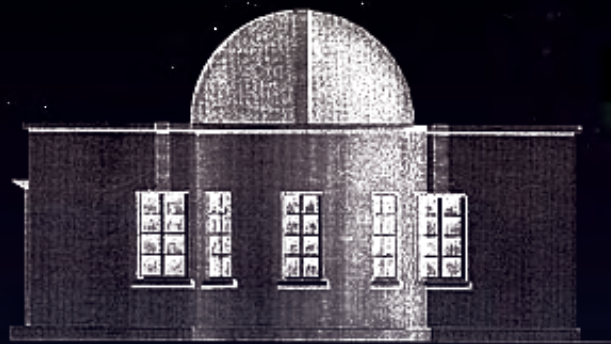
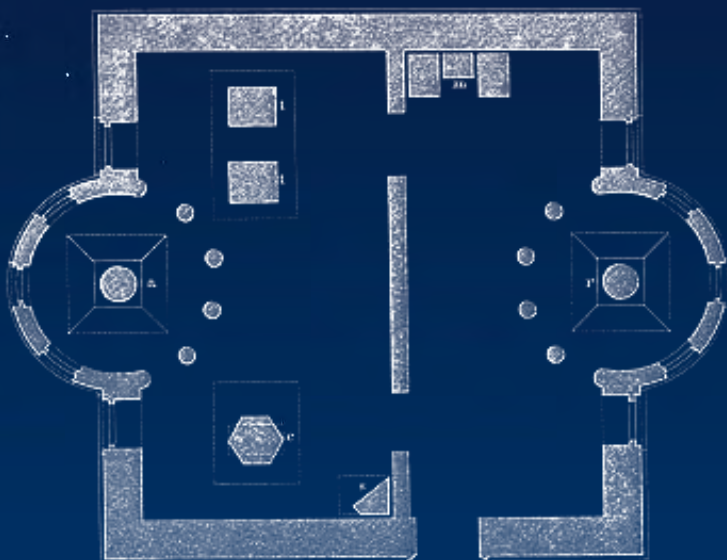


SHAPING THE DOMAIN



THE PARRAMATTA OBSERVATORY &
THE STUDY OF THE SOUTHERN SKIES

THE PARRAMATTA DOMAIN 1821-1848



THE PARRAMATTA DOMAIN: UNDER THE SOUTHERN STARS

Parramatta Park's landscape today remains remarkably true to the land walked by Governor Brisbane. However, the stars he studied in such detail here are timeless.

Under the skies of Parramatta Park it is important to acknowledge the traditional owners, and to remember the generations of Burramatta families who lived their lives beneath familiar star patterns, which were full of meaning in their culture. It is important also to acknowledge the first colonists – convicts and soldiers – who arrived at this site in November 1788. They were strangers in a strange land, and the alien skies of the southern hemisphere were a nightly reminder of how very far they were from their homes.

Lieutenant William Dawes was the first European to study the skies over New South Wales, from 1788 to 1791. Governor Brisbane, who arrived here in 1821, was a naval officer and gentleman scientist who knew the importance of the stars in navigation. He sought to understand and document these southern skies by setting up an observatory and employing astronomers Carl Rümker and James Dunlop to carry out this important work.

Parramatta Park Trust now manages the site of his observatory. It has carefully conserved the archaeological site and the surviving transit stones and celebrates the work done at the site.

THE ABORIGINAL NIGHT SKY

There is a deep interest in the stars across the traditional cultures of Australian Aboriginal people, with mythology, ceremonies and art reflecting a strong connection to the night sky. These traditions focus on how the stars represent events or characters in Dreaming stories, and provide important information about when to harvest certain foods.

For the Burramatta clan of the Darug people these traditions stretched back unbroken for over 30,000 years. The arrival of colonists in 1788 however, saw enormous cultural dislocation. Introduced disease, exclusion from sources of food and water and even deliberate attempts at genocide, have conspired to limit what we now know about how the Sydney Aborigines understood the night sky. Despite this, the cultures can still be studied by examining surviving artifacts. Key resources for this are the thousands of rock engravings that survive around the Sydney Basin. These beautiful carvings show animals, people, creator spirits and symbols whose meanings are still not fully known. It has been suggested that some engravings may tell astronomical stories.

