

VON NEUMAYER AND THE ORIGINS OF AUSTRALIAN AND INTERNATIONAL METEOROLOGY

JOHN W. ZILLMAN

Vice Chancellor's Fellow in the School of Earth Sciences, The University of Melbourne.
Former Director (1978-2003) of the Commonwealth Bureau of Meteorology and
former President (1995-2003) of the World Meteorological Organization.

ZILLMAN, J.W., 2011. Von Neumayer and the origins of Australian and international Meteorology. *Transactions of the Royal Society of Victoria* 123(1): 70-77. ISSN 0035-9211.

Georg von Neumayer played a central role in building the foundations of Australian meteorology and in shaping the global framework of cooperation under the International Meteorological Organization (IMO), the forerunner of the World Meteorological Organization (WMO). Though his time in Australia was relatively brief, his name stands alongside those of Lieutenant William Dawes (active from 1788-1791), Sir Thomas Brisbane (1822-24), Robert Ellery (1863-1895), Sir Charles Todd (1856-1906), Clement Wragge (1883-1903) and Henry Chamberlain Russell (1859-1904) in the short list of Australia's outstanding meteorological pioneers; and with Lt. Matthew Fontaine Maury, Admiral Robert FitzRoy and Professors C.H.D. Buys Ballot, H. Wild and E. Mascart in building the 19th century framework for international cooperation in meteorology, especially through his role as President of the International Polar Commission which organised the First International Polar Year (1882-83). This paper provides a brief overview of the origins of Australian meteorology and of the 1873 establishment and early work of the IMO in providing the international framework for cooperation in meteorology until its replacement by the intergovernmental WMO in 1950.

Keywords: meteorology, international, observations, cooperation

THE 19th century pioneers of colonial meteorology in Australia left a remarkable legacy of science and service (Gibbs 1975) on which to build the 20th century achievements of the Commonwealth Bureau of Meteorology (Zillman 2001; Day 2007). The 19th century pioneers of international meteorology established a tradition and framework of collaboration that made 20th century meteorology a model of international cooperation (Davies 1990; Gibbs 1994; Zillman 2006).

The common link in these two achievements was the German meteorologist, mariner and magnetician Georg Balthaser von Neumayer (1826-1909), who, over a period of almost 50 years, played a pre-eminent role in establishing the foundations of Australian, German and polar science and especially in building the spirit of peaceful scientific cooperation between nations for the good of all.

I am not an expert on von Neumayer's career though I have read the fascinating earlier accounts of his life's work by Sussenberger (1968), Home (1991), Home and Kretzer (1991) and others. But, as a major beneficiary of his legacy in all three phases of my own career, Australian meteorology, Antarctic research and international cooperation, I am pleased

to pay tribute to him by reviewing briefly the people and events of his time, those who inspired him and those whom he inspired in Australian, polar and international meteorology over the period 1857-1903.

MILESTONES IN AUSTRALIAN AND INTERNATIONAL METEOROLOGY

The early history of Australian and international meteorology reflects the strong Humboldtian influence on the development of all the Earth sciences through the second half of the 19th century (Heilbron 2003). It is illuminating to juxtapose a simple chronology of meteorological milestones and the names associated with them (Table 1) as they emerge from detailed histories such as those of Daniel (1973), Gibbs (1975), Davies (1990) and Day (2007).

There were, of course, many fascinating individuals and influences behind each of the events listed in Table 1 but a few stand out for their foresight, dedication and determination to advance the scientific understanding and practical application of Australian and global weather and climate.

Table 1. Milestones in the early development of Australian and international meteorology. The role of the scientists whose names appear in brackets are elaborated in the text and the references.

