

how Joseph Fraunhofer developed a spectroscopic device that enabled him to identify 574 spectral lines in the light from the Sun.

The delicacy of this work is emphasised in an anecdote about John Herschel, who invited Charles Babbage to his home to view the Fraunhofer lines. Herschel warned Babbage that even though he would look for the lines, he would not find them. “I will instruct you how to see them,” Herschel said, “and you shall see them ... [in such a way that] you shall find it impossible to look at a spectrum without seeing them.” Babbage writes:

On looking as I was directed, notwithstanding the previous warning, I did not see them; and after some time I inquired how they might be seen, when the prediction of Mr. Herschel was completely fulfilled. (p. 169)

As these snippets from the book attest, the author weaves a tale of personality with that of laboratory and instrumental discovery, making the story of astrophotography accessible to a wide audience.

I found only one passage to contest. The assertion (p. 137) that the Astrographic Conference of 1887 in Paris was “... the first-ever international conference of astronomers ...” is incorrect. That honour goes to Baron Franz von Zach, who held the first such conference in Gotha in 1798.

The book concludes with 65 pages of references, a time line, glossary of names, bibliography and index. Some nineteenth-century aspects of Hirshfeld’s text, such as Herschel and the Fraunhofer lines, overlaps with Steven Case’s book, *Making Stars Physical*, which is also reviewed in this issue of the *JAHH*. Both books form valuable companions to Stefan Hughes’ massive 2013 two-volume tome *Catchers of the Light ...* (that also has been reviewed in *JAHH*).

Starlight Detectives: How Astronomers, Inventors and Eccentrics Discovered the Modern Universe is not only immensely informative but written in fine prose that few history of astronomy books attain.

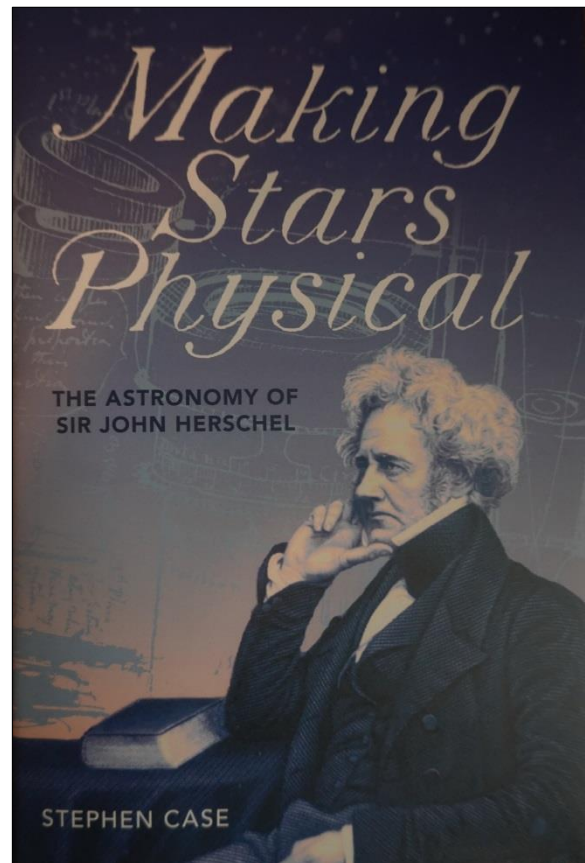
References

Hughes, S., 2013. *Catchers of the Light. The Forgotten Lives of the Men and Women who First Photographed the Heavens: Their True Tales of Adventure, Adversity & Triumph*. Paphos, ArtDeCiel Publishing.

Dr Clifford J. Cunningham
Centre for Astrophysics, University
of Southern Queensland,
Toowoomba, Queensland,
Australia.
cliff.cunningham@usq.edu.au

Making Stars Physical: The Astronomy of Sir John Herschel, by Stephen Case. (Pittsburgh, University of Pittsburgh Press, 2018). Pp. viii + 319. ISBN 978-0-8229-4530-7 (hardcover), 155 × 235 mm, US\$39.95.

Sir John Herschel (1792–1871) remains an enigmatic figure in the history of astronomy, amazingly famous in his lifetime but rarely referenced today. John’s popular-level book *Outlines in Astronomy* was published in 1849, “... just prior to spectroscopic analysis.” (p. 209). While his text “Offered the first avenue ...” by which a “... new understanding of stars was presented to an English reading public ...”, it ultimately suffered the same fate as books about spacecraft published before 1957.