One of the most beautiful and well researched of these sites is in Ku-ring-gai Chase National Park and features a finely engraved emu. Many Aboriginal groups have stories about the celestial dark cloud next to the Southern Cross. Some see it as a possum in a tree, other stories tell of a great emu, the head of which is formed by this dark cloud, and whose neck, body and legs are represented by the dust lanes stretching across the Milky Way. The Ku-ring-gai engraved emu is thought to look more like the celestial Emu in the Sky than a real emu. The engraving is oriented to line up with the Emu in the Sky at the time of year when emus are laying their eggs and it may have been associated with harvest or fertility rituals. While there are no such rock carvings in Parramatta Park, emus were plentiful here in 1788, and the story of the Emu in the Sky reminds us that the Burramatta had a very different relationship to the night sky than subsequent European astronomers.



The Ku-ring-gai engraving aligns with the celestial Emu in the Sky above.
Photograph Barnaby Norris

AUSTRALIA'S FIRST OBSERVATORY

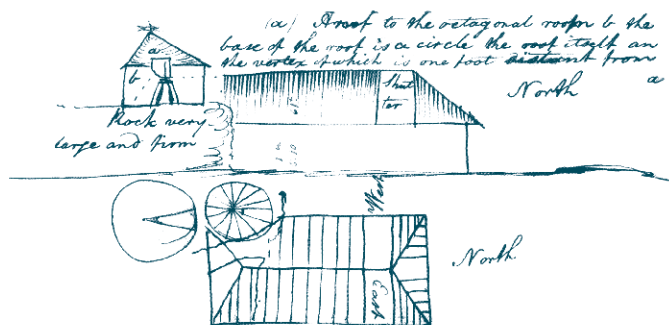
From the arrival of the First Fleet early in 1788, the European settlement of NSW struggled to find the basic necessities of water, food and shelter. Despite these pressing concerns, the construction of an astronomical observatory was high on the list of tasks set by the British Admiralty.

Before leaving for Australia, Lieutenant William Dawes had been asked by the Astronomer Royal, Nevil Maskelyne, to undertake observations to locate the return of a comet predicted by Edmond Halley. Halley had calculated that this comet would be visible only from the southern hemisphere, and if his predictions were right, it would be only the second time a comet returned as predicted. A sighting would prove that comets followed predictable orbits and would confirm that Newton's theory of gravity was valid for objects other than the planets. The location of an observatory at the new colony, deep in the southern hemisphere, offered the chance to advance science – an intellectual enterprise of the greatest prestige in England and Europe.

As early as April 1788, Phillip instructed Dawes to clear land on a rocky promontory on the western side of Sydney Cove. Soon, a two storey wood and canvas observatory was built, complete with a simple removable roof. It housed astronomical instruments provided by the British Board of Longitude. The main purpose of this observatory was practical: to use the stars to establish the precise position of the new settlement; to define local time for Sydney Town and for the chronometers of visiting ships; and to help with surveying the new colony.

Dawes' observatory was a temporary timber and canvas affair, and sadly no comet was seen. Apart from comet hunting and time-keeping, Dawes also diligently compiled the first meteorological observations for the colony and the first maps. This venture into a scientific understanding of the new colony didn't last long. After a dispute with Governor Phillip, Dawes left Sydney in 1791, taking the Board of Longitude's instruments with him.

The observatory soon fell into disrepair and the rocky headland eventually became a fortification. The site is now buried under the southern pylon of the Sydney Harbour Bridge, but Australia's first astronomer is still commemorated by its name, Dawes Point.



William Dawes' Observatory

This sketch by Dawes' was included in a letter to the Astronomer Royal on 30 April 1788.
Papers of the Board of Longitude, Royal Greenwich Observatory Collection, Cambridge University Library



Chart of Sydney Harbour, 1789 extending west to Rose Hill, by Captain John Hunter
The only line of longitude (horizontal) on the map is marked 151 degrees 19 minutes East (of Greenwich), which is where Dawes' transit circle stood. State Library of NSW



General Sir Thomas Brisbane
State Library of NSW



James Dunlop
State Library of NSW



Christian Carl Ludwig Rümker
Relief from Hamburg Town Hall

THE PEOPLE OF THE PARRAMATTA OBSERVATORY

The lack of fresh food quickly became a serious problem for Sydney's early settlers. In April 1788, Phillip explored the western end of Sydney Harbour and there found fresh water and soil much richer than the sandy foreshores of Farm Cove. He established a settlement there and built a Redoubt, established the Government Farm and built himself a small house overlooking the Crescent and the growing settlement of Rose Hill, the site of which is now in Parramatta Park.

