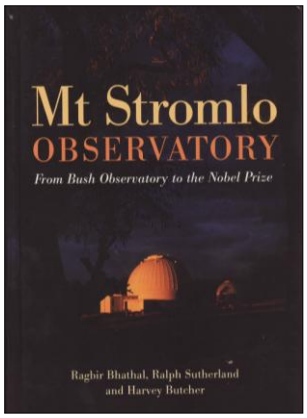
BOOK REVIEWS

***Mt Stromlo Observatory: From Bush Observatory to the Nobel Prize*, by Ragbir Bhathal, Ralph Sutherland and Harvey Butcher. (Melbourne, CSIRO Publishing, 2013), pp. xiv + 330. ISBN 9781486300754 (hard cover), 180 × 250 mm, AU$39.95.**



Mt Stromlo Observatory, near the Australian capital city of Canberra, is one of the great astronomical observatories of the world.

Formed as a solar observatory in 1924, it turned to astrophysics in the 1940s, and for the past decade or so staff have carried out forefront research in 'galactic archaeology' which in 2011 culminated in the Observatory's Brian Schmidt sharing the Nobel Prize for Physics with two U.S. astronomers.

It is now more than a decade since Tom Frame and the late Don Faulkner produced *Stromlo: An Australian Observatory* (2003), so it is good to have a new perspective that also brings us up to date.

Mt Stromlo Observatory: From Bush Observatory to the Nobel Prize, written by a science historian from the University of Western Sydney, a current member of the Stromlo staff and a former Director, recounts the history of Mt Stromlo Observatory in thirteen chronologically-based chapters, each with its own distinctive title.

For those familiar with Australian astronomical history the first two chapters ('A beginning in the bush' and 'A bush observatory', covering collectively the period 1905 to 1929) traverse familiar territory: Geoffrey Duffield's ingenuity in gaining Federal Government approval for the formation of a new solar observatory near Canberra, and its subsequent erection. After lengthy frustrating delays caused partly by WWI, the Commonwealth Solar Observatory was formally established on 1 January 1924, with a suitably-rewarded Duffield as the founding Director. "After almost 18 years Duffield had realized his dream of an observatory …" (page 27), even if the staff had to use temporary facilities at the Hotel Canberra while the Observatory was under construction.

Next is a chapter titled 'Caretaker', which spans the period 1930–1939 when William Rimmer was the Officer-in-Charge (following Duffield's sudden death on 1 August 1929). Fortunately, the Great Depression had relatively little impact on the Observatory, where the solar and ionospheric research programs initiated under Duffield were continued. This chapter introduces Ronald Giovanelli, who was the vibrant Chief of the CSIRO's Division of Applied Physics in the 1960s when I worked in the Division of Radiophysics and we shared the same building in Sydney. Ron was a very productive Visiting Fellow at Stromlo in 1937–1939.

And so we arrive at Chapter 4, 'Second World War: the Observatory becomes an Optical Munitions Factory'. Richard Woolley was the new Director, and the Observatory's role was to support the allied war effort through the design and construction of optical equipment no longer easily accessed from overseas. At Stromlo the staff increased sevenfold, but I was surprised to learn that

> Rather than having a central research institution, the optical work was spread out to *no fewer than 25 establishments*, *including several firms and university physics departments*. (page 64; my italics).

Among the employees was Syd Elwin, who is shown (but not identified) in Figure 4.9. After the war Elwin joined the Sydney Technical College, where he taught optics. During the 1960s, 1970s and 1980s he was one of Australia's leading amateur astronomers, and was a prolific observer of variable stars. In 1982 he was the first recipient of the Bernice Page Medal which would then be awarded every two years by the Astronomical Society of Australia for outstanding research by an amateur. Syd Elwin died in 1990 (Bembrick, 1990).

Chapter 5 ('The change master') tracks Woolley's success in gradually turning Stromlo into an astrophysical observatory following the war, even though "… no one on the staff had any extensive knowledge of stellar astronomy." (page 78). This was the time when the institution changed its name to the Commonwealth, and later, Mt Stromlo Observatory, and when the 30-in reflector, donated many years earlier, finally was refurbished so that it could be used for photoelectric photometry. It also marked the start of substantial U.S. influence at Stromlo, with extended visits by Gerald Kron and Olin Eggen from 1951. Woolley realized that the Observatory's future depended on larger telescopes, culminating—eventually—in the commissioning of the refurbished 'Great Melbourne Telescope' and a Grubb-Parsons 74-in reflector. The 'Great Melbourne Telescope', with its original 48-in speculum mirror, had an interesting history (see Gillespie, 2011), but at Stromlo it featured a short-focus 50-in pyrex mirror. Woolley also convinced Uppsala University to site their new Schmidt at Mt Stromlo, and he arranged the transfer of the Yale-Columbia 26-in refractor

from South Africa to Stromlo. Finally, Woolley's other key achievement was to arrange for the Observatory to be transferred from the Department of the Interior to the Australian National University. But this only occurred in January 1957, just over a year after he had left Stromlo in order to accept the post of Astronomer Royal in England.

