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SCIENCE, THEOLOGY & THE COPERNICAN REVOLUTION

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SCIENCE, THEOLOGY & THE COPERNICAN REVOLUTION

By John F. Haught

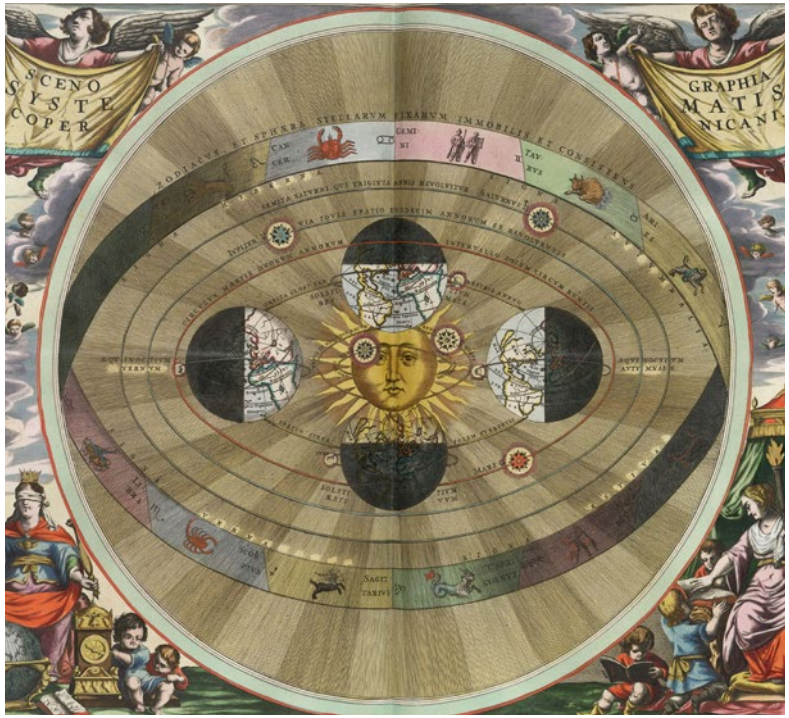
Why is there such resistance to science by so many religious believers? It is partly because faith has always been closely tied to a particular age's picture of the natural world.

At the beginning of the scientific age, people were not only intellectually shocked but also spiritually threatened by the news that the Sun was being asked to exchange places with the Earth. In 1612, the devout Anglican poet John Donne wrote these anguished lines in his poem "Anatomy of the World":

> And new philosophy calls all in doubt,
> The element of fire is quite put out;
> The sun is lost, and th' earth, and no man's wit
> Can well direct him where to look for it
> 'Tis all in pieces, all coherence gone;
> .....
> (lines 205–208, 213)

The "new philosophy" that Donne refers to — since there was no word for "science" at the time — is the Copernican revolution. In 1610, two years before Donne's poem appeared, Galileo Galilei (1564 — 1642) had published the world's first scientific bestseller, *The Starry Messenger*. This revolutionary work argued that the heavens are not organized the way astronomers, philosophers, and theologians had taught for ages. As far as Donne was concerned, however, Galileo's ideas threatened not only the entrenched cosmology of Plato, Aristotle, and Ptolemy but also the religious sensibilities associated for centuries with an Earth-centered (geocentric) vision of nature.

In 1543, the Polish astronomer and cleric Nicolaus Copernicus had already proposed that movements in the skies could be predicted more accurately than before if one supposes that the Earth and other planets revolve around the Sun. However, prior to Galileo's release of *The Starry Messenger*, Copernicus's new model of the heavens seemed little more than an abstract mathematical scheme for making astronomical predictions. Those who read Copernicus's work often took it simply as an experiment in thought rather than a realistic representation of the heavens and Earth. For Galileo, on the other hand, the Copernican system was not a mental exercise but an approximation of the way the heavens really do hang together.



