

## NOTED COLONIAL GERMAN SCIENTISTS AND THEIR CONTEXTS

GABRIELLE L. McMULLEN

Mary Aikenhead Ministries, 55 Grafton Street, Bondi Junction NSW 2022

Correspondence: gabrielle.mcmullen@maministries.com.au

**ABSTRACT:** German scientists made substantial and notable contributions to colonial Victoria. They were involved in the establishment and/or development of some of the major public institutions, e.g. the Royal Society of Victoria, National Herbarium, the Royal Botanic Gardens, Museum Victoria, the Flagstaff Observatory for Geophysics, Magnetism and Nautical Science, the Pharmaceutical Society of Victoria and the Victorian College of Pharmacy. Further, they played a leading role not only in scientific and technological developments but also in exploration – Home has identified ‘science as a German export to nineteenth century Australia’ (Home 1995: 1). Significantly, an account of the 1860 annual dinner of the Royal Society of Victoria related the following comment from Dr John Macadam MP, Victorian Government Analytical Chemist: ‘Where would science be in Victoria without the Germans?’ (Melbourn Deutsche Zeitung 1860: 192). This paper considers key German scientists working in mid-nineteenth century Victoria and the nature and significance of their contributions to the colony.

**Keywords:** German colonial scientists, Humboldt, Humboldtian science, German education

### 1860 ROYAL SOCIETY OF VICTORIA ANNUAL DINNER

On Tuesday, 10 April 1860 a group of some 60 men gathered in the Criterion Hotel in Collins Street, Melbourne, for the annual dinner of the Royal Society of Victoria. The dinner was held in the presence of the Governor of Victoria, Sir Henry Barkly, who was the new president of the Royal Society. Other dignitaries present included three colonial government ministers, namely the Chief Secretary, the Attorney-General and the Postmaster-General. The Governor delivered the toast to Her Majesty Queen Victoria and later, in his inaugural address as president, remarked:

Most especially am I sensible of my unfitness to succeed one who has achieved so high a reputation in the scientific world as my predecessor in the presidential chair – Ferdinand Mueller – a man whose enthusiasm as a botanist is only surpassed by his industry as a writer, evidenced, despite the official demands on his time, by the publication during his presidency, of several most useful works ... through his zeal and perseverance, moreover, the Philosophical Institute has, during the past year, obtained a “local habitation,” as well as a change of name, and may now, therefore, be considered an established institution of the land ... (*The Argus* 1860: 4–5)

### THE GERMAN PRESENCE

**Dr Ferdinand Mueller** was Victoria’s first Government Botanist and Director of the Botanic Gardens (McMullen 1997; Home et al. 1998; Gillbank 2011). He had been President of the predecessor Philosophical Institute of Victoria and, during his term of office, royal assent had been gained for its retitling as the Royal Society of Victoria and a dedicated building had been completed to house the new Society.

**Georg Neumayer**, Vice-President of the Society, who was generally given the honorific title of Professor, was also present at the dinner. He proposed the toast to ‘The Army and Navy’. Founder of the Flagstaff Observatory for Geophysics, Magnetism and Nautical Science, Neumayer was Government Meteorologist and Director of the Magnetic Survey (Swan 1974; Home 1991; Morton 2011).

Several other Germans were also active members of the Royal Society of Victoria and likely attendees at the 1860 annual dinner (ASTHC 2001):

- **Ludwig Becker**, an artist, naturalist, natural history draftsman and lithographer, was to be the only member of the Royal Society of Victoria on the forthcoming Burke and Wills Expedition (Tipping 1969; Darragh & Koehler 1993).
- **Professor Karl Damm** had just opened Melbourne’s German College (*Deutsches Gymnasium*) in East Melbourne and was its principal. Prior to fleeing Germany, he was a teacher and then headmaster, a member of the Frankfurt National Assembly (1848–1849) and an 1849 revolutionary (*Victoria Deutsche Presse* 1860; Beckler 2000: 248).