The new Director was Bart Bok, an international figure who was widely respected for his research in both optical astronomy and radio astronomy. He is the focus of Chapter 6, titled 'The astronomical godfather'. Bok was the first Professor of Astronomy at the Australian National University, and his legacies were the graduate school, that he established; Siding Spring field station; research by Stromlo astronomers on the Milky Way and the Magellanic Clouds; Stromlo's first international symposium, on this latter topic; bringing the 74-in telescope, and later its coudé spectrograph, into operation; the introduction of digital computers; his success in lobbying for the 3.9-m Anglo-Australian Telescope; and his acumen in bringing astronomy before the Australian Parliament and the general public. His public lectures were legendary, and whenever he performed in Sydney I tried to attend. To this day, he remains the most captivating entertaining public speaker I have ever encountered.

In March 1966 Bart Bok and Priscilla returned to the U.S.A., and Stromlo's new Director was a familiar face from earlier years, Olin Eggen. The authors start each chapter with between one and three quotations, often from notable astronomers, highlighting the achievements of the subject of that chapter. One of the three quotations that launches Chapter 7 ('A life on the dome floor') is by Ben Gascoigne, and this is what he has to say about Eggen:

> What I [Ben Gascoigne] think he will be remembered for is the controversy over the AAT and the great rift that developed between Stromlo and the rest of Australian astronomy … It was very damaging; it was years before Stromlo was accepted back into the fold, and it saw the centre of optical astronomy shift considerably from Canberra to Sydney. (page 129).

But is this really true? It suggests that Eggen achieved little. Certainly, there was controversy over the hosting of the Anglo-Australian Observatory, and yes, optical astronomy did grow rapidly in Sydney, through developments at the various universities, but this had nothing to do with Eggen. However, Eggen's Directorship *was* marked by an impressive increase in the annual publications output of the Observatory; the acquisition of important new instrumentation; the growth of a pool of brilliant new staff members or Ph.D. students (including Mike Dopita, Ken Freeman, Harvey Butcher, Jeremy Mould, John Norris and Alex Rodgers) who would forge international reputations, and in several cases, eventually become Directors of the Observatory). In addition,

> Eggen's work on the motions, ages and compositions of stars in the Milky Way became a research theme for a generation of Stromlo astronomers. (page 134).

To my mind, these were Eggen's key achievements, and as for Gascoigne's claim that Eggen caused a rift in the Australian astronomical community that would take years to heal we need only note that when Don Mathewson took over the Directorship from Eggen in 1979 he was widely respected and accepted by optical *and* radio astronomers throughout Australia, as were the other leading astronomers at Stromlo. It is obvious that there was 'bad blood' between Eggen and Gascoigne, so we need to allow for an element of bias in Gascoigne's statements and his assessment. It is a great pity that we do not have Eggen's 'take' on all this, so we can learn why he chose to marginalize his one-time friend.

Chapter 8 ('an astronomical entrepreneur') covers Don Mathewson's directorship, and is of great interest to me. Don and I were both closely associated with the Chris Cross radio telescope at Fleurs, near Sydney (see Orchiston and Mathewson, 2009) and I knew him well during our days at Radiophysics in the 1960s, so in 1985 I accepted his invitation to take up a Visiting Fellowship at Mt Stromlo and Siding Spring Observatory and carry out research on the history of Australian astronomy. After serving as Acting Director following Eggen's departure in September 1977, Don took over as Director in April 1979, the first Australian since Duffield to lead the institution. Under his directorship the annual publications output and the number of graduate students increased substantially, while Mathewson's discovery of the Magellanic Stream was the highlight of his research career (see Mathewson, 2012). Other Stromlo astronomers also made important contributions to photoelectric photometry; studied the Hubble Constant, quasars, and planetary nebulae in the Magellanic Clouds, and conducted theoretical studies of Mira variables. This also was the first time that a number of Stromlo staff used space-based telescopes for their research programs. Mathewson's other major achievement was the 2.3-m Advanced Technology Telescope (ATT), a computer-controlled thin mirror telescope on an altazimuth mounting, which the popular Australian Prime Minister, Bob Hawke, opened at Siding Spring on 16 May 1984 (and because the Annual Meeting of the Astronomical Society of Australia was held at the time in nearby Coonabarabran, many of us from the Australian astronomical community were able to attend this grand event). This telescope was a great success, and it served as the model for later telescopes that were built around the world. Very recently the ATT was refurbished, so that it can continue to contribute

to forefront astrophysics.

