewise, was taken by death before he could see the work through the press. It was originally written in Latin, the language of the learned world at that time. By whom it was translated into English and edited for publication is not revealed. The publisher's foreword indicates that there was also an edition in the original Latin.

It is interesting to note that as late as 1698 it was so unusual for a scientific work to be published in the vernacular that the publisher of our little book wrote in justification:

"I doubt not but I shall incur the Censures of learned Men for putting this Book into English, because, they'l say, it renders philosophy cheap and vulgar, and, which is worse, furnishes a sort of injudicious people with a smattering of Notions, which being not able to make a proper use of, they pervert to the Injury of Religion and Science. I confess the Allegation is too true: but after Bishop Wilkins, Dr. Burnet, Mr. Whiston, and others, to say nothing of the antient Philosophers, who wrote in their own Tongues; I say after these great Authors have treated on as learned and abstruse Subjects in the same Language, I hope their Example will be allowed a sufficient excuse for printing this Book in English."

It should be remembered that when this quaint book was published, the Copernican system was still comparatively novel; the rotundity and motion of the earth were ideas which were as yet by no means universally understood and accepted. The author's opening words, in which the Copernican theory is referred to with some diffidence, are in this light particularly significant. He says:

"A Man that is of Copernicus's Opinion, that this Earth of ours is a planet, carry'd round and enlighten'd by the Sun, like the rest of them, cannot but sometimes have a fancy, that it's not improbable that the rest of the Planets have their Dress and Furniture,

nay and their inhabitants too as well as this Earth of ours; Especially if he considers the later Discoveries made since Copernicus's time of the Attendants of Jupiter and Saturn, and the Champain and hilly Countrys in the Moon, which are an Argument of a relation and kin between our Earth and them, as well as a proof of the Truth of that System."

The author goes on to speak of the speculation of philosophers and astronomers with reference to life on other heavenly bodies:

"This has often been our talk, I remember, good Brother, over a large Telescope, when we have been viewing those Bodies, a study that your continual business and absence have interrupted for this many years. But we were always apt to conclude, that 'twas in vain to enquire after what Nature had been pleased to do there, seeing there was no likelihood of ever coming to an end of the Enquiry. Nor could I ever find that any Philosophers, those bold Heroes, either antient or modern, ventur'd so far. At the very birth of Astronomy, when the Earth was first asserted to be Spherical, and to be surrounded with Air, even then there were some men so bold as to affirm, there were an innumerable company of World's in the Stars. But later Authors, such as Cardinal Cusanus, Brunus, Kepler, (and if we may believe him, Tycho was of that opinion too) have furnish'd the Planets with Inhabitants. Nay, Cusanus and Brunus have allow'd the Sun and fixed Stars theirs too. But this was the utmost of their boldness; nor has the ingenious French Author of the Dialogues about *the Plurality of Worlds* carry'd the business any farther.. Only some of them have coined some pretty Fairy Stories of the Men in the Moon, just as probable as Lucian's true History; among which I must count Kepler's, which he has diverted us with in his Astronomical Dream."

He proceeds to tell how the book came to be written:

"But a while ago thinking somewhat seriously of this matter (not that I count myself quicker sighted than those great Men, but that I had the happiness to live after most of them) methoughts the enquiry was not so impracticable, nor the way so stopt up with Difficulties, but that there was very good room left for probable Conjectures. As they came into my head, I clapt them down into common places [note-books], and shall now try to digest them into some tolerable Method for your better conception of them, and add somewhat of the Sun and Fixt Stars, and the Extent of that Universe of which our Earth is but an inconsiderable point. I know

you have such an esteem and reverence for any thing that belongs to Heaven, that I perswade my self you will read what I have written without pain: I'm sure I writ it with a great deal of pleasure; but as so often before, so now, I find the saying of Archytas true, even to the Letter. That tho a Man were admitted into Heaven to view the wonderful Fabrick of the World, and the Beauty of the Stars, yet what would otherwise be Rapture and Exstasie, would be but a melancholy Amazement if he had not a Friend to communicate it to. I could wish indeed that all the World might not be my Judges, but that I might chuse my Readers, Men like you, not ignorant in Astronomy and true Philosophy; for with such I might promise my self a favourable hearing, and not need to make an Apology for daring to vent any thing new to the World. But because I am aware what other hands it's likely to fall into, and what a dreadful Sentence I may expect from those whose Ignorance or Zeal is too great, it may be worth while to guard my self beforehand against the Assaults of those sort of People."

