

GEORG NEUMAYER AND MELBOURNE OBSERVATORY: AN INSTITUTIONAL LEGACY

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This paper assesses Georg Neumayer's impact on the Victorian scientific community, and especially his role in the establishment of Melbourne Observatory as a major scientific institution in colonial Australia. Neumayer's arrival in Melbourne to pursue his own scientific project triggered a chain of events that would lead to the creation of Melbourne Observatory and the integration of Neumayer's geomagnetic and meteorological research into the ongoing program of the observatory. The location of the observatory in South Yarra was a direct result of Neumayer's insistence that the site was the most suitable for geomagnetic measurement. Most critically, Neumayer's attempts to get approval for his project highlighted the need for local scientists to establish political and scientific alliances that would ensure endorsement by international, notably British, scientists, and that would persuade local elites and government of the practical value of their research.

Key words: astronomy, geomagnetism, meteorology, observatories

WHEN Georg Neumayer arrived in Melbourne in 1857, Melbourne's astronomical observatory was a small two-roomed timber shack in Williamstown. When he departed in 1864, Melbourne Observatory was the colony's leading scientific institution, covering astronomy, meteorology and geomagnetism, with substantial buildings at a permanent site and a staff of five. By the time Neumayer had published the results of his magnetic survey in 1869, Melbourne Observatory had also acquired the largest reflecting telescope in the southern hemisphere, and had a full suite of self-registering magnetic instruments.

How much of this transformation was the result of Neumayer's presence in Victoria for those seven years? Much has been made of the initial resistance to and scepticism towards Neumayer's proposed project. Yet what is striking is how quickly he was embraced and funded. But Neumayer had stepped unwittingly into a complex landscape, in which a number of different personal and scientific agendas were jostling for recognition and funding. His arrival would be the catalyst that would create Melbourne Observatory as a pre-eminent scientific institution in Australia for the remainder of the nineteenth century.

NEUMAYER'S PLAN

Rod Home and Hans-Jochen Kretzer have documented in detail Georg Neumayer's early career and his efforts to establish a magnetic and meteorological observatory in Melbourne (Home & Kretzer 1991). Neumayer had arrived in Melbourne in January 1857, and it would take him all of that year to gather support from local scientists, administrators, the public and the government.

Neumayer laid out his proposal in a letter to the Chief Secretary of the colony, William Clark Haines, in June 1857 (Neumayer 1857a). It is something of a rambling document. He introduces himself as a former mate of a German trading vessel who had studied the relations between the currents of the atmosphere and the ocean along the Australian coast, and then worked on the Victorian goldfields, acquiring information for lectures back in Germany. Neumayer briefly mentions that he is a graduate of the University of Munich, and explains that he has selected Victoria as he wishes to undertake research on the links between hot winds, cyclones and changes in geomagnetic forces. He will also gather the log-books

from ships entering Port Phillip to analyse data that will show the connection between magnetism and navigation.

Neumayer then gets to the nub of his proposal. He has brought the most recent magnetic instruments with him from Germany, and proposes to 'observe the horary annual and accidental variations of the magnetic constants, in comparison with simultaneous natural phenomena.' He requests that the government grant land for the erection of a 'Government Observatory for Terrestrial Magnetism and Navigation'. He estimates this will cost about £700, along with annual expenses of £600 for travelling and assistants, for a period of about 6 years. Neumayer will make available his instruments which he values at more than £2000 (a slight exaggeration, as the grant from King Maximilian II was worth about £400).

Only then does Neumayer outline the practical benefits to the colony. By preparing a magnetic map of the colony he will be able to help show its probable value for agriculture and mining. And just possibly, he may be able to identify gold-bearing land. In addition his magnetic survey will identify local magnetic disturbances that can be used to refine the survey of the colony, and to improve navigation along the coast.

With the benefit of hindsight, we can say that Neumayer's proposal was an ambitious and far-ranging expression of Humboldtian science, tailored as much as possible to the particular needs of the colony and his potential funders (see Home 1991: 46-49). But Neumayer at this stage was a largely unproven scientist, although certainly with impeccable scientific training. Chief Secretary Haines met with Neumayer, and indicated he would be prepared to support the proposal, as long as it had the backing of the leading scientists of the colony.

