Harrison and his chronometer. The book includes images of the four moons of Jupiter, but not the moons discovered by Cassini! And the book has no index!

In nearly every case when the author quotes a passage, it is given in the original language and English. But this laudable example is not carried over into the appendices. Here we find 41 pages in Italian and French, making a sizeable portion of this slim volume utterly useless to the vast majority of potential readers. Totally indefensible. The ethos I used in my own 5-volume series on asteroids for Springer was to publish everything in English, no matter what effort was required to render it into the international language of science. It is all quite ironic as the author makes it clear Cassini could not make his views properly understood when he arrived in Paris, because people there did not understand Italian and his French was not very good.

The subtitle of the book is also questionable. While Cassini was an excellent observer, his analytic skills led him to notable blunders. The author mentions two of these. He believed the comet observed in late 1680 and early 1681 were two separate comets, a conclusion Bernardi describes as an 'epic fail' because of his impatience and eagerness to publish (p. 132). From observations of Jupiter's satellites, he realised before anyone else there was a finite speed of light, but rejected the evidence in favour of the hypothesis "… that the diameter of Jupiter changed periodically." (p. 132).

The author mentions the fact Jean-Baptiste Delambre "… dismantled Cassini's contributions piece by piece …", without engaging in exactly what Delambre wrote. A topic Bernardi chose not to examine was the fact Cassini denied that planets move in elliptical orbits. Instead he introduced another oval named cassinoids in honour of himself! He also denied Newton's gravitation and insisted that the polar semi-axis of the Earth is longer than the equatorial.

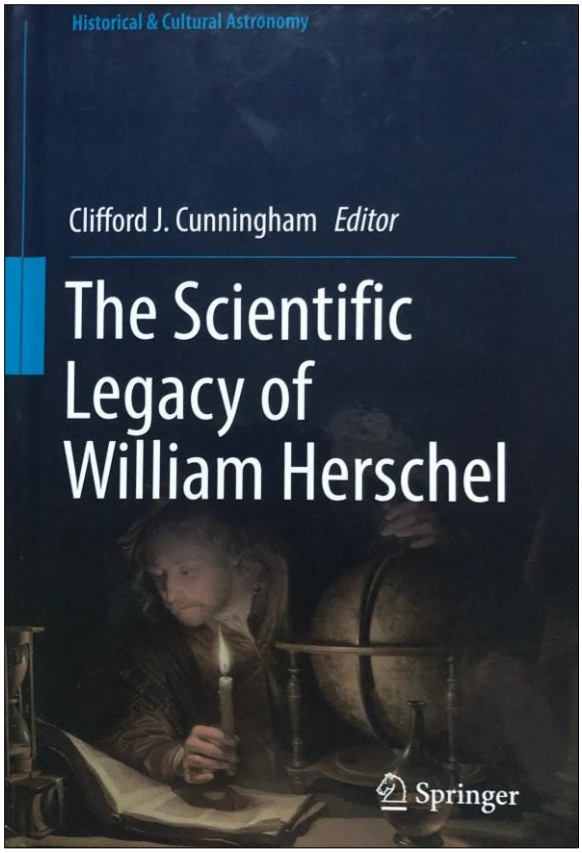
Bernardi offers just a single page on one of Cassini's greatest efforts, "… the first scientific map of our satellite …," which was completed in 1679 (p. 106). We are told he made drawings of the Moon at the Observatory of Paris from his arrival there in 1671. It is unfortunate none of these original drawings is shown here; rather we see one image of the entire Moon, which was actually done by Cassini's artistic assistants. The book includes the image of a letter written by Galileo, but nothing in the hand of Cassini, another missed opportunity.

In the absence of a full-fledged autobiography of Cassini in English, this book does serve the useful purpose of bringing his life and work in astronomy, cartography, astrology and engineering to a larger audience. It vividly portrays the limitations and potential of astronomy at the beginnings of modern astronomy.

Dr Clifford J. Cunningham
Centre for Astrophysics, University of Southern Queensland, Toowoomba 4350, Australia.
Email: Cliff.Cunningham@usq.edu.au

The Scientific Legacy of William Herschel **edited by Clifford J. Cunningham. (Springer, Cham, 2018). Pp. xxv +373. ISBN 978-3-319-32825-6 (hardback), 160 x 235 mm, US $189.**

It is certainly no exaggeration to say that William Herschel remains one of the most compelling figures in the history of astronomy. Volumes have been written on his life and work as well as his influence in moving the focus of astronomy from the Solar System to the sidereal Universe beyond. Despite this scholarship, however, many questions about his life and work remain unanswered. What influenced William to take



up astronomy in the first place, and how were his early research interests shaped? How effective were his telescopes from a technical point of view? How was William portrayed and perceived during his own time—as an astronomer making important scientific strides or as an observer whose claims made him considered by some "… fit for Bedlam"? Clifford Cunningham's volume is an important step toward answering many of these questions and brings together

papers by some of the most important scholars writing on Herschel today.