Stromlo under Alex Rodgers is the focus of Chapter 9 ('An instrumentalist and the MACHO project'). Rodgers became Stromlo's sixth Director in June 1987, having served as Acting Director from May 1986 when Don Mathewson retired. Like his predecessor he was born in Australia. Rodgers

> … was an exceptional instrumentalist and enjoyed nothing more than spending time in the Observatory's workshops, getting his hands dirty … He also was responsible for moving the Observatory into the electronic era by designing and constructing photon-counting arrays … In fact, he kept the Observatory's instrumentation up to date, thus enabling it to remain at the frontiers of international astronomy. (page 178).

Rodgers' major achievement was to refurbish the Great Melbourne Telescope so that it could be used for the MACHO Project: the search, using gravitational lensing, for evidence of the missing mass in our Galaxy. Other staff members carried out important research on star-forming regions, planetary nebulae in the Magellanic Clouds, and SN1987A. Rodgers' one major regret was that his concept of a locally-built 14-m telescope had to be abandoned, because Australian sites adequate to justify so large and expensive a telescope could not be found.

Chapter 10 ('Masters of the universe') discusses Jeremy Mould's directorship, from December 1993, when a number of different Stromlo staff made major discoveries and received national or international honours. In 1998 the Government provided funding for Australian astronomers to access 4.76% of observing time on the two Gemini Observatory 8.1-m telescopes, and Stromlo, working in partnership with other institutions, won contracts to design and construct instruments for the Gemini North telescope and ESO's Very Large Telescope. Thus,

> Mould's ideas about the feasibility of generating income from the commercialisation of astronomical instrumentation were being vindicated. (page 199).

Mould also brought Stromlo research to the public by opening a Visitor Centre on the mountain, designed in the best tradition of overseas science centres, and there was an impressive range of research to promote. Personally, Mould was primarily interested in the Hubble Constant, utilising Hubble Space Telescope data, and his team derived a figure of 72 ± 8 km s^{-1} Mpc^{-1}. A second major Stromlo cosmological project was led by Brian Schmidt. He and the 'High-Z Supernova Team' came up with an amazing result: that the expansion of the Universe was speeding up. Furthermore, by utilising data derived from supernovae and the cosmic microwave background, Schmidt et al. came up with figures of about 25% dark matter and 70% dark energy for the composition of the Universe. Stromlo's third major cosmological research project was the 2dF Galaxy Redshift Survey led by Matthew Colless and Durham University's Richard Ellis. This project explored the large-scale structure of the Universe, and "… produced more than 50 papers, of which more than 20 were in the highly cited category." (page 214). Colless and his colleagues also were able to derive a figure of 23% for the percentage of dark matter in the Universe, remarkably close to the value obtained by Schmidt. Two other notable Stromlo projects were carried out during Mould's directorship, one by John Norris and Mike Bessell on stars with low metallicities, and the other by Ken Freeman and Stromlo colleagues on the chemical evolution of globular clusters. As a result of this research, in 2001 six Stromlo astronomers (out of a total of 33 Australian astronomers) were selected by the Institute of Scientific Information as Citation Laureates. They were Mike Bessell, Matthew Colless, Mike Dopita, Ken Freeman, Jeremy Mould and Bruce Peterson. In addition, Ken Freeman was elected an F.R.S. in 1998 and the following year received the Dannie Heinemann Prize, while Brian Schmidt was the inaugural winner of Australia's Malcolm McIntosh Award for Achievement in the Physical Sciences.