Therein lay a profound difficulty, for Neumayer had unwittingly stepped into a complex scientific, administrative and political landscape. Not least of his problems was that Neumayer had anticipated he would be seeking approval for his project from the governor. But the introduction of responsible government in 1856 meant that he needed to negotiate with an elected government that reflected the inexperienced power of gold-rush immigrants rather than the more predictable attitudes of appointed colonial officials. In describing the situation to his mentor Justus Liebig in late 1857, Neumayer was quick to dismiss the opposition he faced as due to a mix of petty jealousies and anti-German sentiment (Neumayer 1857b). In fact it was rather more interesting than that, and it throws

considerable light on the development of government science in colonial Victoria.

NEUMAYER'S COMPETITION

Neumayer's major problem was that he had arrived back in Melbourne only two months after William Parkinson Wilson, foundation professor of mathematics at the University of Melbourne, had given an address to the Philosophical Institute of Victoria, outlining the steps taken in England over the past seven years to have a large telescope erected in the southern hemisphere (Wilson 1856). Wilson had a particular interest in astronomy, having founded an observatory while professor at Queen's College, Belfast, and he had worked closely with Thomas Romney Robinson, astronomer at Armagh Observatory, the leading Irish observatory. The discovery of a spiral nebula with Lord Rosse's 6 foot reflecting telescope at Birr Castle in 1849 had inspired the British Association for the Advancement of Science to establish a committee to ask for government funds to erect a similar telescope in the southern hemisphere. By 1853 a joint committee of the British Association and Royal Society had decided on the best design, but the Crimean War intervened, stalling possible government funding.

Recounting these recent discussions, Wilson argued to the Philosophical Institute that Melbourne, rather than the Cape of Good Hope, should be the home of such a telescope:

... the latitude of Melbourne is nearly the same as that of Cape Town. In transparency of atmosphere it can vie with any country in the world; as the metropolis of the great nation of the south, it possesses means and appliances, wealth and energy, with which no place on this side of the equator can enter into competition.

However, the telescope needed to be part of a well-established observatory, with fixed meridian and prime-vertical instruments. The creation of such an institution is 'a noble object, to which some portion of the apparently inexhaustible wealth of our gold-fields may be worthily devoted' (Wilson 1856: 150-151).

In early 1857, just as Neumayer arrived, Wilson had led a delegation from the Philosophical Institute to the then Chief Secretary, asking for support for an observatory and the telescope project. The Chief Secretary agreed to place £2000 per annum on the estimates, and would write to the British Govern-

ment offering to pay all operating costs if the British would provide the telescope. Wilson recognised that the British would be unlikely to pay for the telescope and send it to Melbourne rather than the Cape; he would have to continue lobbying for local funding for the telescope (Wilson 1857a).

Neumayer's proposal therefore threatened to cut directly across Wilson's. When Neumayer addressed the Philosophical Institute about his project in May, Wilson immediately jumped to his feet. Neumayer reported to Liebig that Wilson 'declared it would be a scandal if a foreigner should have the honour of carrying out such an important task; he hoped the government would feel the same way and in any case would award this prize to an Englishman by birth' (Neumayer to Liebig, 14 Sep. 1857 in Home & Kretzer 1991: 232-243). Andrew Clarke, President of the Institute, Surveyor-General and Commissioner for Lands, rose to defend both Neumayer and the project. But to Neumayer's bewilderment, when the proposal was debated in parliament in early August 1857, Clarke opposed the project, arguing that the research had already been done at the Hobart magnetic observatory in the 1840s. Funds did not need to be spent on 'an itinerating scientific man'; they should be spent on establishing a permanent scientific institution (*Argus*, 1857).

What had brought about Clarke's about face? Neumayer was convinced that Professor McCoy had changed Clarke's mind; Rod Home has suggested it was possibly Robert Brough Smyth, an official within Clarke's Crown Lands Department, who had established a meteorological network that was threatened by Neumayer's proposal. Certainly Brough Smyth questioned both the value of Neumayer's project and his credentials (Home & Kretzer 1991: 221-223). But it seems more likely that Wilson was the key opponent. Wilson seems to have persuaded Clarke to oppose Neumayer's project in order to buy some time for his and the institute's own project.

