Acceptance speech
21 de septiembre de 2021

Sandra Lavorel, awardee in the Ecology and Conservation Biology category (13th edition)

Agradezco mucho a la Fundación BBVA y a todas las personas presentes por el gran honor que este premio representa.

This prestigious prize comes as an opportunity to celebrate a near 25-year endeavour. This year's BBVA Foundation Frontiers of Knowledge Award in Ecology and Conservation Biology recognizes Professor Sandra Díaz from CONICET and the University of Cordoba, Argentina, Professor Mark Westoby from Macquarie University in Sydney, Australia, and myself for our roles as visionaries and catalysts in a collective adventure that challenged researchers in plant ecology like ourselves to bring biodiversity into the assessment of climate change impacts on Planet Earth.

Here is the problem as initially formulated. Climate modellers were aware that the thin, green skin of terrestrial ecosystems significantly influences climate at least by sequestering and respiring carbon, exchanging water vapor and reflecting solar energy. Vegetation modellers then asserted that this green skin was not the same colour or texture everywhere across regions, and that short of taking this into account projections of climate impacts and of the climate itself would be incorrect. But how could one account for all the biodiversity of vegetation across the globe to feed high-level models?

About 391,000 species of vascular plants are currently known to science. In the highly biodiverse Iberian Peninsula, there are nearly 6,500 species and subspecies. This region is famous for its long tradition in outstanding botany and vegetation science. Yet it is still impossible to describe and anticipate the response of each of these species to changing climate, and the impacts this would have on carbon and water cycling.

Plant scientists had to imagine a solution! Lead thinkers including Colin Prentice, Hank Shugart and Ian Woodward thought the problem could be resolved by using a small number of groups of species with similar behaviours. But how to group species?

The concept of plant functional traits was born. Put simply, functional traits are characteristics of plants morphology, physiology or reproduction that can achieve at least one of two things.

First, be linked to their responses to environmental factors like climate or soil fertility. Secondly, have impacts on ecosystem functions like carbon and water cycling. Additionally, for practical purposes these traits should preferably be easy to measure for many species across regions.

Professor Sandra Díaz, Professor Mark Westoby and I boarded this adventure as field-based ecologists who had a strong understanding of how plants behave in natural ecosystems, and a lot of optimism that this would even be possible. Together with motivated colleagues we have in the last two decades helped advance the identification and use of plant functional traits, in more ways that any one including ourselves would have imagined at the start.

Make it simple we were asked! Some plant physiologists thought accounting for the intricacies of photosynthesis, respiration and plant growth by measuring simple things like how much area a leaf has per unit mass was simply wrong. Some vegetation scientists were outraged that one dare simplify the complexity of diverse communities by just describing plant leaves, how tall they are and the size of their seeds. This is where our passion for knowledge as a never ending adventure and three qualities came to help. First, our creativity to use theory to abstract ourselves from complex details and look for the big picture without betraying our intimate knowledge that every plant is subtly different. Secondly, our optimism and persistence that allowed us to trial the concept in the ecosystems we each new best. Thirdly, our ability to motivate and charm others to do the same in their own backyard.

Ten years later, with co-instigators we had proved the concept, produced methods allowing compatible measurements on many species in many different contexts, and several groups of researchers were investigating different aspects of the problem like how the structural and chemical properties of leaves reflect plant physiology, whether measuring leaves is enough to know what plant roots are doing, or whether these traits do explain species distributions across regions with different climates and their responses to management.

This is when two things happened.

The trick could only work if scientists could collect lots of data, across all continents and ecosystem types. Additionally, even if this ambitious goal was reached, it would not be any use to anyone if data was archived in individual labs, sometimes in arcane formats. Sharing data was essential if we did want to continue to discover global patterns. Additionally, people who are good at measuring plants in the field and in the lab are very rarely those who can design and apply complex models coupling climate and vegetation. The next step in our collective adventure had a daring name: TRY, because we just needed to convince people to do that, even if this was not yet the culture in our scientific discipline. Impulsed in 2007 with visionary modellers like Colin Prentice and with support from three exceptional individuals at the Max Planck Institute for Biogeochemistry, Jens Kattge, Gerhard Boenisch and Christian Wirth, the TRY data base now contains nearly 280,000 taxa, well over half of all known plants. It has served over 10 billion data supporting continuing discoveries about global patterns in plant form and function, ever more advanced models of vegetation - climate interlinkages and a multitude of local applications that could not have been imagined before.

I led a second transformative step. I like pushing the boundaries, and dreamt that what we did for understanding plant functions could be extended to plant interactions with other biota like pollinators, or soil microbes and decomposers. If this were true, we could then help understand how environmental changes modify not only plant production for agriculture and forestry, or carbon sequestration for climate mitigation, but also other vital functions to human quality of life. It took me nearly ten years to publish this discovery after patient field data collection and work with local people in a small corner of the French Alps. Since then, others have continued to build the fundamental science on how traits are matched across different biota in food webs, how this helps predicting global change impacts on ecosystems, and how this will affect people.

I am proud that this research informs climate change and biodiversity science, and can help designing better management for the ecosystems we all depend on.

I thank the BBVA Foundation, my dear colleagues Sandra Díaz and Mark Westoby and all adventurers who have joined us along the way, for the honor of this award.