

As Murdin explains in his preface, “rather than being arranged chronologically or thematically, the book pairs complementary or contrasting pairs of images to underline continuity, innovation or change” (p. 7). Each image is accompanied by a short text of 300 to 400 words that explains what the reader is seeing and sets it within a historic or cultural context. The range of material presented is wider and more culturally diverse than one finds in *Cosmos* and the quality of the reproductions is superb (the larger 2017 format is truly sumptuous, but the 2019 midi-format is much easier to carry and consult). The text is reassuringly authoritative, while allowing room for admissions where our collective understanding is still in flux.

There is a pairing of the *Hall of the Bulls* from Lascaux (c. 15000 B.C.E.) with a digital photograph from 2012 of M45 (with the nice tag of “dimensions variable”) that leads one to speculate on the possibility that the former might contain an early depiction of the Pleiades. A seventeenth-century copper engraving of the Moon by the astronomers Gian Domenico Cassini and Jean Patigny is set beside a painting of *Moon Dreaming* by the aboriginal artist Mick Namarari Tjapaltjarri (1978), prompting questions about how one expresses what one “knows to be true.” The mapping of galaxies is addressed by the contemporary Argentinian artist Tomás Saraceno (2008) and the Sloane Digital Sky Survey Team III, led by Daniel Eisenstein (2016). The schematic rendering of the night sky, painstakingly carved on the surface of the Tal Qadi stone from Malta (c. 3000–2500 B.C.) vies with the jaunty rendering of *Constellation: Towards the Rainbow* by Joan Miró (1941). And a woodblock print of the *Hare in the Moon* by the Japanese artist Matsumura Go Shun (1801–1850) is set alongside the well-known image of a rocket landing in the eye of “the Man in the Moon” from George Méliès’s film, *Le Voyage dans la lune* (1902).

In some ways, then, the arrangement of the pictures mimics the experience of walking through an intelligent and well-curated museum exhibition, where the “visitor” is provided with sufficient information to encourage active engagement with the subject at hand, but is left free to browse and discover, to muse and opine, to reflect and challenge. As such, it panders – in the best of ways – to our curiosity and sense of wonder.

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Copernicus’s Fifteenth-Century World

Before Copernicus: The Cultures and Contexts of Scientific Learning in the Fifteenth Century.
Edited by Rivka Feldhay and F. Jamil Ragep (McGill-Queen’s University Press, Montreal & Kingston, London, Chicago, 2017). Pp. xx + 344. CAD 39.95. ISBN 9780773550100 (paper).

The volume *Before Copernicus* is a most welcome and direly needed contribution to research on Nicholas Copernicus. It shifts attention from Copernicus himself to the

fifteenth-century intellectual and scientific context of his work, both within and outside Europe, in Latin, Arabic, Hebrew and Greek. The book combines eight papers by different authors but is much more than a standard collective volume. With the exception of the first two papers, which are rather short and unspectacular, the volume offers long and substantial research papers by a group of experienced experts on the topic, who convened in four workshops in Berlin and Toronto between 2005 and 2009 to prepare this book. The work, therefore, has a certain coherence which will help to make it the point of departure for future scholarship on Copernicus' background.

The introduction by Rivka Feldhay and Jamil Ragep is very recommendable reading, unusual for a collective volume. It offers an informative analysis of the *status quaestionis* and a well-argued rationale for the volume and for future scholarship. The editors sympathize with Noel Swerdlow's internalist interpretation of the origin of Copernicus' astronomy in terms of mathematical and astronomical motivations, but believe that it falls short of a full explanation of the phenomenon. Their main argument is that Copernicus could have solved the astronomical problems he saw within a geocentric framework, as did other critics of Ptolemaic astronomy before him. This is why the editors call for a multidisciplinary and multilingual study of Copernicus' background – with much justification.