Whatever the case, Neumayer by this stage could not be ignored. He had been steadily making his case to other interested parties, and building support. The local German community pledged funds, ship's captains wrote in support of the practical benefits of the project, as did the Chamber of Commerce. And the *Age* and *Argus* newspapers supported the proposal and were critical of the government for not providing funds.

Wilson's solution was to propose that the Philosophical Institute establish a committee to promote

the establishment of an astronomical, magnetical and meteorological observatory 'on a scale commensurate with the importance of the colony'. The proposed members were Clarke, Smyth, Neumayer, Robert Ellery, superintendent of the Williamstown Observatory and of course Wilson himself (Wilson 1857b).

The committee developed a new proposal that would see Neumayer's instruments purchased by the government, and Neumayer's magnetic survey of the colony done under the auspices of an integrated observatory. In the committee's report, Wilson again made the argument about not allowing a foreign prince to do the government's work for it; by this he was clearly trying to pressure the government into funding the project, not doubting Neumayer's abilities or the King of Bavaria's generosity. His concern was overwhelmingly about how to establish a permanent institution, not a six-year survey. When the committee presented its report to the Chief Secretary at the end of November, Haines supported their proposal to establish a permanent observatory, but emphasised that it would need to await the government's budget (Philosophical Institute of Victoria 1857). In the meantime the government funded Neumayer separately, and his government grant was approved in December 1857, 11 months after he had arrived in the colony. Neumayer started observations at Flagstaff Observatory in May 1858.

ROBERT ELLERY AND WILLIAMSTOWN OBSERVATORY

By contrast, Robert Ellery seems to have quickly established an effective working relationship with Neumayer. Ellery had been appointed by the government to operate a small astronomical observatory at Williamstown in July 1853, under the direction of the Chief Harbour Master. The observatory's main role was to provide a timekeeping service for ship's captains to correct their chronometers after the long voyage to Australia—a thoroughly practical function. Ellery was given a two-roomed cottage; his observatory was a small attached room, 8 feet square. After heavy rains subsequently damaged the instrument piers, a new observing room was hastily built, comprising a canvas tent erected around the instrument and clock piers (Ellery 1856).

By the time Neumayer had arrived in Melbourne in January 1857, Ellery was again lobbying the gov-

ernment for a new building and better instruments. His aims for Williamstown Observatory were now more expansive. In addition to the timekeeping service, linked by telegraph to a timeball at Williamstown and in Melbourne, Ellery was making observations to more accurately fix the longitude of Melbourne. Meanwhile he was receiving requests from the Royal Astronomical Society in London to undertake sweeps for an anticipated comet. While Neumayer's proposal still hung in the balance in the second half of 1857, the government provided funds for the erection of a new meridian room and computing room. But Ellery was still pushing for additional rooms and for £1200 for a better transit circle, equatorial telescope and sidereal clock. Ideally he wanted a new building, but this would cost about £3,000 (Ellery 1857).

Ellery was also now thinking big, conceiving of an astronomical observatory that would carry out a full range of astronomical functions. By mid 1858, just as Neumayer was starting at Flagstaff Observatory, Ellery could reflect back on the five years he had been running Williamstown Observatory, and hope that in a further five years the observatory would be on a par with those in England and America (Ellery 1858a). Ellery's vision for a national observatory was rather different from that of either Wilson or Neumayer. Ellery had received his astronomical training at Greenwich, and it was to Greenwich and the smaller British and American observatories that he set his sights. Wilson had been primarily inspired by the large reflecting telescopes of Lord Rosse at Birr, and by Armagh Observatory. Neumayer of course had a somewhat different disciplinary focus, although he too was trying to recreate the kind of institutions he had trained at in Hamburg and Munich.