The author is anxious to defend himself against possible critics, and to show that his ideas are not repugnant to the teachings of the Bible:

"There's one sort who knowing nothing of Geometry or Mathematics will laugh at it as a whimsical and ridiculous undertaking. It's mere conjuration to them to talk of measuring the Distance or Magnitude of the Stars; And for the Motion of the Earth, they count it, if not a false, at least a precarious Opinion; and no wonder then if they take what's built upon such a slippery Foundation for the Dreams of a fanciful Head and a distemper'd Brain. What should we answer to these Men, but that their Ignorance is the cause of their Dislike, and that if they had more Sense they would have fewer Scruples? But few people having had an opportunity of prosecuting these Studies, either for want of Parts, Learning or Leisure, we cannot blame their Ignorance; and if they resolve to find fault with us for spending time in such matters, because they do not understand the use of them, we must appeal to properer Judges.

"The other sort, when they hear us talk of new Lands, and Animals endued with as much Reason as themselves, will be ready to fly out into religious Exclamations, that we set up our Conjectures against the Word of God, and broach Opinions directly opposite the Holy Writ. For we do not there read one word of the Pro-

duction of such Creatures, no not so much as of their Existence; nay rather we read the quite contrary. For, That only mentions this Earth with its Animals and Plants, and Man the Lord of them: but as for Worlds in the Sky, 'tis wholly silent.

"Either these Men resolve not to understand, or they are very ignorant; For they have been answer'd so often, that I am almost asham'd to repeat it: That it's evident God had no design to make a particular Enumeration in the Holy Scriptures, of all the Works of his Creation. When therefore it is plain that under the general name of Stars or Earth are comprehended all the Heavenly Bodies, even the little Gentlemen round Jupiter and Saturn, why must all the multitude of Beings which the Almighty Creator has been pleased to place upon them, be excluded the Privilege, and not suffer'd to have a share in the Expression?

"And these Men themselves can't but know in what sense it is that all things are said to be made for the use of Man, not certainly for us to stare or peep through a Telescope at; for that's little better than nonsense. Since then the greatest part of God's Creation, that innumerable multitude of Stars, is plac'd out of reach of any man's Eye; and many of them, it's likely, of the best Glasses, so that they don't seem to belong to us; is it such an unreasonable Opinion, that there are some reasonable Creatures who see and admire those glorious Bodies at a nearer distance?"

Our author next seeks to show that the study of the stars is not only a worthy and useful occupation, in that it increases our store of knowledge, but that it also leads to a feeling of greater reverence for the Creator:

"But perhaps they'll say, it does not become us to be so curious and inquisitive in these things which the Supreme Creator seems to have kept for his own knowledge: For since he has not been pleased to make any farther Discovery or Revelation of them, it seems little better than presumption to make an inquiry into that which he thought fit to hide. But these Gentlemen must be told, that they take too much upon themselves when they pretend to appoint how far and no farther Men shall go in their Searches, and to set bounds to other Men's Industry; just as if they had been of the Privy Council of Heaven; as if they knew the Marks that God had plac'd to Knowledge or as if Men were able to pass those Marks.

"If our Forefathers had been at this rate scrupulous, we might

have been ignorant still of the Magnitude and Figure of the Earth, or of such a place as America. The Moon might have shone with her own Light for all us, and we might have stood up to the ears in Water, like the Indians at every Eclipse: and a hundred other things brought to light by the late Discoveries in Astronomy had still been unknown to us. For what can a Man imagine more abstruse, or less likely to be known, than what is now clear as the Sun? That vigorous Industry, and that piercing Wit were given Men to make advances in the search of Nature, and there's no reason to put any stop to such Enquiries.

"I must acknowledge still that what I here intended to treat of is not of that nature as to admit of a certain knowledge; I can't pretend to assert any thing as positively true (for that would be madness) but only to advance a probable guess, the truth of which every one is at his own liberty to examine. If any one therefore shall gravely tell me, that I have spent my time idly in a vain and fruitless enquiry after what by my own acknowledgement I can never come to be sure of; the answer is, that at this rate he would put down all Natural Philosophy as far as it concerns it self in searching into the Nature of things: In such noble and sublime Studies as these, 'tis a Glory to arrive at Probability, and the search it self rewards the pains. But there are many degrees of Probable, some nearer Truth than others, in the determining of which lies the chief exercise of our Judgment.

"But besides the Nobleness and Pleasure of the Studies, may not we be so bold as to say, they are no small help to the advancement of Wisdom and Morality? so far are they from being of no use at all. For here we may mount from this dull Earth, and viewing it from on high, consider whether Nature has laid out all her cost and finery upon this small speck of Dirt. So, like Travellers into other distant Countrys, we shall be better able to judg of what's done at home, know how to make a true estimate of, and set its own value upon every thing.

"We shall be less apt to admire what this World calls great, shall nobly despise those Trifles the generality of Men set their Affections on, when we know that there are a multitude of such Earths inhabited and adorned as well as our own. And we shall worship and reverence that God the Maker of all these things; we shall admire and adore this Providence and wonderful Wisdom which is displayed and manifested all over the Universe, to the

confusion of those who would have the Earth and all things formed by the shuffling Concourse of Atoms, or to be without beginning."

