World view

By Beronda L. Montgomery

My most memorable mentors? Plants

To nurture a thriving scientific community, look to the natural world for ideas.

I study how plants and bacteria stay in tune with the fast-changing environment to better survive and reproduce. As the seasons change from winter to spring, light cues signal lengthening days, prompting buds and new leaves to emerge. Shadows hint at the growth of neighbouring plants and can lead branches to extend or bend in a quest for full sunlight and maximal photosynthesis.

As a Black woman professor, I am in the vast minority in my professional spaces. Even while publishing a stream of scientific papers, I have spent a lot of career time reflecting on how the conventional, transactional paths to scientific success can be at odds with nurturing a diverse community in my laboratory and discipline. Some of my most powerful personal lessons in how to thrive and help others to do so have come from the cress and cyanobacteria in my lab, and the corn and soya in university field plots.

That plants with equal 'aptitude' grow and survive differently, depending on their environment, helps me think about how to help colleagues thrive. For instance, going from an observation, such as spotting yellow leaves on a tobacco plant, to listing its potential causes (overwatering, underwatering, nitrogen deficiency) might prompt ideas about, say, how to support graduate students. Are their presentation slides poorly prepared because of boredom, confusion, anxiety or overwork, or is the reason family or financial stress?

Many scientists hesitate to apply the ideas that inspire their research and fuel their publications to their working lives and interactions. We've been trained not to. Instead, we're socialized to construct artificial barriers between scientific and personal insights. The use of the first person is discouraged. So is seeing plants or bacteria as instructive for human beings and society, as I explain in my book *Lessons from Plants* (2021).

Consider the fascination that microbiologists feel for bacteria that do not grow under standard laboratory conditions. They don't blame the bacteria; instead, they try to find and supply the correct nutrients, temperature, light or other conditions that the microbes require to thrive. This is the sort of curiosity needed to learn what contributes to the success and growth of individuals, such as those from backgrounds that are under-represented in research (B. L. Montgomery *mSphere* **5**, e01046-20; 2020). Guided by this approach, in my lab, we avoid dictating strict guidelines, and focus instead on sharing general principles of success — for example, the importance of writing regularly rather than trying to pull together a manuscript in a rush, or putting it off so it never gets done. We then try to help each individual to discover the necessary framework (daily, weekly, monthly or perhaps quarterly writing) that works well for them personally to achieve a particular objective.

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Now consider the clear contradictions that exist between the reality of how science is conducted by teams, and how scientists celebrate individuals. We romanticize competition and put discovering something first above supporting and recognizing a community. Beyond individuals, arbitrary divides and silos exist between units or organizations, to the benefit of those in prized positions or with insider knowledge.

So I reflect on why Indigenous peoples in the Americas have planted beans alongside corn and squash for thousands of years. The beans enrich the soil with nitrogen; the corn stalks support the twining beans and protect them from the pests and stress that the beans would be subject to if they grew along the ground; the squash suppresses weeds. Together, these crops are more productive, more resilient. The same applies to environments from wetlands to wild-flower meadows — strength lies in interactions.

Such biological metaphors have made me unafraid to pursue collective success rather than focusing solely on rankings and prestige. So, in my lab, we regularly discuss the specific ways in which teamwork has advanced our research. Did one person's sharing of their experimental expertise lead to a breakthrough for another team member? To facilitate this culture, when I'm hiring, I deliberately look for individuals with demonstrated interest in collaborative effort.

Increasingly, others are sharing their biologically inspired insights with me. One colleague compared surviving the stress of the COVID-19 pandemic to sporulation — the process by which bacteria or other organisms form a multilayered, dormant cellular structure in response to unfavourable or extreme environmental conditions, and wait until conditions are more favourable before they re-emerge. Another described the extra care and attention needed to mentor students and postdocs during the transition to working remotely as being akin to the transitional care needed when transplanting plants from one environment, such as pots in a greenhouse, to another, such as an open field.

Some people tell me that I'm oversimplifying in thinking that plants can supply useful analogies for humans. They say such knowledge is simply not transferable. Others might counter that nature is about the survival of the fittest; that it, too, is a fierce contest for scarce resources, in which the most competitive wins. I say, let's apply all the cognitive tools we have to solving important challenges.

Even though prevailing scientific norms demand that we remain personally distant from our subjects of study, I've been deeply inspired by mine and the metaphors they offer.

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