

Alexander von Humboldt, scientific explorer and research communicator *par excellence*

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Abstract

In recognition of the 250th anniversary of Alexander von Humboldt's birth, this paper explores his achievements and impact as explorer, scientist and author.

Introduction¹

In his day, Alexander von Humboldt is said to have been the most famous man after Napoleon Bonaparte (1769–1821) (Wulf, 2015). He was recognised for his preeminence as an explorer and as a scientist and his extensive writings for both general and academic audiences. During his life and ever since, honours have been bestowed on Humboldt. European and foreign academies and learned societies elected him to membership. More species have been named after him than any other individual (Wulf, 2015). He is also recognised in both geographical and astronomical features, and the names of places and institutions.

When Humboldt died in 1859, but also upon the centenary of his birth a decade later, both the Old and New Worlds marked these occasions with innumerable events recognising his achievements. In more recent times, particularly in the English-speaking world, Humboldt's significance has been largely forgotten. Two contemporary factors have

seen him returning to prominence: in 2019, the 250th anniversary of his birth and, with climate change now so evident, the fact that it was Humboldt in 1800 who provided the first-recorded description of human-induced climate change.

This paper explores:

- Alexander von Humboldt's background,
- his achievements as explorer, scientist and author,
- why his prominence faded for a significant period, and
- his significance in the contemporary context.

Humboldt's background

Friedrich Wilhelm Heinrich Alexander von Humboldt (Botting, 1974; Wulf, 2015b) was born in Berlin on 14 September 1769. He was from a well-to-do and well-connected family and, with his older brother, Wilhelm (1767–1835), was educated by able and progressive tutors. Wilhelm is famous in his own right as an intellectual, statesman and diplomat as well as founder of the Humboldt University in Berlin.

¹ This paper has been adapted from my address, as President of the Australian Association of von Humboldt Fellows, at the 2019 biennial symposium of the Australian and New Zealand Associations, *Sharing Knowledge in the Spirit of Humboldt*, held at Macquarie University on 22–24 November 2019.

As a child, Alexander was a collector of plants, insects, rocks, shells and the like, perhaps foreshadowing his future calling. Nevertheless, marked for high public office, at 18 years of age he was enrolled at the University of Frankfurt on the Oder and studied government administration and political economics. One semester later, however, he transferred to the University of Göttingen. Here he spent two years focusing on sciences, mathematics and languages.

Significantly, in Göttingen, Humboldt met Georg Forster (1754–1794) who, as a young man, had accompanied Captain James Cook (1728–1779) on his second voyage to the Pacific. During his youth, Humboldt had read and been captivated by Cook's journals. Lively conversations with Forster intensified Humboldt's *Wanderlust* ('travel bug'). Subsequently, he relished four months of journeying with Forster in the Netherlands, England and France. While in England, Forster introduced Humboldt to Sir Joseph Banks (1743–1820), President of the Royal Society and botanist on Cook's first voyage. This 1790 encounter led to a supportive scientific friendship between Banks and Humboldt. It is worthy of note that Forster was not only a prominent scientific traveller but also a significant figure in the Enlightenment movement — in both spheres, he influenced the younger Humboldt.

Humboldt's intense curiosity, extraordinary memory and passion for travel were developing as a powerful combination. For example, he published a paper in 1790 on the several types of basalt observed during a scientific excursion up the Rhine River (*Mineralogical Observations on Several Basalts on the River Rhine*). In this period, he amassed a range of such experiences, which

would see him well qualified as a scientific traveller. He also developed his knowledge of commerce, languages, anatomy, astronomy and the use of scientific instruments. Further, he undertook academic and practical studies at the renowned Mining Academy of Freiberg in Saxony.

At the age of 22 years, Humboldt gained a government appointment as mining inspector which gave him some scope for travel. He excelled in the role of mining inspector, increasing gold production, inventing safety equipment and, for the miners, improving their conditions through writing textbooks for them and opening a free school, the latter at his own expense. His diligence and capacity saw him promoted and also entrusted with diplomatic missions. At the same time, he continued his scientific interests, undertaking plant research and dabbling in animal electricity (galvanism). With his developing profile, he was introduced into the famous Weimar cultural and intellectual circle, which included Johann Wolfgang Goethe (1749–1832) and Friedrich Schiller (1759–1805). Humboldt continued to travel, including undertaking a geological and botanical expedition through Italy and Switzerland in 1795. The next year brought a life-changing development when, following his mother's death, he inherited the means to resource scientific travels and resigned from the public service.

