seven-page small-print index is especially thorough considering the length of the book.

This is a well-written and interesting book accessible to a broad readership. Although one might not agree with his more speculative points (which might turn out to be wrong), most will probably learn something from it and might be inspired to follow up the references in order to learn more. — PHILLIP HELBIG.

References

(1) C. Rovelli, *Seven Brief Lessons on Physics* (Allen Lane), 2015.
(2) P. Helbig, *The Observatory*, **136**, 155, 2016.

Io: A New View of Jupiter's Moon, edited by Rosaly M. C. Lopes, Katherine de Kleer & James Tuttle Keane (Springer), 2023. Pp. 375, 24 × 16 cm. Price £129·99 (hardbound; ISBN 978 3 031 25669 1).

Io After Galileo: A New View of Jupiter's Volcanic Moon, edited by Lopes and J. R. Spencer, appeared as a 'first edition' in 2007, but was not reviewed in these pages. This little world is a fascinating place, and all that molten sulphur takes me back to my career in the chemical laboratory. Tidally squeezed and heated, Io exhibits active volcanism and sports an exotic atmosphere. It emits 100 terawatts. Some light elements form a tail around its orbit. The sodium component of the tail is remarkably bright, and by 2023 was being successfully imaged by amateur astronomers even with small-aperture telescopes equipped with narrow-band filters.

That Io's darker poles had first been spotted by Barnard is mentioned in an historical summary early on, but the first low-resolution map made by the Pic du Midi observers in 1943–44 is not mentioned. The latter shows seven or eight intriguingly circular dark patches, of which several actually coincide with volcanoes, and I feel that it should be better known.

Early chapters discuss the moon's formation and evolution. Next comes Io's surface, where geological processes have eliminated the cratering record. I was particularly interested in Chapter 6 where Katherine de Kleer and Julie Rathbun show how, after the close of the *Galileo* mission, hotspots continued to be mapped by the limb-occultation technique, or imaged directly (with adaptive optics) by the *Keck* telescope. These data revealed four persistently active volcanoes. Different classes of eruption are now recognized, with even a suggestion of explosive or Strombolian-type activity.

Further chapters review the bulk composition of Io, its plumes, atmosphere, and magnetosphere. In Chapter 10 the authors discuss how Io can serve as a model for a tidally heated exoplanet, in particular planets b and c in the TRAPPIST-1 system. Future investigations by telescope and spacecraft feature in Chapter 11, written by Alfred McEwen *et al.* The latter missions include *JUICE*, scheduled to arrive in 2031.

A multi-author work such as this one needs a very detailed index, and I don't believe five pages are quite good enough. There are few names: 'Galileo' could equally be the philosopher or the space probe. 'Sulfur' is not indexed, although S_2, SO, SO_2, and sulphur ions are included. 'Volcano' and 'volcanic' are conspicuous by their absence. It would also have been convenient to have had (at the front or back) a full page (cylindrical?) reference albedo map of Io showing all the features named in the text: the maps on pages 149 and 250 only include a few names. Another issue is the high price. These drawbacks aside, this latest review of Io is full of fascinating data, richly illustrated, crammed with references, and is much to be welcomed. — RICHARD MCKIM.