AUSTRALIA		INTERNATIONAL COOPERATION	
1788	First observations (Dawes)	1780	Societas Meteorologica Palatina Mannheim -57 Stations
1822	Paramatta Observatory (Brisbane)		
1840	Hobart Observatory (Ross)	1853	Brussels Conference (Maury)
1858	Flagstaff Observatory (Neumayer)	1872	Liepzig Conference (Wild)
1858	Sydney Observatory (Scott, Russell)	1873	First International Meteorological Congress, Vienna
1863	Melbourne Observatory (Ellery)		
1872	Overland Telegraph (Todd)	1873-79	Permanent Committee (Buys Ballot)
1876	Perth Observatory (Fraser)	1879	Second International Meteorological Congress, Rome
1877	First Weather Map (Russell)		
1879	First Inter-colonial Meteorological Conference, Sydney	1879-88	International Meteorological Committee (Wild, Neumayer)
1881	Second Inter-colonial Meteorological Conference, Melbourne	1882-83	First Polar Year (Neumayer)
1888	Third Inter-colonial Meteorological Conference	1891	First Conference of Directors, Munich
1901	Federation of Australia	1891	International Meteorological Committee
1906	First Meteorology Act	1896	Second Conference of Directors, Paris
1908	Commonwealth Bureau of Meteorology	1905	Third Conference of Directors, London

AUSTRALIA’S METEOROLOGICAL PIONEERS

Table 2 provides a short list of Australia’s meteorological pioneers and Fig. 1, based primarily on Gibbs (1975), provides a summary chronology of their period of active engagement in Australian meteorology.

Though it is exceedingly difficult to further reduce the short list in Table 2, arguably the six most outstanding figures of pre-20th Century Australian meteorology (Fig. 2) were:

- Lieutenant William Dawes who arrived with the First Fleet, established an observatory near where the southern pylon of the Sydney Harbour Bridge now stands and maintained detailed weather observations from 1788–1791.
- Georg Neumayer who first visited Australia from 1852–54. He returned to Melbourne from 1857–63 where he established the Flagstaff Observatory and a remarkable network of meteorological and other geophysical observations throughout Victoria.
- Robert Ellery, a Melbourne doctor-scientist, who took over Victorian meteorology on Neumayer’s departure, was appointed Government Astronomer and Meteorologist and served for almost 20 years as President of the Royal Society of Victoria.
- Sir Charles Todd who led the construction of the Overland Telegraph and established mete-

orological observing networks throughout South Australia and the Northern Territory. He was elected a Fellow of the Royal Society of London in 1869.

- Henry Chamberlain Russell who was Australia’s first native-born Government Meteorologist, the first graduate of Sydney University to be elected a Fellow of the Royal Society of London and the First President of the Australasian Association for the Advancement of Science (now ANZAAS).
- Clement Wragge the colourful and controversial Queensland meteorologist with national aspirations who pioneered the naming of tropical cyclones in the Australian region.

Neumayer’s contribution to Australian meteorology is documented extensively in the various other presentations at this Symposium but it is appropriate here to note, from his report of 14 September 1857 to Justus von Liebig, adviser to the King of Bavaria (Home and Kretzer 1991)), the resolve with which he set about the establishment of the original Melbourne Observatory on Flagstaff Hill (Figs. 3-6).

At the beginning of 1858, systematic work will begin.

This will have two aims: to detect simultaneous phenomena, and also to provide the strongest support for the magnificent work of Lieutenant Maury’s wind and current charts.

I believe I can state with assurance ... that the

Table 2. Australia's meteorological pioneers, showing their period of active engagement in Australian meteorology.

Name	Born	Active Period		Died
		Start	End	
W Dawes	1762	1788	1791	1836
T Brisbane	1772	1822	1824	1861
P P King	1791	1831	1848	1856
C Todd	1826	1856	1906	1910
G B Neumayer	1826	1857	1863	1909
R L J Ellery	1827	1863	1895	1908
H C Russell	1836	1859	1904	1907
C L Wragge	1852	1883	1903	1907

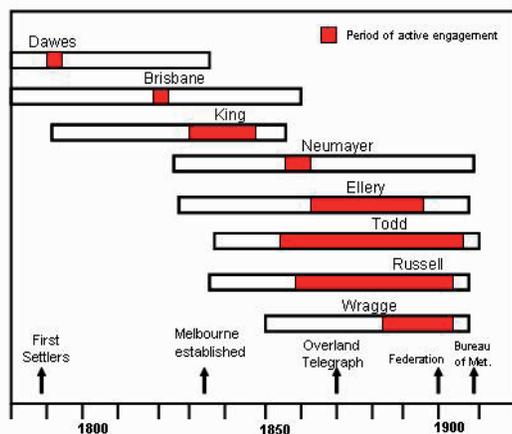


Fig. 1. The period of active engagement of eight of Australia's meteorological pioneers relative to landmarks in the early development of Australia (based on Gibbs 1975).

establishment and maintenance of an observatory in Melbourne for the combined purposes of navigation and the science of terrestrial magnetism is assured, something which should be greeted with the greatest pleasure by all men of science. (Neumayer 1857 in Home & Kretzer 1991: 242).