- **Eugen von Guérard**, the Austrian-born but German-trained artist, was gaining a reputation as ‘decidedly the landscape painter of Australia’. The scientific basis of his art was acknowledged in his membership of the Royal Society of Victoria. Guérard would go on to be foundation curator at the National Gallery of Victoria, master of its School of Art and its painting instructor (Tipping 1972; Pullin 2011).
- **Johann Kruse** was a pioneer of the pharmaceutical industry and pharmacy training in Victoria. He was instrumental in the founding of the Pharmaceutical Society of Victoria in 1857 and an inaugural member of its council. He would later establish Victoria’s first pharmacy training school (McMullen 2000).
- **Georg Ulrich**, a geologist and cartographer, initially prospected on the Victorian goldfields before becoming assistant secretary and surveyor when the Geological Survey of Victoria was expanded. The Royal Society of Victoria titled him Assistant Geological Surveyor (Hoare 1976a).
- **Carl Wilhelmi**, a seedsman on coming to Australia, gained extensive collecting experience and became Assistant Government Botanist under Mueller (Kraehenbuehl 1990; Darragh 2003).

Not present at the dinner but a founder of the predecessor Philosophical Society of Victoria and a life member of the Royal Society of Victoria was **Wilhelm von Blandowski**. He contributed in Australia as mining engineer, Government Zoologist, first curator of the Museum of Natural History and founder of the Geological

Society of Victoria, but had returned to Europe in the previous year amid considerable controversy (Paszkowski 1969; Allen & Weldon 2009; Darragh 2009 & 2013).

These, and other local Germans not associated with the Royal Society of Victoria, were prominent citizens in the community, contributing significantly to its scientific, technological and cultural development—their contributions were notable. Another one of the participants at the dinner, Dr John Macadam MP, Government Analytical Chemist and Secretary of the Royal Society of Victoria, remarked during the Royal Society of Victoria annual dinner, ‘Where would science be in Victoria without the Germans?’ (*Melbournner Deutsche Zeitung* 1860: 192). What was the basis for this remark? Why had these Germans come to such prominence in the colony?

#### THE IMPACT OF THE GERMAN SCIENTISTS

Scientists and other German-trained professionals were making significant and impressive contributions to colonial Victoria in 1860. They had been involved in the establishment and/or development of some of the major public institutions – for example, the Royal Society of Victoria as noted above, the Botanic Gardens, the Natural History Museum, the Flagstaff Observatory and the Pharmaceutical Society of Victoria or their predecessor institutions. Further, the Germans were playing a leading role not only in scientific and technological developments but also in exploration (Rose 1988; Home 1995). Why was their contribution of such significance?

Table 1: Key German members of the Royal Society of Victoria in 1860

Name	Role/s	RSV Role/s
Ludwig Becker (1808–1861)	Artist, naturalist, natural history draftsman and lithographer	Member
Wilhelm von Blandowski (1822–1878)	Mining engineer, first Government Zoologist, first Curator of the National Museum of Natural History, founder of the Geological Society of Victoria	Previous Council Member, Life Member (returned to Europe in 1859)
Professor Karl Damm (1812–1886)	Educationalist, former German Parliamentarian, Principal of Melbourne’s German College (Deutsches Gymnasium)	Member
Eugen von Guérard (1812–1901)	Artist, foundation curator at the National Gallery of Victoria, master and painting instructor of its School of Art	Member
Johann Kruse (1822–1895)	Chemist and pharmacist, founder of the Pharmaceutical Society of Victoria and of Victoria’s first pharmacy training school	Member
Dr Ferdinand Mueller (1825–1896)	First Government Botanist in Victoria, Director of the Botanic Gardens	Outgoing President, Council and Honorary Member
Professor Georg Neumayer (1826–1909)	Founder of the Flagstaff Observatory for Geophysics, Magnetism and Nautical Science, Government Meteorologist, Director of the Magnetic Survey	Vice-President
Georg Ulrich (1830–1900)	Geologist and cartographer, Assistant Geological Surveyor	Member
Carl Wilhelmi (1829–1884)	Assistant Government Botanist	Member

### *German technical and higher education*

The most outstanding factor was their education. Whether they attended a technical college or a university, whether they graduated or only partially completed their studies, they were generally better qualified for their professions than their non-German counterparts. Significantly, education and training offered through German universities and technical colleges at this time was superior to that of Great Britain and of most other countries (Kruse 1858; Abel 1887).

Pharmacist and Royal Society member Kruse wrote in detail about the breadth, depth and quality of contemporary German education for pharmacists. The training in Germany consisted of an apprenticeship, which could not be commenced before the age of 15 years, followed by an assistantship. Normally both of five years' duration, an apprenticeship could be shortened by one year depending on the age and attainments of the apprentice and an assistantship by two years through a year's study of pharmacy at university. While university studies were not mandatory for intending pharmacists, they were customary and Kruse attended the University of Göttingen.

