

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 (hard-back), 158 x 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.

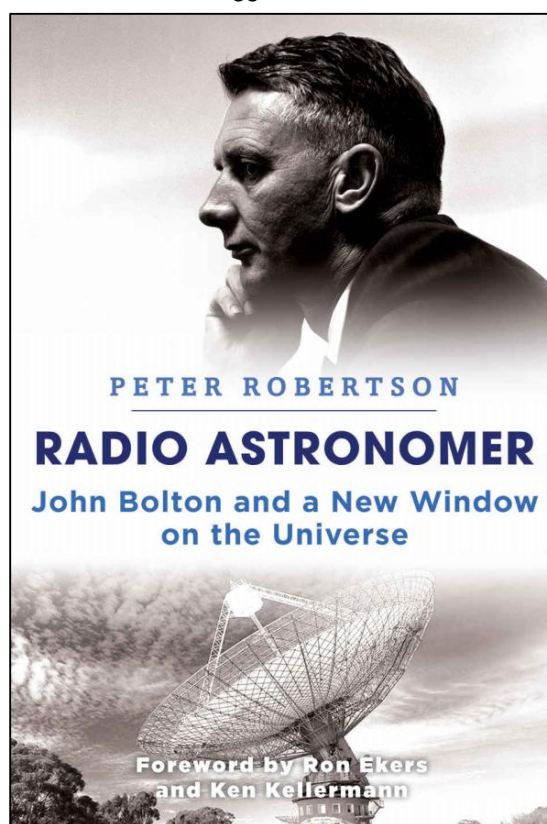
It was only much later, in the early 1990s (not long before his premature death) that I encountered the 'other' John Bolton, always happy to help me with my research on early Australian radio astronomy. And he had ideal credentials to do so: although born in England in 1922, he settled in Sydney when 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 Foreword 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 Lefty Bolton's numerous overseas trips, to attend conferences and meet-

ings, to visit old friends whose names are now famous in the astronomical world, or to conduct optical follow-up observations of sources detected at Parkes. I found some of these accounts particularly appealing and informative. Also well worth reading was the discussion on whether or not Bolton should have been a co-recipient of the Nobel Prize awarded for the discovery of quasars.

These comments aside, *Radio Astronomer* ... is not just about scientific research and its just rewards—like John Bolton's long-awaited election as a Fellow of the Royal Society, his involvement at a very senior level in the IAU, his role in the development of the 3.9-m (150-in) Anglo-Australian Telescope; and his television appearances. We also learn about the problems created by the popularity of the Parkes Dish as a tourist destination and how the (eventual) construction of a visitor centre effectively solved this; and about the Dish's involvement in the American Space Program, including the first manned landing on the Moon.

Nor is this book solely about radio astronomy, notwithstanding the title, for Peter Robertson also traces John Bolton's short sojourn in RP's cloud physics and rain-making group prior to his move to Caltech.

In 1992 Peter Robertson produced what for more than two decades has remained the standard reference on the Parkes Radio Telescope, and he has now written another well-researched and very readable tome about one of Australia's and the world's foremost radio astronomers. This very affordable work belongs on the bookshelves of all those with an interest in radio astronomy, and like its 1992 predecessor is bound to become a classic.

References

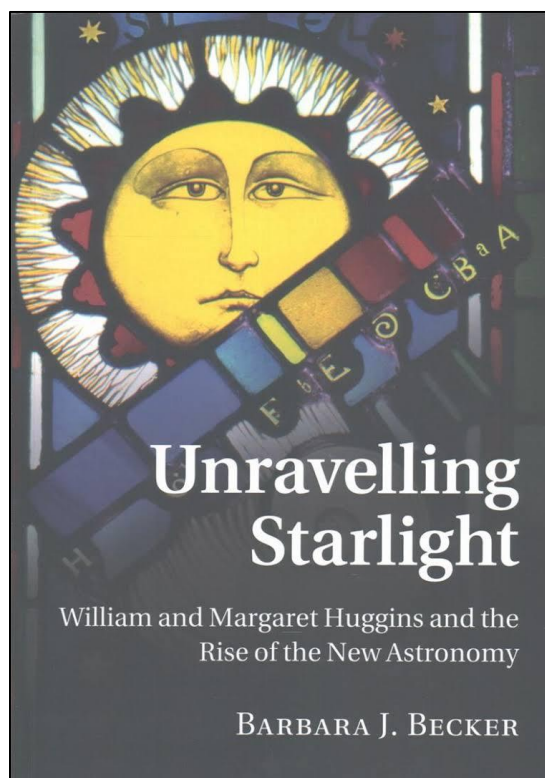
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***Unravelling Starlight: William and Margaret Huggins and the Rise of the New Astronomy*, by Barbara J. Becker. (Cambridge University Press, Cambridge, 2016). Pp. xx + 380. ISBN 978-1-316-64417-1 (paperback), 170 × 244 mm, £36.99.**

Six years after the publication of the original hard-copy version of *Unravelling Starlight* ... Cam-

bridge University Press has produced a paperback edition, thereby bringing this important volume within the price-range of all astronomers. And by “all astronomers” I include amateurs, for William Huggins was surely one of the world's foremost nineteenth century amateur astronomers.



William Huggins was—by his own admission—one of the ‘founding fathers’ of astrophysics, the ‘new astronomy’ of the nineteenth century. As Barbara Becker reminds us in *Unravelling Starlight*

....

Astrophysics is built on a range of questions and methods that were unimaginable to individuals in the first half of the nineteenth century [and in 1824, when Huggins was born]. At that time, positive knowledge of physical and chemical structure of celestial bodies was presumed to be unattainable by proper scientific methods, and hence relegated to the no-mans-land of mere speculation. (page 2).

William Huggins, with substantial help from his wife Margaret, was one scientist who completely changed this.

But as Barbara Becker recounts, Huggins came from a business background, and some of his pioneering research was opportunistic and aimed not only at progressing science but also increasing his own international standing as a scientist. Huggins was a master astronomical entrepreneur, something that is not apparent from reading earlier accounts of him written by others. As pointed out on page 156, after conducting