Explorer of the Americas

Humboldt went to Paris, a major centre of contemporary intellectual life. There, he gained an invitation to join a five-year French voyage of exploration and was greatly disappointed when it was cancelled due to the outbreak of war. Having met the expedition's intended botanist, Aimé Bonpland (1773–1858), the two decided to set out in

search of other options. Arriving in Madrid, they gained access to the King of Spain, who was open to Humboldt's proposal for a self-funded scientific expedition to Spanish America. Armed with the necessary authorisations and the best instrumentation of the day, Humboldt and Bonpland set sail in June 1799 and spent the next five years exploring the Americas.

Their travels commenced in Venezuela, took them twice to Cuba, included an extensive period of exploration in the Andes, and concluded with a visit to the United States, where Humboldt was received by President Thomas Jefferson. Humboldt's venture encompassed:

- some 10,000 kilometres across Venezuela, Columbia, Ecuador and Peru;
- a 6,000 metre climb in the Andes to just below the peak of what was then considered to be the world's highest mountain, Chimborazo;
- collection of 45 crates of specimens, including 60,000 plant specimens;
- recording of ground-breaking data encompassing astronomy, biology, geology, meteorology and oceanography;
- some 4,000 pages of notes in travel diaries, and
- expenditure of a third of Humboldt's fortune.

It is worthy of note that Humboldt was meticulous in recording his observations, without knowing whether or not he would need the material for subsequent analyses or publication. He wrote: "I have made it my duty to enter all my observations into my diary without any selection" (Leitner, 2005, p. 67).

The impacts of Humboldt's travels were profound. As well as the scientific knowledge

distilled from the data sources highlighted above and applications thereof, his travels made available:

- ethnographic studies into the ancient civilisations of Spanish America;
- social research on the Spanish colonies;
- mineralogical surveys;
- assessments of agricultural and mining production and their enhancement, and
- improved maps.

Jefferson would acknowledge Humboldt as "the most scientific man of his age" (Wulf, 2015b, p. 102).

Visionary scientist and research communicator *par excellence*

In August 1804 Humboldt returned to Europe with one legacy of his expedition an international scientific reputation — he was a nineteenth-century superstar. His publications were to become another legacy — significantly, he wrote for both scientific and wider audiences, the latter transporting readers into Humboldt's adventures. Ultimately, 30 volumes, disseminating his observations and their interpretation, were published over the rest of Humboldt's life, consuming the remainder of his fortune. Thus, while Humboldt had been working from Paris, he needed to relocate to Berlin in 1827 for a salaried post. On occasions, interspersed with all his intellectual endeavours, Humboldt was called upon by the Prussian royal family for diplomatic duties.

On his return 'home', Humboldt missed the intellectual stimulation of Paris but did not rest on his laurels. He offered popular free public lectures which were immortalised in his last major publication, the 5-volume *Cosmos: A Sketch of a Physical Description of the Universe* (1845–1862). He also furthered

his interest in terrestrial magnetism, which led to a chain of magnetic and meteorological stations across the globe. As exemplified by this initiative, Humboldt promoted free exchange of knowledge and his project was one of the earliest examples of international scientific collaboration.

Humboldt continued to undertake travels in Europe but only one other major expedition, in his sixtieth year, to Russia. He and his party traversed over 15,500 kilometres by coach in eight weeks. The journey's focus was to assess mining prospects for the Russian Government. While the travel was too rapid to be very profitable scientifically, Humboldt did gather some comparative data for his later works. Further, his observations corrected an exaggerated height estimate for the Central Asian plateau and predicted the discovery of diamonds in Ural gold washings.

This gifted man also had the ability to draw, a talent which enabled him to generate visual records of his observations and subsequently illustrations for his publications. With maps and diagrams, Humboldt sought to present complex information in an accessible manner. His illustrations were enhanced by a significant contribution based on his observations of temperature, pressure, humidity and flora and fauna against elevation. Thus, informed by his research into the geographical distribution of plants, he introduced the concept of isotherms, lines on a map connecting points of the same temperature. He similarly instituted isobars to connect points of the same pressure.

Humboldt's studies into climatology included early work on atmospheric disturbances and recognition of comparable climate zones across continents and flora and fauna distributed accordingly, with the conclusion that nature was a global force.

His magnetic studies demonstrated the decrease in the Earth's magnetic field in moving from the poles to the equator. He also discovered that the Earth's magnetic equator was some 800 kilometres south of the geographic equator.

Thus, Humboldt had a major impact on the evolution of a number of sciences, in particular, physical geography and meteorology. Key to this were:

- his mastery of relevant contemporary instrumentation,
- his painstaking collection of wide-ranging data sets,
- his studies of flora and fauna *in situ*, and
- the meticulous publication of his observations and their interpretation.