A 1661 engraving of the Copernican model of the Solar System

In his later and more controversial work, *Dialogue of the Two Chief World Systems*, Galileo could scarcely conceal his growing conviction that the Copernican universe must now replace the Ptolemaic one. His increasingly bold teachings and writings eventually led, in 1633, to the Catholic Church's notorious condemnation of Galileo's new science and to his being put under house arrest until his death in 1642.

The Church now regrets its mistake and insists that there can be no genuine conflict between science and faith. However, in the seventeenth century, Donne and many of his contemporaries interpreted the new science as a great threat to spiritual as well as intellectual life: "'Tis all in pieces, all coherence gone," the poet worried, expressing a kind of religious anxiety that still occurs among many people of faith when they hear about new scientific discoveries.

A crossroads for science and theology

Why is there such fierce resistance to science by so many religious believers? It is partly because faith, theology, and spirituality have always been closely tied to a particular age's picture of the natural world. In biblical times, for example, the religious drama of salvation assumed a three-level picture of the cosmos: the heavens fixed firmly above; the Earth beneath; and then, lower still, the underworld (Sheol), the dwelling place of the dead. In the seventeenth century, most religious believers took the biblical portrait of nature literally. Certain passages in the Bible insinuated that the Sun moves and the Earth stands still. Thus, the Bible seemed to support the Ptolemaic picture of the Universe, while Copernican astronomy seemed to contradict God's word.

Galileo's opinion, however, was that the Bible should not be read as a source of scientific information, a position that the Catholic Church now officially accepts. The Bible has nothing to contribute to any knowledge that human beings can gather on their own, that is, with their own natural powers of observation and mathematical reasoning. Galileo continued to believe that the Bible was inspired literature, but he cautioned that people miss the religious meaning of Scripture whenever they treat it as a source of scientific truths.

In his Letter to the Grand Duchess Christina, Galileo claimed the support of the renowned early Christian writer Augustine of Hippo (354 — 430 CE). Augustine had pointed out that Christian instruction should not insist that converts to Christianity take the cosmology of the Bible literally. To do so would only prevent those who can't accept the literal cosmology from taking the religious meaning seriously in the Scriptures.

Some historians and scientists have assumed wrongly that Galileo's clash with his Church means that he saw a conflict between science and faith. However, he never thought of his observations and ideas as contrary to the basic teachings of his faith. For him science has little or nothing to do with theology. Nonetheless, the case of Galileo and the entire Copernican revolution, as Donne's poem indicates, did have implications for human spirituality.

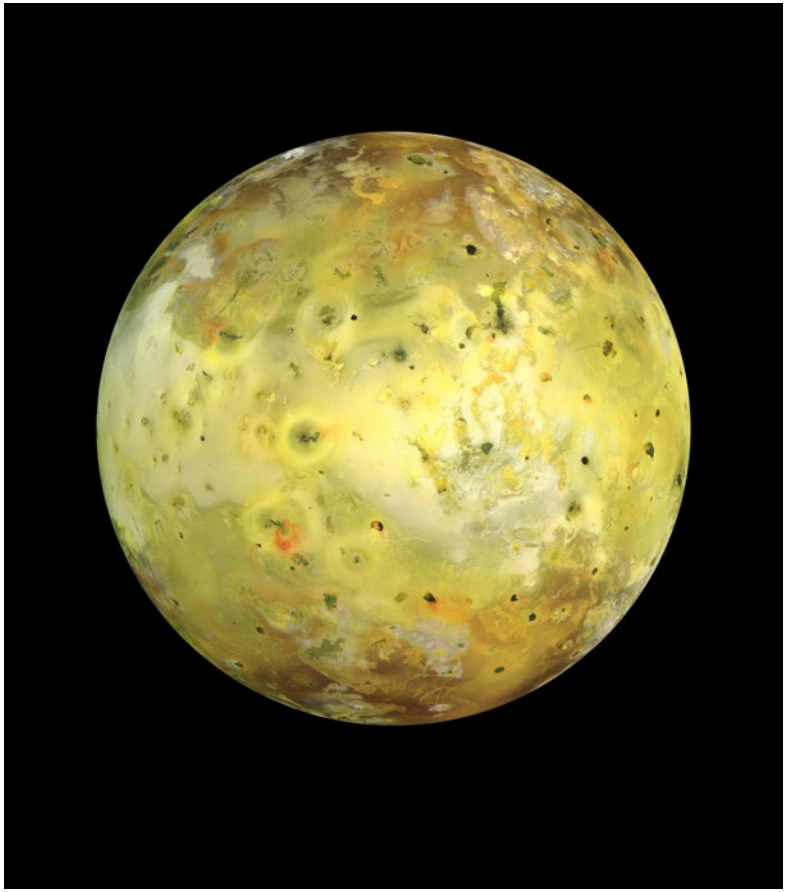
"Spirituality" is the quest for a vision of reality that will give people courage, hope, and some degree of happiness in the midst of life's inevitable tribulations. For centuries, Ptolemaic astronomy had provided a framework for spiritual inspiration. For most people, the skies held visible hints of a better world. The perfectly circular movement of heavenly bodies and the faultless spherical geometry of the Sun and Moon, for example, offered at least a hint of the infinite beauty that seemed to lie beyond our shadowy and perishable world.

