

AUSTRALIAN SOLAR ECLIPSE EXPEDITIONS: THE VOYAGE TO CAPE YORK IN 1871

Nick Lomb

School of Agricultural, Computational and Environmental Sciences,
University of Southern Queensland, PO Box 4196, Springfield,
Central Queensland 4300, Australia.

Email: Nick.Lomb@usq.edu.au

Abstract: Techniques such as photography and spectroscopy only became available to study solar eclipses in the 1860s. The first subsequent total eclipse of the Sun to be visible from Australia was one in December 1871 that was visible from far north Queensland. Initiated by the Royal Society of Victoria, astronomers in Melbourne and Sydney cooperated to organise the Australian Eclipse Expedition aboard the steamship *Governor Blackall* to a suitable observing location. Though on the day of the eclipse clouds prevented viewing, this was an important expedition that was complex to organise and involved dealings with colonial Governments and with relatively large sums of money that Australian scientists had not previously experienced. With a newspaper reporter as part of the expedition along with two photographers the expedition was well recorded and provides a clear insight into the activities of late nineteenth century astronomers and other scientists.

Keywords: nineteenth century eclipse expeditions, 1871 total solar eclipse, Eclipse Island, Royal Society of Victoria, *Governor Blackall*, Melbourne Observatory, Sydney Observatory

1 INTRODUCTION

Total eclipses of the Sun are one of the most spectacular sights provided by Nature (Figure 1), and always are watched with great interest. When one occurs, the sky becomes dark, the visible disc of the Sun is covered for a period of a few minutes by the Moon, and the faint corona surrounding the Sun becomes visible. Those with keen eyesight or with optical aid can sometimes make out red prominences surrounding the darkened disc. The Australian Aboriginal people, amongst many others, were keen watchers of eclipses and developed their own theories to explain them (Hamacher and Norris, 2011).

To astronomers, total eclipses provide rare opportunities to study solar features such as the prominences and the corona that are otherwise not observable, or at least, not until relatively recently. Unfortunately, total eclipses at a particular location are fairly rare; in the southern hemisphere on average one is likely to occur only once in 540 years (Steel, 1999: 351). That means that interested astronomers must be willing to travel if they want to observe an eclipse. During a total eclipse the Moon casts a shadow on the Earth and totality occurs for those inside the shadow. This shadow moves across the surface of the Earth from west to east and forms an eclipse track. Such eclipse tracks can be calculated in advance, and keen observers can station themselves along the track. Of course, the actual observing locations are carefully selected and depend on such criteria as accessibility and weather prospects, if known.

Up until about 1860 astronomers lacked suitable observing instruments to record and to try to understand what they were seeing during an eclipse. For instance, when the Reverend Wil-

liam Scott (1825–1917), the Government Astronomer of New South Wales, set out to observe the total eclipse of 26 March 1857 from South Head, near the entrance of Sydney Harbour, all he had was a small refractor with an unstable mounting, micrometers and a thermometer (Scott, 1857). In any case, cloud prevented much observation. However, by 1860 photography had advanced sufficiently for the eclipsed



Figure 1: Clouds parted for the total eclipse of 14 November 2012 as seen from Palm Cove, Queensland (photograph: Nick Lomb).

Sun to be permanently recorded and in the same year Kirchhoff and Bunsen (1860) showed the link between chemical elements and their spectra. Spectroscopy was soon applied to the sky and the science of astrophysics was established (Meadows, 1984). With new tools available eclipse expeditions assumed much greater importance than previously.

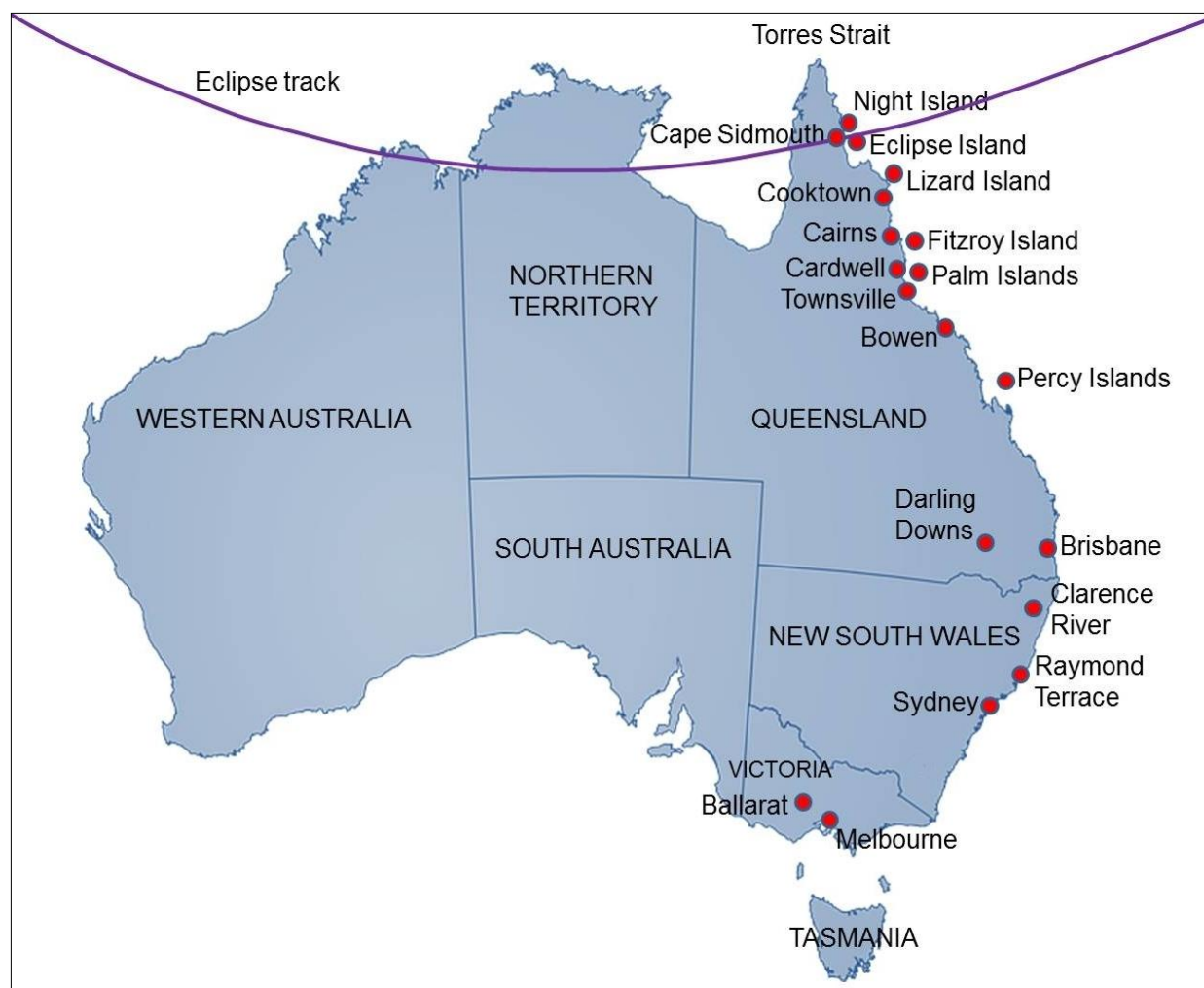


Figure 2: A map of Australia showing locations mentioned in the text as well as the path of totality for the December 1871 eclipse (map: Nick Lomb).

The first total eclipse of the Sun from Australia after the one Scott had attempted to view in 1857 was on 12 December 1871, with an eclipse track crossing the north of the continent. The Royal Society of Victoria in co-operation with the colonial Governments of Victoria, South Australia, New South Wales and Queensland organised an expedition to view the eclipse from its most accessible point, an island almost at the furthest extremity of Cape York (Figure 2 shows the track of the 1871 eclipse, as well as the places visited on the expedition and other Australian locations mentioned in this paper). As Hoare (1976: 9) states, “This enterprise was the first real attempt at formal inter-colonial scientific co-operation [in Australia] on any scale.” The cooperation and friendships formed would have eased the way to the formation of the Australasian Association for the Advancement of Science in 1888 (MacLeod, 1988) with two of the participants on the eclipse trip, Henry Chamberlain Russell (1836–1907) and Robert Lewis John Ellery (1827–1908), taking leading roles in the new association. Furthermore, the instruments acquired for the voyage to far north Queensland would have introduced

Australian astronomers to the brand new science of astrophysics. This paper examines the background to the 1871 Australian Eclipse Expedition, the organisational details and the voyage itself.