The reader is then treated to a lengthy description of the solar system, so far as the facts were known in the seventeenth century. An engraving, one of several in the book, shows only six planets, including the earth. Uranus and Neptune were undiscovered at that time. The discovery of Neptune, in the nineteenth century, was one of the greatest triumphs of the human mind. Long before it was actually perceived, nearly three billions of miles from the sun, its existence was mathematically proved by reason of certain peculiarities in the orbit of Uranus. When powerful telescopes were focused on the spot indicated by the delicate calculations, the planet was found.

Having shown that the earth is governed by the same natural laws as are the other planets our author proceeds:

"Now since in so many things they thus agree, what can be more probable than that in others they agree too; and that the other Planets are as beautiful and as well stock'd with Inhabitants as the Earth? or what shadow of Reason can there be why they should not?

"If any one should be at the dissection of a Dog, and be there shown the Intrails, the Heart, Stomach, Liver, Lungs and Guts, all the Veins, Arteries and Nerves; could such a Man reasonably doubt whether there were the same Contexture and Variety of Parts in a Bullock, Hog, or any other Beast, tho he had never chanc'd to see the like opening of them? I don't believe he would. Or were we thoroughly satisfy'd in the Nature of one of the Moons round Jupiter, should not we straight conclude the same of the rest of them? So if we could be assur'd in but one Comet, what it was that is the cause of that strange appearance, should we not make that a Standard to judg of all others by? 'Tis therefore an Argument of no small weight that is fetch'd from Relation and Likeness; and to reason from what we see and are secure of, to what we cannot, is no false Logick. This must be our Method in this Treatise, wherein from the Nature and Circumstances of that Planet which we see before our eyes, we may guess at those that are farther distant from us."

Modern Science, I fear, cannot make much use of this worthy seventeenth century Dutchman's "Logick," since it has now been proved that the planets are in very dissimilar stages of evolution, to

say nothing of the immense differences in the amount of light and heat which they receive from the sun.

But our author with kindling enthusiasm goes on:

"And, First, 'tis more than probable that the Bodies of the Planets are solid like that of our Earth, and that they don't want [i. e., lack] what we call Gravity, that Virtue, which like a Loadstone attracts whatsoever is near the Body to its Center. And that they have such a Quality, their very Figure is a proof; for their Roundness proceeds only from an equal pressure of all their Parts tending to the same Center. Nay more, we are so skilful now adays, as to be able to tell how much more or less the Gravitation in Jupiter or Saturn is than here; of which Discovery and its Author you may read in my *Essay of the Causes of Gravitation.*"

Through several pages our Author demonstrates, as he thinks, to the reader's as well as his own satisfaction, the suitability of conditions on the other planets for the propagation of plants and animals, and their probable resemblance in many respects to the fauna and flora of earth. He continues:

"Here then we have found in these new Worlds Fields warm'd by the kindly Heat of the Sun, and water'd with fruitful Dews and Showers: That there must be Plants in them as well for Ornament as Use, we have shown just now. And what Nourishment, what manner of Growth shall we allow them? Why, I think there can be no better, nay no other, than what we here experience; by having their Roots fastned into the Earth, and imbibing its nourishing Juices by their tender Fibres. And lest they should be only like so many bare Heaths with nothing but creeping Shrubs and Bushes, we'll e'en send them some nobler and loftier Plants, Trees, or somewhat like them: These being the greatest, and, except Waters, the only Ornament that Nature has bestow'd upon the Earth. For not to speak of those many uses that are made of their Wood there's no one that is ignorant either of their Beauty or Pleasantness."

The plants and trees, it seems, are propagated by seed, as on the earth. He then indulges his fancies concerning the planetary animals:

"'Tis much the same in Animals as 'tis in Plants, as to their manner of Nourishment, and Propagation of their kind. For since all the living Creatures of this Earth, whether Beasts, Birds, Fishes, Worms, or Insects, universally and inviolably follow the same constant and fixt Institution of Nature; all feed on Herbs, or Fruits,

or the Flesh of other Animals that Fed on them: since all Generation is perform'd by the impregnating of the Eggs, and the Copulation of Male and Female: Why may not the same rule be observ'd in the Planetary Worlds? For 'tis certain that the Herbs and Animals that are there would be lost, their whole Species destroy'd without some daily new Productions: except there be no such thing there as Misfortune or Accident: except the Plants are not like other humid Bodies, but can bear Heat, Frost and Age, without being dry'd up, kill'd, or decay'd: except the Animals have Bodies as hard and durable as Marble: which I think are gross Absurdities.

