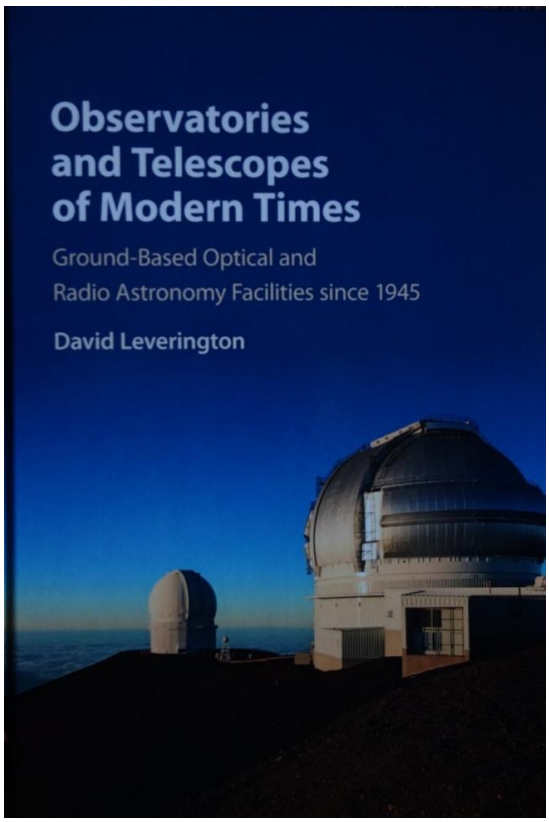
BOOK REVIEWS

***Observatories and Telescopes of Modern Times: Ground-Based Optical and Radio Astronomy Facilities since 1945*, by David Leverington. (Cambridge University Press, Cambridge, 2017). Pp. xii + 490. ISBN 978-0-521-89993-2 (hardback), 180 × 250 mm, US$175.**

Anyone even passingly familiar with astronomy during the past few decades knows the number of telescopes—especially large telescopes—has mushroomed. While other books have focused on a survey of telescopes and observatories in various eras of astronomy, this is the first to comprehensively tackle the complex task of the post-1945 era.



Dr David Leverington wisely looks in this book only at optical and solar observatories (in 260 pages) and radio telescopes (in 210 pages). Observatories dedicated to other portions of the electromagnetic spectrum are excluded, and are now sufficiently numerous to merit their own volume.

For each observatory, beginning with the 200-in Palomar Telescope, the author carefully explains the scientific and political considerations that led to their construction. It would have been easy to give the human dimension short shrift, but by examining often contentious conversations and negotiations, Leverington offers us a superb capsule history of each observatory.

Just to cite one example of many, he spends six pages on the divisive tale of the Very Large Telescope of the European Southern Observatory. It is a tale of bankruptcy, resignations and lawsuits. Another ESO project, the New Technology Telescope of 1989, had a jaw-dropping mistake: Zeiss realised the mirror had a curvature error, "… but they made a mistake in quoting the sign of the error, and so in trying to correct it had doubled the error." (page 88). The creation of these modern behemoths maintains an element of 'art' in addition to pure science and engineering. Leverington lovingly exposes every mis-step, which makes for a delightful read, as this extract about the Sloan Digital Sky Survey attests:

> Unfortunately early operation of the telescope indicated that it had been installed with a slight tilt, which caused problems with the scanning software. That problem was easily solved but a much more threatening one was the discovery in October 1999 that there was a crack near the centre of the secondary mirror. In this case the Mirror Lab cut out the centre and capped the hole. (page 226).

It seems that an expertise in surgery is now a prerequisite to build telescopes!

Just two minor quibbles: the travails of the telescopes he studies are so numerous that Leverington tends to rely a bit too much on the word "unfortunately", and while he is excellent on the technical details these are not always explained. One wonders, for example, what a Gascoigne astigmatic corrector is on page 223.

The book is profusely illustrated (all in black and white) so that each telescope or observatory has at least one photo or artist conception. The work of Professor Orchiston is well represented in the section on radio telescopes in Australia, with several of his papers in this journal cited in the references. The role of Dr Lequeux, one of our *JAHH* Associate Editors, is also included in a discussion of the IRAM radio telescope project of the 1970s.

I found a few typos: on page 102 Herzburg should read Herzberg (it is correct in the Index); on page 166 "There where" should be "there were"; on page 204 "That the had" should read "That he had"; and on page 304 "immediately the war" should be "immediately after the war". As a great assist to those using this as a reference work, considerable care was taken with the Index: there are separates ones for names, Optical/Infrared Observatories, Radio Observatories, and a general index. The text includes developments up until 2015 when the manuscript was completed, so the fact that Arizona State University joined the Giant Magellan Tele-

scope project in 2017 is not included. The text suggests the GMT will be ready with three of its primary mirrors in 2021, but the project website now pushes that back to 2023.