Ellery also differed from Wilson in seeing Neumayer as a colleague rather than a competitor. In his report of June 1858, Ellery reported positively on his working relationship with Neumayer:

In conclusion, I would state that the Magnetic Observatory, under the direction of Professor Neumayer, and the Astronomical Observatory, are now placed in telegraphic communication, and that means are in preparation for the determination of the difference in the longitude of the Magnetic from the Astronomical Observatory; and I desire to express my appreciation of the courteous liberality with which Professor Neumayer has offered me his valuable assistance in the matter. We have made all the preliminary arrangements for comparing and combining our observations wherever we can profitably do so;

and I feel assured that the communication existing between the two Observatories, and the cordial co-operation which it is the desire of Professor Neumayer and myself to maintain, will largely conduce to the progress and usefulness of the establishments over which we are privileged to preside (Ellery 1858a: 15):

This captures much of Ellery's character: calm, judicious, collegial—the characteristics that would make him the president of the Royal Society of Victoria for 20 years from the mid 1860s. Ellery wrote this in his official report to the government, but I would suggest that Ellery was directing his comments specifically at Wilson, suggesting a professional rapprochement based on collaboration.

But William Wilson was a fiery, combative man. And even while he may have accepted the reality of government support for Neumayer's project, his goal of an integrated observatory with a large reflecting telescope at its heart remained paramount. Wilson now started to garner support back in Britain for his grand vision. He wrote to Edward Sabine, the astronomer and physicist who had been the leader of magnetic research in Britain since the 1820s, and had instigated the establishment of magnetic observatories in the 1840s, including the one at Hobart. Wilson had met Sabine when they had been involved in running the British Association meeting in Belfast in 1852. Sabine was an influential figure in British science, and would be appointed President of the Royal Society in 1861 (Sabine 1858).

Sabine endorsed Wilson's proposal, if it united three prerequisites: funds should be made available from the colony itself; direction of the observatory should be by a person 'who has received education and training in the Mother Country' (clearly both Wilson and Sabine assume this to be Wilson himself); and there should be assistance from experts in the preparation of instruments. With regards to the telescope, Sabine suggested Wilson correspond with Lord Rosse, Thomas Robinson and Thomas Grubb, who had been the key players in the earlier plans for a southern telescope. For magnetic instruments, Sabine could arrange the supply of the type of instruments used at Kew Observatory, the magnetic observatory near London (Sabine 1858).

Wilson, in short, was seeking to establish his own magnetic observatory, if not in actual competition with Neumayer, then certainly to replace it when Neumayer's anticipated five-year project came to an end. Even after the Flagstaff Observatory had been

operating for 15 months, Wilson had still not deigned to visit Neumayer's observatory, despite repeated invitations (Neumayer 1858).

BUILDING INTERNATIONAL SUPPORT

Critically, 1858 was the year in which all the protagonists in Melbourne realised that they had to integrate their plans into an international, and more particularly a British scientific network. Neumayer wrote to Sabine only a few weeks after Wilson, setting out the work at the Flagstaff Observatory. Neumayer had hoped to seek Sabine's support for his project at the 1856 meeting of the British Association, prior to returning to Melbourne, but Sabine had been in Italy. Now he sought Sabine's endorsement, noting that he was using German instruments of Lamont's construction, but hoped to be able to persuade the government to purchase Kew pattern instruments (Neumayer 1858).

Neumayer was learning that he needed to make his science more consistent with that of the British Empire. Ellery too was establishing stronger connections back home. On the very same day that Neumayer wrote to Sabine, Ellery wrote to Astronomer Royal George Airy, giving an account of Williamstown Observatory, sending some data for checking, and asking Airy to assist in having Ellery appointed a Fellow of the Royal Astronomical Society (Ellery 1858b).

The battle over Neumayer's project had shown that while the Victorian government was sufficiently wealthy to support scientific projects, any proposal needed to meet two key criteria: it needed to have clear practical benefits to the colony, that could be understood and accepted by an elected legislature; and its science needed to be endorsed by eminent scientists back in Britain, especially if the scientific project entailed basic research.

Neumayer's letters to Sabine show that he had begun to realise these criteria. Discussing his attempts to persuade the government to purchase Kew pattern self-registering magnetic instruments, Neumayer explained:

In a country like this, where the minds of the people are entirely taken up by money making it is a matter of necessity to show first the practical usefulness of an institution and then to induce them to incur expenses. (Neumayer 1858)

Ellery had less difficulty in explaining the practical value of his work, for it meshed so seamlessly

with navigation and timekeeping. But Ellery was constantly at pains to ensure that the practical benefits of his observatory were visible; especially through the distribution of a public time system, at first by telegraphic connection to a time ball in Melbourne, and subsequently by telegraph to public clocks.