Of course, the track of the 1871 eclipse did not only pass through Australia but also through India, Ceylon (present day Sri Lanka) and the Dutch East Indies (Indonesia). The eclipse was carefully observed in all three places, especially from India where there were both locally-based observers such as Lieutenant-Colonel James Francis Tennant (1829–1915) and expeditions organised from Britain such as that of Norman Lockyer (1836–1920) and from France such as that of Jules Janssen (1824–1907). As observationally these expeditions were more successful than the Australian one they have been described both by participants (Lockyer, 1872) and by modern astronomical historians (Launay, 2012; Orchiston and Pearson, 2011). Mumpuni et al. (2016) discuss the observations of Jean Abraham Chrétien Oudemans (1827–1906) in the Dutch East Indies.

2 ECLIPSE EXPEDITIONS 1860–1870

An expedition to observe the 1871 eclipse obviously had to take into account the discoveries that had been made during solar eclipses overseas in the previous decade. Nineteenth century Australian astronomers were especially interested in developments associated with eclipse expeditions organised from London as they took their lead from Britain, which at that time was still referred to as 'Home'.

The British expedition to observe the total eclipse of 1860 from Spain was organised by the Astronomer Royal George Biddell Airy (1801–1892) and two well-known gentleman amateur astronomers, Warren de La Rue (1815–1889) and William Huggins (1824–1910) (Pang, 2002: 14). De La Rue succeeded in taking the first photographs of the eclipsed Sun, as did the Director of the Roman College Observatory the Reverend Pietro Angelo (see Lankford, 1984). By comparing the two series of photographs taken from different locations and allowing for parallax it was established that the prominences did belong to the Sun (Todd, 1894). Examination of drawings of the corona made at the same eclipse indicated that the corona surrounded the Sun and was not, as some had suggested, part of the Earth's atmosphere.

For the eclipse of 1868, which was visible from India, more new instruments became available, namely the spectroscope and the polariscope. By viewing through the latter instrument an observer could detect if the light from the corona was polarised due to scattering by dust or by something else (Pang, 2002). The eclipse was notable for its long, five and a half minute, duration, as well as for a striking prominence that was named 'The Great Horn' (Todd, 1894). Among the major discoveries made during this eclipse, Norman Pogson (1829–1891), the Director of Madras Observatory, found the first indication of a spectral line from an unknown element that was later to be called helium (Nath, 2013), while Jules Janssen and others saw bright lines in The Great Horn indicating the presence of hydrogen gas (Cottam and Orchiston, 2015).

The first important result about the corona obtained with the spectroscope was when two American astronomers on 7 August 1869 noted a bright green light in the spectrum at 1474 in the Kirchoff scale (Todd, 1894). As there was no known terrestrial equivalent, this line was thought to be due to some unknown substance that was later dubbed 'coronium'.¹

The final solar eclipse before the 1871 eclipse was that of 22 December 1870. At that eclipse observations by a British team that had travelled to Sicily only confused what had been discovered during the two previous eclipses. A drawing made by an observer with a 'powerful telescope'

indicated a boundary to the corona much closer to the edge of the dark Moon than previously claimed. This led to renewed speculation about the connection with the Sun of the much more extensive regions stretching away from it recorded on photographic plates at the same eclipse (Lockyer, 1872). Although much had been discovered about the Sun during the brief periods of these earlier total eclipses, there was much more to investigate during the 1871 eclipse and those that would follow it.

3 INITIATING THE PLAN

The suggestion for the eclipse trip came at an ordinary meeting of the Royal Society of Victoria on the evening of Monday 12 March 1871. Near the end of the meeting William Parkinson Wilson (1826–1874), Professor of Mathematics at the University of Melbourne and Chairman of the Board of Visitors to Melbourne Observatory, informed the 28 members present that in December 1871 a total eclipse of the Sun would be visible from northern Australia. Proposing that the Society organise a voyage to Cape York by hiring a steamer for that purpose, he stressed that there would not be another opportunity to view a total eclipse from Australia for the remainder of the century. As well, he noted that no one present was likely to have seen a total eclipse previously (RSV Ordinary Meeting minutes, 1854–1893).

The President of the Society, Robert Ellery, Government Astronomer at Melbourne Observatory, warmly supported the proposal and it was decided to discuss the idea further at the next meeting (Royal Society of Victoria, 1871). At that meeting, held on 17 April 1871, an Eclipse Committee comprising Wilson, Ellery, a Dr Parker and an engineer named Smith was set up to consider the proposed trip. The need for urgency was emphasised as,

Some instruments would have to be procured from England and that therefore no time should be lost. (RSV Ordinary Meeting minutes, 1854–1893).

The Eclipse Committee estimated the cost of hiring a steamer for an all-inclusive voyage of 25 days from Melbourne to Cape Sidmouth on Cape York at £2,000 (~\$400,000 in 2015 dollars).² They proposed raising the funds by opening participation in the voyage to suitable gentlemen: if there were 100 participants the cost to each would be £20 (\$4,000) and if only 80 then £25 (\$5,000). The following advertisement was then placed in the local newspaper:

Gentlemen desirous of JOINING the EXPEDITION must apply forthwith, enclosing £25 as their share of the expense, to Mr Ellery, at the Observatory.

Despite the use of the word 'Gentlemen' at the

special meeting of the Eclipse Committee on 18 October 1871 (RSV Council Meeting minutes, 1854–1888), it was clarified that the eclipse voyage also was open to ladies.

The advertisement was not a great success as by 11 September there were only 15 or 16 applicants for the voyage. This meant that the scale of the proposed expedition had to be cut back and Government support was essential if the voyage was to eventuate. The Eclipse Committee drafted a strongly-worded letter appealing for funds, which was sent by the Secretary of the Royal Society to the “The Honourable the Chief Secretary” of Victoria. This letter asked for the direct payment of the fares of Observatory staff going on the expedition, as well as a guarantee to cover any unmet expenses of the voyage. To reinforce the importance of the proposed expedition, the letter stated that:

... it appears by the last paper from Europe that entire dependence seemed to be placed upon Victoria and New South Wales to observe the approaching Eclipse in Australia.

As mentioned in Section 1, this same eclipse also was visible from India and a British eclipse expedition was sent there (Lockyer, 1872). Clearly, Australia was too far away to send people, but the Eclipse Committee of the British Association for the Advancement of Science did send the following up-to-date instruments for use by the Australian astronomers:

An integrating spectroscope on small equatorial stand by Grubb; [to observe the spectrum of the entire eclipsed Sun]
 An analysing spectroscope by Browning; [to observe selected sections of the eclipsed Sun]
 A hand spectroscope, by Browning;
 Two Savart’s polariscopes;
 One large long focus rectilinear photographic lens and camera, by Dallmeyer;
 And several useful photographic appliances.
 (Ellery, 1874b: 9).

There was little knowledge of the weather to be expected near Cape Sidmouth at the date of the eclipse in December, even though this was the ‘wet season’ in tropical northern Australia. The Dutch ship *SS Curaçoa* was heading north, and while it was still in port in Melbourne the Captain was asked to provide weather reports during the journey. At the October Ordinary Meeting of the Royal Society of Victoria a letter was read from Mr Ploos van Austel, written on board the ship while it was docked in Bowen, Queensland. This warned that

... the weather is often thick and heavy about the middle of December, with a dense atmosphere, skies overcast and clouds gathering in great masses.

After a fairly positive reply from the Chief Secretary’s Office tenders were called for a steam

ship to travel to Cape York via Sydney on the basis of 40 first-class passengers. Two ships were offered: the *Alhabra* at £2,100 and the *Coorong* at £1,700. At a special Council Meeting of the Royal Society of Victoria on 25 October the *Alhabra* was under active consideration, despite its high cost. The fee for paying passengers was raised from £25 to £30 (\$6,000), the Chief Secretary was to be informed of the cost, and a telegraph message was to be sent to the Government of South Australia asking for a financial contribution.