A successful examination before the district medical officer qualified an apprentice as either a dispenser or as a laboratory assistant. According to Kruse, the subsequent *Staatsexamen* (State Examination), the necessary qualification to practise as a pharmacist, could not be taken by an assistant before 25 years of age. Significantly, the diploma from a successful State Examination was awarded at four different levels – the fourth, and lowest, grade allowed the holder to conduct a pharmacy, the third additionally to instruct apprentices, the second to work also as a government analyst, and the first to act as well as a government botanist. Kruse achieved the last and thus the highest grade (Kruse 1858 & 1880–1881).

Comparably, an apprenticeship and studies at the University of Kiel in Holstein qualified Mueller as a pharmacist; during this time he became fascinated by botany. He botanised extensively and the herbarium that he established as a student provided the basis for his doctoral studies at Kiel (Home et al. 1998: 14). Mueller was an outstanding student and, presumably, regulations in Holstein, which was then under the King of Denmark, were different from those in Germany, and he graduated at the age of 21. It is worthy of note that the doctor of philosophy was a further German educational innovation.

In contrast to the German situation, while most trainees in the United Kingdom then spent some years working under a practising pharmacist and undertook coursework by correspondence or at a school of pharmacy, examination by the Royal Pharmaceutical Society of Great Britain was not yet compulsory in 1860 (Royal Pharmaceutical Society).

### *The influence of Alexander von Humboldt*

Apart from their superior education, the German members of the Royal Society of Victoria, for the most part, had a pronounced sense of adventure. This seems to have been fostered by their desire to emulate their Prussian hero, Alexander von Humboldt (1769–1859). Humboldt, who had a profound impact on nineteenth century scientific developments, classed himself as a scientific traveller rather than as an explorer. For Humboldt, the former implied:

- travelling with good, and preferably the latest, instrumentation for a number of branches of science
- taking accurate measurements of variables that differ with geographical position
- graphing, mapping and integrating the data
- subsequent theorising to arrive at scientific concepts and laws.

His revolutionary vision encompassed both the inorganic and organic nature of the world, with land exploration and not just sea voyages critical, and would require generations of scientists to gather the necessary geographically distributed data (Cannon 1978: Chapter 3; Home 1998 & 2000). Thus, Humboldtian science, as it has been termed, was 'the accurate, measured study of widespread but interconnected real phenomena in order to find a definite law and a dynamic cause' (Cannon 1978: 105).

In their youth the colonial German scientists had read works of Humboldt and been inspired to contribute to his scientific vision. Thus, at the 1859 dinner in Melbourne to mark the death of Humboldt in his ninetieth year, Mueller stated:

... his grand accounts of his journeys ... left an unspeakable and ever unquenchable impression on my youthful mind, an impression that determined the direction to my life's plan ... Humboldt's works ... also inspired me to contribute to investigations of the realms of nature, drove me as well, with endless longing, to distant places in order to give the great master a few, potentially valuable stones for the construction of the palace of science. (*Melbourn Deutsche Zeitung* 1859: 42)

When Mueller came to Australia in 1847, he was eager to undertake scientific explorations in the naturalist traveller mould of Humboldt. In the first instance, however, he sought employment as a pharmacist in Adelaide while undertaking field trips and becoming captivated by and an expert on the remarkable local flora, and gaining the position as Government Botanist of Victoria in 1853. In his early years in this latter role, he actively participated

in exploration of Australia and in later life would, like Humboldt, foster others in this regard. As advocated by Humboldt, Mueller sought to promote the economic and social benefits of opening up Australia as well as the scientific opportunities from exploration (Home et al. 1998; Home 2000; Gillbank 2011).

Neumayer also idolised Humboldt, ‘discussing his theorems with those he met and carrying a well read copy of [Humboldt’s] *Cosmos*’ on his treks across Victoria (Heathcote 2001: 31). He had met Humboldt and had his backing for the magnetic survey Neumayer planned to conduct when he returned to Australia in 1857. Significantly, Neumayer brought to his endeavours in the colony ‘new standards of precision and sophistication in physical inquiry’ while reinforcing the integrative Humboldtian orientation in his work (Home 1995: 11–13). He was ‘the first professionally trained physicist to work in Australia’ and his:

... was not laboratory-style investigation but the Humboldtian, field-based, observational and world-encompassing style, entirely of a piece with that which motivated many of the great naturalist-explorers such as Ludwig Leichhardt. (Home 1991: 51)