With a foreword by Michael Hoskin, Cunningham has succeeded in assembling a veritable 'Who's Who' of Herschel scholarship. The volume includes important contributions by Emily Winterburn on William's education and the role of his sister Caroline in their joint observing projects; a thorough analysis of William's star gauges by Wolfgang Steinicke; and reflections on William's views regarding extraterrestrial life by Michael Crowe. In addition, Woody Sullivan's paper focuses on a neglected aspect of William's work, his research on comets, illustrating that William's evolutionary approach was not limited to the sidereal heavens. Cunningham concludes the volume with a collection of period poems and satires that make mention of William and his telescopes, specifically his giant 40-foot reflector.

All of these papers bring important aspects of William's multifaceted life and career into new focus. The initial article by Winterburn in particular contextualizes William's burgeoning interest in astronomy. As she shows, the mastering of scientific subjects was during this time a form of cultural capital helping musicians and music instructors such a William appear more professional and appeal to their clients in the upper classes. By showing the ways in which William's first forays into natural philosophy were motivated in light of his career as a musician, Winterburn has provided insight into the origins of William's astronomy. As Winterburn admits, this does nothing to subtract from William's unique accomplishments, but her emphasis on this context helps us understand the resources and framework that made his eventual career possible.

As another example of insights in these papers, Steinicke's detailed analysis of William's star gauge project provides a specific example of the tenacity William brought to his astronomical projects. With characteristic rigor, Steinicke walks readers through the details of William's program of tallying numbers of stars in various regions of the sky to construct a map of the sidereal system—one of Herschel's much discussed but often misunderstood endeavors. Steinicke recreates William's equation from his 1785 paper for calculating distance (or the 'visual ray') that his telescope could penetrate based on number of stars in the view and shows this was not dependent on any assumption regarding uniform stellar brightness.

The most significant work in this collection is the extensive technical study by Roger Ceragioli on William's telescopes and in particular his 'front-view' adaptation by which the secondary mirror was removed and the eyepiece placed at the front of the telescope. Ceragioli begins by situating William's work in the history of telescope optics and technical details such as the speculum metal used for mirrors, which, he says, made reflectors of this time "… inevitably cantankerous, impermanent instruments." (p. 107). He goes on to a detailed analysis of the various aberrations such instruments suffered from due to the arrangement of their mirrors.

Of course, this leaves the reader wondering how Herschel was able to make such excellent observations, and why, as Ceragioli shows, other contemporary astronomers adopted the front-view configuration. In the case of Newtonian reflectors, which William produced and which he used for high-resolution observing, an additional problem was that there was no way to effectively grind or test the secondary mirror. Modern testing, as Ceragioli relates, has shown most of these to be highly defective, including Herschel's. The success of his instruments seem to be a combination of the fact that Herschel's secondary mirrors were nonetheless better than others (although Ceragioli maintains there was nothing special about his primaries) (p. 147), he kept the focal ratio of his telescopes high (p. 151), and, fortuitously, the orientation of the secondary mirror often cancelled out various errors (p. 156).

Shifting the primary mirror for the front-view arrangement caused noticeable aberrations in high resolution images like stars. However, it was effective in observing dimmer, diffuse objects where the goal was to gather as much light as possible and eliminate loss due to the secondary mirror. Proper bracing and alignment of the primary was essential in this arrangement however, which Ceragioli explains contributed to the inevitable failure of the monster 40-foot, which did not have adequate support technology. Ceragioli's paper provides welcome insights into the technical details of Herschel's telescopes, drawing on the detailed descriptions of William's methods held in the Royal Astronomical Society and complemented by modern optical analysis. This 100+page paper is no doubt, as Hoskin relates in the foreword, "… the most important publication on Herschel as a telescope-maker ever to appear." (p. ix)

With a $189 price-tag, *The Scientific Legacy of William Herschel* is an academic book aimed at an academic audience. That being the case, the scholarly apparatus upon which the largely well-written articles rest is unfortunately a bit uneven. There is not, for instance, a uniform method for citing important archives throughout. One paper provides helpful abbreviations used in citations; others leave the reader to decipher these on their own. Though most readers familiar with the major Herschel repositories won't have too much trouble, this is something that

should have been addressed and unified for the edition. At least one paper confusingly intersperses in-text citations with footnotes throughout. There is also some repetition between the essays, as a few cover similar general background on William.