Stromlo's eighth Director, American Penny Sackett, took over from Acting Director John Norriss on 22 July 2002. She was Stromlo's first (and thus far only) female Director, and Chapter 9 ('Bushfires and a new beginning') highlights her achievements. As the chapter title suggests, the most momentous event that occurred during her short directorship was the disastrous Canberra bushfire of 18–22 January 2003 which not only led to the loss of 4 lives but also the destruction of much of Mt Stromlo, surrounded as it was by pine trees. *Mt Stromlo Observatory: From Bush Observatory to the Nobel Prize* shows image after image of burning or burnt-out observatory buildings—a poignant reminder of the power of nature. All of the telescopes on the mountain were destroyed, as were the workshop and the library (where I had spent many hours carrying out my research), and the $5 million Near-infrared Integral Field Spectrograph, which was undergoing final testing before being shipped to the Gemini North Telescope in Hawaii. Fortunately, the Visitor Centre and the main building housing the astronomers' offices survived intact. As the authors say, a lesser person would have given up, but instead Penny Sackett focusing on rebuilding the Observatory. Despite on-going problems with the insurers, by the time she completed her term as Director in 2007, Stromlo had a new Advanced Instrumentation Technology Centre; a replacement Spectrograph had been constructed for the Gemini North Telescope and an Adaptive Optics Imager for the Gemini South Telescope; and con-

struction of Brian Schmidt's 1.35-m Sky-mapper had been approved. But more important was Sackett's success in getting Stromlo formally involved in planning the Giant Magellan Telescope, which the authors regard as "… the best and furthest-reaching decision she made for the future of the Observatory and Australian astronomy." (page 243). Despite the devastating fire, the Stromlo research staff were remarkably productive during Sackett's directorship, producing >500 research papers on

> … solar and extrasolar planetary systems, stars and stellar populations, the Milky Way and galaxies, dark energy and dark matter, gamma-ray bursts, interstellar medium and galactic feedback, and adaptive optics. (page 244).

In 2002 Ken Freeman and Joss Bland-Hawthorn (from the Anglo-Australian Observatory) wrote a major review paper on how our Galaxy was formed for the *Annual Review of Astronomy and Astrophysics*, and in 2005 Mike Bessell prepared a paper on standard photometric systems for the same journal. In that same year, Brian Schmidt was awarded a prestigious Federation Fellowship and in 2006 he shared the Shaw Prize with two American colleagues.

It is sometimes hard to decide where the chronological cut-off date should be for any historical study, especially when one of the authors just happens to be a former Director of the Observatory in question. In the case of *Mt Stromlo Observatory* …, Chapter 12 is the last, and it spans the period 2007–2013 and Harvey Butcher's Directorship, where his "… approach to doing research, of developing new instrumental capabilities to make new observations possible, characterized … his career." (page 254). Butcher continued the direction charted by Penny Sackett, appointing new staff with international reputations, involving Stromlo in the Australian space industry, developing an adaptive optics facility and obtaining further Government funding for Stromlo's participation in the Giant Magellan Telescope. Cutting-edge research continued, and the annual number of published research papers increased. Several staff members reaped international honours, led by American-born Brian Schmidt who shared the 2011 Nobel Prize for Physics with two other American astronomers. In addition, in 2007 Schmidt and members of the High-Z Supernovae Research team shared the Gruber Prize for Cosmology. Schmidt also was elected an F.R.S. In 2012 Ken Freeman received the Prime Minister's Prize for Science. Also a F.R.S., in January 2013 he was awarded the Mathew Flinders Medal by the Australian Academy of Science and the Henry Norris Russell Lectureship by the American Astronomical Society. For further details of Butcher's directorship see Bhathal (2014).

The final chapter of the book is titled 'Brian Schmidt's Nobel Lecture 2011: accelerating expansion of the universe through observations of distant supernovae'. After a 1-page introduction, there is a reprint of the 25-page paper by Brian P. Schmidt with the above title that was published in the *Review of Modern Physics* on 13 August 2012.

The book ends with a 1-page listing of the successive 'Directors of Mount Stromlo Observatory', followed by a 10-page 'Timeline of major events', spanning 1905–2012, and finally a 10-page Index.

Mt Stromlo Observatory … is beautifully illustrated, boasting numerous images that have never been published before, many in colour. But although the book is well written, there are some obvious omissions or areas of over-simplification which should have been picked up by the assessors of the MS. For instance, while Cla Allen was indeed involved in galactic radio astronomy (page 80), the important contributions that he and his Stromlo colleague David Martyn made to solar radio astronomy (see Orchiston et al., 2006: 51–53) are ignored. Then, prior to the 50-in and 74-in telescopes becoming operational, the workhorses for the Observatory's research programs were the 30-in Reynolds reflector *and* the 'Catts Telescope'. Between 1952 and 1963

> … the Catts Telescope was first used at MSO in its original 20-in Cassegrainian configuration and from December 1959 as a refurbished 26-in Cassegrainian reflector at the Mount Bingar field station … [It] was used very effectively by ten MSO astronomers and visiting astronomers and by five different Ph.D. students for photometry or spectrophotometry of stars in our Galaxy and for photometry of clusters of southern extra-galactic nebulae. These investigations resulted in the publication of twenty-six research papers based *in toto* or in part on observations made with the Catts Telescope, and these were published mainly in *The Astronomical Journal*, *The Astrophysical Journal*, *Monthly Notices of the Royal Astronomical Society*, *The Observatory* and *Publications of the Astronomical Society of the Pacific*. (Orchiston, 2010: 251).

