computer'; just as Chaucer had written for his ten-year-old son.

The *Equatorie of the Planetis* described a large instrument, six feet across, which Westwyk specially designed to calculate the positions of each planet with surprising precision. Throughout his manuscript you can follow his thinking as he worked; he crossed out words and noted further explanations. Falk explains the construction and operation of the *Equatorium* in excruciating detail, which would have worked better as an appendix for the truly devoted historians and astronomers. All but the most interested and advanced readers will probably skim the lengthy and involved description of the construction and operation of the astronomical device. After this manuscript production there has been no further information on Johannes de Westwyk yet discovered.

Falk's book (named a Best Book of 2020 by *The Telegraph*, *The Times*, and *BBC History Magazine)* is divided into seven finely crafted chapters in which he manages to revitalize the medieval period with its variety of interesting personalities, theological doctrines, and cosmological theories that reach into numerous areas. Study of nature and of the heavens was a fundamental part of medieval lives, including those in religious orders. Falk contends that rather than being isolated in their monasteries, medieval monks were influenced by an "… international scientific fraternity of Jews and Muslims, Italians and Germans." (page 121). They were eager to keep up with intellectual progress and the latest scientific discoveries. There was no contradiction in being a monk and a scientist.

Through the life of a single, undistinguished, but captivating monk, Falk touches on all aspects of medieval life, on the monks' Rule of St Benedict, chanting, prayer, memorization techniques, canon law, the movement of books in monastic libraries, the Albigensian Crusade and the Black Death. Almost drowning in exacting details, he describes the Roman calendric system of Kalends, Nones, and Ides, the Muslims and Jews in Spain. He mentions innumerable personalities who made contributions to medieval astronomy, including Walcher of Malvern, Pedro Alphonso, Constantine the African, Gerard of Cremona, Roger Bacon and Robert Grosseteste, explaining the scientific explosion before the Renaissance. Falk notes that for medieval people, the "… study of the world – that is, the whole created cosmos – was a route to moral and spiritual wisdom." (page 295).

This survey, or reader's guide, to the Middle Ages, with 62 illustrations, is well constructed and tediously researched. It seems overly ambitious, at times trying to cover all bases; in some areas too tedious for newcomers and then covering too much well-known material for those knowledgeable in medieval studies.

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**_Mars_, by Stephen James O'Meara. (London, Reaktion, 2020). Pp. 230. ISBN 978-1-78914-220-4 (hardback), 180 × 230 mm, US$40.00.**

Mars by Stephen James O'Meara is the latest in a series of Kosmos books by Reaktion Press on the Solar System. Published to date are volumes on Jupiter, Mercury, Saturn, The Moon, and The Sun. In the interests of full disclosure, my Asteroids book in the series was published in May 2021.

O'Meara, who has asteroid 3637 named in his honour, is a well-known writer of popular astronomy books, and his association with *Sky & Telescope* and *Astronomy* magazines has brought his name to the attention of everyone interested in astronomy. His fluid prose is always a delight to read, and nowhere has it been more needed than this book on Mars, where terms such as cyanobacteria, sputtering, andesitic lava and crystal magnetic field litter the text. Not all of these are explained, but 11 pages of references are given for the reader who wants to explore further.

An example of his writing to make complex issues more relatable is his mention of ice ages on Mars.

> In contrast to Earth's ice ages, a Marian ice age waxes when the planet's poles warm up ...They wane when the poles cool and lock water into polar ice caps … Understanding the ice caps' Jekyll-and-Hyde behaviour is important for future missions to Mars, so we can plan where the water will be when we send astronauts to the planet. (pages 89–90).