The deceased **Ludwig Leichhardt** (1813–c1848) was another admirer of Humboldt, his ‘grandmaster’ whom he (and others) honoured ‘as a father’ and whom he had met once briefly in Paris. In his youth, Leichhardt eagerly read the travelogues of his time, including Humboldt’s *Ansichten zur Natur*. Driven by a desire to explore foreign lands, he prepared himself for his ‘calling’ by philological, scientific and medical studies and practical work in Berlin and Paris, and extensive excursions in Europe. Upon his arrival in Australia in 1842, he undertook shorter scientific travels in preparation for his first major expedition, which contributed significantly to opening up northern Australia, both geographically and scientifically. Tragically, he later disappeared during an attempt to cross the continent from east to west – he was a particular hero of the colonial German scientists. Leichhardt wrote that he continually had Humboldt in mind on his journeys, ‘as one of those men ... whose deeds sounded like tales of wonder to the boy, filled the youth with enthusiasm and finally drew him to follow a similar direction’ (Felden 1996; Fiedler 2007).

The second German on the Burke and Wills Expedition was **Dr Hermann Beckler** (1828–1914), a medical doctor and naturalist, who had been working for Mueller when he was engaged as the expedition’s medical officer and botanist. During his medical studies in Munich, Beckler had developed a keen interest in the natural sciences. Upon graduation he had little inclination to practise

medicine and a growing passion for scientific endeavours. Like his compatriots described above, he too had been inspired by the life and example of Humboldt, and his decision to go to Australia was motivated by his desire to be a naturalist traveller as well as his dissatisfaction with the political climate in Germany. He gained information about Australia from Neumayer, who was in Munich seeking support for his second scientific expedition to Australia, and Neumayer assisted him to obtain a letter from Humboldt recommending Beckler as a naturalist and skilful doctor. Beckler makes reference to Humboldt in his correspondence written en route to and during his travels in Australia (Jeffries 1993; Beckler 2000; Gillbank 2011).

Guérard responded to Humboldt’s call for *Reisekünstler* (travelling artists) and came in 1852 to Australia where he covered vast distances in the south-east of the continent, including accompanying scientific expeditions, two of which were with Neumayer. He sought over some 15 years both to capture the pristine wilderness and explicitly to record the impact of European settlement. Significantly his works have contemporary scientific (as well as their artistic) relevance in furnishing information about the virgin environment and aiding environmental restoration. In his sketch books Guérard recorded the unique geological, botanical and climatic characteristics of the Australian landscape and the forces of nature impacting upon it. He subsequently captured *Naturgemälde* (nature painting) on canvas in true Humboldtian style (Heathcote 2001; Pullin 2011).

In his works, Humboldt had laid out ‘“scientific” terms for landscape art’. The impact of this development had seen ‘botanical and zoological illustrators ... rendering their subjects in their habit [and] landscape painters ... present[ing] holistic views of the landscape-as-environment’. Members of the Royal Society of Victoria, Becker and Guérard, and other artist ‘disciples’ of Humboldt, expressed their admiration for him by their adherence to his ‘rule that the landscapist should be a precise natural historian’ (Heathcote 2001: 29 & 31).

Humboldt’s example and works inspired not only these colonial Germans but generations of other scientific travellers, the example *par excellence* being Charles Darwin (1809–1882). He had read Humboldt’s *Personal Narrative* (1819–1829, seven volumes) and was captivated by the concept of Humboldtian science, which ‘stirred up in me a burning zeal to add even the most humble contribution to the noble structure of Natural Science’ (Darwin 1958: 68). Darwin sought to imitate Humboldt and later, on seeing South American forests for the first time, was to record, ‘I formerly admired Humboldt, I now almost adore him’ (Darwin 1887: 237).

Humboldt, on his part, encouraged and supported capable younger naturalist travellers to explore unknown regions of the world. For him and those seeking to contribute to his endeavours, Australia would have been particularly alluring as vast areas of the Fifth Continent remained to be discovered. What was known about it was scientifically rich and intriguing, but much still needed to be explored, and the resulting knowledge would advance Humboldt's and others' work towards an integrated and holistic understanding of nature. It had been the influence of Georg Forster (1754–1794) who, with his father Johann, accompanied Captain James Cook on his second voyage that had inspired the young Humboldt to be a scientist traveller, and perhaps Forster also aroused Humboldt's curiosity about Australia (Botting 1974: 14–18).