His achievements over the following six years in establishing the scientific foundations for meteorology in Victoria are nicely summarised by Home (1991) and the published records of his observations are held in the library of the Royal Society of Victoria.

INTERNATIONAL COOPERATION IN METEOROLOGY

It is, of course, quite difficult to produce an agreed short-list of the most outstanding pioneers of international cooperation in meteorology but one such

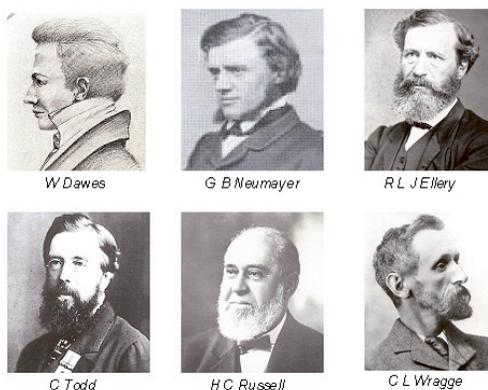


Fig. 2. Some of Australia's outstanding meteorological pioneers (see text).

attempt is given in Table 3 with their periods of active engagement in various international roles summarised schematically in Fig. 7.

The individual contribution of these pioneers of international cooperation in meteorology are chronicled in the records of the International Meteorological Organization (IMO) and various other publications on the history of meteorology (Daniel 1973; Davies 1990). And, of course, there were many others from many countries who played comparatively important roles in fostering the spirit of international cooperation which was to become the hallmark of meteorology in the 20th century (Zillman 2006). Those who, the literature suggests, would make a short short list (Fig. 8) include:

- Lieutenant Matthew Fontaine Maury, unquestionably the father of international cooperation in meteorology, who convened the 1853 Brussels Conference which originated the world-wide collection of data for scientific analysis and practical application and which led on to the 1873 establishment of the IMO.

Table 3. The pioneers of international cooperation in meteorology showing their period of active engagement on the international science and key offices held.

Name	Country	Born	Active Period		Died	Office Held
M F Maury	US	1806	1841	1873	1873	
C H D Buys Ballot	Netherlands	1817	1845	1890	1890	IMO President 1873-79
R FitzRoy	UK	1805	1853	1865	1865	
H Wild	Switzerland	1833	1868	1896	1902	IMO President 1879-96
G B Neumayer	Russia Germany	1826	1875	1903	1909	International Meteorological Committee 1879-1888
E Mascart	France	1837	1878	1908	1908	IMO President 1896-1907
V Koeppen	Germany,Russia	1847	1875	(1930)	1940	
W Napier Shaw	UK	1854	1879	1930	1945	IMO President 1907-23

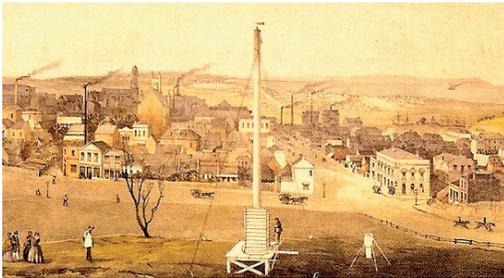


Fig. 3. The iconic image of Neumayer’s meteorological stand at Flagstaff Observatory looking south along what is now King Street.

