

Studying Soil Science at an Ivy League School

Justin Richardson

When the northern hardwoods were nearing their peak red and gold foliage in 2011, I met my fellow first-year graduate students at Dartmouth College. I was an earth science graduate student working on soils—the one and only—and most of my fellow students were pursuing doctorates in molecular biology, mathematics, and physics. “Soil science?” they’d ask. “You mean soil has its own field?” “You’re a dirt scientist?” “Does this mean you are a farmer?” Their puzzled questions certainly had validity. Why would a young soil scientist enroll at an Ivy League institution that didn’t have a soil science program for a degree perhaps better sought at a large, land grant public university?

Arguments in favor of attending a large university focus on the abundance of courses, expertise of advisers, and availability of instruments. These are the arguments I had encountered as a graduate student at the University of California, Riverside, an established soil chemistry powerhouse. It was certainly a gamble, but after two years at Dartmouth, I contend that students do not need their graduate degree from a large soil science department to work with soils. Further, educating graduate and undergraduate students about soil science outside of the land grant strongholds is an important area for the future.

Half of the Ivy League institutions have no introductory soil science class on their current list of offered courses (as of 2013). When I first applied to graduate schools, private institutions were never suggested as even a possibility. However, a search of publications on forest soils yielded Dartmouth College as a private university with active research on soils nested among the Biology, Earth Science, and Environmental Studies Departments. After leaving my alma mater, UC-Riverside, I joined the Dartmouth College Earth Science Department to work with Dr. Andrew Friedland on forest soils.

My first year as a graduate student in the earth sciences was much akin to living in a foreign country. Gone were the days when I understood every seminar talk while studying soil science at UC-Riverside. Now, seminars covered topics from the biogeochemistry of earth two billion years ago to flying helicopters over ice sheets in Antarctica. In journal club, we covered topics and read from journals that I was not familiar with (e.g., *Precambrian Research*). I certainly can relate to some points raised by detractors of studying beyond the agricultural schools: concepts that would be deemed common knowledge in a large soil science department had to be defined for some of my colleagues and professors, and I had to spend time learning topics far removed from soils.



Justin Richardson (far right) teaching undergraduates at Dartmouth College. Richardson is a Ph.D. candidate studying soil science in the Earth Sciences Department.

Despite the initial shock, I learned about a wide array of new experimental designs, chemical techniques, and concepts many students would not be exposed to from a soil science department. In addition, my constant interactions with non-soil scientists have greatly helped my research by providing points of view not commonly encountered when interacting with fellow soil scientists. Colleagues studying Greenland ice sheets or amino acids in stream water have provided invaluable feedback; they have even helped change my perspective on soil morphology and terrestrial biogeochemistry. Furthermore, the exchange of knowledge was reciprocal. The students and professors in my department are now more aware of how soils form and why soils are not just dirt! My colleagues now hesitate to use the term dirt when referring to soil (at least in my presence).

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Studying soil science at a non-land grant school as been a mutually beneficial experience for both Justin Richardson as well as the students and professors he has encountered at Dartmouth College.

Inspiring Students to Study Soils

Helping to teach the fundamentals of soil science to non-agricultural students has been one of my favorite experiences. When the registration for the first course opened, the professor, Dr. Devon Renock, and I were afraid that not enough students would register. I wondered if students were interested in soils, like at UC-Riverside, where one hundred students packed the lecture hall and dozens more were on the wait list annually for the introduction to soil science course. To our excitement, the Dartmouth course filled with 13 enthusiastic students, ready

to learn the stories told by soils. In the class, Dr. Renock covered the essentials, from Hans Jenny to hydric soils. The field trips we led were the highlight of the course—the march into the wilderness, the clinking and commotion during excavation of the soil pits, and the experience of seeing and feeling the variety of soil horizons. These are the very same experiences that helped ignite my passion for soils. No one complained about being covered from head to toe in soil. They even found the highly decomposed organic horizon an excellent hair styling product. Students left the evidence of their soil pit excursions on the floor and even the ceiling of the college vehicles.

Despite learning the same material, students at UC-Riverside and Dartmouth College seemed to have very different takes on the material, as evident in their questions in the field. I recall many UC-Riverside questions pertained to gardening, agriculture, and soil quality in California, given most students were local and studying environmental science, plant biology, or entomology. In contrast, Dartmouth College students were either environmental studies or earth science majors with much broader questions on climate change or contaminant transport and soil taxonomy of soils outside of the United States. One could argue that how the material was presented brought about these differences, or they arose from what students had learned previously, as well as their future plans. In any case, I believe these differences illustrate the importance of soil science

education far beyond land grant universities to students who may never pursue a career in soil science or agriculture. The basic knowledge of soils will aid both UC-Riverside and Dartmouth College students, whether they end up working for a consulting firm in California, green technology company in Texas, or non-governmental organization in Africa.

During my two years at Dartmouth College, I have helped spread the joy of soil science with soil-themed cakes, lectures to the general public, and short talks to undergraduate and graduate students. Undoubtedly, undergraduates ranging from large, land grant universities to private, Ivy League schools can be inspired to study soil science. Many undergraduates have completed research and honors theses with Dr. Friedland on soils, with Taylor Hornig completing her honors thesis this year on carbon dynamics in forest soils after clear-cutting. Similarly, Isabel Caldwell, a rising senior who took the introduction course with Dr. Renock, is adamantly interested in soils and has decided to do her senior thesis on toxic metals in soils. With these and many other students in mind, soil science education must remain or become a part of non-land grant universities, even if it is only one or two courses living in an earth science, environmental studies, or biology department. I do not doubt that large land grant colleges will still lead in teaching soil science to the greatest number of students. However, there are other paths for students interested in soils to travel.