### *Hallmarks of the Germans*

What else was there about these Germans that contributed to their prominence? Their hallmarks were unquestionably zeal, industry and thoroughness, across their various disciplines. At the same time some of their mannerisms were considered to be strange, eccentric and even comical!

Take, for example, Royal Society of Victoria council member Blandowski who, in 1858, read a paper to the predecessor Philosophical Institute on new species of freshwater fish collected on an expedition and named for other council members of the institute. While the latter was conventional practice and would be normally deemed an honour, controversy arose because of Blandowski's accompanying non-scientific and most uncomplimentary descriptions of the fish. Thus, one was described as a 'slimy, slippery fish ... [living] in the mud [and] ... of a violent bluish colour on the belly'. Another fish was said to be 'easily recognized by its low forehead, big belly and sharp spine'. The former fish was named for council member and Catholic priest Rev. John Bleasdale and the latter for prominent physician Dr Richard Eades. Blandowski declined to remove the descriptions from his paper and was censured by the institute (Museum Victoria 2004; Darragh 2009).

Beckler recounted another illustration of this 'Germanness'. In 1859 Beckler wrote to his brother Karl in Germany describing his fellow countrymen Mueller and Neumayer as:

... odd characters. Working to drive you mad, and if one can talk about nothing but genera and species, the other says nothing that isn't related to magnetism ... Both suffer from one and the same complaint, which I permit myself to call by a presumably new name, namely 'minute hunger'. (Beckler 2000: 243–244)

Beckler went on to describe how he felt compelled to restrict any conversations with Mueller and Neumayer to two to three minutes. He concluded, however:

... they are both nice people of mature experience, who with an iron will have overcome mountains and difficulties, both take an interest in their fellow countrymen, both are sociable and unpretentious, and I like both very much. (Beckler 2000: 245)

It was their extreme dedication and idealism that particularly characterise these Germans and, at times, when it was excessive, amused their fellow colonists.

### *Great expectations*

Many of the colonial Germans were forthright in seeking government grants and sponsorship. Likely their superior qualifications gave them confidence to make such petitions. Their expectations perhaps also reflect the nature of the respective public service systems: the contemporary German public service differed from that of the colony, which had largely been adopted from the United Kingdom and there was probably better resourcing for the sciences and exploration in their homeland. Further, previously Charles La Trobe, Superintendent and then Lieutenant-Governor of the colony until mid-1854, had actively encouraged, and had more ready access to funds to support, colonial science. For example, La Trobe established the Botanic Gardens in 1848; he appointed Mueller as Foundation Government Botanist in 1853 and Blandowski as Government Zoologist in 1854. Having lived in Switzerland and with a Swiss wife, La Trobe presumably also had an affinity for the Germans, which his successors would not have. Later with an elected government, neither did they have such ready access to funding for science (Eastwood 1967). Whatever the reasons, the colonial German scientists seemed to have an expectation of support for their scientific endeavours.

The controversial Blandowski provides an example of the Germans' sense of entitlement. In 1853 he requested a grant from Lieutenant-Governor La Trobe to enable him to complete the research for and then publish a major work entitled *Illustrated Natural History of the Colony of Victoria*. While he did not get the grant, when the government approved funding to establish the Museum of Natural History in Melbourne, La Trobe remembered Blandowski and recommended his involvement. Blandowski provided input into the planning for the Museum and in April 1854 was the first officer to be appointed to its staff in the role of Government Zoologist, with a salary of £400 and £250 for equipment (Paszkowski 1969; Darragh 2009 & 2013: 80–81).

Another case in point was Neumayer seeking funding for his geophysical observatory. He came back to Victoria in 1857 with the backing of Humboldt, the support of King Maximilian of Bavaria, including £2,000 worth of instruments and equipment, as well as the patronage of the British Association and Royal Society. Having been familiar with Victoria under La Trobe, he anticipated similar support from the colonial government and put in an application for £700 to build, and £600 yearly to conduct, the observatory. While he gained popular support and subscriptions for his project, especially from the local German community, he met opposition inside the Parliament and from key locals, like Robert Brough Smyth, who was then in charge of the colony's meteorological stations (Hoare 1976b). There was also resistance from some within the Philosophical Institute who were promoting an alternative project for an astronomical observatory. In derogatory comments, Smyth described Neumayer as a 'Magnetic-cum-Earthquake wonder' who 'says he is of "European reputation"'. This attempt to undermine Neumayer reflects the threat of the better educated and better resourced German to a local colleague and is evidence of such antagonism against German colleagues. Eventually the colonial government was won over, and Neumayer received a grant of £500 which, together with the subscriptions, allowed the establishment of the Flagstaff Observatory in May 1858 (Home 1991; Home & Kretzer 1991: 222–224).