ESTABLISHING MELBOURNE OBSERVATORY

Both Ellery and Neumayer were fully occupied with the work of their respective observatories through 1858 and 1859. Indeed both took on additional responsibilities. Ellery was put in charge of the Geodetic Survey, which required him to oversee the painstaking measurement of a base line at Werribee through the summer of 1858/59 and then supervise teams of surveyors to establish a geodetic grid across the colony. In early 1859, the meteorological branch of the Crown Lands Department was transferred to Flagstaff Observatory, necessitating that Neumayer oversee the integration of the country weather stations and standardise their instruments. They also found time to work together. Neumayer's first field trip to test his Lamont magnetometer was taken with Ellery to Kilmore in December 1858 (Neumayer 1869; Morrison 2006: 122, 12).

The two men quickly came to realise that they would be in a much better position if they merged their institutions into a single observatory. By mid 1859, the site at Flagstaff Hill, never desirable from a magnetic point of view, was becoming untenable. A sawmill and engine, an iron shed and iron works had been erected at the edge of the site, disturbing the magnetic observations (Neumayer 1860a). Ellery, who had previously been happy with the site at Williamstown, was also now finding it less suitable. Traffic was increasing in the neighbourhood and would start to disturb the instruments, and the railways were encroaching on what had been the observatory reserve (Ellery 1860).

The two men agreed that they needed to identify a site that would meet both their needs. Ellery would have preferred to move to another site he had identified at Williamstown, but the entire region west of central Melbourne was unsuitable for Neumayer's magnetic observations. Failing that, Ellery would have preferred a site in Royal Park, which he had used for geodetic survey observations. But Neumayer argued strongly for a site in the Botanic Gardens reserve as ideal from a magnetic point of view. Ellery was still concerned that dust kicked up by traffic

from the main road leading to St Kilda would interfere with observations; but he was prepared to compromise on the site, which was ideal in other respects (Neumayer 1860b). (Ellery would be proved right about the dust.)

Persuading the government it needed to grant both the site and appropriate funds was another matter. The Victorian government was constantly in turmoil, with ministries changing frequently, battling over issues such as protection for local industry and land reform. After his initial overtures to Sabine about a new observatory, William Wilson became despondent about the prospects in the current political climate (Wilson 1861).

George Verdon stepped into the breach. Verdon was a young Williamstown merchant with an interest in astronomy and science. He had become acquainted with Ellery and started to work as an unpaid assistant at the Williamstown Observatory, being trained by Ellery. When Ellery took on the geodetic survey, Verdon and two other volunteers stepped in and continued the Williamstown observations. Verdon also assisted Neumayer during the first of his field observations at Williamstown in mid 1859.

Fortuitously, Verdon was elected the local parliamentary member for Williamstown in August 1859; three months later he moved in Parliament for the creation of a Board of Visitors to oversee the 'astronomical and magnetic observatories'. Governor Henry Barkly appointed the Board in January 1860, with Verdon as Secretary; the Governor also agreed to be a member. Wilson was appointed a member of the board, but had not been the prime mover. Although only 25 years old, Verdon became Treasurer in a new ministry in late 1860, and in this capacity he proposed and gained the support for the building of a new observatory. The government lost office in 1861, but Verdon had established a commitment and momentum that would see the new Melbourne Observatory open in June 1863. By then Verdon was again Treasurer, and would remain so for another 5 years, and he ensured that the observatory receive funds for new instrumentation and buildings.

Chief among the new instruments would be the Great Melbourne Telescope, a project driven forward by Wilson. He carefully garnered support from British astronomers, the Royal Society of London (Edward Sabine was now its President), the Victorian Governor Henry Barkly, and of course George Verdon. Even then it was a close run thing with Wilson able to get the order placed with William Grubb in

Dublin only days before Verdon's government fell. Basic science projects could receive government funding, but only when the planets were aligned (Wilson 1862).