- Admiral Robert FitzRoy (‘Darwin’s Captain’), who pioneered international cooperation in meteorological data collection for warning purposes and who was the first head of the UK Meteorological Office.
- Professor C.H.D. Buys Ballot, the Dutch meteorologist who formulated the physical laws linking the winds and atmospheric pressure fields and who served as the first President of IMO.
- Professor Heinrich Wild the remarkable Swiss-Russian scientist who played the leading role in the establishment of the IMO and who went on to serve as its second President.
- Professor E. Mascart of France, professor of physics at the College de France, the first Director of what is now the French Meteorological Service and the third President of IMO.
- Professor Dr Georg von Neumayer who, from his position as Director of the Deutsche Seewarte



Fig. 4. One hundred and fifty-nine years on. The small white building (just to the right of the meteorological stand in Fig. 3) constructed in 1850 at the corner of King and Latrobe Street as it is now.

from 1875 to 1903 played a pre-eminent guiding role in development of international cooperation in meteorology, oceanography and polar science and especially in the planning and organisation of the first International Polar Year (1882–83).

It is not possible here to provide more than the briefest glimpse of the origins of international cooperation in meteorology but it is worth quoting from Maury’s account (Maury 1855: 5-7) of the outcome of the 1853 Brussels Conference:

This conference recommended a plan of observations which should be followed on board the vessels of all friendly nations...

In peace and in war these observations are to be



Fig. 5. The memorial cairn now located on the approximate site of Neumayer's Flagstaff Hill Observatory.

carried on and, in case any of the vessels on board of which they are conducted may be captured, the abstract log is to be held sacred.

This plan contemplates the cooperation of all the states of Christendom, at least so far as the form, method, subject of observations, time of making them, and the interchange of results are concerned. I hope that my fellow citizens will not fail to second and cooperate in such a humane, wise and noble scheme.

Neumayer was an early and committed disciple of the Maury plan. As he and his international colleagues worked systematically to implement the Maury vision, the data collection made possible through this cooperation led to more and more authoritative versions of Maury's original diagram of the winds (Fig. 9)

The growing spirit of cooperation was well captured in the invitation, originated by Professor Wild, to the 1872 Leipzig Conference, which preceded the 1873 Vienna Conference and the establishment of IMO. In Wild's words:

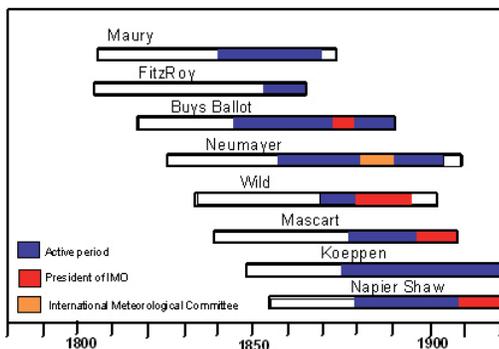


Fig. 7. The pioneers of international cooperation in meteorology and their periods of most active engagement in various international roles.



Fig. 6. The inscription on the Neumayer plaque on the Flagstaff Hill cairn mounted on the occasion of the 150th anniversary of Victoria as an independent colony.

At the present time, the increasing interest in meteorological research shown by all civilized countries has led to a demand for far-reaching coordination and standardization of the methods and procedures in use in different countries. Such suggestions have been put forward and discussed so frequently..... that the undersigned consider it both feasible and timely to propose the convening of a meteorological conference... (Daniel 1973: 160)

The 1873 First International Meteorological Congress was convened by the Government of Austria and attended by 32 delegates from 20 countries. It agreed on standardisation of meteorological instruments and times and methods of observation. Most importantly, it also put in place arrangements for the mutual exchange of observations by telegraph. It agreed on the need for a permanent international me-



M F Maury



G B Neumayer



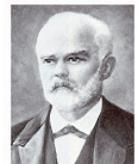
R FitzRoy



C H D Buys Ballot



H Wild



E Mascart

Fig. 8. Some of the pioneers of international cooperation in meteorology (see text).

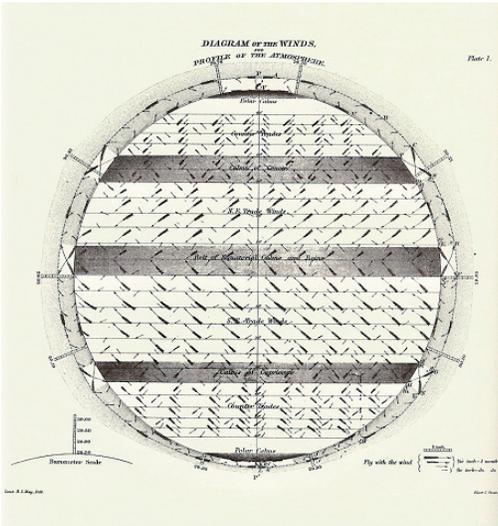


Fig. 9. Maury's original diagram of the winds (Maury 1855).

teological organisation and established a Permanent Committee which is now regarded as marking the birth of the IMO (Daniel 1973).

