

I used to wonder what the species in my backyard were up to. Crawling around in nooks and crannies, I could usually find five or six species of ants. Looking for plants, I would run into at least a dozen weedy species snuggled in with the grass on my lawn. And in the summer, I expected to see eight or nine bird species come to my feeder every day. These species appeared pretty consistently from year to year, and yard to yard. But what was it about these combinations of species that made them assemble so consistently across space and time? Why was it that some ecological communities were stable, and others were not?

It turns out that the species living in my yard aren't there by accident: they are the result of predictable underlying processes. Everybody knows that ants turn soil and plants make air, but there is an incredibly complex network of interacting species that build soil, collect nutrients, and, ultimately, make the ant or plant do what it does well. They're complicated, but these systems are not beyond comprehension, and that's what makes them fascinating. If we can understand the biological rules governing ecosystems' constituent species, we can understand the ecosystems themselves. In ecology, we already know a lot of these rules, but are just starting to piece them together into a coherent whole. We're teetering on the edge of a great understanding, and I want to be part of the effort that helps push us over the lip.

I grew up reading memoirs from naturalists like Ditmars and Durrell, and dreamed of someday going on my own adventures. I got my chance early in high school, when Juan Carlos-Vargas, a PhD student studying landuse preferences among rural Costa Rican communities, invited me on a month-long field expedition to one of the last remaining old-growth rainforests in Central America. To earn my keep, I learned to program and digitize maps. Lugging sixty pounds of prototype GIS mapping gear along muddy and snake-infested roads, I collected interview data from local residents, stumbling through the "ticos" and "ticas" of Costa Rican Spanish. As Juan Carlos and I analyzed our data, we were able to reveal conflicts between the development plans of large landowners and their tenants. It deeply impressed me to find that the data collected on our adventures in the field could lead to meaningful solutions for real problems.

As I began my freshman year in college, I again hopped into a field project and joined Prof. Brian Farrell's entomology lab. Though the lab focused on insect phylogenetics, I was most interested in a side-project conducting biodiversity inventories of the Boston Harbor Islands (BHI) and Dominican Republic (DR). Since inventories were not a focal project in the lab, I did most of my work independently which was both exciting and terrifying. That first summer, I almost hydroplaned off a cliff near Santo Domingo, was marooned on two islands, and had to kayak across ten miles of open water after coming down with hypothermia at my camp site. In hindsight, I learned that with careful planning I could have avoided these problems. But, I also gained the confidence to trust myself in tricky situations when there was no one else to guide me.

As my fieldwork progressed, I started to wonder what kept species so meticulously in their places. Why was there one community of species that I could always find in forests, and another that would only appear in fields? I knew that this meant learning a lot about the taxa I collected. Ants in particular interested me because they were so diverse and abundant. Luckily, E.O. Wilson's iconic ant department was across the hall from my lab. Under the tutelage the "ant room", I was introduced to the swiftly fading art of morphological taxonomy. Over four years, I spent hundreds of hours peering through a microscope at my specimens, learning how to identify them. The hours were worth it: An identified specimen unlocks centuries of accumulated knowledge about its natural history. Once I knew a species' name, I could add to my observations those published by every researcher before me.

This early training in taxonomy was my first formal instruction in ecology, and that of which I am most proud. By mixing taxonomy and ecology, I could access information and explain processes that my peers, and many professors, could not. I gained the confidence to disagree when I found mislabeled specimens in museums. I learned my own limits, and tapped into a huge network of taxonomists and field biologists who I could ask for help. My work in the ant room also convinced me that any ecological theory I dreamed up had to be anchored on observations of the species under my boots. As I returned to my field sites in subsequent years, I developed more precise methods, focusing on the questions and species that I wanted to study.

As my work advanced, I looked for ways to share my results with a broader community. As part of my senior thesis work, I wrote papers on the diversity patterns of ants on the BHI and DR, which I published in *PLoS ONE* and the Dominican news journal *El Caribe* respectively. As an extension of my work on the BHI, I led seminars for inner-city students working for the National Park Service. At my field sites, I taught hands-on sampling techniques and showed how the data the students collected could be used to explore diversity across the islands. They in turn taught me, as they talked about the parks in their native Algeria and Armenia, and explained how hard it was to consider “sustainable” living choices when paychecks just covered food and heat.

I also began leadership of EnviroEd, a program run by Harvard undergraduates teaching K-12 students in Boston about environmental issues. Having grown up in the region’s public schools, it was wonderfully nostalgic to teach the same lessons that first got me excited about fieldwork and biology. Working with an economics undergraduate, I overhauled the program to incorporate social and environmental issues relevant to our urban students. We secured funding for field trips and greatly expanded the number of volunteers and attendees. Developing lessons forced me to reconsider my own understanding of subjects, since lessons had to be simple enough to be understandable, but complex enough to let students figure out why processes worked the way they did. Otherwise, lessons were just preaching scientific gospel. Ultimately, I found that until I had wrestled with a subject to learn how to teach it, I didn’t truly understand it.

Strangely, while teaching about my study systems and wading through my data, I began to feel increasingly frustrated and trapped. Thinking back to my roots, Juan Carlos had used his research to help make landuse decisions better. I wanted to work on a similarly applied problem. But, I was afraid that doing so would mean abandoning ants, and starting at square one in some new system! Nonetheless, as I began contacting professors about graduate positions to continue my research, Dave Tilman at the University of Minnesota stuck out among the otherwise ant-centered researchers. Dave’s use of ecological theory to tackle complex environmental and social problems, such as how to improve conservation strategies or build better biofuels, excited me. In his program, I saw that I could apply what I knew about the functional consequences of species’ interactions to address ecosystem services vital to human wellbeing.

It is somewhat ironic that the person who finally convinced me to move on from ants was E.O. Wilson, the ant guru himself. As I was grappling with this question near the end of my junior year, Wilson offered a small seminar on pursuing research in graduate school. He reiterated a common thread from his books – among ecologists, there are those who follow a species, and those who follow a problem. To be successful, you just have to follow the thing you love. It hit me that ants... weren’t actually what I loved about ecology. My most exciting moments as a researcher had been deciphering the patterns and mechanics of species coexistence through space and time – not the ants themselves. Ants had treated me well for four years and had taught me a lot that I would keep with me. But there was nothing holding me back from looking at my questions in a new, exciting way.