David Leverington has written the definitive account of modern observatories that is not only readable but a valuable sourcebook for the telescopic era of the past 70 years.

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***Radio Astronomer: John Bolton and a New Window on the Universe*, by Peter Robertson. (NewSouth Publishing, Sydney, 2017). Pp. viii + 421. ISBN 978-1-742-23545-5 (hardback), 158 × 242 mm, AU$59.99.**

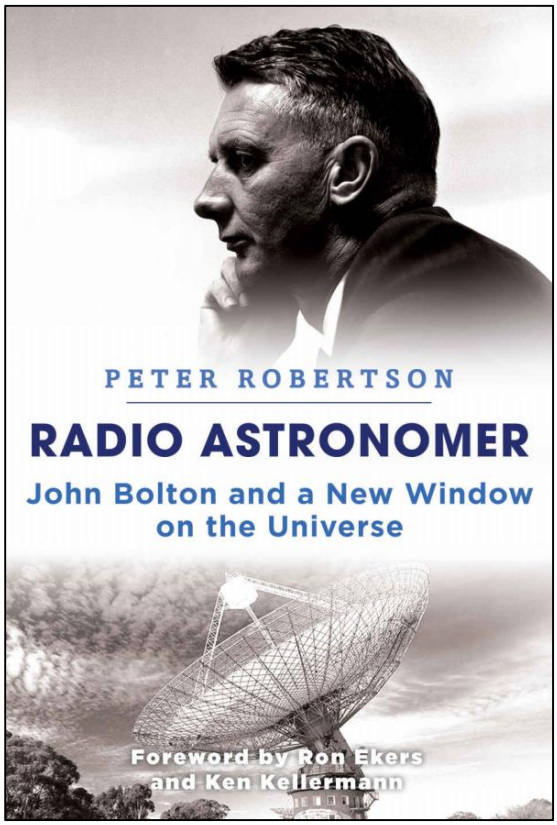
Although he died in 1993, John Bolton's name is well known today as the inaugural Director of the Parkes Radio Telescope, and the founder of radio astronomy at the California Institute of Technology in the USA. For those of us who knew John personally and worked with him, he was a hard task-master, as I found when using the 64-m Parkes Radio Telescope in the 1960s.

It was only much later, in the early 1990s (not long before his premature death) that I encountered the 'other' John Bolton, always happy to help me with my research on early Australian radio astronomy. And he had ideal credentials to do so: although born in England in 1922, he settled in Sydney when WWII ended and joined the Council for Scientific and Industrial Research's Division of Radiophysics (RP), leading the team at Dover Heights field station that identified optical correlates for the first discrete radio sources, thereby launching the new field of extragalactic radio astronomy. At the same time he forged close links with leading optical astronomers. These were the halcyon days of radio astronomy, with a seemingly never-ending supply of new discoveries, but elsewhere we have suggested that even though the Dover Heights team of John Bolton, Gordon Stanley and Bruce Slee would go on to build international reputations, none of them "… would produce another paper to rival the importance of their 1949 *Nature* letter." (Robertson et al., 2014: 302) that effectively launched extragalactic radio astronomy.

But Dover Heights was only the beginning of John Bolton's long and remarkable career in radio astronomy. In 1955 he launched radio astronomy at Caltech, culminating in the construction of the twin 90-ft antennas at the Owens Valley Radio Observatory. John was not your typical ivory-tower academic scientist. He believed the best way to effectively utilise scientific equipment was to build it, or help build it, yourself, and this included the Owens Valley interferometer. He also expected his graduate students to follow his example, so as two of them, Ron Ekers and Ken Kellermann, recount in their Foreward to Peter Robertson's book,

> … Barry Clark, who was the brains behind the Very Large Array, started at Owens Valley by learning how to use an oxyacetylene torch; Bob Wilson, who went on to win a Nobel Prize, did the circuit design for the Owens Valley instrumentation; and one of us (KK) wired the cables for the interferometer. The other of us (RE) started his PhD by using a tractor to grade the north-south track for the Parkes interferometer … (page vii).

Thus, when I worked at RP in the 1960s, 'Ph.D.' meant 'Post-hole Digger'!



In *Radio Astronomer: John Bolton and a New Window on the Universe*, Peter Robertson skilfully weaves the story of Bolton's life in and out of radio astronomy, starting with his childhood in England, and progressing to his role as the 'Dishmaster' at Parkes. Along the way we learn how the construction of the Parkes Radio Telescope led to the destruction of the RP field stations and the disintegration in the early 1960s of RP as arguably the world's foremost radio astronomy research group. We also learn about quasars, and the role that John Bolton played in the initial discovery and numerous later discoveries. And scattered throughout the book are accounts of John and Letty Bolton's numerous overseas trips, to attend conferences and meet-