The situation changed on 28 October 1871 when a telegram was received from Henry Russell, the Government Astronomer in New South Wales and Director of Sydney Observatory (The Queensland Government and the Eclipse Expedition, 1872b). In the telegram Russell informed Ellery that the Queensland Government was likely to lend the steam ship *Governor Blackall* (Figure 3) at a cost of under £1,300 (\$260,000). Russell stated that the “Steamer is just what is wanted.” He clarified the situation regarding the steamer in a letter sent a few days later, on 2 November 1871. After the use of the ship was suggested to Russell by Captain Francis Hixson (1833–1909), the Superintendent of Light Houses, Harbours and Pilots, enquiry was made of the ship’s agents and the Queensland Government (which owned the vessel). The indication was that provided the estimated cost of about £1,200 was met, the ship would be available. One of the reasons why the agents were willing to proceed with the enterprise was that Lieutenant Jack Gowlland (1838–1874), an experienced Royal Navy officer engaged in mapping the coast of NSW, and who just happened to be Captain Hixson’s brother-in-law (Vink, 2013), had volunteered to captain the ship.

With just two weeks left before the Melbourne party had to depart there was still considerable doubt about whether the expedition would go ahead, because of lack of funds. In spite of grants of £100 each from the South Australian and Queensland Governments plus £300 from the New South Wales Government (which also would cover the cost of their observing party), Ellery telegraphed Russell on 7 November 1871 indicating that a further £150 had to be found in order to cover the cost of the ship (The Queensland Government and the Eclipse Expedition, 1872b). At that afternoon’s Committee meeting of the Royal Society of Victoria it was resolved to write to the Chief Secretary threatening to abandon the expedition if the funding shortfall could not be resolved.

This threat worked, and the Victorian Government promised an additional £250 for the expedition, in order “... to carry it into execution.” Ellery then telegraphed Russell on 11 November

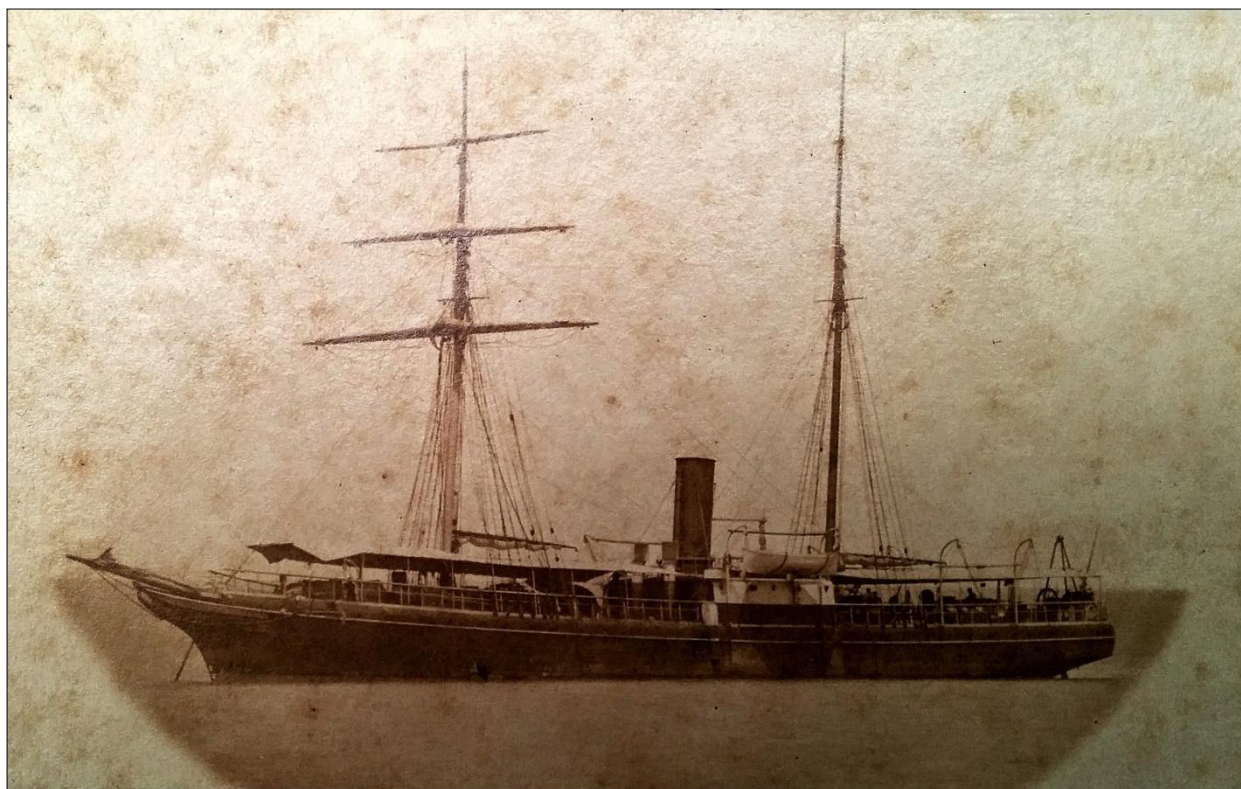


Figure 3: The photograph taken by Beaufoy Merlin of the *Governor Blackall* (courtesy: State Library of NSW, Australian Eclipse Expedition 1871, SPF).

1871: “You can finally accept Blackall offer.” At that afternoon’s meeting of the Council of the Royal Society of Victoria final arrangements were discussed, including the passage to Sydney, and an important decision was reached “... not to take 2nd class passengers besides those attached to the observing staff.” In the meantime, on 16 November Russell went ahead (on behalf of Ellery) and signed the contract with the agents, Eldred and Spence. When a copy of the contract reached Melbourne it was found that the Queensland Government had withdrawn their promised £100, stating that

... the use of the steamer (valued at £300) be regarded as the contribution of the Queensland Government towards the expense of the expedition.

Ellery received the contract just three days before departing for Sydney, so it was too late for him to request any alteration to the conditions.

4 TRAVELLING TO SYDNEY

The Victorian party left from Port Melbourne (then called Sandridge) at 2 pm on Thursday 23 November 1871 on board the Australian Steam Navigation Company’s iron steamship the *Wonga Wonga* (White, 1869–1876). The observing party was mainly from Melbourne Observatory and consisted of Ellery, the Assistant Astronomer Edward John White (1831–1913), Assistants Charles Moerlin and Ebezener Farie MacGeorge (1836–?) plus Alexander Black (1827–1897) of

the Geodetic Survey, the photographer Charles Walter (1831–1907), Professor Wilson and an assayer from the Melbourne Mint, George Foord (ca. 1823–1898). The dozen or so other members of the Victorian party included the journalist Henry Britton (1843–1938), who wrote a useful and detailed series of articles about the voyage, and Henry Keylock Rusden (1826–1910), who was the Secretary of the Royal Society of Victoria.

Apart from initial sea sickness for some of the passengers the voyage went smoothly, and the *Wonga Wonga* berthed in Sydney at around 1 am on Sunday 26 November. Lodgings for the whole party were at the Royal Hotel (Britton, 1871a), which was centrally located in George St between King and Market Streets. During the day there was an excursion by steamboat to Parramatta, which included a visit to the site of the old Parramatta Observatory near Government House (White, 1869–1876). The next day, departure day, Edward White transferred the chronometers from the *Wonga Wonga* to the *Governor Blackall*, and then called at Sydney Observatory in order to obtain accurate time for his pocket chronometer.

Another expedition member who came to Sydney was Silvester Diggles (1817–1880), a naturalist, artist and musician from Brisbane. As one of the conditions for supporting the Australian Eclipse Expedition the Queensland Government reserved the right to send someone on the

voyage and Diggles was chosen, partly because he was "... accustomed to the use of the telescope ..." (Diggles, 1872). In order to save the expedition the trouble of stopping in Brisbane on the way north he travelled to Sydney to join the rest of the party, arriving on Saturday 25 November. While in Sydney he visited the Botanical Gardens and renewed an acquaintance with the Director, Charles Moore (1820–1905), who also would join the expedition. However, Diggles spent most of his time at the Museum (now the Australian Museum), with its Curator, Gerard Krefft (1830–1881).

5 THE GOVERNOR BLACKALL

When the members of the eclipse expedition embarked on the *Governor Blackall* on Monday 27 November 1871 they were on an almost brand new ship, the largest that had been built in the Colony of NSW up to that time. However, the ship already had a curious history as it was implicated in the bringing down of a Queensland Premier and Government.

