

landscape photography over the last decade or so. His books on the topic have been widely successful and his exhibitions have appeared at the Smithsonian Institution and elsewhere. In the book under review, Benson unfolds a visual history of the universe and its conceptual framing. The focus is largely on European material and the images he has chosen mainly span the period from the 12th to the 21st century, but also include a few earlier items such as the Nebra sky disc and material from Egypt. Many of the images are not commonly seen, as Owen Gingerich rightly stresses in his foreword.

Benson has chosen his material diligently and it excellently illustrates the fascination with the universe, its phenomena, its secrets and its marvels, that has been widely spread between art and science over the last four millennia. The book presents illuminations from early imprints of Dante's *Divine Comedy*, maps from the 16th to the 21st centuries, scientific illustrations, paintings, photographs, still pictures from animated films and computer simulations. Benson has done an impressive job in bringing this diverse material together and providing very short commentaries to help us understand its provenience and relevance.

The book is structured in ten thematic chapters, arranged in chronological order, covering creation, the earth, the moon, the sun, the structure of the universe, planets and moons, constellations (including the Zodiac and the Milky Way), eclipses and transits, comets and meteors, and, finally, auroras and atmospheric phenomena. Each chapter is preceded by a short historical introduction of three to four pages, which may not always stand the scrutiny of the expert but surely would help non-experts to engage with the material. Often these introductory remarks are somewhat focused on the Renaissance and the early modern period. The story of Jeremiah Horrocks and his achievements in calculating and observing the transit, for instance, is too good to be left out and takes center stage in the chapter on eclipses and transits.

Benson clearly states that his book "is not an academic study" (317). Indeed, it is sparsely footnoted and the bibliographic hints are scarce. Why, then, is *Cosmigraphics* of relevance for the readers of the *Journal for the History of Astronomy*? Well, I find at least three good reasons. First of all, the book is just plain good fun, something we cannot say about all writings by professional historians of science. Second, it will make a valuable resource for teaching (conveying the fun). Finally, the book inspires, not so much by the quality of the commentaries, but by the choice and the arrangement of its visual material. And beyond this warm recommendation for academic use, the book is beautifully designed and would be a welcome addition to any cultivated coffee table.

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New sources for history of early modern astronomy

Celestial Novelties on the Eve of the Scientific Revolution, 1540-1630. Edited by Dario Tessicini and Patrick J. Boner (*Biblioteca di Galilaeana*, iii; Leo S. Olschki Editore, Florence, 2013). Pp. xvi + 282. € 32. ISBN 978-88-222-6254-7 (paper).

Several comets and new stars drew European eyes between 1572 and 1618, a period of new worlds, warring Empires, and Christian schism. Historians of astronomy have, understandably, centred on luminaries like Kepler and Galileo to see how objects like the supernova of 1604 cracked the crystalline purity of the Aristotelian worldview. More recently, following Sarah Schechner's study of popular interest in comets (1997), we have begun to learn how such celestial novelties mattered throughout European culture. Tessicini and Boner's collection of essays spans these two approaches, connecting the history of celestial novelties with broader intellectual, political, and religious histories of early modern Europe.

One theme is the ways early moderns turned to history to make sense of comets. Adam Mosley opens with a study of how the historical record was used to debate the worth of astrology. Antoine Mizauld and those inspired by Melanchthon found that history supports the inference that comets do, in fact, portend human affairs. Others, from Thomas Erastus to Thaddaeus Hegadius, disagreed, based on the same evidence as extracted from the new genre of comet catalogues. Not that astrologers grew scarce during the period; Tayra M.C. Lanuza Navarro and Victor Navarro Brotons show that commentaries on comets written in Spain were driven by astrological assumptions; history showed the validity of astrological prediction and heavenly conjunctions in turn explained the great turning points in history. As Nick Jardine argues, Christoph Rothman's *Dialexis* on the comet of 1585 exemplifies *historia* as collections of *observationes*.

