

The Dawn of a New Universe

It must have been a breathtaking experience to have been among those earliest scientific revolutionaries of the modern era, Copernicus and his immediate successors—Rheticus, Giese, Digges, Bruno, Maestlin, Kepler, Galileo—as they first began to grasp the stupendous truth of the heliocentric theory. The sense of cosmic upheaval and wonder would have been nearly inexpressible. A view of the Earth and its place in the universe that had governed the human mind virtually without question for untold thousands of years was now suddenly recognized to be a vast illusion. We in the twenty-first century, long accustomed to living in the new universe those Renaissance visionaries first revealed, must call upon a profound act of the intellectual imagination to enter again into that dramatic moment of transition between worlds. To have it suddenly dawn upon one that the great Earth itself, the most obviously stationary and immovable entity in the cosmos, upon which one had lived in changeless solidity all one's life, was in fact at that moment moving freely through space, through the heavens, spinning and circling around the Sun in an immensely expanded universe—no longer the absolute fixed center of that universe, as had been assumed since the beginning of human consciousness, but rather a planet, a wanderer, an exalted celestial body in a new cosmos whose dimensions and structure and meaning were now utterly transfigured: such a revelation must have filled the mind and spirit with an awe seldom known in human history.

Yet it is not just the sheer magnitude of the Copernican revelation that so easily escapes us today. We also tend to forget, and conventional histories of the Scientific Revolution tend to overlook entirely, the degree to which the original discovery was charged with intense spiritual significance. The early scientific revolutionaries perceived their breakthroughs as divine illuminations, spiritual

awakenings to the true structural grandeur and intellectual beauty of the cosmic order. These were not merely abstract conceptual innovations or empirical findings of purely theoretical interest. They were not, as had been true of astronomy since classical antiquity, merely instrumentalist mathematical constructs, epicyclic elaborations ingeniously devised for the purpose of marginally increasing predictive accuracy. The new discoveries were triumphant fulfillments of a sacred quest. For thousands of years, the celestial and terrestrial realms had been regarded as unalterably separate realities, as incommensurable as the divine was to the human. Because of their extreme complexity, the true nature of the planetary motions had come to be seen as fundamentally beyond the capacity of the human intellect to understand. Concerning heavenly and divine matters, it seemed, only the Bible could reveal the truth; human astronomy could produce nothing but artificial constructions, as through a glass darkly. But now the true reality of the divinely ordered cosmos had finally been revealed. The deep mysteries of the universe were suddenly unfolding within the awestruck minds of the new scientists through the grace of a sovereign Deity whose glory was now dramatically unveiled. The stunning mathematical harmonies and aesthetic perfection of the new cosmos disclosed the workings of a transcendent intelligence of unimaginable power and splendor. In that very epiphany, the human intelligence that could grasp such workings was itself profoundly elevated and empowered.

The heliocentric discovery thus became the source and impetus for a tremendously magnified confidence in human reason. It revealed the human being's divinely graced capacity for direct, accurate knowledge of the world at the most encompassing macrocosmic level, something never before known in the entire history of Western astronomy. It was specifically this unprecedented claim to cosmological truth, the claim to represent the objective reality of the great universe, not just a useful instrumentalist fiction, that made the Copernican revolution so

revolutionary, so emancipatory, as the very paradigm of modern humanity's new power of self-definition and cosmic illumination through reason.

Moreover, contrary to the human-decentering consequences later drawn from the Copernican shift, all of the great Copernicans from Copernicus through Newton were deeply convinced that the cosmic order was expressly created to be known and admired by the human intelligence. Here and now, after millennia of dark ignorance in an exile that had been as much spiritual as intellectual, the human mind had finally achieved direct contact with the true cosmic order as the divine mind had long intended. Only thus can we understand the full exaltation of Kepler, the pivotal figure of the Copernican revolution, as he announced his discovery of the third law of planetary motion, which completed the early mathematical foundation of the heliocentric theory:

Now, since the dawn eighteen months ago, since the broad daylight three months ago, and since a few days ago, when the full Sun illuminated my wonderful speculations, nothing holds me back. I yield freely to the sacred frenzy; I dare frankly to confess that I have stolen the golden vessels of the Egyptians to build a tabernacle for my God far from the bounds of Egypt. If you pardon me, I shall rejoice; if you reproach me, I shall endure. The die is cast, and I am writing the book—to be read either now or by posterity, it matters not. It can wait a century for a reader, as God himself has waited six thousand years for a witness.