It is recorded that 'Humboldt had remarkable powers of persuasion' and that directly and indirectly he gained more funding from monarchs for scientific enterprises than any other had (Cannon 1978: 92, 239). Thus, in their expectations of sponsorship, the Germans may also have been emulating Humboldt.

### *Cultural differences*

Those from the United Kingdom could be rather 'suspicious' of foreigners, and the Teutonic traits of the Germans sometimes rubbed them up the wrong way. Some found their language flowery, although many contemporary Englishmen also used florid language. Their prejudice related more likely to the 'Germanised' syntax and intonation of the colonial Germans' speech.

'Poor interpersonal relations with their fellow colonists' were, however, also an issue in some instances. While these may have reflected cultural differences and misunderstandings rather than ill will, 'the full effect of their efforts' for the colony was marred by this circumstance (Hoare 1967: 16).

On the other hand, there was good reason for the colonial Germans to be frustrated with some of the local institutions. Take, for example, the Royal Society of Victoria – many

of its members were only amateur scientists at best and there was 'much mediocrity, pettiness and parochialism' in the Society's transactions (Hoare 1967: 25). The serious and well-qualified Germans could be impatient with fellow colonists' efforts.

Their expertise and dedication saw colonial German scientists such as Mueller, Neumayer, Becker, Blandowski and Kruse take a lead in founding and developing local institutions – the Royal Society of Victoria and its predecessors, the Herbarium, the Botanic Gardens, the Natural History Museum, the Flagstaff Observatory, the Pharmaceutical Society of Victoria and so on. At the same time, these qualities and other German traits could be a source of some antagonism in the substantially British colonial context.

### CONCLUSION

The mid-nineteenth century colonial German scientists known to the members of the Royal Society of Victoria 'punched above their weight' with respect to leadership roles and government support for their enterprises and hence Macadam's above-mentioned observation at the 1860 Royal Society of Victoria annual dinner. Such was the significance of their contributions that Home has identified 'science as a German export to nineteenth century Australia' – Mueller and Neumayer emerge as examples *par excellence* in support of this thesis (Home 1995: 1). Macadam's tribute to the colonial German scientists was apt – it was also appropriate, a century and a half later, that the Australian Association of von Humboldt Fellows joined the Royal Society of Victoria in holding the Humboldt Kolleg Symposium, entitled *Celebration of German Contributions to Australian Science and Victorian Scientific Institutions – Past and Present* on 1–3 October 2014 to recognise and honour these Germans' pioneering contributions to Victorian science and scientific institutions.

### References

- Abel, F., 1887. *The Work of the Imperial Institute: Address Delivered at the Royal Institution of Great Britain before His Royal Highness the Prince of Wales, KG, FRS, Vice-Patron, 22 April 1887*, facsimile copy, State Library of Victoria, p. 17.
- Allen, H. & Weldon, E.A., eds, 2009. William Blandowski and his contribution to nineteenth century science and art in Australia. *Special Issue: Proceedings of the Royal Society of Victoria* 121(1).
- The Argus*, 11 April 1860, pp. 4–5.
- Australian Science and Technology Heritage Centre (ASTHC) and the Royal Society of Victoria, 2001. *Science and the Making of Victoria: Histories and Views of the Royal Society of Victoria from*