An historical article in *The Brisbane Courier* newspaper (Famous ship, 1931), written on the occasion of the scuttling of the *Governor Blackall* off Sydney Heads relates the circumstances surrounding the ordering of this ship and its consequences. In 1869 the Australian Steam Navigation Company supposedly misused its monopoly power in Queensland by asking for large subsidies, not bringing the English mail from New South Wales, and providing an irregular service. In December 1869, while visiting Sydney, the Queensland Premier, Charles Lilley (1827–1897) and the Queensland Governor, Colonel Blackall (1809–1871), decided to confront the monopoly by ordering a fleet of ships to be operated by the Government.

Lilley then negotiated for the construction of three ships by Mort and Co., each of 480 tons, at a cost of £16,500 (\$3.3 million) for the first and £16,000 (\$3.2 million) for the other two. Not surprisingly, his cabinet colleagues were strongly opposed, with the Treasurer cabling back, "We think had better not buy steamers. Cannot tell what annual cost may be". Despite this opposition Lilley managed to have one ship built that became the *Governor Blackall*. However, the political cost was high as it was a significant contribution to the disintegration of his government a few months later and the opposition assuming government.

The *Governor Blackall* was designed by Captain William Henry Eldred (1819–1897) who, with his partner Edward Jones Spence, became the agents for the ship. The steel-hulled ship had two steam engines and an auxiliary brigantine rigging (i.e. two masts with sails). There was saloon accommodation for "... twenty-seven gentle-

men and nine ladies ...", as well as steerage berths for "... twenty-eight males and eight females." (Trial trip of the steamer *Governor Blackall*, 1871).

6 THE VOYAGE NORTH TO ECLIPSE ISLAND

By 4 pm on the afternoon of Monday 27 November 1871 the expedition party was on board the *Governor Blackall*, which was berthed at Campbell's Wharf close to Sydney Observatory (Britton, 1871b). The freshly-cleaned and painted ship, equipped with new pistons, departed soon afterwards for the Heads at the entrance to Sydney Harbour. The New South Wales observers had only one representative from Sydney Observatory, Henry Russell, but he was to have a number of helpers: the Reverend William Scott (1825–1917) who had been the first astronomer at Sydney Observatory and had employed Russell there as a 'computer' (Orchiston, 1998), William John Macdonnell (1842–1910) a bank manager and active amateur astronomer (Orchiston, 2001), and the photographer Beaufoy Merlin (1830–1873) (Bradshaw, 2005). Others from New South Wales, extracted from the list of expedition members that Merlin (1872) provides at the start of his "Rough Notes" on the expedition, were Charles Moore, from the Botanical Gardens in Sydney (King, 1974); the conchologist John William Brazier (1842–1930) (McMichael, 1969); Henry James Bolding, the police magistrate at Raymond Terrace; and a Mr C. Whitehead of the Clarence River.

There were 33 members of the eclipse party housed in the saloon. On sitting down to dinner they were pleased to find menus on the tables headed "S.S. Governor Blackall" and "Eclipse Expedition" with an illustration of champagne bottles and glasses resting on grapes and vine leaves (Britton, 1871b) suggesting to the participants that their voyage would not be Spartan. For the first few days, the Victorians having become acclimatised to sea travel on the *Wonga Wonga* could watch the others fall to sea sickness with "... a sense of calm superiority."

By the end of the week the *Governor Blackall* had reached the Great Barrier Reef. Britton (1871b) was unimpressed stating that "There is nothing picturesque about these reefs ..." and stressing how dangerous and difficult they were for navigation. On the afternoon of Friday 1 December the ship reached No 2 Percy Island (now Middle Percy Island), and the passengers were able to disembark, though with some difficulty and some trepidation. The difficulty was that the waves were pushing the boats sideways so that there was a risk of capsizing and some deft manoeuvring was needed with the oars (Diggles, 1872) before the passengers could reach

the sandy beach. The fear also was due to the remembrance that 17 years earlier local Aboriginal people on the island had speared and killed a young naturalist and collector Frederick Strange (1826–1854), along with three members of his party (Murder of Mr. Strange and three others, 1854). Fortunately for all concerned, there appeared to be no inhabitants on the island when the eclipse party landed. Diggles found a plant of interest with its leaves being eaten by "... a very pretty species of *Cassida* or Tortoise Beetle." Others found some small but sweet oysters and someone else discovered a turtle nest from which many of the eggs were removed for later cooking and eating; the white portions of the eggs turned out to be "... rather slimy and tasteless ..." (Merlin, 1872). A number of cockatoos were shot and, to the later disgust of the steward, the naturalists collected a host of specimens of snails, shells, coral and green ants.

On Sunday 3 December 1871 as the ship was passing the Palm Islands that are about 60 km north of Townsville Reverend Scott performed a church service with a sermon that according to Merlin (1872) was "... truly devotional and impressive". The next day the ship anchored in a sheltered bay at Fitzroy Island near present-day Cairns in order to fill up its water tanks. Some of the passengers explored the island; Edward White with five others including some of the ship's crew climbed the island's peak and determined its height as 653 feet (199 m). Diggles was pleased with the island, for he considered that, "The insect tribes were holding high holiday on our arrival ..." so that he could catch many specimens, especially Lepidoptera (moths and butterflies). Later, when back on board the *Governor Blackall*, Diggles was called upon by some of his fellow passengers to identify birds that they had shot and collected.

On the late afternoon of Tuesday the ship anchored at yet another tropical island, Lizard Island, which lies to the north of present-day Cooktown. Those who left the ship found footprints in the sand, indicating the presence of local Aboriginal people. As well, the island had a ruined stone house, one wall of which was still standing, and on which was painted a large black cross. Although Robert Louis Stevenson's *Treasure Island* was not to be published for another decade, the cross was taken as an invitation to dig, which they did, but without finding any treasure. The house was believed to have been used by collectors of sea cucumber, also known as *bêche-de-mer* and *trepang*, which was exported to China where it is considered as a delicacy (Diggles, 1872).

Being now close to the right latitude for the eclipse, which was calculated to occur just one

week later, it was time to make a decision about the observing location. Merlin (1872) relates that a discussion was held on Tuesday evening to decide between two candidate sites. One was Cape Sidmouth on the mainland and the other was Number 6 Island of the Claremont Group. Although the Cape had been the planned destination, it was surrounded by shallow water for 5 km or so making the landing of instruments difficult and, in addition, there was considerable fear of the Aboriginal people who were believed to live in the locality. Hence, No 6 Claremont Group was selected as the observing site.

7 ECLIPSE ISLAND

The *Governor Blackall* reached No 6 Claremont Group at 6:30 pm on the evening of Wednesday 6 December 1871 (White, 1869–1876), just six days before the eclipse, and Ellery (1874a: lxi) was far from impressed:

... it was a most uninviting place—a mere sandbank, over which an 8 ft. [2.4 m] tide would have swept, clothed only with a few miserable bushes, and infested with myriads of rats."

When the tide was low a reef 10-km long and 3-km wide was exposed, while at high tide only the sandbank, with a length of about 800 m and a width of 200 m, was above the water level. Nonetheless, the island met the main criteria for an observing site in that the instruments could be easily and safely landed, and there was sufficient room for them to be set up.

Figure 4 shows a reproduction of a watercolour, almost certainly painted by Silvester Diggles, of the *Governor Blackall* at the island, which the expeditioners dubbed 'Eclipse Island'.³ Unfortunately, the name does not seem to have stuck. Comparison with a nineteenth century map of the area by the British Hydrographic Office (Coral Sea and Great Barrier Reefs, 1886) shows that Number 6 Island of the Claremont Group is the same as the northernmost of the two Morris Islands marked on modern maps. The Queensland place names website set up by the Queensland Government provides no information about the origin of that name, which does not appear to be known.⁴ The earliest reference to the name that could be found is from 1894, in the form "Morris Island, No. 6 Claremont" (Wrecked cutter, 1894), when it was in the news in connection with a rather grisly discovery by Frank Lee, the owner of a *bêche-de-mer* station on the island.

Edward White's observations provide a position for the island of 13° 29' 36.1" S latitude and 143° 46' 30" longitude (Ellery, 1874a). The latitude is 'spot on' according to modern coordinates from the above website, but the longitude is too far to the east by a distance of about 5 km or 3'. That is equivalent to an error of only 12 seconds



Figure 4: A watercolour painting by Silvester Diggles of the *Governor Blackall* at Eclipse Island (courtesy: State Library of NSW, Australian Eclipse Expedition 1871, SV*/Ecl/1).

of time, which is quite reasonable for the period, especially as poor weather prevented White from taking many observations for time.