A new universe had dawned, and the Sun, whose luminous centrality Copernicus and Kepler perceived as the very image of the Godhead, seemed to shine on the world a new light of divine intelligibility. Yet as Kepler's words remind us, these first discoverers were altogether alone in their new cosmos, alone in a way we today can hardly comprehend. Now that Copernicus and Kepler and the rest are seen

as but the first of millions to recognize the new universe, it is easy to forget how supremely isolated they were. During their lifetimes, there were no millions, but rather just one or two, later a handful, who wrote letters to each other from one country to another secretly encouraging each other in their scarcely believable conviction. To put ourselves in their position, we would have to imagine that we had made an epochal discovery that would be rejected out of hand not only by the untutored masses but by virtually all the major intellectual and cultural authorities of the time—all the most distinguished university professors, the most respected scientists, the Nobel Prize winners, the pope and other religious leaders, the most prominent philosophers, the scholarly contributors to the *New York Review of Books* and the *Times Literary Supplement*—all the conscientious and learned guardians of the cultural world view. For decade after decade our new conception of the cosmos would be, when noticed at all, forthrightly condemned by just about everyone who counted—dismissed and ignored as absurd nonsense or, if necessary, attacked and suppressed as a dangerous heresy.

Copernicus himself had anticipated such a reaction. In his preface to the *De Revolutionibus*, he predicted that as soon as certain people heard of his thesis they would “cry out that, holding such views, I should at once be hissed off the stage.” Recalling the Pythagoreans' habit of imparting their “noble and arduously won discoveries” only to an inner circle of friends and intimates, Copernicus stated that he had long hesitated to publish his work lest it be despised by those too unintelligent or prejudiced to comprehend it. And despised it was, by even the most advanced and innovative thinkers of the time. History textbooks have long made us aware that the major religious authorities of the time, first Protestant and later Catholic, vehemently opposed the Copernican theory. Even before the *De Revolutionibus* was published Luther is reported to have said, “People gave ear to an upstart astrologer who strove to show that the Earth revolves, not the heavens or the firmament, the Sun and the Moon. . . . This fool wishes to reverse the entire science of astronomy; but sacred

Scripture tells us that Joshua commanded the Sun to stand still, and not the Earth.” And in his *Commentary on Genesis*, Calvin wrote: “Who will venture to place the authority of Copernicus above that of the Holy Spirit?” Yet secular intellectuals were equally dismissive: “No one in his senses,” said the influential liberal philosopher Jean Bodin, “or imbued with the slightest knowledge of physics, will ever think that the Earth, heavy and unwieldy from its own weight and mass, staggers up and down around its own center and that of the Sun; for at the slightest jar of the Earth, we would see cities and fortresses, towns and mountains thrown down.”

The new theory conflicted not only with common sense, and not only with literal interpretations of certain passages of the Bible, but with the most cogent and long-established principles of physics and cosmology. Most of the leading academic scientists of the day thought the idea so implausible as not to require serious examination. Impressive scientific arguments (for example, concerning falling objects on the Earth) and rigorous astronomical observations (such as the absence of annual stellar parallax) strongly contradicted the heliocentric hypothesis. In the light of scientific assumptions then current, the new idea seemed altogether unreasonable. Arguments we find compelling today were not compelling then. Without an entirely new cosmological framework and new principles of interpretation through which to view the data, all the arguments and evidence for a moving Earth lacked force. Both physically and philosophically, the new theory was “impossible.” Though it depended in part on hard-won conceptual advances made by the Scholastics of the medieval universities, its implications radically challenged the entire medieval world view. Today we can easily lose sight of what a bold, almost reckless act of faith supported the revolutionaries' belief in their new world. It certainly was not empirically “proven.” Little wonder that to bolster their fledgling hypothesis and give themselves encouragement, the early Copernicans repeatedly brought up the

names of every ancient authority they could—Aristarchus, Heraclides, the Pythagoreans—as precursors of their own view.