- its Inception to the Present Day, and its Role Supporting Science and Technology in Victoria.* ASTHC, Melbourne. Accessed on 31 August 2014 at <http://www.austehc.unimelb.edu.au/smv/title.html>. (The Philosophical Society of Victoria and the Victorian Institute for the Advancement of Science, which were both founded in 1854, were amalgamated in July 1855 to form the Philosophical Institute of Victoria. Following royal assent in 1859, the name was changed to the Royal Society of Victoria.)
- Beckler, H., 2000. *Entdeckungen in Australien: Briefe und Aufzeichnungen eines Deutschen 1855–1862.* Jan Thorbecke Verlag, Stuttgart.
- Botting, D., 1974. *Alexander von Humboldt: Biographie eines grossen Forschungsreisenden.* Prestel Verlag, Munich.
- Cannon, S.F., 1978. *Science in Culture: The Early Victorian Period.* Dawson and Science History Publications, New York.
- Darragh, T.A., 2003. My journeys in South Australia: lecture by Carl Wilhelmi, 14 September 1857. Translated and introduced by T.A. Darragh. *Journal of Friends of Lutheran Archives* 13: 5–24.
- Darragh, T.A., 2009. William Blandowski: a frustrated life. *Proceedings of the Royal Society of Victoria* 121(1): 11–60.
- Darragh, T.A., 2013. Wilhelm von Blandowski: Ein Leben voller Enttäuschungen. In *Wilhelm von Blandowski. Ein Naturforscher in Australien.* Muzeum w Gliwicach/ Museum für Naturkunde Berlin.
- Darragh, T.A. & Koehler, M., 1993. Introduction. In *A Letter from Australia*, L. Becker. Translated by T.A. Darragh. Garravambi Press, Bacchus Marsh, pp. xi–xxxviii.
- Darwin, C., 1958. *The Autobiography of Charles Darwin 1809–1882.* N. Barlow, ed. Collins, London; accessed on 16 January 2015 at <http://darwin-online.org.uk/>.
- Darwin, F., ed., 1887. *The Life and Letters of Charles Darwin, including an Autobiographical Chapter.* John Murray, London, Volume 1. Accessed on 16 January 2015 at <http://darwin-online.org.uk/>.
- Eastwood, J., 1967. La Trobe, Charles Joseph (1801–1875). *Australian Dictionary of Biography.* National Centre of Biography, Canberra. Accessed on 15 January 2015 at <http://adb.anu.edu.au/biography/la-trobe-charles-joseph-2334>.
- Felden, D., 1996. *Durch den Fünften Kontinent: Leben und Leistung Ludwig Leichhardts.* Justus Perthes Verlag, Gotha.
- Fiedler, H., 2007. Ludwig Leichhardt und Alexander von Humboldt. *Alexander von Humboldt im Netz*, VIII(15). Accessed on 19 September 2014 at [www.uni-potsdam.de/u/romanistik/humboldt/hin/hin15/fiedler.htm](http://www.uni-potsdam.de/u/romanistik/humboldt/hin/hin15/fiedler.htm).
- Gillbank, L., 2011. The Botanical Legacy of Ferdinand Mueller and Hermann Beckler. In *Burke & Wills: The Scientific Legacy of the Victorian Exploring Expedition*, E.B. Joyce & D.A. McCann, eds. CSIRO Publishing, Collingwood, Vic., pp. 97–129.
- Heathcote, C., 2001. When science meets art: Humboldt, von Guérard and the Australian wilderness. *Art Monthly Australia* 145: 27–31.
- Hoare, M.E., 1967. Learned societies in Australia: the foundation years in Victoria, 1850–1860. *Records of the Australian Academy of Science* 1(2): 7–29.
- Hoare, M., 1976a. Ulrich, Georg Heinrich Friedrich (1830–1900). *Australian Dictionary of Biography.* Melbourne University Press, Melbourne 6: 321–322.
- Hoare, M., 1976b. Smyth, Robert Brough (1830–1889). *Australian Dictionary of Biography.* National Centre of Biography, Canberra. Accessed on 9 September 2014 at <http://adb.anu.edu.au/biography/smyth-robert-brough-4621>.
- Home, R.W., 1991. Georg von Neumayer and the Flagstaff Observatory, Melbourne. In *From Berlin to the Burdekin: The German Contribution to the Development of Australian Science, Exploration and the Arts*, D. Walker & J. Tampke, eds. New South Wales University Press, Sydney, pp. 40–53.
- Home, R.W. & Kretzer, H.-J., 1991. The Flagstaff Observatory, Melbourne: new documents relating to its foundation. *Historical Records of Australian Science* 8(4): 213–243.
- Home, R., 1995. Science as a German Export to Nineteenth Century Australia. In *Working Papers in Australian Studies*, T. Griffiths & D. Lowe, eds. Sir Robert Menzies Centre for Australian Studies, London 104: 1–21.
- Home, R.W., 1998. Humboldtian imagery and ‘the Humboldt of Australia’. *Pacific Science* 52(4): 294–300.
- Home, R.W., Lucas, A.M., Maroske, S., Sinkora, D.M. & Voigt, J.H., 1998. Introduction. In *Regardfully Yours: Selected Correspondence of Ferdinand von Mueller*, Vol. 1: 1840–1859, R.W. Home et al., eds. Peter Lang, Bern, pp. 9–38.
- Home, R., 2000. Emigrants or scientific travellers: Ferdinand Mueller and Georg Neumayer between Germany and Australia. In *Baron von Mueller’s German Melbourne, Plenty Valley Papers*, E.I. Mitchell, ed. 3: 11–23.
- Jeffries, S., 1993. Introduction. In H. Beckler, *A Journey to Cooper’s Creek.* Translated by S. Jeffries and M. Kertesz; edited and with an introduction by S. Jeffries. Melbourne University Press, Melbourne, pp. xv–xlv.
- Kraehenbuehl, D.N., 1990. Carl Wilhelmi, the seedsman from Dresden: his botanical endeavour in South Australia and Victoria. In *History of Systematic Botany in Australasia: Proceedings of a Symposium Held at the University of Melbourne, 25–27 May 1988*, P.S. Short, ed. Australian Systematic Botany Society Inc., Melbourne, pp. 115–119.