There are also numerous minor errors of fact. Figure 2.8 shows a traction engine not a 'tractor'. It is misleading (pages 39–40) to claim that Janssen and Lockyer alone discovered helium, when Pogson was the first to notice and comment on the anomalous yellow emission line, during the 1868 total solar eclipse (see Nath, 2013). Although used briefly for solar observations, the Collaroy radar station in Sydney (page 77) never was a CSIRO Division of Radiophysics field station (see Orchiston and Slee, 2005). The claim that R.H. Reynolds (the donor of the 30-in telescope) was the only amateur astronomer to serve as President of the Royal Astronomical Society (page 78) is certainly incorrect, as over the years many other amateur astronomers held

this office, including Francis Bailey, George Bishop, Henry Colebrooke, Arthur Common, Sir John Herschel, Sir William Huggins, Edward Knobel, William Lassell, Dr John Lee, William Maw, T.E.R. Phillips, Sir James South and Lord Wrottesley. When Walter Stibbs moved to Scotland it was as the Napier Professor of Astronomy at the University of St. Andrews and not just as "… Director of the St. Andrews Observatory …" (page 79). And contrary to the claim on page 190, SN 1987A was independently discovered on the same night by Ian Sheldon (University of Toronto), *as well as* Oscar Duhalde (Las Campanas Observatory) and the world's leading visual observer of variable stars, amateur astronomer Albert Jones of New Zealand (see Marsden, 1987), and all should be assigned equal credit. On page 226 Sydney's Ruby Payne-Scott is listed as the world's first female radio astron-omer, but her career in radio astronomy was inspired by Dr Elizabeth Alexander, who carried out earlier research in New Zealand (for details see Orchiston, 2005). Fortunately, 'typos' are rare, although descendents of Heinz Gollnow would not enjoy seeing him listed as 'Gollonow' on page 109 (and in the Index).

One of the positive features of this book is the extensive use made throughout of sidebars to provide specific information without detracting from the flow of the main narrative. Some of these are biographical, others contain very specialised astronomical material, whilst yet others impart general information. Thus, there are sidebars on the 'Rise of astrophysics', 'Stark effect', 'The ionosphere and radio communications', 'McCarthyism and the intellectual community in the US', 'Supernova 1987A', 'WIMPS and MACHOs', 'Women astronomers in Australia' and the 'Butcher-Oemler effect', to name just a few. However, given his research interest in Australian astronomical history, it would seem that Bhathal missed several excellent opportunities. For instance, Father O'Connell is mentioned on page 84, without any indication of who he was or where he worked. He was Director of the Riverview Observatory in Sydney and it would have been nice to learn a little about this Jesuit research institution and its work on variable stars. Again, on page 163 we discover that an innovative feature of the 2.3-m Advanced Technology Telescope was that the whole observatory building rotated, not just the dome. Yet this was not an Australian 'first', for Henry Russell constructed the very same type of facility at Sydney Observatory back in 1880 (Orchiston and Bhathal, 1982), and associated with this observatory was a 15-in reflector with a mounting designed by Russell that is reminiscent of the horseshoe mounting that was used much later with the 200-in Palomar Telescope (Orchiston, 2000).

Although this book is well written and well illustrated, it is clear that the senior author could have been more thorough in his research as numerous errors of fact occur and some key references are missing. It is equally clear that the publishers did not maintain an adequate level of quality control during the printing process for my review copy suffers from having pages 132, 133, 136, 137, 140, 141, 144 and 145 overprinted with pages 90, 87, 86, 83, 98, 95, 94 and 91 respectively, making nearly half of the Eggen chapter totally unreadable! Without this defect, and with the numerous errors corrected, *Mt Stromlo Observatory* … would be good value at just AU$39.95.