History also mattered in political and confessional battles. Boner and Francesco Barreca together unfold the rhetorical layers of Kepler's dedicatory letters to Rudolph II, showing how Kepler coupled the comet of 1604 with the rise and fall of war with the Ottomans and the Hungarian Rebellion, with the comet and conflicts all fading by 1606. Celestial novelties and their meaning for empire gave Kepler a chance to defend, at one stroke, his salary and the new Copernican theory. The science of the stars divided along confessional lines, as Isabelle Pantin shows for the Carmelite Francesco Giuntini, suspected of Lutheran sympathies for his astrology. To answer suspicions, he shored up positions associated with Gemma Frisius and Melanchthon using a longer tradition of ancient and medieval authorities, thus blurring confessional lines. Elide Casali similarly finds Christian motivations for astronomy across the period, despite great changes in the nature of astronomy. In response to the comet of 1577, Italian comet literature presented the interpreter of the stars as the Christian *sapiens*. But after 1618—after the study of the stars had been mathematized and mechanized, Casali contends—Italian comet literature evinced the same 'Christian astrology', so that 'religious and devotional sentiments' drove accounts of comets no less than before (131).

Several contributions describe what celestial novelties meant for medicine, natural philosophy, and planetary theory. John Henry describes the French physician Jean Fernel's *De abditis rerum causis*, which underscored the ongoing significance of celestial influences for reformist approaches to medicine. Tessicini surveys texts on the comet of 1577 that were produced in Italy; most were *discorsi* on the received Aristotelian theory of comets as exhalations, which could be vehicles for critique of the tradition, like that by the Veronese physician Giuseppe Valdagno, who synthesized Aristotle's exhalation theory with the newer optical theory of Cardano. Comets, he argued, were exhalations from earth illuminated by the sun. Miguel Angel Granada turns to the longer history

of Kepler's response to the nova of 1604, in Tycho Brahe's "Anti-Copernican Campaign" after 1588. Most remarkably, Granada shows how Brahe developed a case *against* Copernicus based on internal proportions and harmonies in his own Tyconic theory of the planets (an argument Kepler would flip on its head, discovering compelling evidence *for* Copernicus in the harmonies of ratios between planetary distances and motions). Édouard Mehl sets Descartes' account of vortices as the origins of comets against the backdrop of several "heterodox" German contemporaries who, like Descartes, ignored both Genesis and Aristotelian meteorology. Finally, Giorgio Strano returns to the familiar ground of Galileo's telescope observations; his own reduplication of Galileo's drawings, using a Galilean telescope, allow us to understand with greater precision just what Galileo saw, as well as the visual rhetoric of his sketches.

One of the accomplishments of this volume is to bring a feast of new sources to the table. Navarro and Brotons unearth a large Spanish comet literature that needs attention, including some manuscripts (although without citing shelfmarks). Tessicini's contribution is exemplary, not only for refuting old assumptions that the Italy of Galileo's youth was uninterested in comets but also for offering a generous handlist of 36 works on comets published in Italy. Mosley has collected an entire genre of cometary catalogues. With new sources springing up on every side, the story of early modern astronomy is far from finished.

This collection may guide that story, precisely because it ranges over a wide spectrum of evidence. Several chapters suggest the importance of astrology in popularizing the Copernican theory, supporting Robert Westman's *Copernican Question*, which attends to a similarly broad spectrum of "literature of the heavens". The middling parts of the spectrum, as Casali shows, are full of evidence about the religious motivations for natural knowledge and would help us to better map the twisting confessional allegiances. Such a map might help us, for example, better distinguish theological and natural philosophical heterodoxy, which Mehl's contribution elides. Given the role of medical men in writing such middling literature, the chapter on Fernel seems a somewhat token representative of a set of authors who drew together the gritty and the grand of European responses to new lights in the skies.

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On dark matters and metaphors

The Cosmic Cocktail: Three Parts Dark Matter. Katherine Freese (Princeton University Press, Princeton, 2014). Pp. xi+250. \$29.95. ISBN 978-0-691-15335-3

Pull up a chair, pour yourself something nice to drink, and let me tell you a little bit about dark matter, dark energy, and some of the most challenging concepts in cosmology. That is the informal yet informative tone that Freese sets in *The Cosmic Cocktail*. The image