Finally, as perhaps a minor but very noticeable issue, the choice that the publisher has made to give every cover in this series the same image is unfortunate. Though the rear cover contains an image of a bronze medal commemorating the Herschel family, for someone who is picking up this particular edition to learn more about William Herschel, the presence of an unexplained, unidentified individual on the cover is especially confusing.

Stephen Case
Director, Strickler Planetarium, and Associate Professor, Department of Chemistry and Geosciences, Olivet Nazarene Universit, Bourbonnais, Illinois, USA.
Email: scase@olivet.edu

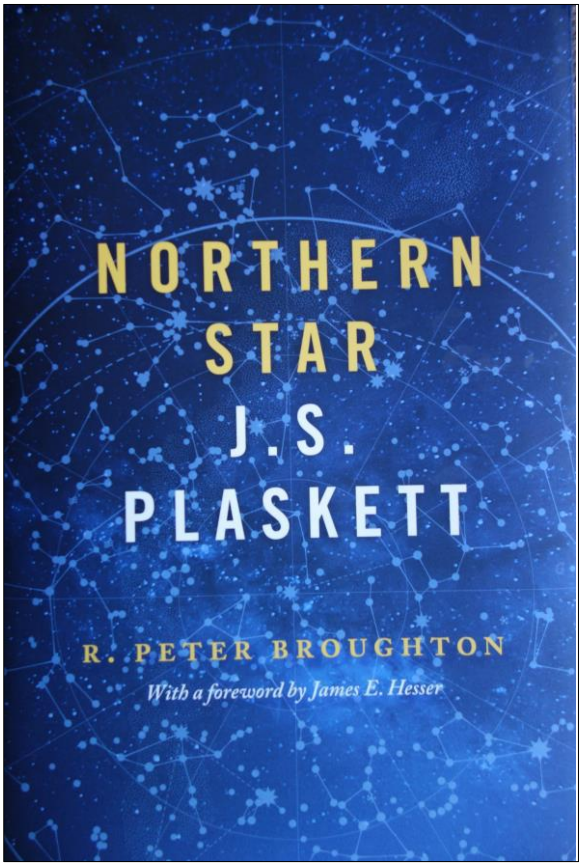
Northern Star: J.S. Plaskett, by R. Peter Broughton (Toronto, University of Toronto Press, 2018), Pp. xx + 539. ISBN 978-1-4426-3017-8 (hardback), 235 × 160 mm, US$67.50.

If one man may be said to have brought Canada into twentieth century astronomy it would be John Stanley Plaskett (1865–1941). During his career JSP (as he is usually denoted in this book) gave many talks to the Royal Astronomical Society of Canada; the author of this biography, Peter Broughton, was President of the RASC from 1992 to 1994.

Aside from its biographical importance, *Northern Star* is actually an excellent survey of astronomy in early twentieth century Canada. I had the good fortune to meet many of the people JSP knew, including Peter Millman and Helen Hogg who, when I knew them, were considered the foremost astronomers in Canada. When JSP knew them half a century earlier in the 1930s, they were young and ambitious. Towards the end of his life, Plaskett corresponded with Hogg, and Broughton makes use of these letters.

Plaskett, who was not shy about promoting himself, is best known for his diligence in constructing the Dominion Astrophysical Observatory in Victoria, British Columbia. Its 72-inch mirror seems puny by today's standards, but when it was first used visually in 1917, it was the largest telescope in the world. The book details not just the technical efforts involved, but the political machinations necessary to persuade the Canadian Government to spend money on something that did not promise a financial return. One factor that adds spice to the story is the clash between JSP and Otto Klotz, who harboured a life-long grudge against his colleague. Klotz's diaries, which Broughton mines, "… often betray his mean spirit and jealousy." (p. 147). Once DAO was opened, JSP became its Director, while Klotz was appointed Director of the observatory (with a small telescope) in Ottawa.

Lengthy as the book is, I would have liked a fuller explanation of what happened in 1917 when Plaskett "… tried to have calculating machines and measuring equipment transferred to Victoria from Ottawa." The author says JSP eventually got what he needed, without specifying how long this took, but the intriguing line is that his nemesis Klotz wanted the equipment to remain with him in Ottawa "… resulting in quite a brouhaha involving even the deputy minister." No details are given (p. 180).



One important example of international cooperation happened in 1919, when JSP asked Henry Norris Russell if he had any ideas about observing eclipsing variables. Russell responded enthusiastically:

> To have someone offer to observe some of the things I have wanted to see observed for several years is remarkably satisfactory. (p. 207).

JSP observed eight stars on Russell's list, deducing their masses, radii, densities and actual separation in kilometers. By 1935 a list of such stars and their physical details was compiled: fully a quarter of the information was provided