The new science, however, seemed to call all of this "in doubt," as Donne puts it. With the more precise astronomical measurements by Copernicus, Brahe, Kepler, and Galileo, the heavens were undergoing a series of demotions that dimmed their luster. Consequently, the Copernican revolution produced a massive upheaval not only in science but also in spiritual life.

The final blow

Ancient astronomy, philosophy, and theology had all assumed that the superlunary world — the world beyond the orbit of the moon — is special. Above the Moon's orbit the heavens seemed immune to change, novelty, and collapse. Their immutability pointed both minds and hearts toward a better and more permanent world than that which existed on Earth. Aristotle (384 — 322 BCE) had even portrayed the heavens as a "quintessential" (fifth) kind of reality far surpassing in value the four mundane elements (earth, air, fire, and water) that make up the sublunary world "down here." In contrast to imperfect earthly things that change and eventually perish, the heavens seemed to mirror the changeless eternity of God.

Modern astronomy, however, gradually robbed the heavens of their transparency to God — at least for many thoughtful people like Donne. Tycho Brahe (1546 — 1601), for example, demonstrated to his shocked contemporaries that comets and supernovae — both implying change and novelty — existed beyond, rather than beneath, the Moon's orbit. Thus the superlunary heavenly vault showed itself to be imperfect after all and could no longer adequately represent the unchanging perfection of God. Johannes Kepler



A photograph of Io, one of Jupiter's moons

(1571 — 1630), moreover, calculated that planets move in "ugly" elliptical patterns rather than perfectly circular orbits. Careful new observations increasingly demonstrated that the heavens, like things on Earth, are ordinary after all.

It was left to Galileo, however, to deliver the decisive insult to the heavens, although even he still believed that celestial orbits were perfectly circular. His lively writings delivered the news that the Moon is pocked with craters, Venus goes through phases, Jupiter has satellites, and the Sun is blemished with dark spots.

Finding perfection in change

Galileo's view of the Copernican model was both simple and profound. What is so great, he asked, about changelessness? And what is so bad about the dirty, changing Earth that we inhabit? Look carefully at what lies beneath our feet and not just over our heads! If the total amount of dirt on Earth were as small as the tiny amount of precious jewels, what ruler or king would not gladly exchange all his diamonds for just enough dirt to bring forth a tangerine or jasmine tree?

Isn't life, in other words, a much richer symbol of perfection than the mistaken idea of changeless heavens could ever be? Little did Galileo know, however, of the remarkably tight narrative connection that astronomy and astrophysics would eventually draw between the existence of life and the seemingly unchanging and impersonal heavens.

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A 1999 photograph of Jupiter's moon Io taken by the Galileo spacecraft,
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