This grew into a much larger town and was renamed Parramatta in 1791. By the time the sixth governor, Sir Thomas Brisbane (1821–1825) arrived, the town had a population of 1200 and had become an important seat of colonial administration.

At the age of 48, Brisbane had accomplished much in his life. He joined the British Army at the age of 16 and was promoted to the rank of Brigadier General. He served in three wars and his interest in astronomy was kindled as the result of poor maritime navigation. This culminated in a near-shipwreck on the way to the West Indies in 1795:

Reflecting that I might often, even in the course of my life and services, be exposed to similar errors, I was determined to make myself acquainted with navigation and nautical astronomy; and for that purpose I got the best books and instruments, and, in time, became well acquainted with these sciences ...

This practical application was the origin of his keen interest in astronomy. Brisbane had no formal training in either astronomy or mathematics, but by 1808 he had become so involved in this new science that he built an observatory at his home, Brisbane House in Largs, Ayrshire. This was only the second observatory to be built in Scotland.

Brisbane's interest in astronomy was so well known that when his application for the position of Governor of NSW arrived on Lord Bathurst's desk, Bathurst was reputed to have written to The Duke of Wellington complaining that he required a man to "govern, not the heavens, but the earth". Wellington testified that Brisbane's scientific studies had never interfered with his military duties, and Brisbane got the job, receiving his commission in March 1821.

Brisbane was recently married and had an infant daughter when he arrived in Sydney. His wife, Anna-Maria Makdougall, bore him two more children while he was governor. The Australian-born children were named Eleanor Australia and Thomas Australius, an indication of his strong feelings for this country. He arrived in NSW in November 1821, with equipment for his own observatory, two astronomical assistants, Carl Rümker and James Dunlop, and a determination to discover the secrets of the southern skies.

Christian Carl Ludwig Rümker, a native of Stargard, Germany, trained and worked as a master builder until economic conditions sent him to England. He served in the merchant navy, the first term voluntarily, the second term when in 1813 "he was seized by a pressgang and carried off on board a man-o-war". During service in the Mediterranean his mathematical skills led him to become a skilled navigator. Returning to Hamburg in 1819 he took up a teaching position. There he heard of Brisbane's need for an assistant to chart the southern skies and, with characteristic impulsiveness, he left without giving notice to join Brisbane as his first assistant, with a salary of £200 a year and free passage to NSW.

Brisbane's second assistant was James Dunlop who, like Brisbane, was a Scot. He was the son of a weaver, and worked in a thread factory. He had little formal education but had an excellent mind for design. Young James had a mechanical gift and he was constructing telescopes by the age of 17. It was these skills that brought him to the attention of Brisbane, and although initially employed in a technical role, Dunlop was industrious and keen to learn. He became a diligent and prolific astronomical observer at Parramatta. In later life his interests included poetry, geology and botany.

PARRAMATTA OBSERVATORY

Soon after his arrival on 7 November 1821, Brisbane and his family took up residence in Parramatta. Brisbane visited Sydney once or twice a week to deal with the business of the colony, but throughout his governorship he worked on official business from Parramatta.

To emphasise the independence of his astronomy from his tasks as governor, Brisbane paid for the observatory entirely from his own pocket. He set about planning an observatory in the grounds next to Government House and the first observations on the site were of the solstice in December 1821. At this early stage Brisbane's interest was mainly in documenting the southern stars, rather than the practical business of using them to tell the time or map the colony, as Dawes had done.