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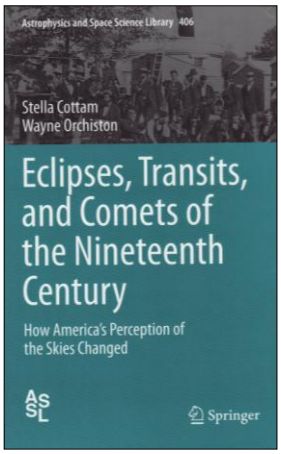
***Eclipses, Transits, and Comets of the Nineteenth Century: How America's Perceptions of the Skies Changed*, by Stella Cottam and Wayne Orchiston (Springer, 2015), pp. xii + 336, 239 illustrations. ISBN 978-3-319-08340-7 (hard cover), 160 × 240 mm, US$129.00.**



As we approach the total solar eclipse of 21 August 2017, whose totality will cross the co-tinental United States from northwest to south-east and whose partial phases will be visible to the north through Can-ada to the Arctic and to the south through Cen-tral and northern South America, it is interesting and useful to ponder how best to get the public to participate in the event. Even today, I saw a discussion of worry about potential panic concerning eye safety—a panic that easily could be averted with proper public education and out-reach in the days and months leading up to the eclipse.

The recent transits of Venus, in 2004 and 2012, did not lead to a darkening of the sky (since the dimming of the sunlight was only 0.1% of the total solar irradiance), but there was interest among the general public in those parts of the world from which the events were visible. Be-cause of Mercury's small apparent size, the 9 May 2016 transit of Mercury will be less detect-able (even from its zone of visibility, which in-cludes the Americas, Europe, and Africa), and we will have to wait until 2117 and 2125 for the next transits of Venus.

In a Ph.D. thesis completed through James Cook University in Australia, Stella Cottam des-cribed the nineteenth century public interest in America in major astronomical events, and she has now teamed with her former supervisor, Wayne Orchiston—who added additional material—to pro-duce an interesting new book. They start with a discussion of interest shown in the Leonid Meteor Storm of 1833 (due back in about 2030) and the Great Comet of 1843 (with a Great Comet liable to appear at any time), and then move on to discuss the nineteenth century solar eclipses—especially those of 1868, famous for the discov-ery of helium, and the pair in 1869 and 1878 that were visible in the United States. They next discuss the 1874 and 1882 transits of Venus. For both eclipses and for transits, they discuss the then-current world-wide science, and scientists who were active in the field.

But interestingly, Cottam and Orchiston go be-yond the scientific stories, however interesting they may be. They also discuss the treatment of these events in periodicals and newspapers of the time. Major sections discuss published reports, first of the eclipses and then of the transits. A short concluding section on public participation in re-search is a good forerunner to some potential projects for 2017.

This is a beautifully-produced book, with color images throughout, and the *Scientific American* map of the 1869 eclipse path shown on page 181 resembles the forthcoming eclipse path for 21 August 2017. The wide variety of images come from many sources, not just Wikipedia, and show the research skills of the authors.

This historical book by Cottam and Orchiston is fun to read and to look through. I can recom-mend it to all who like to know about eclipses, transits, or nineteenth century science in general, or who otherwise want something to tell them about the interactions of science with the public—or who just want an interesting book to read.

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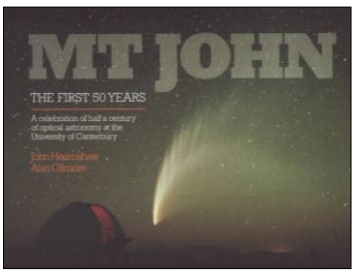
***Mt John – The First Fifty Years. A Celebration of Half a Century of Optical Astronomy at the University of Canterbury*, by John Hearnshaw and Alan Gilmore (Christchurch, Canterbury University Press, 2015), pp. 216, 188 illustrations. ISBN 978-1-927145-62-3 (hard cover), 310 × 240 mm, NZ$59.99.**



Mt John Observ-atory (henceforth MJO) is New Zea-land's premier re-search observa-tory. Sited atop a ridge near the western shore of Lake Tekapo, in the South Island, with the snow-capped Southern Alps and New Zealand's highest peak, Mt Cook, off to the west, it is in a truly beautiful setting and must be one of the most charmingly-situated observatories in the world.

This book was written by two University of Can-terbury astronomers, Emeritus Professor John Hearnshaw, who for years ran the Astronomy pro-grams at the University, and Alan Gilmore, who until recently was the Superintendent of MJO. Both have had long and intimate associations with MJO, and both are 'key players' in New Zea-land's small community of professional astrono-mers.