There is no synopsis of the results at the end of the volume, and there cannot be, because the authors take different routes in their analyses. I shall point to some important directions. One concerns the much-disputed question of whether Copernicus was influenced, consciously or unconsciously, by astronomers in the Islamic world. The general tendency of the volume is to answer "yes." The most important argument operates with the phrase "sustained criticism." Whereas criticism of Ptolemaic astronomy and the development of alternative planetary models was a long-term process in the Islamic world, the attempts at reform in the Latin West were "ad hoc, episodic, and decontextualized" (p. 197); in other words, "sustained criticism" of Ptolemaic astronomy was a phenomenon of the Islamic world only (pp. 214, 271). Because of this, Jamil Ragep and Robert Morrison find an East-Western transmission of astronomical models such as the Tūsi-couple much more likely than a parallel invention.

As to the possible routes of transmission, the volume explores many possibilities (via Greek and Hebrew in particular), but does not offer smoking-gun evidence. The arguments and hypotheses advanced in the book are strongest when based on philological evidence, e.g. as when Edith Sylla shows that an important source for the Latin criticism of Ptolemy was Albertus Magnus' paraphrasis of Aristotle's metaphysics, which transports Arabic criticism of Ptolemy (p. 75), or when Jamil Ragep demonstrates that Proclus' Euclid commentary cannot be the source of Copernicus' Tūsi-couple (p. 185). In general, however, the volume is much stronger on historical than on philological arguments. More philology, more studies of textual vestiges of influence, seem to me the main future road towards solving the transmission vs parallel development problem.

Another important avenue of investigation concerns the influence of Regiomontanus and Peurbach on Copernicus. In a very convincing paper, Edith Sylla argues that, already in Cracow, Copernicus learned to conceive of astronomy as a mathematical *and* physical science, his source being Peurbach's *Theoricae novae planetarum*, which in turn continues the discussion of the physical principles of astronomy by the famous Arab scientist

Ibn al-Haytham. From reading another Arab, Averroes, Copernicus learned in his student years that cosmology and astronomy are works in progress and that a reform of the physical side of astronomy is a matter of great concern. The true setup for Copernicus was formulated by Regiomontanus, as Michael H. Shank shows. Regiomontanus inherited to him the unsettled question of how to develop a physical astronomy that is concentric without epicycles and eccenters. In view of Shank's conclusion that Copernicus worked within a tradition that did not derive models from observation, I am not convinced of the paper by Raz Chen-Morris and Rivka Feldhay who argue that changing attitudes towards visibility in the fifteenth century, as reflected in Alberti and Cusanus, may have influenced Copernicus' attitude towards observation and the observer standpoint. This is not impossible; but Alberti and Cusanus, the primary objects of this paper's analysis, are difficult to connect to Copernicus historically and do not seem to be representative of the major trends in academic optics that Copernicus was confronted with.

All in all, this is an impressive research volume, which will certainly and deservedly exert important impulses on future scholars who set out to understand the origin of the Copernican transformation.

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Copernicus from 30,000 Feet

Nowy obraz świata, Poglądy filozoficzne Mikołaja Kopernika [The New Image of the World, The Philosophical Views of Nicolaus Copernicus]. Marcin Karas (Jagiellonian University Press, Cracow, 2018). pp. 220. 36.71 Zł. ISBN 9788323344896.

After initial comments on the state of research and his research plan, Marcin Karas in an introductory chapter considers Copernicus' national and social identity. The five chapters that follow treat the predecessors of heliocentrism, with sections on cosmology in Copernicus' time and Copernicus' inspirations; the philosophy of nature and methodology of science; cosmology; the problem of Earth's motions; and the heliocentric universe. The author concludes with a summary and further reflections and a bibliography of sources with lists of fundamental references and auxiliary studies. An index of names and a subject-matter index are followed by three appendices, on the cosmology of the Venerable Bede, on the heavens in the writings of Thomas Aquinas, and on the history of science and philosophy in the Baroque era, each providing perspective on Copernicus' philosophical views.

The book does not include a summary in another language, but there is a paragraph from the conclusion that can serve that purpose:

In scholarly and popular literature the figure of Copernicus is associated with many alternative theses. He is treated either as Polish or as German. As a scholar who wrote only in Latin and Polish, or only in Latin and German. His theory belongs to the Middle Ages or to the