"If we should invent some new way for their coming into the World, and make them drop like Soland Geese from Trees, how ridiculous would this be to any one that considers the vast difference between Wood and Flesh? Or suppose we should have new ones made every day out of some such fruitful Mud as that of Nile, who does not see how contrary this is to all that's reasonable? And that 'tis much more agreeable to the Wisdom of God, once for all to create all sorts of Animals, and distribute them all over the Earth in such a wonderful and inconceivable way as he has, than to be continually obliged to new Productions out of the Earth? And what miserable, what helpless Creatures must these be, when there's no one that by his duty will be obliged, or by that strange natural fondness, which God has wisely made a necessary argument for all Animals to take care of their own, will be moved to assist, nurse, or educate them?"

We next come to the rational inhabitants of the planets, concerning whom our Author indulges in a wealth of imagination. He begins:

"But still the main and most diverting Point of the Enquiry is behind, which is the placing some Spectators in these new Discoveries, to enjoy these Creatures we have planted them with, and to admire their Beauty and Variety. And among all, that have never so slightly meddled with these matters, I don't find any that have scrupled to allow them their Inhabitants; not Men perhaps like ours but some Creatures or other endued with Reason. For all this Furniture and Beauty the Planets are stock'd with seem to have been made in vain, without any design or end, unless there were some in them that might at the same time enjoy the Fruits, and adore the wise Creator of them.

"But this alone would be no prevailing Argument with me to

allow them such Creatures. For what if we should say, that God made them for no other design, but that he himself might see (not as we do 'tis true; but that he that made the Eye sees, who can doubt?) and delight himself in the contemplation of them? For was not Man himself, and all that the whole World contains, made upon this very account? That which makes me of this opinion, that those Worlds are not without such a Creature endued with Reason, is, that otherwise our Earth would have too much the advantage of them, in being the only part of the Universe that could boast of such a Creature so far above, not only Plants and Trees, but all Animals whatsoever: a Creature that has a Divine somewhat within him, that knows, and understands, and remembers such an innumerable number of things; that deliberates, weighs and judges of the Truth: a Creature upon whose account, and for whose use, whatsoever the Earth brings forth seems to be provided. For every thing here he converts to his own ends."

After some reflections upon man's moral nature, he goes on by analogy to postulate humanlike senses and intellectual characteristics in the Planetarians. Our author is quite liberal in allowing these beings to possess various articles of convenience and comfort. They know how to read and write, and they use a variety of instruments. But he hesitates to admit that they wear spectacles. He explains:

"But for all our large and liberal allowances to these Gentlemen, they will still be behind-hand with us. For we have so certain a knowledge of the true System and Frame of the Universe; we have so admirable an invention of Telescopes to help our failing Eyesight in the view of the bigness and different forms of the Planetary Bodies, in the discovery of the Mountains, and the Shadows of them on the Surface of the Moon, in the bringing to light an innumerable multitude of Stars otherwise invisible, that we must necessarily be far their Masters in that Knowledge.

"What must I do here? I could find in my heart (and I can see no reason why I may not, except it be to flatter and complement ourselves in being the only People that have the advantage of such excellent Inventions) either to alow these Planetary Inhabitants such sharp Eyes as not to need them, or else the use of Glasses to help the deficiency of their Sight. And yet I dare not, for fear People should be so disturbed at the ridiculous Extravagancy of such an

Opinion, as to take the measure of my other Conjectures by it, and hiss them all off, upon the account of this alone."

He grants that there is no logical reason why the Planetarians' bodies should not be widely different from those of human beings; yet he avows that it would be a shock to think of them in this way. "I cannot without horror and impatience," he owns, "suffer any other figure for the habitation of a reasonable soul. For when I do but represent to my Imagination or Eyes a Creature like a Man in everything else, but that has a Neck four times as long, and great round sawcer Eyes five or six times as big, and farther distant, I cannot look upon't without the utmost aversion, altho at the same time I can give no account of my Dislike."

As to the size of the Planetarians, they are presumably of generous proportions. "For," he reflects, "if we should make them little Fellows about the bigness of Rats or Mice, they could neither make such observations as are requisite; nor such Instruments as are necessary to those Observations. Therefore we must suppose them larger than or at least equal to our selves, especially in Jupiter and Saturn, which are so vastly bigger than the Planet which we inhabit."

Our author's fancy is still far from exhausted. He throws out interesting conjectures as to the forms of industry and recreation that exist among the Planetarians. On the subject of music he is especially eloquent. We find, too, a great deal of serious astronomical data concerning the several planets jumbled with his extravagant fancies. There is a mine of interesting and entertaining matter in this unique old book, but space limitations preclude further quotation. Here we must take leave of Christian Huygens, astronomer, mathematician, and precursor of Jules Verne and H. G. Wells.