The site chosen for Australia's second observatory was on a rise, a short walk to the west of the Governor's grand residence. It was a single storey building about nine metres square, largely made of wood. There were movable domes at the northern and southern ends of the building and the roof of the building immediately over the instruments could be opened. Corresponding slits in the walls allowed astronomers to see the sky along a north-south line. Inside the observatory itself there were two solid stone piers for mounting a refractive transit telescope, used for general observing, and a repeating circle for measuring small angles

between stars. Stone structures also supported sidereal and mean-time (local time) pendulum clocks, and a mural circle (a graduated circle used to complement the transit telescope's measurement of star positions) was attached to a six-sided pier. Brisbane had brought these astronomical instruments with him and they were amongst the finest available at the time. He also brought a reference library of 349 volumes. By May 1822, only six months after he was sworn in as governor, the observatory was set up and ready for use.

THE STUDY OF THE SOUTHERN SKIES

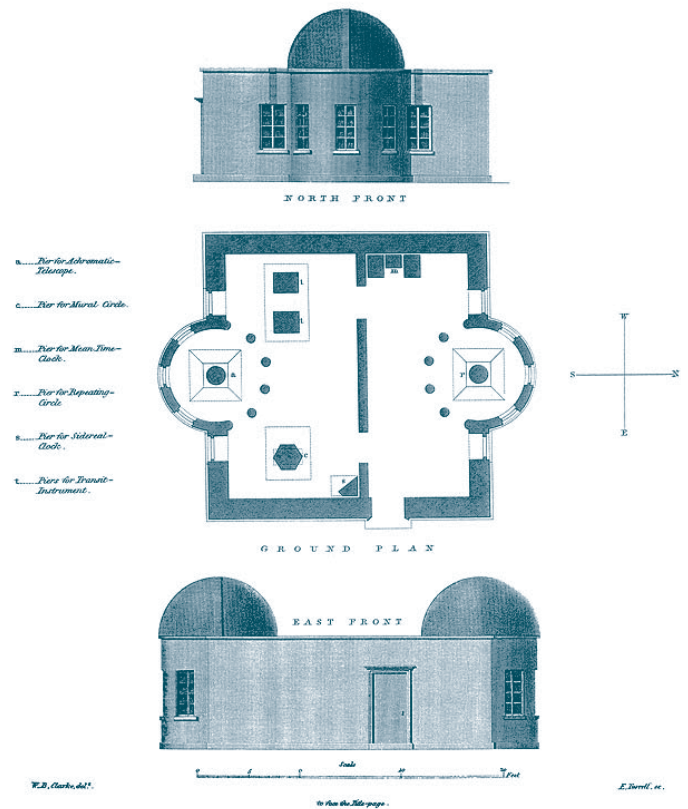
Brisbane's commitments to his post as governor kept him busy, so Rümker and Dunlop undertook most of the observational work on the numerous projects Brisbane set them. In addition to its astronomical activities, the observatory also provided the colony's first permanent centre for meteorology and time keeping, as well as the measurement of terrestrial magnetism, another of Brisbane's interests. The Governor supervised the research and made sure that all the findings of his new observatory were written up and published.

A stroke of good luck quickly brought the Parramatta Observatory to the notice of the international astronomical community. While the most significant scientific work undertaken at the observatory was to appear over a decade later as the *Parramatta Catalogue of 7385 Stars*, what immediately caught the attention of the astronomical world was the observation of Encke's comet; seen low in the evening sky on 2 June 1822, exactly a month after regular observations began at Parramatta. The sighting of this comet, whose orbit had been calculated in 1818 by the German astronomer Johann Franz Encke, was only the second example of a comet's predicted return (Halley's was the first, in 1759), and made up for William Dawes' futile search 35 years before. This was the much delayed and very welcome confirmation that the calculations of celestial mechanics really worked. The relief felt by the international scientific community at the sighting of Encke's comet can be gauged from the fact that Rümker received £100 and a silver medal from the Royal Astronomical Society of London in recognition of his work. Brisbane also gave him a 1000 acre land grant at Picton in recognition of the discovery.

Brisbane's Reichenbach repeating circle
This fine instrument was intended to measure the angular distance between pairs of stars to obtain the relative separations between them. It was used at Parramatta to measure the separation of the stars in the Kappa Crucis cluster (the Jewel Box, NGC 4755). Powerhouse Museum, Sydney. Photograph Sue Stafford



PARAMATTA OBSERVATORY.