His insights led him to a recognition of the sciences' interconnection and to the promotion of a holistic view of the natural world, the unity of nature. His quantitative methodology is characterised as Humboldtian science. In line with his view of nature, Humboldt advocated for *Reisekünstler* (artist travellers) to present scientifically accurate *Naturgemälde* (nature painting); they were to be precise natural historians (Heathcote, 2001; Pullin, 2011).

His wide-ranging studies and integrated view of nature enabled this visionary thinker to develop an ecological understanding that recognised the interconnectedness of life on Earth. In 1800 he provided the first-recorded description of human-induced climate change. In South America, he saw the impacts of colonisation — deforestation for the introduction of agriculture with consequent soil erosion and altered climate patterns. Linking social and economic factors with environmental issues, he highlighted the importance of forests to the ecosystem.

Humboldt not only spoke out against environmental concerns but also against slavery, colonialism and other social issues. Familiar with the repressive Prussian state, he sought to promote a more democratic society.

Humboldt as mentor

Significantly, Humboldt's travelogues inspired the youth of his day. German Australian explorer Ludwig Leichhardt (1813–ca. 1848) wrote that Humboldt was:

one of those men ... whose deeds sounded like legends to the boy, filled the youth with rapture and finally drew him to follow a similar direction (Fiedler, 2007, p. 75).

Young scientists looked up to Humboldt and sought to emulate him. Renowned Australian botanist Dr Ferdinand von Mueller (1825–1896) stated:

Humboldt's works ... 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 (*Melbourner Deutsche Zeitung*, 1859).

Similarly, the young Charles Darwin (1809–1882) had read Humboldt's *Personal Narrative*. He indicated that, without Humboldt's influence, he would not have undertaken his *Beagle* voyage or written *On the Origin of Species* (Worrall, 2015). Darwin described Humboldt as the "greatest scientific traveller who ever lived" (Wulf 2015b, p. 282).

Through his publications, prolific correspondence, accessible lectures, gift for languages, and lively personality, Humboldt profoundly influenced the scientific community of his day. He also generously supported and mentored young scientists

and scientific travellers. The Alexander von Humboldt Foundation,² which similarly fosters young researchers, is thus aptly named in his honour.

Conclusion

Humboldt died in Berlin in May 1859, in his ninetieth year, and was honoured with a state funeral. Innumerable tributes were paid to him in both the New and Old Worlds. For example, in Melbourne, the German community held a dinner to honour Humboldt (McMullen, 2012; *Melbourner Deutsche Zeitung*, 1859b). With the passing of this great polymath came the end of a scientific era "when you could hold all the world's knowledge in your head" and a time when science was "hardening" into specific disciplines (Worrall, 2015; Wulf 2015b, p. 335).

That phenomenon of specialisation and increasing Anglo-Saxon dominance were reasons why Humboldt generally faded into obscurity outside Germany. A more significant cause, however, was anti-German sentiment arising especially from the two World Wars, but already evident in Australia in the 1880s, when Germany was developing as a colonial power in our region, and again during the Boer War (Tampke & Doxford, 1990).

Further, Wulf has noted that Humboldt: invented the web of life ... We are shaped by ideas from the past, and Humboldt gave us the very concept of nature that we hold today. But ironically, his views became so self-evident that we have largely forgotten the man behind them (Wulf, 2015c).

² The Alexander von Humboldt Foundation promotes "academic cooperation between excellent scientists and scholars from abroad and from Germany", particularly through provision of research fellowships and research awards, <https://www.humboldt-foundation.de/web/about-us.html>.

In a recent Humboldt Foundation magazine, the editor asks: “What if Humboldt were a researcher today?” The editor then fantasises—Humboldt:

was a marketing genius. A networker who never stopped writing letters. He loved succinct sentences and punchlines. He held lectures for a wide audience. He took a stand on slavery, colonialism and environmental destruction. Today, he would probably tweet—against climate change sceptics and fake news mongers. He would appear on talk shows and have his own YouTube channel.

Which area would this polymath choose to specialise in today, where would his adventures lead him?

Perhaps he would study the melting permafrost in Siberia. He would certainly be attending international conferences all over the place. Or he would be on the first manned flight to Mars (Scholl, 2018).

If Humboldt was with us today, I think that his focus would be on contemporary environmental and climatic issues—he would likely home in on the fires in the Amazon basin and, in the engaging style for which he was renowned, admonish us for failing to heed his forewarnings of 1800 in relation to the impacts of “meddling with the environment” (Wulf, 2015d).

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