

Alex Sinclair,
in a conversation
with author
Andrea Wulf,
explores Alexander
von Humboldt's
contribution to
science

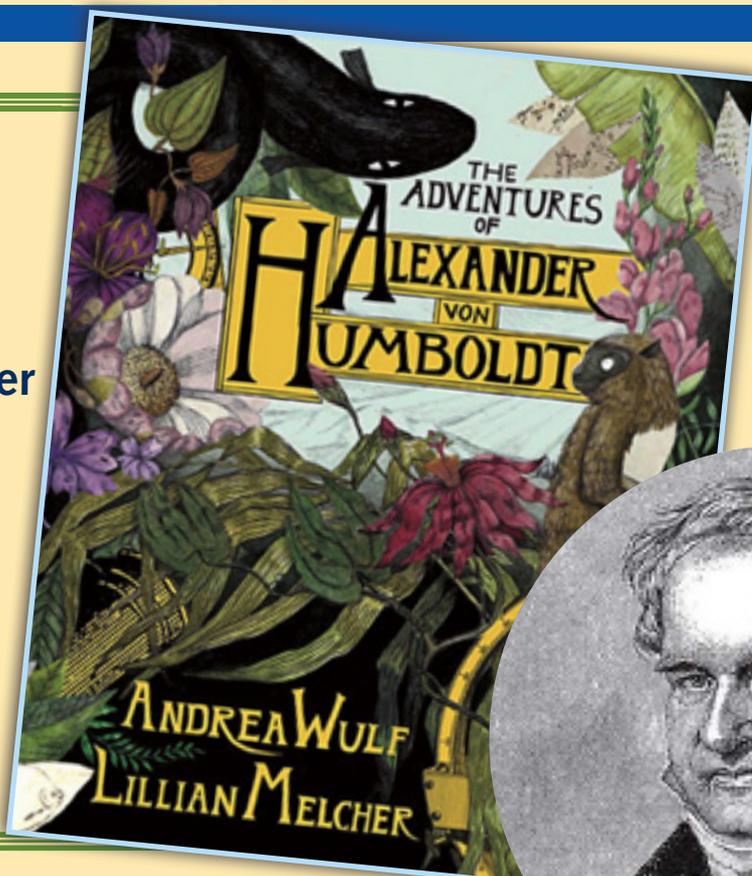


Figure 1
Alexander
von Humboldt
(1769–1859)
(image, Wikimedia
Commons)



WHAT HAS HUMBOLDT EVER DONE FOR YOU?

How many times have you been asked who your favourite actress, musician or film star is? But what about your favourite scientist? Do you even have a favourite scientist? I hope that by introducing my favourite scientist, this article gets you thinking about how the current fascination with celebrities could be widened to encompass scientists as well as media stars.

Let me present Alexander von Humboldt (Figure 1). Despite having more places and living things named after him than any other person in history (the Humboldt penguin, the Humboldt mountain ranges and *Mare Humboldtianum*, an area on the Moon, to name but a very few), I am

confident that many readers have not heard of him.

This article developed from a conversation with Andrea Wulf, the author of a beautiful new graphic book called *The adventures of Alexander von Humboldt*, who is convinced, as I am, that he should feature in the primary science curriculum. Between us we identified five broad areas that we think justify his inclusion and these are outlined below.

He loved to observe and measure

Like any good scientist, Humboldt was fanatical about taking accurate recordings and measurements (Figure 3). His science, however, was

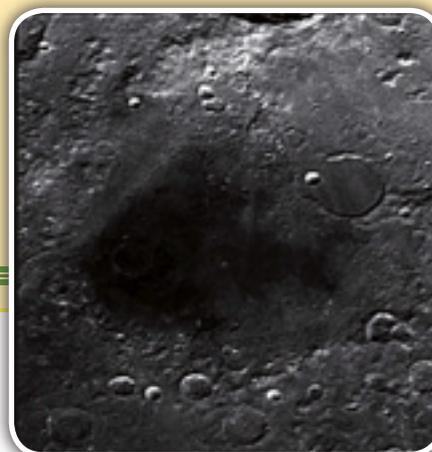


Figure 2 *Mare Humboldtianum*, an area of the Moon, and the Humboldt penguin, just two of the huge number of places and living things named after Humboldt (images, Wikimedia Commons)



Key words: ■ Humboldt ■ Famous scientists

not confined to a laboratory and much of his working life was spent travelling around the Americas. In this time he and his companions carried up to 42 different measuring instruments. These included a hair hygrometer that measures relative humidity (see *Weblinks* below), thermometers to test the boiling point of water at different altitudes, and chronometers (time pieces). Perhaps his most prized possession was his barometer, which he used to measure the air pressure in the different places that he visited to determine his altitude (see *Weblinks* for how to make one). He also collected and preserved all the new plant species that they discovered (see *Weblinks* for how to press flowers).

So meticulous were Humboldt's recordings that in 2012 a group of scientists felt confident enough to use a set of his historic data on the distribution of plant species in the Andes to compare with their own (Morueta-Holme, *et al.*, 2015). Do children get enough opportunities to undertake science activities outside the classroom as Humboldt did, and could they be challenged to take accurate measurements that would withstand scrutiny 210 years later?