Plan and elevations of Parramatta Observatory, 1835
The floor plan of the Parramatta Observatory shows where the primary instruments were to be positioned with respect to the two columns of the transit telescope. The substantial-looking walls were constructed in timber, and were eventually destroyed by termites. State Library of NSW

A DISPUTE

Despite the promising beginning, it was not long before there was a disagreement between Rümker on the one hand and Dunlop and Brisbane on the other. The specific reason for the quarrel is not clear, but it is evident that Rümker and Brisbane did not see eye to eye on a number of matters, both professional and personal. Rümker also had little respect for Dunlop's astronomical abilities. Whatever the reason, Rümker suddenly left Parramatta for his untended land at Picton in June 1823. Brisbane was both annoyed and embarrassed by Rümker's abrupt departure. He later wrote "Mr. Rümker rendered himself obnoxious to myself and my family ... I found him devoted alone to his own objects and pursuits". Brisbane's initial anger subsided as progress on his numerous observing programs inevitably slowed despite Dunlop's hard work, and he made several attempts at reconciliation, but to no effect.

BRISBANE RECALLED

In December 1824 Brisbane was recalled to London, well before his term as governor was due to expire. The reasons for his early departure are complex, but it is clear that his implementation of the recommendations of the 1822 Bigge Commission's report to reduce expenditure in the colony had made him powerful enemies. He was also criticised by some in the colony as spending too much time at his observatory. Brisbane responded to his critics:

In place of passing my time in the Observatory or shooting Parrots, I am seldom employed in either. And Altho' I rise oftener at 5 o'clock in the Morning than after, I cannot get thro' the various and arduous duties of my Government.

Brisbane did not leave the colony until a year later, when Governor Ralph Darling arrived. He was paid £1614 for his instruments and library, which became the property of the Executive Council of NSW. Many of his books and instruments are now part of the collection of the Powerhouse Museum, Sydney.

ANOTHER DISPUTE

After Brisbane's departure in December 1825, Dunlop remained and continued to work on the star catalogue. By the end of February 1826 he had made a total of 40,000 observations for the defining work Brisbane had intended for his observatory. Dunlop continued to observe the sky and published an extensive illustrated catalogue of nebulae and star clusters (1828), and another listing of double stars (1829), using a 9-inch, 9-foot focal length telescope he made himself. A year later, in February 1827, he left Sydney to join Brisbane in Scotland, to work at his observatory in Makerstoun, and to prepare the Parramatta Observations for publication.

In May 1827 Rümker was recalled to the Parramatta Observatory at the request of Governor Darling, to measure the arc of the meridian. This work was needed for accurately mapping the colony, which was rapidly expanding far beyond the Sydney basin. Darling recommended that Rümker be appointed as Government Astronomer, at a salary of £300 a year, but the British Government did not confirm the appointment until July 1829.

By this time Rümker was on his way to England to purchase the equipment necessary for the survey, to see to the publication of his observations and to consolidate his position as Australia's first Government Astronomer. Despite the lengthy delays in confirming the appointment, it seemed as if Rümker would end his days happily in NSW. He had certainly told Governor Darling he intended to return, and in September 1830 Darling instructed that the "accommodation for the Colonial Astronomer, proposed to be added to the Observatory, should be expedited as Mr Rümker is preparing to return and resume the duties of his situation".

Unfortunately, while in London, Rümker became involved in a dispute with influential members of the Royal Astronomical Society, especially its newly elected president, Sir James South. Superficially the matter concerned the ownership and publication of the Parramatta observations, but South also tried to sell Rümker a Troughton reversible four-foot transit circle, which South had purchased for £400. Such an instrument would have been useful at Parramatta. However, when the government consented to the purchase, South raised the price to £650 and Rümker then refused to buy it. He ordered a new transit circle from another maker, but was warned that it was foolish to spite "a man of wealth and interest, whose patronage [he] ought to have courted".

This warning proved correct and as a result of South's influence, Rümker was dismissed and never returned to Australia. Instead he returned to Germany and eventually became the respected director of the Hamburg Observatory. Rümker died in Lisbon in 1862.

