

**Cave Biology Research Intern/Vernal Pool Research Intern
at The University of the South**

The University of the South offers many internships for undergraduate students in a wide range of fields. The biology department of the University always has summer research opportunities for students to work with professors on a variety of projects. This summer I was chosen to work with Dr. Kirk Zigler and Dr. Deborah McGrath on two projects that were of great interest to me. The first was a cave biology survey of which Dr. Zigler was head, and the second was a vernal pool internship of which Dr. McGrath was head. The cave internship was to be completed the same summer that it was begun, and the vernal pool research was the beginning to what I hope will be a two-year-long project.

The cave biology study was conducted from May through August in Buggytop Cave and Tom Pack Cave in Lost Cove, just south of the Sewanee Domain. The project's main goal was to find what troglotibiotic (cave obligate) organisms lived in each cave and in what abundance, since no studies have documented these caves in depth. This was an exciting opportunity for me because the Cumberland Plateau area is a global hotspot for troglotibiotic organisms, and one of the caves we were going to be studying has one of the most stunning entrances in the entire state. The project involved Dr. Zigler and me making trips to the caves twice a month to set up traps and collect specimens. My responsibilities were to gather and organize the equipment and clean gear following a strict decontamination procedure given to us by the state biologists. I also separated and cataloged specimens and referenced literature to confirm troglotibiotic species. I created lists for both of the caves of the organisms found and their abundance, and used this information in a paper that Dr. Zigler and I will send into Speleobiology Notes for publication online. We also gathered specimens, prepared them, and had them sent off for further processing by specialists. This happened on a handful of occasions when we came across some peculiar organism in the caves that we ourselves were not sure about.

Having never been caving before, I learned and observed proper safety methods in the caves. This included wearing a helmet and always taking at least three sources of light with you as backup. I learned appropriate methods of collection of small cave obligate invertebrates, which included learning how to bait pitfall traps and aquatic traps and choose locations for these traps. I also learned how to attain litter samples and how to properly sort out small invertebrates for collection. Identification of species is of the utmost importance in studies such as this one, and I learned the proper methods of identification for all of the species that were found in the caves. This included learning how to use and becoming competent in using dissecting microscopes and compound microscopes, and learning how to manipulate small invertebrates under these microscopes and prepare slides of certain body parts.

There were many high points in this internship because every time we went out into the field, there was something new for us to bring back to the lab and catalog. Even though we did not go out into the field every day, the days we did go out were strenuous, exhausting, but completely worth the time and effort. We were working in Lost Cove so we were already away from most of the midsummer heat, and whenever we got to the mouths of the caves, we could feel the cold air seeping out of the interior. The two caves were drastically different from each other, so that made working in them interesting. We could compare what we captured in each cave, and we could discuss the differences in the diversity and abundance of the organisms of the two caves and speculate as to why there may have been a difference.

This internship demanded physical toughness and drive to want to do field work. Because of the location of the caves, the intern needed to like to be outside on little worn paths, away from populated areas and cell phone coverage. One of the caves has a mouth that is only two feet high, and there were many other crawl spaces and places where you had to climb up a nearly vertical wall to reach another level of the cave, so the intern also had to be at least a little adventurous and willing to fall, get bruised up, and get completely filthy. I found that these were all things that I found exciting and fun. I had always loved being outside, and this showed me

that I was cut out to do work in the lab as well as outside of it. However, this does not mean that I did not enjoy the lab work. Whenever we had days that were completely spent in the lab, I enjoyed cataloging the specimens and keeping everything organized. I feel that organization is one of my strongest abilities, and the lab was always in top condition, along with the specimens and the coordinating database we created and kept in Microsoft Excel.

I learned that I really enjoy putting together a whole project and seeing it culminate in a paper that can be published. I feel that many students, especially at larger institutions, do not have opportunities such as these, and because of their lack of experience, they go out into the field in a subject that they thought they would enjoy and find that it is not what they expected at all. I will admit that I thought this internship was going to be a little more glamorous, but I will also admit that I came into this position quite naïve. I am glad that it turned out the way it did, the long hikes and the new species every trip, because it made the hard work we did even more valuable to me.

Vernal Pool Internship

I became interested in the ephemeral ponds when I had Dr. McGrath for Ecology Easter semester 2011, and we did a class project on the vernal pools on the Sewanee Domain. This project got me thinking about doing my own project regarding these little understood wetlands. This summer, I worked with Dr. McGrath to come up with an independent study proposal that can be done in the next two years regarding the larval recruitment of the local species of salamanders in the ephemeral ponds, and how this recruitment is affected by the pools' proximities to roads and the runoff from the roads. The ecology class found that some of the ponds that were located closer to roads had different water parameters than those located farther from roads, and I based my hypothesis on these findings.

During the summer, I looked at some of the ponds that would be used for the independent study. This involved using the Landscape Analysis Lab to find places where

ephemeral ponds were located around the domain. I worked with Dr. Van De Ven who put together a map with information from former students' projects about these isolated wetlands, and this map had the locations of many of the vernal pools on campus. He also found another map from a student's project that had locations of vernal pools from other places on the Cumberland Plateau, as far as twenty miles from the Sewanee Domain.

Because some of the ponds were located on private property, I was in charge of contacting the residents and setting up times when I could meet with them, have them show me where the ponds were, and tell me about the ponds so that I could confirm that they were, indeed, the ephemeral ponds that we needed for the study. One of the biology trucks from the university was used because many of the locations of the vernal pools were too far to walk to from central campus, and in order to use the biology truck I needed to have signed it out. I also read many articles and papers on vernal pools and the two species of salamanders so that I could be well informed when I wrote the final proposal for the project. By reading these works, I found that there have been projects in the past in different areas of the world that centered on the same ideas that I had for this project, but there was never one that focused solely on the larval recruitment with regards to the water quality and distance from roads. Because I could not refer to a previous project, I had to take a few of the studies and a few of my own ideas and come up with a plausible study of the ephemeral ponds on the domain. I formulated this proposal, thus meeting the goal of the internship, and talked to other faculty members in other departments so that the study could be an interdisciplinary study.

Overall this summer was a great learning experience. It not only helped me to narrow down what I like about biology, but it also taught me to follow the correct protocols for specific procedures so that I could gather useful data for publication and to come up with unique plans for future projects involving what I find interesting.