He just discovered so much important and fascinating stuff

Humboldt's keen interest in everything to do with the natural world, and his obsession with measuring, meant that he did not just focus on one area of science as most scientists do now. His discoveries were diverse and many. While he did not necessarily use the following terms, these are just some of the ideas attributed to his work:

- Identification of more than 2000 plant species new to Europeans. Considering that only 6000 species had been named at that time this was an incredible feat.
- Suggestions that volcanoes were on fault lines. He noticed that volcanoes could be found grouped together or in long chains, which he thought were linked to what was happening deep under the surface of the Earth.
- He suggested an 'ancient connection' between Africa and South America more than a century before scientists began to discuss shifting tectonic plates. He came to this conclusion by identifying that the coastal plants in Africa and South America were similar.
- Identification of keystone species, 200 years before the concept was

Figure 3
Humboldt was fixated with observing and measuring (from Wulf and Melcher, 2019)



Figure 4 The forgotten father of environmentalism (from Wulf and Melcher, 2019)



named. Humboldt recognised that there are particular key animal or plant species that play a critical role in the healthy functioning of an ecosystem (to exemplify this there is an excellent video that outlines what a keystone species is by demonstrating the effect of the reintroduction of wolves into Yellowstone Park – see *Weblinks*).

- Realising there are global vegetation zones. By comparing the flora and fauna in different places around the world, Humboldt noticed that comparable animals and plants lived at similar altitudes.

The latter two could be used as stimuli when learning about food chains and webs, or when studying the adaptations of different organisms. They are perhaps of most significance to modern-day thinking as they relate to how he viewed the planet as a connected whole. This contributed to his pioneering work for environmental studies.

What he did for environmentalism

Humboldt is also considered the forgotten father of environmentalism, being one of the first to identify many of the key issues that the planet is currently facing. Even back in the 1800s, he was well aware of humans' power over nature, suggesting that we were 'raping nature'. His scientific recordings show his concerns about

the climate and how these were related to deforestation, irrigation and the effects of relying on a monocultural form of agriculture (Figure 4). He even identified the potential dangers of the 'great masses of steam and gas' being produced by industrialised towns and cities. All these topics could provide excellent starting points for discussion about the many effects humans have had on the planet, highlighting that this is not a modern problem.

Influences

Humboldt's influences are wide ranging and, as noted above, much of the current environmental movement can be traced back to his work: he had even considered naming one of his books 'Gaia', more than 200 years before James Lovelock conceived his famous Gaia theory. He described Earth as a living organism and talked about harmful human-induced climate change. The contemporary scientists who used his data have noted that the vegetation he recorded has shifted position as a result of the increased temperatures brought about by climate change. In addition to this, Charles Darwin had a working copy of Humboldt's writing in which he underlined many key ideas. It is tempting to suggest that without this Charles Darwin may not have formulated his ideas about natural selection and evolution.

He was a different type of scientist

As I have highlighted already, Humboldt very much looked at how aspects of the planet were related and was keen to make connections. This is in opposition to the works of Carl Linnaeus who was a rigid classifier. We currently appear to favour Linnaeus's type of science as there are four times as many references to classifying and identifying in the National Curriculum in England as there are to pattern-seeking: perhaps an increase in pattern-seeking enquiries might help to improve this situation. One way to overcome this might be the process of 'non-naming', which focuses on the sensory experiences garnered from engaging with an animal or plant prior to learning its name. This approach includes asking questions such as *How does it feel?*, *How does it talk?*, *How does it see?*, *How does it smell?* and *What is it like?* (Dickinson, 2013: 331). Dickinson recommends that children should still

learn scientific names but only after this process. This would prioritise emotions over classification.

The inclusion of emotions within a science lesson may cause consternation for some. However, this is Andrea Wulf's key reason for wanting Humboldt included in the curriculum. His writings were conveyed in such a way that his awe and wonder for the natural world were evident. She wonders if some of the science community, who convey their ideas in sterile ways, could learn from this approach and as a consequence help us to care more for our planet. There has been a recent trend for a STEAM (science, technology, engineering, arts and maths) approach to learning science and many have rightly commented that this has the potential to reduce the science content. I am convinced, however, there are ways in which the arts can be used to communicate science that do not dilute the scientific content but allow an expression of emotions about the world.

Summary

Because of the sheer volume and diversity of Humboldt's work, it has only been possible to give a small outline of what he achieved. Has this convinced you that you should include Alexander von Humboldt in your teaching? There is so much more for you to explore and I hope that this article stimulates you to do that.

References

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- Wulf, A. and Melcher, L. (2019) *The adventures of Alexander von Humboldt*. London: John Murray.

Weblinks

- How a hair hygrometer works: www.youtube.com/watch?v=6Jzhda5iha0
- To make a barometer: www.wikihow.com/Make-a-Simple-Weather-Barometer
- To press flowers: www.proflowers.com/blog/how-to-press-flowers
- Reintroduction of wolves to Yellowstone Park: www.youtube.com/watch?v=ysa5OBhXz-Q

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