The Observatory, Government Domain, 1844
The domed structure of the Observatory is at far right.
State Library of NSW



The extant transit telescope piers, Parramatta Park Trust. Photograph 2012

BACKGROUND IMAGE 31/4 inch refracting telescope brought to Parramatta Observatory by Governor Brisbane. Made by Banks, London, 1811–1821, Powerhouse Museum, Sydney. Photograph Sue Stafford

DUNLOP AND THE PARRAMATTA OBSERVATORY

Governor Darling approached James Dunlop, who was still in Scotland, to take up the position of Superintendent of the Parramatta Observatory. By April 1831 Dunlop was back at Parramatta. He was to remain in charge of the observatory for the next 16 years. Unfortunately, his second period at Parramatta was not particularly fruitful, and although he undertook many observations and discovered two new comets, between 1832 and 1846 little was published. The work was underfunded and the instruments and building had deteriorated, as had Dunlop's health. By 1846 work at the Parramatta Observatory had almost ceased.

In 1847 an investigation into the running of the Parramatta Observatory was undertaken by a committee led by Captain Phillip Parker King. The committee found the observatory to be in such a bad state of repair that they recommended it should be closed as soon as possible. Shortly afterwards James Dunlop resigned, and in 1848 the observatory was formally closed. The instruments considered likely to be useful in a future observatory were put into storage in Sydney; the rest were sold or sent back to England.

In his poignant resignation letter of 18 August 1847 Dunlop says:

The buildings of this Observatory are in a very sad state of repair. The white ant has been most destructive ... The building was originally of a very inferior description, being only intended as a private establishment and not calculated to last beyond a few years.

He goes on to suggest that a new observatory should be built in Sydney: "I think a very desirable and convenient site may be obtained on the high grounds on the North Shore in the vicinity of Sydney, out of the smoke of the city and in view of the harbour and shipping ...". He appears to have some regrets about the time he had spent in Australia, but was resigned to remaining there for the rest of his days. In September 1848, little more than a year after he wrote this letter, James Dunlop was dead. He is buried at St Paul's Anglican Church, Kincumber.

Three factors contributed to the slow decline of the Parramatta Observatory: the whims and jealousies of the complex personalities that fate brought to NSW in 1821; their remoteness from the scientific mainstream and a lack of resources to do the job. Whims and jealousies also existed in the British astronomical community that profoundly affected the progress of astronomy in Australia. It is difficult nowadays to imagine the isolation of someone like Dunlop, who thrived as an assistant to Brisbane but was increasingly less assured during the years that he worked alone.



THE LEGACY OF THE PARRAMATTA OBSERVATORY

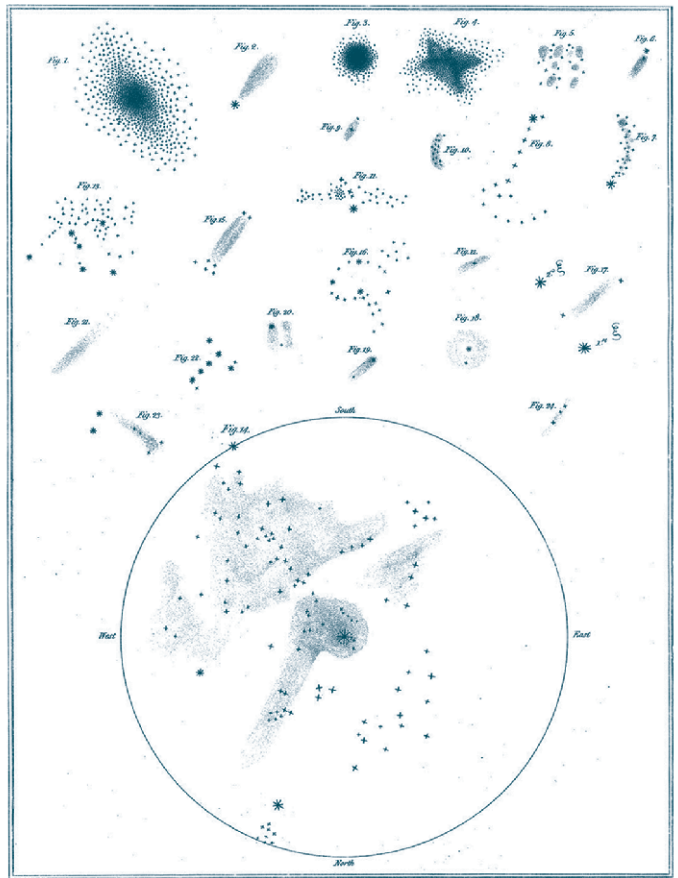
The main purpose of the Parramatta Observatory was to make a detailed catalogue of the stars in the southern skies. (Only two astronomers, Halley (1656–1742) and de Lacaille (1713–1762), had previously addressed this task.) A detailed record was eventually published: *A Catalogue of 7835 stars, prepared from Observations made 1822–6 at the Observatory at Parramatta*. Other astronomical events that contributed to the science were also documented at Parramatta, in particular the rediscovery of Encke’s comet; observations of Mercury and Venus; and observations of the summer and winter solstices.