“Herschel’s goal was to make stars physical ...” (p. 126), but “It was spectroscopy, and not the double stars with their calculated masses or velocities ...” that Herschel spent much of his life studying, “... that most firmly and definitively established the physical nature of the stars.” (p. 224). By a cruel twist of fate, he “... remained unconvinced by the new chemical insights into the nature of stars that spectroscopy purported to provide.” (p. 186). While Herschel saw lines in the solar spectrum (a delight he shared with his friend Charles Babbage), he apparently never saw them in stellar spectra. Thus, Herschel rejected the very scientific advance that made his goal possible.

Herschel's stellar work proved to be an important stepping stone, bridging the work of his father William before him and stellar spectroscopy afterwards. But stepping stones are often forgotten: even though John was one of the most famous scientist/astronomers of his age, there is yet no definitive biography of him. In the absence of such a work, this book by Stephen Case of Olivet Nazarene University will stand as the most thoroughly researched book about the astronomical endeavours John Herschel.

"Witnessing the Great Eruption sharpened Herschel's interest in variable stars," writes Case, referring to the outburst of Eta Carinae that he observed from the Cape of Good Hope in 1837. "Herschel provided an extended account of this stellar outburst in his *Cape Results*, ..." writes Case, but that was a full decade after the event! (p. 101). This highlights the entirely different observing and reporting strategy he employed nearly two centuries ago compared with today. Upon his return to England from the Cape in 1838, Herschel sided with Wilhelm Olbers about the existence of cosmic clouds, invoking the movement of such obscuring clouds to account for the variability of stars such as Eta Carinae. John Herschel was an observer *par excellence*, but this did not extend to developing accurate theories to explain those observations, another key reason that his work has been neglected in the past 150 years.

Another example of this was the enormous effort he expended on nebulae, but

His own theories regarding these objects remained uncertain, as no measurable change was ever linked to mathematical law or physical cause. (p. 166).

By disdaining spectroscopy, what Case characterises as "... the goal and also the great challenge ..." of ascertaining real changes in nebulae ended in frustration. (p. 157).

Case rightly identifies Herschel's primary scientific legacy as his work "... to standardize observations of magnitude, organize these data, and render them useful for other observers." He created great catalogues of variable and double stars, and nebulae. He thus "... set the ground-work for the astrophysics of the final quarter of the century." (p. 122).

For all his scientific work, the legacy of John Herschel resides as the greatest populariser of astronomy of the early nineteenth century. Case concludes the book by briefly looking at how this influenced nine other popularises of the subject in that century, including Agnes Clerke, Thomas Webb and William Whewell.

As an example of the florid Victorian prose that has long ago gone out of fashion, but which

made him so admired to the public as their window on the Universe, here he is describing double stars with what Case characterises as 'rhetorical grandeur':

We must admit that double stars must be accomplishing ends in creation which will remain forever unknown to man; and that we have here attained a point in science where the human intellect is compelled to acknowledge its weakness, and to feel that no conception the wildest imagination can form will bear the least comparison with the intrinsic greatness of the subject. (p. 203).

Case gives us a tremendous insight into a life of supreme dedication to astronomy in all its forms. With 67 pages of notes and bibliography, his meticulous attention to detail has produced the most valuable book ever published on Sir John Herschel.

Dr Clifford J. Cunningham
Centre for Astrophysics, University of
Southern Queensland, Toowoomba,
Queensland, Australia.
cliff.cunningham@usq.edu.au

Kew Observatory & The Evolution of Victorian Science 1840-1910, by Lee T. Macdonald. (Pittsburgh, University of Pittsburgh Press, 2018). Pp. xii + 308. ISBN 978-0-8229-4526-0 (hardcover), 155 × 220 mm, US \$45.00.

This institutional history of Kew Observatory by Dr Lee T. Macdonald (Research Facilitator at the University of Oxford's Museum of the History of Science) celebrates the development of British science before World War I.

Kew Observatory was built as a private astronomical observatory for King George III so that he could observe the transit of Venus in 1769, but the author dispenses with the pre-1840 era in a few paragraphs.

Like two other books reviewed in this issue of the *JAHH*, this one has much to say about the role of Sir John Herschel in British science. Macdonald identifies Herschel's approach to research as one in which "... data should be gathered for the purpose of putting theory to the test." (p. 55). He tells us that

... between 1839 and 1843 Herschel supervised William Birt in a project ... to reduce meteorological observations with a view of verifying the existence ...

of atmospheric waves (ibid.). In 1842 Birt "... sought a testimonial from Herschel in support of his application for the 'curatorship' of Kew Observatory." (ibid.). Herschel agreed and, concerned that the observatory would be closed by the British Association for the Advancement of Science (BAAS), he wrote to the geophysicist Edward Sabine that "... the Association ought not, except on very urgent grounds, throw up