On the Thursday, the first full day after arrival at the island, the first task was to build the piers for the instruments. Henry Caselli, an architect from Ballarat in Victoria, built these from bricks brought for the purpose and set in cement. As these piers were to remain after the departure of the eclipse party they were built as time capsules enclosing newspapers from different colonies, a list of the passengers and a few coins (Diggles, 1872). Edward White quickly installed a transit instrument on one of the piers and that evening began making prime vertical transit observations, that is, timing stars crossing the east-west plane at right angles to the meridian; these observations provided the latitude of the observing site.

For the observers the first three days on the island were spent unloading the instruments and setting them up, along with the tents that were to shelter them from the elements. For the New South Wales observers the main instrument was the 7¼-inch (18-cm) aperture and 124-inch (3.15-m) focal length Merz and Sons refracting telescope⁵ that Scott had ordered, and first used in 1861, when he was the founding Director of Sydney Observatory. Once he became Director,

Henry Russell, devised an ingenious regulator for controlling the speed of the telescope's clock drive. Silvester Diggles (1872) explained the system as

... being merely the immersion of a wooden wheel in a trough of mercury, under which is a regulating screw, which causes the wheel to dip more or less deeply into the fluid.

Although this was an effective method of keeping a star or another astronomical object steady in a telescope, it is to be hoped that precautions were taken to avoid inhaling the mercury vapour.

The Merz telescope was to be used for photography: its eyepiece had been replaced by a camera for focal plane photography, and another camera, with its own 3-inch (7.5-cm) lens, was attached to the telescope tube. During the eclipse Russell was to operate the former, while the photographer Beaufoy Merlin was to use the attached camera. There were two small telescopes with clockwork for visual observing; one was to be used by Lieutenant Gowlland and the other by Silvester Diggles. Reverend Scott was to observe with a slightly larger aperture Troughton and Sims telescope that was equatorially mounted but had to be moved by hand (Russell, 1872). Figure 5 shows the New South Wales party posing in front of their instruments.

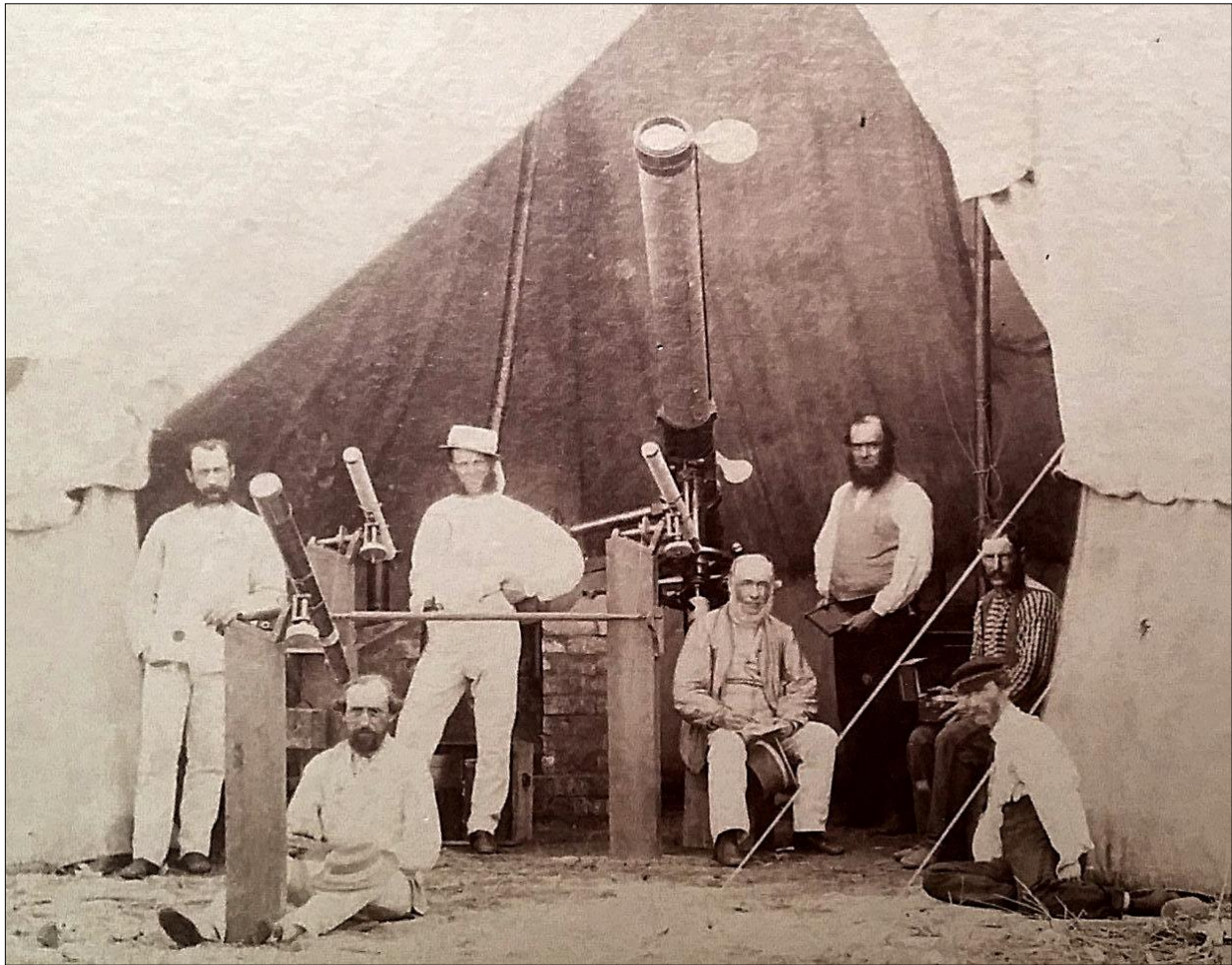


Figure 5: NSW eclipse party clustered around the 7¼-inch (18-cm) Merz telescope at the entrance of the Sydney tent. Pictured from left to right are William Macdonnell, Rev. William Scott, Lieutenant Jack Gowland, Silvester Diggles, Henry Chamberlain Russell, Russell's assistant J. Thrustell (identified in Stevenson, 2012) and Beaufoy Merlin (photograph: Beaufoy Merlin, courtesy: State Library of NSW, Australian Eclipse Expedition 1871, SPF).

These instruments were all housed in a large 'Sydney tent' that also enclosed a photographic dark room with 20 baths and apparatus so that 20 plates could be taken during totality. At that time wet-plate photography was in use so that photographic plates had to be coated before exposure and then developed immediately afterwards. By experimenting, Russell worked out that at the ambient summer temperature on Eclipse Island he could wait ten minutes after coating before exposure and then wait another ten minutes before developing without damaging the plate. Working in that way, and with only two people, 20 exposures could be made during the brief period of totality.

Russell's plans for the eclipse did not include spectroscopy, but only because the instruments sent out from Britain were being used by the Victorian party and he had been unable to source a spectroscope locally. Instead of using a large tent like the Sydney observers, the Melbourne party housed their greater number of instruments in a number of smaller tents. Robert Ellery was to use one of the Browning spectroscopes that was attached to a telescope by the same maker

with a then new-style silver on glass mirror made by the English expert George Henry With (Diggles, 1872). His aim was to examine "... the nature of the light of the chromosphere and the corona." (Britton, 1872a). George Foord from the Mint was in charge of the second Browning spectroscope and had the same aim. Ebezener MacGeorge was looking after the integrating spectroscope, while Professor Wilson had the two Savart's polariscopes to see if the light from the corona was polarised in order to "... ascertain whether the light of the corona is that of a self-luminous body or a reflected light." (Britton, 1872a). Figure 6 shows Ellery and Wilson with other members of the Victorian party in front of two of their instruments.

