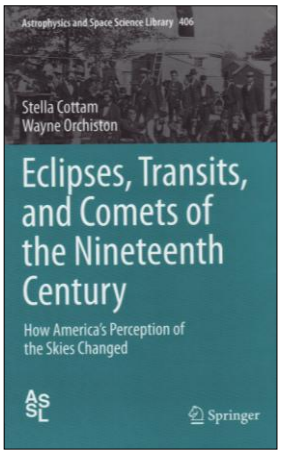
***Eclipses, Transits, and Comets of the Nineteenth Century: How America's Perceptions of the Skies Changed*, by Stella Cottam and Wayne Orchiston (Springer, 2015), pp. xii + 336, 239 illustrations. ISBN 978-3-319-08340-7 (hard cover), 160 × 240 mm, US$129.00.**



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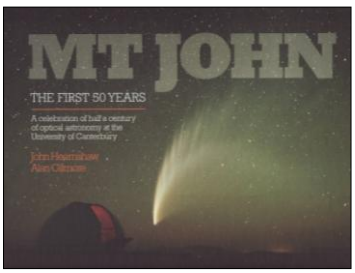
***Mt John – The First Fifty Years. A Celebration of Half a Century of Optical Astronomy at the University of Canterbury*, by John Hearnshaw and Alan Gilmore (Christchurch, Canterbury University Press, 2015), pp. 216, 188 illustrations. ISBN 978-1-927145-62-3 (hard cover), 310 × 240 mm, NZ$59.99.**



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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