There are seven chapters, and the first is an Introduction, titled 'The founding of Mt John: The quest to explore the southern sky'. After briefly

discussing early New Zealand astronomical history, Frank Bateson's site-testing activities in the South Island of New Zealand in 1961–1963 are recounted. Bateson was a leading New Zealand amateur astronomer, with a special passion for variable stars and Jupiter, and he had a vision of a national observatory where cutting edge astrophysical research could be undertaken. The University of Pennsylvania funded a site-testing program which led, eventually, to the selection in June 1963 of Mt John as the site for a new observatory operated jointly by the Universities of Canterbury and Pennsylvania. Later the University of Florida would join the collaboration.

Bateson was Astronomer-in-Charge of the 'Mt John University Observatory' (as it was originally known) from June 1963 until October 1969. Initial instruments were Bateson's own 8-in Grubb refractor and 16-in reflector; a triple astrograph provided by the University of Pennsylvania; and that University's historic 18-in Brashear refractor (which had to remain in its crate, the cost of a dome being prohibitive).

Chapter 2, titled 'The Bateson years: A survey of the southern sky', describes the construction of the early buildings at Mt John; installation of the telescopes and astrograph; the first major research project undertaken—with the 5-in astrograph—which resulted in the Canterbury Sky Atlas; the later Bamberg sky patrol; and the first IR survey of the southern sky. There was no Astronomy offered at the University of Canterbury in those days, so most MJO research was carried out by American astronomers and their graduate students. Leading the Americans was Professor Frank Bradshaw Wood, who

> ... had, from the start, been the most ardent supporter of Mount John University Observatory. Without his enthusiasm for a southern observing station attached to the University of Pennsylvania, and without the funding support that came directly from that university, it is certain that Mt John would never have eventuated. (page 43).

Bateson's departure from MJO also is discussed in detail in Chapter 2. I had always wondered why someone who dreamt of being an astronomer and finally succeeded, with a lovely house overlooking beautiful Lake Tekapo, would contemplate retirement when five years short of the mandatory retirement age of 65. Hearnshaw and Gilmore provide the answer: there was growing tension between Bateson and his American *and* New Zealand employers as they grew increasingly unhappy with his performance. In the end Bateson resigned on his 60th birthday, but Hearnshaw and Gilmore feel that New Zealand shortchanged itself on this occasion:

> The rift with Wood and other Pennsylvania astronomers ... and the cool relations that developed with McLellan, the head of Canterbury's Physics Department, considerably curtailed Bateson's effectiveness as astronomer-in-charge. There were differences of background and personality. Bateson was a businessman, not an academic, and he had a talent for public relations and for organisation. Academics saw him as egotistical and arrogant, and they were frightened of his apparent empire-building. In this respect they probably misjudged him, and in doing so missed out on an exceptional leader for the further development of Mt John into the 1970s.
>
> Probably no-one else could have set the founding of Mt John in motion in the way Bateson had done ... Wood and McLellan ... were both conservative risk-averse academics without Bateson's flair for public relations and garnering community support. It was a clash of personalities that led to tensions, and Bateson's ultimate fall from grace. (page 54).

Despite this prognosis, MJO flourished after Bateson's departure, partly because undergraduate and graduate astronomy programs finally were established at the University of Canterbury, and partly because of the arrival of two new telescopes, both 24-in (61-cm) reflectors ideally suited to photoelectric photometry of variable stars. Canterbury also awarded its first Ph.D. in 1979, to Gerry Gilmore, who would build an international reputation in England. These developments, and others, are outlined in Chapter 3, 'New telescopes, the study of southern variable stars and Mt John turns to spectroscopy'.

The mention of spectroscopy in the chapter title refers to the appointment in 1976 of John Hearnshaw to a new lectureship and his involvement in stellar spectroscopy. Little could he have imagined at the time that this would lead, eventually, to a full Chair and a 39-year association with the University of Canterbury and MJO. John has since become an authority on the design, construction and use of échelle spectrographs.

Fortunately, MJO's acquisition of important new instrumentation did not cease with the first échelle spectrograph. Chapter 4, 'The McLellan 1-m telescope: A new era of research into stellar spectroscopy and binary stars, and a new photographic sky patrol', begins by describing the 1-m Dall-Kirkham reflector, championed by John Hearnshaw. At the time this was the largest Dall-Kirkham in the world, and was built almost entirely in the University's own workshops. It was named the 'McLellan Telescope', and the official opening occurred at MJO on 11 July 1986. Subsequently, the échelle spectrograph was adapted for use on the new telescope. In the 1980s the Department of Physics at the University of Canterbury also gained two new astronomers, Drs Peter Cottrell and William Tobin, who would make important contributions to New Zealand astronomy. Meanwhile, the second author of the *Mt John* book, Alan Gilmore, together with his wife, Pam Kilmartin, began working at MJO in November

1980 and April 1981 respectively. Unlike other Canterbury staff and most of the graduate students—who carried out stellar astronomy—their main interest was in comets and minor planets.