Charles Moerlin from Melbourne Observatory and the photographer Charles Walter were to take photographs with a 4-inch (10-cm) rapid rectilinear lens, a four element lens with low distortion, by Dallmeyer. With a focal length of 30-inch (76-cm) it provided a 0.3-inch (0.8-cm) image of the Sun. Edward White who, as mentioned above, was making observations for time and position with an altazimuth instrument and a

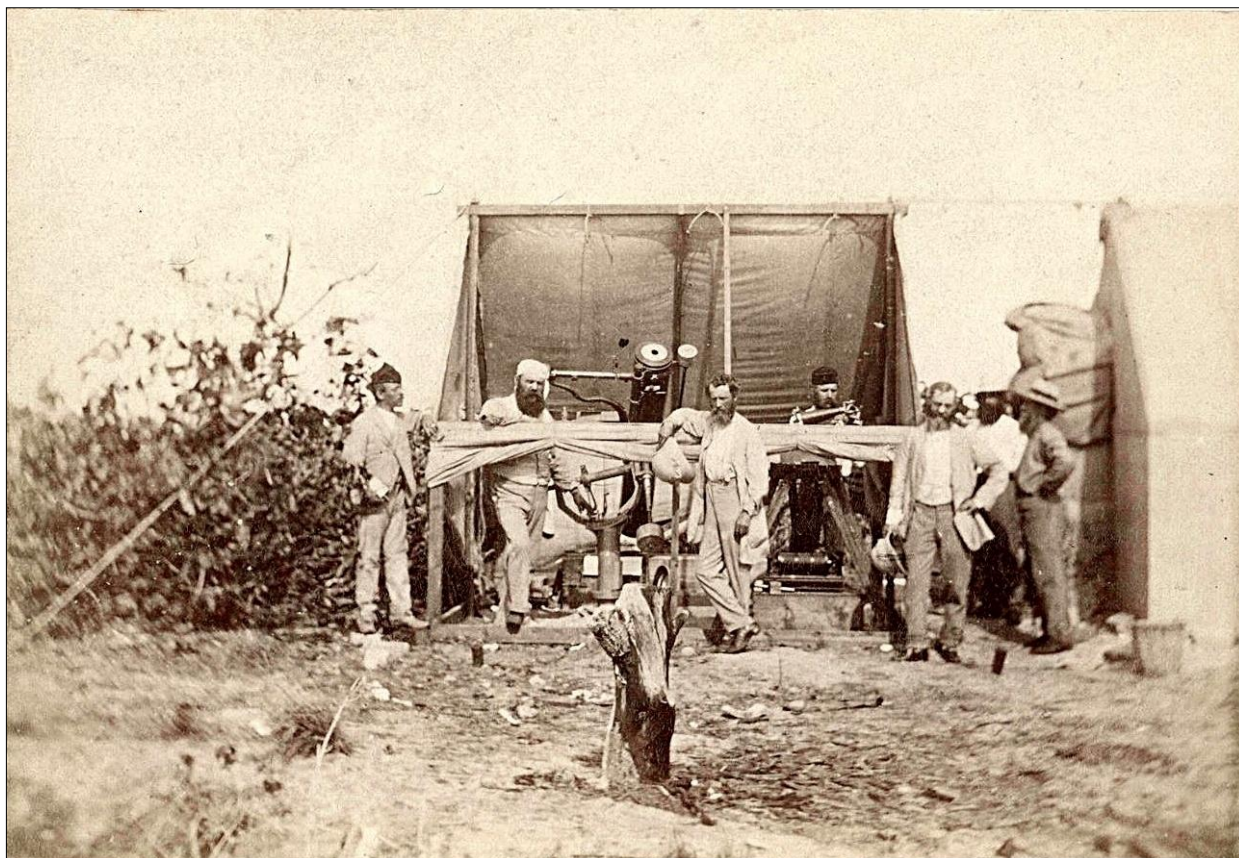


Figure 6: Part of the Victorian party in front of one of their tents. The surveyor Alexander Black is second from left, Robert Ellery is third from left and Professor William Parkinson Wilson is fifth from left (photograph: Charles Walter, courtesy: Museum Victoria Collections <http://collections.museumvictoria.com.au/items/1465827>, accessed 14 December 2015).

transit telescope (see Figure 7), completed the Melbourne observers.

As the observers were setting up the instruments and rehearsing for the totality, the rest of the passengers spent their time exploring, and collecting corals, shells and botanical specimens. Some wandered on the island's exposed reef at low tide, while Charles Moore went by boat to Cape Sidmouth on the mainland with four passengers, two servants and three of the crew.

There they saw evidence of the presence of the local Aboriginal people, but actually only saw three of them. Fear of attack, however, almost led to disaster one night when Charles Moore, who was wearing dark clothes, was challenged and almost shot by two of the party on guard duty after being mistaken for an Aboriginal. Among the variety of interesting plants that Moore and his party found was a species of *Eugenia* that "... bears a fruit about the size and colour of a cherry, having a pleasant sub-acid flavour." (Britton, 1872a). The party happily availed themselves of this fruit, which is likely to have been *Eugenia reinwardtiana* or Cedar Bay cherry.

A number of the eclipse party would bathe in the sea each morning, and Edward White, for example, records bathing on Friday, Saturday and Sunday at Eclipse Island. On the Sunday,

however, the sportsmen managed to catch a number of sharks. After each unfortunate shark took the bait, its head was drawn above the water and then shot three or four times. In just an hour and a half six sharks were placed on the deck to be drawn and quartered, and two more were killed and allowed to sink in the water. Britton (1872a) notes that "After this experience, the morning ablutions of the company were limited to splashing about the decks under the hose."

8 THE ECLIPSE

For the first few days on Eclipse Island the party experienced fine weather. It was so fine that little, if any consideration was given to splitting the party as a precaution against bad weather. When he was in Tahiti in 1769 to observe the transit of Venus, James Cook sent two observing teams to different islands, just in case it was cloudy at his observing site of Point Venus at the critical time (Orchiston, 2005), but this was not done at Eclipse Island in 1871, even though on the days just before the eclipse the weather turned bad. For Sunday 10 December, White (1869–1876) recorded in his diary: "Weather cloudy with heavy rain at night." The next day was no better: "Weather cloudy with heavy storm of rain and terrific thunderstorm at night." Merlin (1872) gives a vivid description of the heavy even-



Figure 7: A photograph by Charles Walter of Edward White with the transit telescope (courtesy: Museum Victoria Collections <http://collections.museumvictoria.com.au/items/1465839>, accessed 14 December 2015).

ing tropical storm:

At last the thunder broke out—peal after peal, then volley after volley, like the rattle of artillery close at hand. The steamer shook and quivered in every part. Rain followed—such rain!

On Tuesday 12 December, the morning of the eclipse, White (1869–1876) reported that the weather had not improved and there were still clouds, rain and thunder. The observers were rather concerned, as shown in Figure 8 where they have “... an appropriately desponding appearance.” (*The Argus*, 1872a). Still some clear patches offered hope, and White made some time observations with the altazimuth. Clouds covered the sky at the start of the eclipse, at 1:15 pm local mean time, but three minutes later White managed a glimpse of the slightly-covered Sun. Just two minutes before totality there was another glimpse, this time of a thin crescent. White (1869–1876) says that

During totality a ring of light surrounding the Sun was just visible through the clouds, the birds went to roost, but the darkness was not very great, but peculiar.

From the Sydney tent Russell (1872) also had two brief glimpses of the Sun during the eclipse, although at different times to White. Just in case the clouds were to clear suddenly, Russell and Moerlin prepared nine plates for use, and

they even exposed two plates for 40 seconds, but without success.

After totality, the disappointed astronomers quickly packed up their equipment and everything was on board the *Governor Blackall* by 5:30 pm. To cheer themselves up that evening, over dessert numerous toasts were drunk, to “Success to the Other Eclipse Expeditions”, “Professor Wilson, the original proposer of the expedition”, “The Australian Governments”, “The Leaders of the Observing Parties”, “Captain Gowlland, the successful navigator of the ship” and “The Passengers” (Britton, 1872a).

Later that evening the eclipse party had a surprise visit from a sailing ship, the schooner *Matilda*, on its way from the Torres Strait to Sydney with a cargo of pearl shell. The crew of the *Matilda* were more fortunate than those at Eclipse Island for as they were sailing near Night Island, 38 km to the north, they had a good view of the eclipse. The officers of the vessel were not anticipating the eclipse, and initially they assumed that it was bad weather that was causing the darkness. Professor Wilson closely cross-examined Mr Walton, the master of the *Matilda*, on his observations of the eclipse. Using a diagram Walton correctly indicated where the Sun’s disc was seen to disappear at the start of totality and where it reappeared at the end. He described the appearance of the corona, as did the



Figure 8: A photograph by Charles Walter of the Victorian party during a rain shower just before the time of the eclipse (courtesy Museum Victoria Collections <http://collections.museumvictoria.com.au/items/1465822>, accessed 14 December 2015).

