THE HAGUE 1698 · TRANSLATED FROM THE LATIN

Cosmotheoros

The Celestial Worlds — Christiaan Huygens on Life on Other Planets

COMPLETE IN MODERN ENGLISH · HUYGENS' OWN FIGURES

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Cosmotheoros

The Celestial Worlds

Christiaan Huygens on life on other planets (The Hague, 1698), translated in full from the Latin into modern English, with Huygens' own figures

BlusaBooks · MMXXVI

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Source: Christiaan Huygens, *Kosmotheoros, sive De terris coelestibus, earumque ornatu, conjecturae* (first edition: The Hague, 1698). Translated from the Latin from images of the pages of the second edition (The Hague, Adriaan Moetjens, 1699). The five figures are Huygens' own plates from the same edition.

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CONTENTS

Foreword 5

To the kind reader, greeting 8

Book one: is there life and reason on the planets? 9

I Ancients and moderns on inhabited planets 10

II The Earth among the planets: water, plants and animals 16

III Reasoning beings and their senses 33

IV Sciences and arts on other worlds 47

V Hands, houses, ships and music 54

Book two: a journey through the planets and the stars 72

VI Kircher's dream; Mercury, Venus and Mars 73

VII Jupiter and Saturn, their moons and the ring 81

VIII The Moon and the moons of other planets 93

IX The solar world and the Sun itself 101

X The stars — other suns with planets of their own 106

Commentary 118

FOREWORD

Are we alone? Today this question is asked by astronomers with giant telescopes who search for planets around distant stars. More than three hundred years ago the Dutch scientist Christiaan Huygens put it to himself and to his brother. His answer is this book — *Cosmotheoros*, Greek for "the observer of the world". Its Latin subtitle explains what it is about: "Conjectures concerning the celestial earths and their adornment". By "celestial earths" Huygens means the planets, and by their "adornment" everything that might be found on them: water, plants, animals and reasoning beings.

Who Huygens was. Christiaan Huygens (1629–1695) was born in The Hague into a distinguished family: his father, Constantijn Huygens, was a poet, a diplomat and secretary to the Princes of Orange. Christiaan became one of the greatest scientists of his century. In 1655, with lenses he had ground himself, he discovered the largest moon of Saturn, now called Titan, and realised that Saturn is surrounded by a thin, flat ring that nowhere touches it — which he explained in his book on the system of Saturn (1659). In 1656 he invented the pendulum clock, which measured time far more accurately than anything before it, and later the balance spring of the pocket watch. He worked out the centrifugal force, wrote on probability and on music, and in his treatise on light (1690) set out the idea that light travels in waves. For many years he worked in Paris as one of the first members of the French Royal Academy of Sciences; he was also a Fellow of the Royal Society of London and knew almost all the great minds of his time.

His last book. Huygens wrote *Cosmotheoros* at the end of his life, after returning to The Hague. It takes the form of a letter to his brother Constantijn, with whom in his youth he had ground lenses and watched the night sky through very long telescopes. The manuscript was finished when Huygens fell ill and died

in 1695; in his will he asked his brother to publish it. But Constantijn, too, died in 1697, before the book appeared. It was printed in The Hague in 1698 — unchanged, with the same dedication to the brother who was no longer alive. The book was much in demand: an English translation appeared in the same year, Dutch, French and German editions soon followed, and the Latin original was printed a second time in 1699.

What the book is about. Huygens reasons as a follower of Copernicus: if the Earth is only one of the planets that circle the Sun, why should life exist on it alone? In the first book he considers, step by step, whether the other planets might have water, plants and animals, whether reasoning beings live there, what their senses, hands and houses would be like, whether they sail ships, study the stars, know geometry and make music. In the second book he takes the reader on a journey: how the Sun and the sky look from Mercury, Venus and Mars, what can be seen from Jupiter and Saturn with their moons and ring, and what the Moon is like — without air, without seas or rivers. Finally, by a method of his own, he tries to calculate the distance of Sirius and arrives at the thought that every star is a sun like ours, perhaps with planets of its own circling it.