The subsequent International Meteorological Congresses changed in organisation and composition but von Neumayer and his colleagues continued to work closely together to guide the process forward (Fig. 10 and 11).

Through all of this period, the focus on international cooperation in data collection, exchange and analysis became stronger and stronger with the First International Polar Year of 1882-83, which was planned and organised under the leadership of von Neumayer (Fig. 12), serving as the prototype for the Second International Polar Year of 1932-33 and the major international global data-collection and research initiatives of the second half of the 20th century (Davies 1990).

THE VON NEUMAYER LEGACY

These, then, were some of the outstanding national and international pioneers of the science and practice of meteorology.

They laid the scientific foundations on which the Australian Bureau of Meteorology was built and serves to the present day.



Fig. 10. The second International Meteorological Congress in Rome in 1879. Von Neumayer is in the front row second from left.



Fig. 11. The first Conference of Directors of Meteorological Services in Munich in 1891. Von Neumeyer is in the front row second from the right. (Clement Wragge is third from the left in the second row).



Fig. 12. Assessing the outcome of the 1882–83 International Polar Year. The Fourth International Polar Conference in Vienna 1884. Von Neumayer is in the front row on the extreme right.

They established, forever, the duality of meteorology as a science and as a service to society.

And they devised the framework of international cooperation, standardisation and data exchange which underpins the Convention of the World Meteorological Organization (WMO) and its role as a Specialised Agency of the United Nations. Their achievement owes much to the dedication and influence of one remarkable man who established the tradition of scientific excellence in Australian meteorology and who inspired the spirit of friendly cooperation between nations in applying meteorology and its sister sciences for the common good.

It has, indeed, been a privilege to join with Australian and German colleagues from meteorology and those other fields of science in which he excelled to honour the life work of Georg Balthasar von Neumayer on the occasion of the 100th anniversary of his death on 24 May 1909.

REFERENCES

- DANIEL, H., 1973. One hundred years of international cooperation in meteorology. *WMO Bulletin* 22(73): 156-199.
- DAVIES, D.A., 1990. Forty Years of Progress and Achievement: A Historical Review of WMO. Secretariat of the World Meteorological Organization, Geneva, WMO-No. 721.
- DAY, D., 2007. *The Weather Watchers: 100 Years of the Bureau of Meteorology*, Melbourne University Press, Melbourne.
- GIBBS, W.J., 1975. *The Origins of Australian Meteorology. Historical Note*. Australian Government Publishing Service, Canberra.
- GIBBS, W.J., 1994. Recollections of the achievements of the International Meteorological Organization and the World Meteorological Organization. World Meteorological Day Lecture 1994. Bureau of Meteorology, Melbourne.
- HEILBRON, J.L., 2003. *The Oxford Companion to the History of Modern Science*. Oxford University Press, New York.
- HOME, R.W., 1991. Georg von Neumayer and the Flagstaff Observatory, Melbourne. In *Berlin to the Burdekin: The German Contribution to the Development of Australian Science, Exploration and the Arts*. UNSW Press, Sydney.
- 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.
- MAURY, M.F., 1855. *The Physical Geography of the Sea and its Meteorology*. Harvard University Press (Edited Reprint, 1963).
- SUSSENBERGER, E., 1968. Centenary of the Deutsche Seewarte. *WMO Bulletin* XVII, No.4, 206-209.
- ZILLMAN, J.W., 2001. A hundred years of science and service. Australian meteorology through the 20th century. In *2001 Yearbook of Australia*, Australian Bureau of Statistics, Canberra, 22-50.
- ZILLMAN, J.W., 2006. The WMO legacy for the 21st Century: Meteorology as a model for humanity. *WMO Bulletin* 55(3): 191-199.