It was not primarily empirical considerations nor, in the narrow modern sense, “rational” factors that were decisive in persuading the early Copernican revolutionaries to pursue and elaborate the heliocentric hypothesis. These were necessary but not sufficient conditions for such a radical change. It was, above all, powerful spiritual and even aesthetic intellectual predispositions that made the crucial difference. And it was these predispositions—influenced by Renaissance Humanism and Neoplatonism, Hermetic esotericism, and Christian mysticism, all supporting a vastly expanded mystical-mathematical cosmology—that effectively transformed the significance of the rational and empirical factors. To conceive and propose the new vision of the cosmos required a new Humanist confidence in the world-completing, self-realizing power and role of the human being, capable of grasping and articulating the true forms of the divinely created universe. To be attracted to the heliocentric conception required as well a Platonic-Pythagorean conviction that the Creator of the universe expressed the divine intelligence through mathematical forms and geometric harmonies of an eternal, transcendent nature, and that the problem of the apparent planetary motions, bewilderingly complex, veiled a simpler, elegant truth. It further demanded a Neoplatonic apprehension of the Sun as a visible reflection of the central Godhead, a living metaphor of the divine creative principle, whose luminous radiance and glory made it the most appropriate body in the heavens to be the cosmic center. To adopt the Copernican idea in those first decades took above all an overriding passion for a certain kind of intellectual beauty and precision, a sensibility that so valued elegance, harmony, simplicity, and coherence as intrinsic qualities of the divine heavens that one would be willing to ignore both the evidence of the senses and the arguments from contemporary physics against the movement of the Earth, confident that in time adequate explanations could be found.

The first Copernicans had experienced a kind of inner conversion. Their epiphany was at once intellectual and spiritual, psychological and cosmological, and all their research and thinking served the new vision by which they were happily possessed. Their intuition ran ahead far in advance of all the theoretical and empirical work that had to be done before the new theory could be fully justified and grounded. Even a century after Copernicus, in the *Dialogue Concerning the Two Chief World Systems*, Galileo underscored this point:

You wonder that there are so few followers of the Pythagorean opinion [that the Earth moves] while I am astonished that there have been any up to this day who have embraced and followed it. Nor can I ever sufficiently admire the outstanding acumen of those who have taken hold of this opinion and accepted it as true: they have, through sheer force of intellect done such violence to their own senses as to prefer what reason told them over that which sensible experience showed them to be the contrary. For the arguments against [the Earth's rotation] we have examined are very plausible, as we have seen; and the fact that the Ptolemaics and the Aristotelians and all their disciples took them to be conclusive is indeed a strong argument of their effectiveness. But the experiences which overtly contradict the annual movement [of the Earth around the Sun] are indeed so much greater in their apparent force that, I repeat, there is no limit to my astonishment when I reflect that Aristarchus and Copernicus were able to make reason so conquer sense that, in defiance of the latter, the former became mistress of their belief.

For the Copernican hypothesis to be made reasonable, an entirely new conception of “reason” itself had to be forged: new ways of deciding what counts as truth, new ways of recognizing patterns, new forms of evidence, new categories of interpretation, a new understanding of causality. Long-established rules of scientific

methodology had to be overturned. An entirely new epistemology and ontology had to be formulated. The nature of the Copernican revolution was so fundamental that what had to be rethought was not only all the conventional scientific theories but the entire established hierarchy of humanity's place in the universal scheme of things: its relation to the rest of nature and to the cosmos, its relation to the divine, the basis for its morality, its capacity for certain knowledge, its historical self-understanding.

Such a radical transformation could not happen overnight. For the cultural mind and psyche to support that transformation, the passage of entire generations was required, including the deaths of the many intellectual authorities who were incapable of escaping the hold of the reigning paradigm. The required change was not just physical but metaphysical: the entire world needed to be revisioned. In the end, the implications of the great shift—cosmological, religious, moral, epistemological, psychological, existential—were so far-reaching that it would take centuries to work them out, even to become conscious of them.

Gradually, the passage of time, and heroic efforts against powerful opponents and entrenched assumptions, brought about the complete triumph of the Copernican shift. Yet as the modern age progressed, the passage of yet more time brought forth, with what now seems a fateful inevitability, a succession of new consequences and elaborations out of the deep matrix of the Copernican revolution that could scarcely have been more paradoxical, revealing implications often sharply antithetical to the cosmological vision of its originators. Its larger meaning has been transformed with each succeeding age, and is, today, still unfolding.