

# Time to end the vascular plant chauvinism



**A**mong the vast diversity of plants, we often focus our admiration, conservation efforts and research on vascular plants: the towering trees, flowering shrubs, and beneficial grasses and herbs. However, this emphasis reveals a bias that leaves the non-vascular plants – the tiny, overlooked, inconspicuous plants – hidden in the shadows, literally. These ‘lower plants’, as the research community likes to call them, lack the majestic height, vascular structures, roots, and flowers of their larger relatives and so rarely capture our attention. However, they are key to some of the Earth’s most extreme and vulnerable habitats.

Bryophytes, non-vascular plants that include mosses, liverworts and hornworts<sup>1</sup>, flourish in environments where even the hardiest vascular plant species cannot survive. They thrive on mountaintops, in the polar tundra, cool shrublands, and under dark forest canopies, where they have key roles in nitrogen cycling, regulating microclimates, storing carbon, pioneering new ecosystems, and serving as bio-indicators of pollution<sup>2,3</sup>.

Comprising approximately 19,000 species<sup>4</sup>, the diversity of bryophytes surpasses that of ferns and lycophytes (~12,000 species<sup>5</sup>) and nearly doubles the recorded species of grasses (Poaceae; ~11,500 (ref. 6)). Their diversity is also nearly 20 times greater than that of

gymnosperms (1,100 (ref. 7)). Despite this, there are only 500–1,000 bryologists worldwide, compared with the 20,000–40,000 researchers who study flowering plants.

These miniature plants invite the keen observer to kneel down and use tools such as a hand lens to admire their beauty up close. They deserve protection and to be studied in their own right, yet their potential uses are also notable – ranging from carbon storage in cement (see, for example, ‘Respyre’) to the potential translational value of the hornwort pyrenoid for improving crop photosynthesis<sup>8</sup>, to the production of biopharmaceuticals<sup>9</sup>.

In ecosystems where vascular plant diversity decreases owing to extreme climates, non-vascular plants rise to the occasion, filling ecological roles that are vital to the ecosystem. For example, bryophytes can be the dominant plant group in cold ecosystems such as boreal forests and arctic tundra as well as in tropical cloud forests, southern temperate rain forests and in the Páramo, an alpine tundra ecosystem in Central and South America.

The delicate, enigmatic beauty of these organisms reflects their equally delicate, yet essential, ecological roles, showing that, indeed, it is the smallest organisms that often drive the greatest functions.

To fully appreciate the plant kingdom, it is time to let go of our vascular chauvinism

and recognize the importance of these humble, yet key, organisms on which our planet depends.

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## Competing interests

The authors declare no competing interests.