CONTINUING NEUMAYER'S MAGNETIC SERIES

By the time the Melbourne Observatory opened in mid 1863, Neumayer's magnetic survey was coming to a close, and he was planning his return to Germany. Ellery and the Board were committed to continuing magnetic observations, and it was Ellery who corresponded at length with Sabine in London, determining the best instruments and measures. Doubtless he also discussed this with Neumayer, but Ellery was keen that the observatory use the Kew pattern self-registering instruments advocated by Sabine (Ellery 1863). Neumayer offered to sell his magnetic survey equipment to the observatory; the Board selected only some instruments which were deemed useful, and paid £200. Just as importantly, Ellery took on Charles Moerlin, who had worked as Neumayer's assistant at Flagstaff Observatory since 1860, undertaking the magnetic and meteorological observations (Melbourne Observatory Board of Visitors 1863).

Ellery worked closely with Moerlin to ensure that the value of the magnetic observations was maintained. The self-registering magnetometers did not arrive until 1867, and necessitated a rebuilding of the Horary House with a photographic room attached. Ellery was a practical man, and spent much time with Moerlin experimenting and mastering the photographic processes. He continued to correspond with Sabine and Balfour Stewart at Kew Observatory about how to refine techniques (Ellery 1867b).

Ellery stayed in contact with Neumayer after his departure in mid 1864, as Neumayer worked up his magnetic and meteorological data for publication in Germany, with funding from the Victorian government. In 1867 Neumayer expressed hope to return to Australia for a new exploring expedition, but Ellery cautioned him against trying. There was an economic recession, and the colonial governments were cutting back their expenditure—'exploration is a word they are tired of'. 'We all want to see you,' Ellery lamented, 'but not for a project doomed to fail' (Ellery 1867a).

NEUMAYER'S CONTRIBUTION TO
MELBOURNE OBSERVATORY

How then can we assess Neumayer's contributions to the development of Melbourne Observatory; to what extent can we see it as his institutional legacy?

First, Neumayer was the unwitting catalyst. His arrival triggered a chain of events that eventually did lead to the establishment of Melbourne Observatory. However, Wilson already had a proposal for a national observatory on the table before Neumayer arrived back in Melbourne, albeit one centred around a reflecting telescope. Equally, Ellery had established the observatory at Williamstown, and was gradually, if slowly building his capabilities, based around the sound strategy of doing practical, applied science with immediate public outcomes.

Second, Melbourne Observatory would not have been located in South Yarra without Neumayer's insistence that this was the superior location for a magnetic observatory. If Ellery had eventually moved away from Williamstown, then it would have most likely been to Royal Park.

Third, Neumayer's establishment of a magnetic series in Melbourne was the basis of the long series maintained at Melbourne Observatory. Here too, though, it is important to note that the Board of Visitors supported the idea of maintaining the observations, and Ellery spent much energy on ensuring that new buildings and instruments were obtained.

Fourth, Rod Home has suggested that Neumayer brought a more rigorous scientific method to the physical sciences in Victoria, based on his German scientific training. He contrasts Neumayer with Ellery, who was largely self-taught, with an unfinished medical apprenticeship in England and only a short time spent training at Greenwich Observatory. Home goes on to suggest that the relative disappointment in the achievements with the Great Melbourne Telescope is evidence of the impact of Ellery's less professional training (Home 1991: 52). This seems to me an unfair assessment. Ellery's astronomical observations were just as accurate and professional as Neumayer's magnetic and meteorological observations. And the longstanding Melbourne magnetic series was superintended by Ellery for over 30 years. The difficulties with the Great Melbourne Telescope cannot be sheeted home to Ellery, who worked tirelessly to get the most out of the instrument, corresponding endlessly with Howard Grubb in Dublin.

Fifth, Neumayer's proposal for a magnetic and navigational observatory highlighted the political and scientific alliances that would be needed to create a viable institution. Neumayer arrived in Melbourne assuming that his project would be endorsed quickly and government funds forthcoming. Yet he came with support from only German scientists; he had failed to gather sufficient support from British scientists such as Sabine or institutions such as the British Association. The lesson was duly learned, and Ellery, Wilson and Neumayer all subsequently began to foster closer relationships with British scientists and institutions, seeking their endorsement and guidance. Without this, the Victorian government was always going to be wary of committing substantial funds.

Finally, local alliances were also critical, and it was the respectful working relationship developed between Ellery and Neumayer that created a firmer basis for the creation of Melbourne Observatory.

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