# Plant Blindness

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Breaking the Ice: Women, Science, and Antarctica,Series

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I'm a plant physiologist, and I study how plants respond to the environment and how plants have shaped the earth's biogeochemical cycles. I'm interested in both natural ecosystems, like forests, and managed ecosystems like crops. Antarctica is not at all an obvious place for a plant physiologist to want to go. There are very few plants on land, and most of them are lower plants like mosses. Life in Antarctica is built on microscopic photosynthetic organisms that live in the sea, and this is the case even for animals that live on the land for part of the time, like penguins. When you think about it, this type of ecosystem is incredibly rare for our planet. Recent work by Bar-On et al. **[1]** estimated that green terrestrial plants form 80 percent of all biomass on earth, on a carbon basis. The land is mostly green, and I'm sure that aliens would comment on plants first if they were to visit earth.

But Antarctica is not green; it is white, blue, and black. This means that the places that have some green stand out like a sore thumb.

The current location and climate of the continent means that Antarctica is just too cold for higher plants to grow. Most plants need temperatures above 5°C to grow; below this temperature, the processes involved in cell expansion just don't work. That's not to say that the key and unique process that plants carry out—photosynthesis—can't operate at 5$^{o}$C. Actually, it can; most plants from temperate environments have measureable photosynthesis even at 5$^{o}$C. The problem is further down the chain. New carbohydrates formed by photosynthesis are used to form and expand new cells, and these processes struggle at lower temperatures. This is called sink limitation, as opposed to source limitation.

**Fossils of trees have been found in Antarctica**. They are around 260 million years old, from when the climate on the continent was warmer, wetter, and more humid than it is now. Geologists think that the location of Antarctica 260 million years ago was similar to today, meaning that these ancient trees were able to cope with almost complete darkness (source limitation) for many months in the year. But the formation of the Gondwana supercontinent resulted in climate extremes leading to the development of the polar ice cap, causing the extinction of Antarctica's forests. The sink limitation was the final nail in the coffin for trees in an environment that was source-limited for nearly half the year.

I saw just a handful of individuals of one species of higher plant my whole time in Antarctica. It was a little grass species called *Deschampsia antarctica* growing at the Argentinian station Carlini. The plants were tiny. If I compare them to another grass species that I work on—wheat (*Triticum aevistum*)—I would guess that wheat would grow to that size (in terms of total biomass) in just a few weeks. But I would guess the Antarctic grasses might take several years to grow that size.

> The lack of green in Antarctica really brought home to me how important higher plants (i.e., larger, multicellular terrestrial plants, especially trees) are to the world. Since the start of the industrial era, humans have reduced the number of trees by 46 percent and caused the extinction of 50 percent of plant species.

Our ecosystems and the planet depend fundamentally on plants for life. Animals are the jewellery of the planet: bright, sparkly accessories that can be done without. Yet humans don't notice or value plants as highly as animals. This is probably because, as animals ourselves, we are evolutionarily primed to take notice of moving organisms. If something moves it might eat us, or we might like to eat it. This has a name—plant blindness.

In Antarctica, my disciplinary training allowed me to see my own plant blindness. I realized that I need to understand myself and other humans by working with social scientists, humanities academics, and artists in order to find ways to open our collective eyes to the vital importance of plants to the future of our planet. In 2019, I provided scientific advice to environmental artist Janet Laurence on her major new installation

**“Theatre of Trees”** for the **“After Nature”** exhibition at the Museum of Contemporary Arts in Sydney, and co-curated an associated public lecture series called **“Talking Trees.”** The exhibition and lecture series raised the profile of plants in the minds of environmental humanities scholars and the general public. I am also currently collaborating with a philosopher and two creative practice artists to develop a new understanding of the environmental sustainability lessons to be learned from plants.

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**[1]** Yinon M. Bar-On, Rob Phillips, and Ron Milo, “The biomass distribution on Earth,” *Proceedings of the National Academy of Science of the United States of America* 115, (2018): 6506–6511, **https://doi.org/10.1073/pnas.1711842115**.