Matilda's first officer, who used a vivid analogy for the colour that he saw in the corona, "... like the glow of fire when the fire is concealed." (Britton, 1872a). According to the first officer, only one small cloud passed across the Sun during the eclipse.

The news of the successful observations of the eclipse relatively close to Eclipse Island must have led to some soul-searching among the leaders of the expedition about whether not splitting the observing party had been a lost opportunity. Britton mentions the disincentives to doing so included difficulties in transporting the instruments and the fear of the local Aboriginal people. In any case, most likely if another party had been sent elsewhere it would have been to the mainland at Cape Sidmouth, where the weather would have been the same as at Eclipse Island. Furthermore, from the description of the *Matilda's* officers, it seemed that the sky was not sufficiently clear at their location to make spectroscopic observations. Certainly, Russell (1872) did not think so as he stated that "It was quite evident from their evidence that there were light clouds over the Sun during totality."

The *Governor Blackall* began its voyage home the next morning, leaving behind on the island the photographers' darkrooms and the brick piers for the instruments, one of which was inscribed on the top: "Sacred to the memory of the Aus-

tralian Eclipse Expedition." (Britton, 1872a). On Saturday 16 December the ship reached Cardwell, approximately halfway between present-day Cairns and Townsville. As the nearest settlement to Eclipse Island with a telegraph station, it was an important stop for those on board. According to Britton (1872b), immediately upon landing the expeditioners "... marched in a compact phalanx to the telegraph-office." There, he says, the telegraph master

... will not forget our visit readily. He had, probably, not sent a message for weeks before, and we left him floundering through a pile of 20 or 30 separate telegrams in a distracted condition.

Four days after Cardwell the ship berthed at Brisbane. There the party was well treated with free accommodation at the Queensland Club and a visit by the Governor on the day after arrival. As well, the members of the expedition were invited on an excursion by coach [horse-drawn] and train to the Darling Downs. The invitation was accepted and they saw "... some fine portions of Queensland scenery." (Merlin, 1872). As the leader of the expedition Robert Ellery (1872: lxii) was most appreciative of

... the great hospitality and kindness which was shown to every member of the Australian Eclipse Expedition by the Government and people of Brisbane.

After three days there the ship left for Sydney, which it reached on Christmas Day, 25 December 1872. Before the end of the voyage the passengers showed their appreciation to Lieutenant Gowlland in the form of a testimonial:

... as some slight recognition of his high and varied qualities as a commander, his urbanity as a gentleman, and his uniform kindness to every individual connected with the Eclipse Expedition of 1871. (Merlin, 1872).

The Melbourne members of the party arrived home just before New Year's Day 1872.

9 THE RESULTS OF THE ECLIPSE EXPEDITION

The naturalists and other collectors were much more successful on the voyage than the astronomers. Silvester Diggles (1872) for example obtained a variety of moths and butterflies such as *Acröe Andromache*, *Danais Archippus*, *Junonia*, *Orythia*, *Velleda* and "... the beautiful *Dia-medea Alimena* ..." of which he collected examples of both sexes. He regretted though losing a brilliant green *Cetonia* moth that was caught in his net but still managed to escape. He also grabbed some parasites from the bodies of the sharks that had been killed at Eclipse Island. These he sent to Gerard Krefft at the Sydney (Australian) Museum, who published at least one paper—complete with illustrations—on his researches into these creatures.

The conchologist John Brazier (1874) was also successful and, in a paper read before the Royal Society of New South Wales on 23 September 1874, he reported on the discovery of 11 new species of shells during the voyage. The leading astronomers on the trip also benefited, as some of the new species were named after them. Henry Russell had two species named after him: *Helix (Conulus) Russellii* from Fitzroy Island and *Columbella (Mitrella) Russellii* from Eclipse Island. There also were shells named after Robert Ellery, William Macdonnell, the Reverend Scott and Edward White. Professor Wilson is notably absent from the list of astronomers immortalised by having species named after them. Brazier also named a shell after the Queensland naturalist Silvester Diggles. The greatest number of species names, three, were reserved for the Captain of the voyage, who sadly was no longer alive by the time Brazier came to present his paper. As he explained in regard to one species:

I have named it after my late lamented friend John Thomas Ewing Gowlland, Staff Commander, R.N., who was unfortunately drowned while employed surveying Port Jackson, August, 1874.

The photographers also did well. The Melbourne-based photographer Charles Walter took

a series of images that provide an evocative view of the activities of the voyage, including at Eclipse Island. According to a paragraph in *The Argus* (1872a), soon after the return of the party he had available—presumably for sale—a set of ten pictures, either printed so as to be suitable for placing in an album or as stereoscopic slides. This brief newspaper article highlights the picture taken in rain just before the eclipse that is reproduced here as Figure 8. A month later another brief article in *The Argus* (1872c) announced the availability of a set of 12 photographs from Beaufoy Merlin, who was part of the Sydney party. In addition to views of the astronomers with their equipment, views at Fitzroy Island and a picture of the *Governor Blackall*, there was a large 'carte' with oval-shaped photographs of all the participants on the voyage. The article comments that "The likenesses are generally excellent."

The poor weather on the day of the eclipse meant that the astronomers could make no useful observations. However, there were major intangible benefits to the voyage that will be discussed below in Section 11, as well as tangible benefits with regard to the modern instruments sent to Ellery by the Eclipse Committee of the British Association. In his Annual Report to the Observatory's Board of Visitors, Ellery (1872: 9) reported that all the instruments taken on the voyage were undamaged on their return to Melbourne, and those from England were "... packed up ready for sending back ...", though he did enquire about purchasing the most useful ones. In his next report to the Board (Ellery, 1874b: 9) would happily state that Norman Lockyer had written on behalf of the Eclipse Committee presenting the three spectroscopes, two polarimeters, a Dallmeyer lens and camera, as well as other photographic equipment, to Melbourne Observatory. A few years later, while on leave in England, Ellery (1876: 415) met Lockyer at a Royal Society reception and heard that there had been some unpleasantness over this donation: the items had been lent to the Eclipse Committee by the Royal Astronomical Society, so the Committee had no authority to dispose of them. In any case, none of the items seems to have survived at Melbourne Observatory to the present day, as they all appear in the 'Unlocated Items section' of the Melbourne Observatory inventory (Clark, 2007).

10 THE AFTERMATH

Ellery gave an account of the eclipse expedition at an ordinary meeting of the Royal Society of Victoria on 22 January 1872, the first such meeting after their return. He explained that the lack of observations of the eclipse was unavoidable due to the cloudy weather. Then he moved on to the financial aspects of the expedition and

mentioned "... the difficulty of closing the a/cs. [accounts] unexpected bills having been sent in by the agents." (RSV Ordinary Meeting minutes, 1854–1893). Not only had the Queensland Government withdrawn its promised £100 contribution, but it also insisted that the expedition was responsible for bringing the *Governor Blackall* up to operating condition, including painting the ship before and after the voyage and replacing its cracked pistons. However, while the ship was in Brisbane on the return voyage, the Queensland Government agreed to pay for the £115 cost of replacing the cracked pistons (*The Argus*, 1872b).

Even though Ellery merely provided a factual report on the situation, *The Argus'* report of the meeting raised the ire of the Queenslanders. Three weeks after the report *The Brisbane Courier* began a war of words by reprinting some of Ellery's comments, and then "... to show how far this statement is borne out by the actual facts ..." they reprinted some of the official correspondence regarding the loan of the ship (The Queensland Government and the Eclipse Expedition, 1872a). This correspondence was mainly between the Colonial Secretary in Brisbane and the ship's agents, Eldred and Spence. A few days later, *The Brisbane Courier* again addressed Ellery's remarks, this time in a column titled 'Odd Notes' that was written by 'A Bohemian' (1872). According to the Bohemian, the

... publication of the correspondence shows that there is [sic] two sides to it, and that the savans [sic] of the Royal Society of Victoria took the wrong one.