It was the endless observation and the associated recording and collating of results for the *Parramatta Catalogue* that occupied the mind of Brisbane and the days and nights of Dunlop and Rümker while at the Parramatta Observatory. The extent of the ‘book-keeping’ necessary to accurately record the observations, and Rümker’s loathing of it, can be gauged from his comment on the endless copying of results from slates to paper: “business of more immediate importance accumulated so that I at first procrastinated the copying ... and at last, finding myself too much in arrear, entirely neglected it”. The long, cold winter nights of observing and note taking, followed by days of transcribing the records were difficult. Most other observatories of the time would have devoted many more people to a task this large and important.

While both Dunlop and Rümker logged the observations and preliminary data at Parramatta, the final star catalogue needed much more specialised work for it to be reliable. The information gathered in Parramatta was eventually analysed and published by the Royal Society of London. Brisbane and Dunlop both received the Gold Medal of the Royal Astronomical Society in 1828 for this work. Sir John Herschel, President of the Royal Astronomical Society, presented the medal and he was lavish in his praise for the work of the Parramatta Observatory. Rümker was not recognised until many years later, long after he had made his peace with Brisbane and had become the highly regarded Director of the Hamburg Observatory. He eventually received the Gold Medal in 1857.

The *Parramatta Catalogue* was an exploratory survey rather than a detailed study of the southern skies. Sadly much of the work from Parramatta proved to be flawed when John Herschel attempted to use it at his own observatory in South Africa in 1834. After comparing his observations of clusters and nebulae with Dunlop’s 1828 catalogue, he noted: “I cannot help concluding that ... [the] want of sufficient light in the instrument used by Mr Dunlop has been the cause [of his recording objects] that do not really exist”. The result of this and other similar criticisms was to diminish the reputation of the Parramatta enterprise.

The problems with the *Catalogue* have now been carefully studied and new analysis allows us to appreciate that the work done at Parramatta was done under very difficult circumstances.



Dunlop’s catalogue, 1828 with sketches of clusters and nebulae. Figure 20 is a Dunlop discovery. It was later catalogued as the galaxy NGC 5128 and later still identified as Centaurus A (α¹), the strongest nearby radio galaxy. State Library of NSW

Although Brisbane’s transit telescope was the best that he could afford, it was not the best that was available. Dunlop complained that it was difficult to use and when it was later examined at the Sydney Observatory in the 1850s, it was found to be faulty. In addition, the stone pillars on which it was mounted (and which still stand in Parramatta Park) were not built on bedrock and allowed movement. These factors, along with the lack of adequate resources, undermined the accuracy of the work that was done at the Parramatta Observatory. Dunlop did his best with the instruments and the slender resources available to him. We can only wonder what more might have been achieved if the resources, personalities and politics of the period had been different.

All that now remains of the Parramatta Observatory structure are the eroded piers of the transit telescope. However the astronomical results from the Observatory, though flawed, have an enduring significance in the history of astronomy and the Parramatta Park Trust will continue to care for this site and its legacy.

Old Government House & Domain [Parramatta Park] is one of 11 historic sites that together form the Australian Convict Sites World Heritage Property.

**PARRAMATTA PARK
OPEN EVERY DAY**

6am–6pm (8pm Daylight Saving)
Phone 02 8833 5000
www.parrapark.com.au

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