Chapter 5 is titled 'Two new spectrographs for Mt John, a robotic telescope, more research on variable stars, comets and asteroids, and the search for extrasolar planets'. Hearnshaw and Gilmore regard the 1990s as "... Mt John's golden years." (page112), which saw the commissioning of two new spectrographs at MJO. The more important one was Hercules,

> ... a pioneering instrument that would become the world's first fibre-fed vacuum échelle spectrograph designed for precise Doppler-shift measurements on brighter stars, as well as detailed analysis of fundamental stellar properties, including chemical composition. (page 116).

Like the 1-m telescope, Hercules (which stands for High Efficiency and Resolution Canterbury University Large Echelle Spectrograph) was another locally-designed and built innovative instrument, and it would serve New Zealand astronomy well by providing data for Canterbury staff and a succession of graduate students. Two of the most interesting projects, employing Hercules, relate to asteroseismology and the search for extrasolar planets. But not all of Chapter 5 is devoted to instrumentation and stellar astronomy, for Alan Gilmore provides several pages about the MJO minor planet program as well as a page on 'Life on Mt John: A personal perspective from Alan and Pam'.

In Chapter 6 ('The MOA Project at Mt John') the authors introduce a very different type of extrasolar planet search strategy that also is pursued at MJO, and this is the use of gravitational lensing. The MOA Project (MOA = Microlensing Observations in Astrophysics) was launched in 1995 as a Japanese-New Zealand collaboration, with the New Zealand astronomers from Auckland University, Carter Observatory, Victoria University of Wellington and the University of Canterbury (where John Hearnshaw was the sole participant). The 61-cm Optical Craftsman Telescope at MJO was dedicated to the Project and was automated, some optical modifications were necessary, and the Japanese collaborators provided a very large digital CCD camera. While a number of microlensing events were recorded it was only in July 2003 that irrefutable evidence was obtained of an extrasolar planet (named MOA-2003-BLG-53Lb). As Hearnshaw and Gilmore observe,

> This was the first ever planet found by the new microlensing technique and the results were beyond doubt. Nine years of hard work by the MOA team had finally come to fruition. (page 141).

Meanwhile, the Japanese decided to ramp up their support for the MOA Project by providing a larger dedicated telescope, and on 1 December 2004 the 1.8-m altazimuth-mounted MOA Telescope, with its 80 million pixel CCD camera, was officially opened at MJO.

An exciting discovery by the MOA team is the presence of large numbers of extrasolar planets that are not associated with any known stars. Meanwhile, research also continues on variable stars discovered during the MOA Project.

Finally, it is important to point out that in addition to the MOA Project, two University of Canterbury astronomers are involved in PLANET, another successful extrasolar planet search program that uses microlensing. Thus, extrasolar planets are an important component of the overall research strategy of the Canterbury astronomers.

The final, profusely-illustrated Chapter, on 'Mt John reaches out to the public' turns from astronomical research to astronomical education and popularisation. The University of Canterbury organises Aurora Schools in Astronomy for senior secondary school students, which include popular visits to MJO. The University also arranges several popular MJO visits each year for alumni. However, two other recent developments have succeeded in bringing astronomy to much larger audiences. Responding to an explosive public interest in astro-tourism, Earth & Sky Ltd. began running very popular day-time and night-time tours of Mt John and MJO in 2004, and they later set up an astro-cafe with stunning views across Lake Tekapo. Now the company is planning to erect a Visitor Centre at Lake Tekapo village along with a dome to house the historic 18-in Brashear refractor, which (finally) will be used for public viewing. The other initiative was the successful creation in 2012 of the McKenzie Basin—where MJO is located—as a recognised UNESCO International Dark Sky Reserve. This led, in turn, to an international conference in 2012, and in 2013 to the first 'Starlight Festival', which drew an audience of 300 and helped create a greater awareness of MJO and the research carried out there.

Rounding out this very attractive, large-format book with numerous stunning non-astronomical coloured photographs, are appendices listing University of Canterbury Astronomy staff and astronomy graduate students, plus students from other universities who observed at MJO or used MJO data; 16 pages of notes and references; a Glossary; a Bibliography; and an Index.

Mt John ... provides a visual feast and is a wonderful read. It is reasonably priced, and I thoroughly recommend it for anyone interested in New Zealand astronomy.

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