Of course, the publication of the correspondence and comments upon it did not go down well in Melbourne. At a special meeting of the Council of the Royal Society of Victoria on 26 February 1872 (RSV Council Meeting minutes, 1854–1888) Ellery told his colleagues that the published correspondence was "... entirely one-sided ..." as only one letter from Melbourne was included, and the missing correspondence would show that "... he had not been duly acquainted with conditions desired to be observed or imposed until the last moment." In a battle of published letters the meeting decided to ask *The Argus* to publish Ellery's correspondence in chronological order. This publication occurred on 8 March 1872 (The Queensland Government and the Eclipse Expedition, 1872b).

Although at our remove this minor dispute between the Queensland Government and the Royal Society of Victoria may seem petty and the conduct of both sides slightly childish, the publication of the letters is a boon for understanding the organisation of the Australian Eclipse Expedition. From the letters published in *The Argus* we learn in one from the ship's agents

addressed to Ellery that after the members of the expedition disembarked at Campbell's Wharf the *Governor Blackall* was towed to another wharf, and on the way "... the L. T. [lower top] gallant stay of the Governor Blackall caught the jibboom of the ship Parramatta, and carried away the topmast." The repairs to the other ship were yet another expense for the Royal Society of Victoria. The last letter published in *The Argus* was from Eldred and Spence (the ship's agents) to Ellery, indicating the difficult position in which they found themselves in this dispute: "We regret that anything should have arisen to interfere with the amicable feeling that has subsisted throughout." (The Queensland Government and the Eclipse Expedition, 1872b).

There was still further correspondence between Ellery and Eldred and Spence after the publication of the letters, as there were monetary issues still to be finalised. At the Council meeting of 4 April 1872 (RSV Council Meeting minutes, 1854–1888) an offer from Eldred and Spence to accept the bedding and linen that was used on the expedition as part payment equivalent to £50 of their commission was discussed. The Council instead requested that the items be sold and pointed out that the commission was only to be paid after all other payments have been made. The imminent receipt of the £100 voted by the South Australian Parliament promised that the Society could soon clear all the debts associated with the voyage of the *Governor Blackall*.

11 DISCUSSION

The botanists and other collectors were successful on this voyage as they were not tied to a specific time nor were they constrained by the weather. Astronomers, however, always take a risk when travelling to see a solar eclipse or a similar event such as a transit of Mercury or Venus; sometimes they are fortunate and there are no clouds or the clouds clear at the appropriate moment, but at other times clouds totally block the view. In the case of the voyage to Cape York to see the 1871 total solar eclipse the astronomers were not favoured by the weather and could not make any useful observations. Still the voyage was important and exceptionally useful, with implications for the future development of astronomy and science in Australia.

Possibly the most important aspect was the cooperation between the colonies in organising this scientific expedition. As was quoted from Hoare (1976) in the Introduction, this was the first time that such cooperation had happened, especially on such a large scale. This cooperation occurred at Government level and also at a personal level. The two Government Astronomers, Ellery from Melbourne and Russell from

Sydney, became well acquainted when organising the voyage and during it. The lasting friendship between them is reflected in the tone of numerous letters sent by Russell to “My Dear Ellery” preserved in the Sydney Observatory archives, such as one dated 15 January 1891 (Russell, 1891). Three years prior to that letter the scientific cooperation between the colonies, specifically between the Royal Societies in the colonies, led to the formation of the Australasian Society for the Advancement of Science (see MacLeod, 1988), with Russell as President and Ellery in charge of Section A, that included Astronomy (Lomb, 2015).

The eclipse expedition for the first time led astronomers to seek support from Governments on a large scale, initiating ‘big science’ in Australia. Handling the large amounts of money involved in mounting the expedition also was an important learning exercise. Similarly, negotiating with the shipping agents about a contract worth the equivalent of a quarter of a million dollars in today’s money would have been instructive, especially for Russell who had been in his position only since the previous year. For both Government Astronomers, being involved in the rapid organisation of such a complex logistical exercise would have helped them in making arrangements for the next major astronomical event in Australia, the 1874 transit of Venus (see Lomb, 2011). These arrangements were complex, with Melbourne and Sydney Observatories both sending well-equipped teams consisting of mixtures of professionals and scientific volunteers to a variety of suitable locations (Orchiston, 2004). There was to be no repeat of the 1871 situation of being clouded out at only one observing location!

The expertise and friendship built up on the eclipse voyage was not only needed at astronomical events. In 1887, Sydney and Melbourne Observatories, under Russell and Ellery, respectively, joined the international Astrographic Catalogue project. To operate this project the two Observatories needed access to funds, the ability to organise staff, and to cooperate between each other as well as with other observatories in Australia (Stevenson 2014).

There was also a gain in scientific expertise due to the eclipse trip. Russell and the staff from Melbourne Observatory gained familiarity with the complex process of using wet-plate photography for astronomical observing, a skill that was to be important again during the 1874 transit of Venus. The loan and subsequent donation of the latest astronomical instruments from London—spectroscopes and polarimeters—also boosted interest in astrophysics. There had already been some spectroscopic observing with the Great Melbourne Telescope over the

previous two years (Le Sueur, 1870), but that did not directly involve Ellery, and certainly not Russell.⁶ Russell was so enthused by the possibilities that during his first trip to England, in 1875, he made sure to purchase a three-prism spectroscope for his Observatory from the eminent London maker Hilger (Russell, 1875: 144).⁷

To the Royal Society of Victoria in a way the eclipse expedition represented redemption after the disastrous Burke and Wills expedition that its Exploration Committee had organised a decade or so earlier. In that large-scale expedition seven lives were lost, including that of the two leaders (Fitzpatrick, 1969). In contrast, all of the eclipse expedition participants returned safely and expeditiously to their homes.

The 1871 Australian Eclipse Expedition may not have succeeded in its primary objective of researching a rare total eclipse of the Sun, but it had positive ramifications for Australian science, and especially astronomy, for the remainder of the century and beyond.

12 NOTES

1. Today that line is identified with highly ionized iron (Fe-XIV) at a wavelength of 530.3 nm.
2. Estimating the value of money in the nineteenth century is difficult due to lack of official statistics at the time and the different structure of society. A rough conversion factor of 200 was estimated by a) comparing the fare charged passengers for the 1871 voyage with the cost of a modern cruise around Australia of comparable length, and b) comparing the cost of building the *Governor Blackall* with the advertised sale price of a comparably-sized ship.
3. Confusingly, there is an Eclipse Island off the coast of Queensland, but it is over 600 km to the south of the 1871 observing site and has no connection with it. Only a few hundred meters long and part of the Palm Island group, the island has the Aboriginal name of *Garoogubbee*. The Queensland place names search website suggests that it was “Probably named by [the] Admiralty Hydrographer, date unknown, after HMS Eclipse, on Australia Station of the Royal Navy 1862–66.”
4. An attempt will be made to persuade the relevant authorities to revert to the name Eclipse Island.
5. The tube of the telescope is missing but the lens is part of the collection (H10187) of the Museum of Applied Arts and Sciences in Sydney and as of 2015 was on display at Sydney Observatory.
6. Although both astronomers would remain committed to positional astronomy, in 1881 Russell would carry out spectroscopic obser-

vations of the Great Comet of 1881 (see Orchiston, 1999), and later in the 1880s Ellery and his Melbourne Observatory colleague, Pietro Baracchi, would conduct spectroscopic surveys of southern stars (Andropoulos and Orchiston, 2006).

7. H9974 in the collection of the Museum of Applied Arts and Sciences, Sydney.

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Dr Nick Lomb obtained a Ph.D. from Sydney University for work on short-period variable stars. One of the outcomes of his thesis was a technique of frequency analysis that today is widely used in many areas such as finding exoplanets. In 1979 he joined Sydney Observatory, where he became the co-author of the Sydney Southern Star Catalogue that was published just after the Observatory came under the auspices of



the Museum of Applied Arts and Sciences. Afterwards as Curator of Astronomy he organised numerous exhibitions at the Observatory and at the Museum with the last being *From Earth to the Universe* in 2009. He is the author of a number of books on astronomy including the annual *Australasian Sky Guide* (that is now in its 26th edition) and *Transit of Venus:*

1631 to the Present. Retiring from full-time work in December 2009, he is currently an Adjunct Professor at the University of Southern Queensland. With regard to the topic of this article, he has been to see three total eclipses of the Sun and has been fortunate with the weather at all three: South Australia 2002, Siberia 2008 and Palm Cove, Queensland 2012.