What we know now. Many of Huygens' conjectures have proved remarkably far-sighted. The first planet around a Sun-like star was discovered in 1995, and thousands of exoplanets are now known; astronomers look for those that might hold liquid water — just as Huygens linked life with water. His guess that Venus is wrapped in a thick veil of cloud was confirmed, but he was wrong about Jupiter and Saturn: they are gas giants with no solid surface. In 2005 a probe named after him — *Huygens* — landed on Titan, the moon he had discovered. Life beyond the Earth has not yet been found, so Huygens' question is still open.

Our translation. We translated from the Latin original, working from images of the pages of the second edition of 1699. The translation is complete, sentence by sentence, with nothing left out or retold; some long Latin sentences have been divided, but the content has not been changed. In the margins of his book Huygens wrote short notes saying what each passage is about; we have turned

them into headings in the text. For convenience Huygens' two books are divided into ten parts. Five of Huygens' own figures from the original edition — the solar system, the sizes of the planets, the orbits of the moons of Jupiter and Saturn, Saturn with its ring, and the path of the Earth and the Moon — appear where he refers to them.

How to read it. People, books, instruments and less familiar terms are explained in footnotes at the foot of the same page. Where Huygens' figures or views are known differently today, a footnote briefly says what we know now. Huygens writes as a seventeenth-century European, and in places his judgements about other peoples reflect the prejudices of his time; they are kept in the text as a witness of history and explained in the notes. At the end of the book each part has a commentary — "In plain words" and "What science says".

TO THE KIND READER, GREETING

This little book had already been brought to completion and was destined for the press when, to the very great loss of the world of letters, its illustrious Author was seized first by illness and then by death. He took care, however, that it should see the light: in his last will he asked his brother, to whom it was written, to be willing to undertake the care of its publication. But that most noble man, burdened with countless duties and journeys, being Secretary to the King of Great Britain[1] for Dutch affairs, was not free to attend to it until nearly a year after the Author's death. So it came about, since the printers' delays then intervened as well, that just when everything was ready for publication, this man too departed this life[2]; and thus this little book was bereft both of its Father and of him who after the father's death took his place, and to whom it had been destined. Nevertheless it comes before the public in exactly the form in which the Author composed it, and with the same dedication to his brother, though he is now dead (for it would have seemed a sacrilege to change anything), and in the firm hope that the learned will receive this last offspring of the Author as kindly as all his other works. Mathematical demonstrations, to be sure, they will not find everywhere, for the subject does not allow it; but they will find probable and ingenious conjectures, beyond which nothing more, it seems, can rightly be asked in such matters. Whatever could be drawn from our knowledge of the heavens they will see here demonstrated by reason; what cannot be seen from it has been shrewdly conjectured from the kinship of the heavenly bodies with our Earth. But what all this amounts to, you will better see from the Author himself. Farewell.

1. William III of Orange (1650–1702) — Stadtholder of the Netherlands and, from 1689, King of England and Scotland; Constantijn Huygens served as his secretary.
2. Constantijn Huygens the younger (1628–1697), Christiaan's elder brother, died in October 1697; Christiaan himself had died in July 1695.

BOOK ONE: IS THERE LIFE AND REASON ON THE PLANETS?

Christiaan Huygens' «Cosmotheoros», or Conjectures concerning the Celestial Earths and their Adornment. To his brother Constantijn Huygens

PART I

ANCIENTS AND MODERNS ON INHABITED PLANETS

Illustration in the manner of 17th-century Dutch painting

It can hardly be, my excellent brother, that anyone who holds with Copernicus[3] that the Earth we live on is one of the planets, which revolve about the Sun and receive all their light from it, should not sometimes think it not unreasonable to suppose that, just as this globe of ours, so the others too are not without cultivation and adornment, and perhaps not without inhabitants either. Especially if he also considers what has been discovered in the heavens since

3. Nicolaus Copernicus (1473–1543) — Polish astronomer; in *On the Revolutions of the Heavenly Spheres* (1543) he placed the Sun at the centre and counted the Earth among the planets.