- Kruse, J., 1858. On pharmacy in Germany and the British Empire. *Quarterly Journal and Transactions of the Pharmaceutical Society of Victoria* 1(2): 45–49.
- Kruse, J., 1880/1881. Pharmaceutical education. *The Chemist and Druggist* December: 63–64 and January: 71–72.
- McMullen, G.L., 1997. Getting to know Dr Müller: accounts of Ferdinand von Müller in Victoria's mid-nineteenth-century German-language newspapers. *Historical Records of Australian Science* 11(3): 325–333.
- McMullen, G.L., 2000. Johann August Kruse (1822–1895), leader in Melbourne's nineteenth-century chemical and pharmaceutical professions. *Historical Records of Australian Science* 13(1): 43–66.
- Melbournier Deutsche Zeitung* 4: 30 September 1859, 20–21; 5: 7 October 1859, 26–27 and 7: 21 October 1859, 42–43.
- Melbournier Deutsche Zeitung* 32: 13 April 1860, 192. In 1857 Mueller named the indigenous Australian nut tree *Macadamia* after his friend Dr John Macadam.
- Morton, A.M., ed., 2011. *Proceedings of the Royal Society of Victoria: Special Centenary Anniversary Symposium Issue Commemorating Georg von Neumayer – His Australian, German and Polar Scientific Achievements and Legacies* 123(1).
- Museum Victoria, 2004. William Blandowski's fish. *Treasures*. Accessed on 1 September 2014 at <http://museumvictoria.com.au/treasures/details.aspx?img=3&Path=4&PID=21>.
- Paszkowski, L.K., 1969. Blandowski, William (1822–1878). *Australian Dictionary of Biography*. Melbourne University Press, Melbourne 3: 182–183.
- Pullin, R., 2011. Eugene von Guérard: a remarkable life; and Eugene von Guérard: art, science and nature. In *Eugene von Guérard: Nature Revealed*, R. Pullin, ed. National Gallery of Victoria, Melbourne, pp. 0–13 and 14–35, respectively.
- Rose, M.A., 1988. Alexander von Humboldt and Australian art and exploration. In *The German Experience of Australia 1833–1938*, I. Harmstorf & P. Schwerdtfeger, eds. Australian Association of von Humboldt Fellows, Adelaide, pp. 106–119.
- Royal Pharmaceutical Society, undated. Accessed on 19 September 2014 at [www.rpharms.com/museum-pdfs/b3qualifying-as-a-pharmacist-2011.pdf](http://www.rpharms.com/museum-pdfs/b3qualifying-as-a-pharmacist-2011.pdf). Examination became compulsory in 1868.
- Swan, R.A., 1974. Neumayer, Georg Balthasar von (1826–1909). *Australian Dictionary of Biography*. Melbourne University Press, Melbourne 5: 329–331.
- Tipping, M.J., 1969. Becker, Ludwig (1808?–1861). *Australian Dictionary of Biography*. Melbourne University Press, Melbourne 3: 127–128.
- Tipping, M.J., 1972. Guérard, Johann Joseph Eugen von (1812–1901). *Australian Dictionary of Biography*. Melbourne University Press, Melbourne 4: 306–307.
- Victoria Deutsche Presse* 38: 23 March 1860, 3.