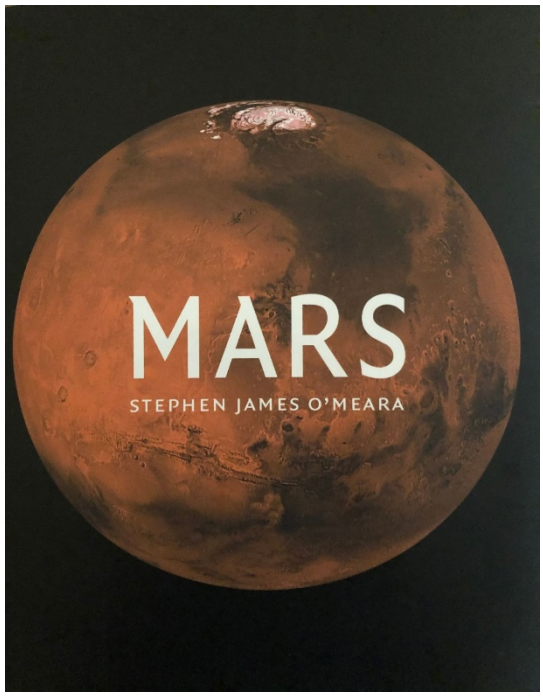
Specifically, on the topic of history of astronomy, O'Meara has a rich history of Martian studies to choose from. The first 50 pages of the book are an extremely fine synopsis of this history, beginning with a finely-crafted sentence, "Mars has burned its imprint on the human imagination ever since stargazers first pondered its appearance in the night sky." (page 7). A resident of Botswana, O'Meara begins with rock drawings dated to 70,000

years ago in that country. While fascinating, this prehistoric depiction of the Milky Way has no known connection with Mars, or any other planet. However, a photograph of the eclipsed Moon close to Mars on 28 July 2008 is especially beautiful, as it includes elephants in the Botswana landscape. The research paper of *JAHH* Associate Editor Duane Hamacher (2018) is duly noted, wherein he discovered the misidentification by anthropologists of Mars with a mythical being covered in red ochre. The old tale was actually referring to the red star Antares.

O'Meara shows us the earliest drawings of Mars, by Francesco Fontana in 1636, and the "… first indisputable recording of the V-shaped Syrtis Major dark surface marking, giving birth to the study of Martian geography …" by Christiaan Huygens in 1659 (page 27). The finest early geographic maps were drawn by Giovanni Cassini in 1666, which are also shown here. To William Herschel he attributes the first unequivocal statement of Mars' likeness to Earth, "… one that ignited the imagination with possibilities of life beyond Earth." (page 31). On that topic, I was quite surprised that the American fiction writer Ray Bradbury was totally ignored by O'Meara, as no one is more closely associated with the idea of life on Mars than Bradbury—an unfortunate lacuna in an otherwise excellent text.

The whole business of canals on Mars is naturally explored, but an important twist on this topic—ignored in most accounts—makes it much more intriguing. It is typically stated the *canali* noted by Giovanni Schiaparelli at the opposition of 1877 were soon misinterpreted as man-made canals, but O'Meara quotes Schiaparelli in 1895 as stating the idea intelligent beings were behind them "… ought not to be regarded as an absurdity." (page 38). The efforts of Percival Lowell to capitalise on all this is also well-known (a new section of the *JAHH* based on astronomical archives includes a paper on the Lowell-Schiaparelli correspondence—see Putnam and Sheehan, 2021), but O'Meara seems to have the chronology a little mixed up. He mentions the observations of Eugène Antoniandi made at the close opposition of 1909, which led to his 1930 publication of a book on Mars in which he called the canals illusions. A couple of paragraphs later, O'Meara states Antoniandi's arguments did not sway Lowell "… who continued to popularize his views in two more books, *Mars and its Canals* (1906) and *Mars as the Abode of Life* (1908) …", but these were published prior to Antoniandi's observations and analysis (page 42).

The author ably covers the study of Mars throughout the twentieth century, and gives us a remarkable quote that encapsulates the 'romancing of Mars' that Lowell, H.G. Wells and Orson Welles were instrumental in creating. He cites a 1959 U.S. Congressional report on space activities, which stated that "… there is rather good evidence that some indigenous life forms may exist …" on the red planet (page 56)!




O'Meara's survey of spacecraft encounters with Mars consume most of the book, perhaps the best brief survey of Martian exploration ever published, although I did find the inclusion of two graphics on methane production (pages 115 and 125) a bit puzzling, as one was certainly sufficient. Rounded out by chapters on the Martian moons (which cover their history of observation and geology) and what citizen astronomers can expect to see on the Martian surface in their own telescopes, this is a superb book on a planet whose red glare has entranced humanity through the ages.

## References

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