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Ellie Tiley: A Year of Research in Michael Moore's Laboratory

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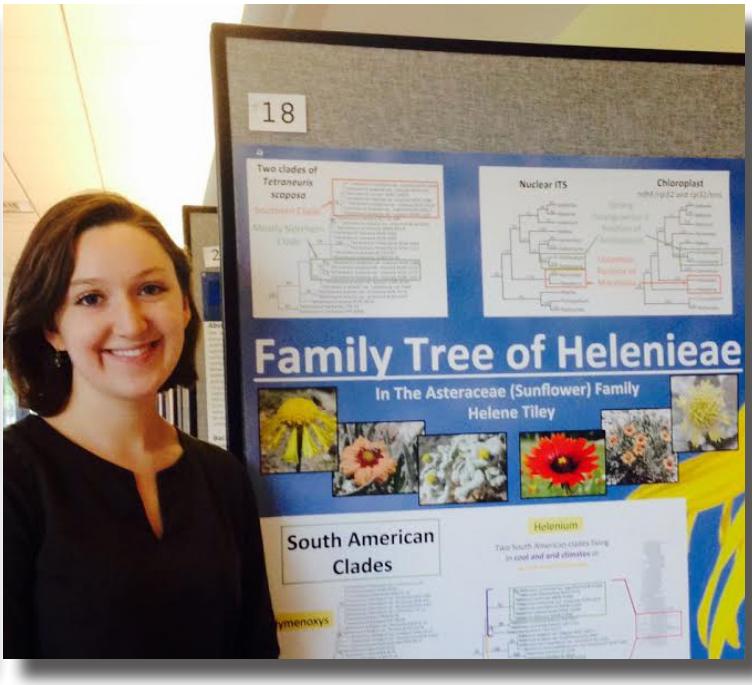
A Year of Research in Michael Moore's Laboratory

By Cameron Moss

Ellie Tiley, a second year and prospective biology major, has been working for almost a year in the plant laboratory of Dr. Michael Moore, a professor of Biology at Oberlin College. This past summer, she presented her findings at the Botany 2016 Conference, an international conference held in Savannah, Georgia where botanists come from all over the world come to share their research.



How did the conference work, and how many other undergraduate students were there?

There were over 1000 presentations in the span of 3 days, and basically, everyone gives either an oral or poster presentation for 15 minutes' time. I chose to use the poster method. The lectures get grouped together into different topics; there are tons of topics — paleobotany is an example — and each topic would present their information in one single room. There were so many cool topics; one I particularly enjoyed was economic botany. My favorite thing about it was the fact that you could basically window shop every field of botany, and everything there was really cool and informative and interesting. At this conference, it was easier than it is at college to figure out what you are interested in and what you aren't interested in because all of the information was basically thrown at you at the conferences. There were also events for networking and building connections; a lunch-in with undergraduates and graduate students with professionals was one of them, and the professionals would basically move around the tables while you could ask them questions and get advice. They also had workshops and field trips 2 days before the 3 days of lectures, which included events like kayaking, collecting plants, and workshops on how to apply to graduate schools. They also had a panel of people who were current students and admissions officers, and an event on how to write your elevator speech. It was really nice because I met a lot of people my age or older who were interested in the same things I am.

How do you think your first talk went?

I've been told it went really well by Moore and others in the field, but it is very hard to not be critical. During the presentation, I was also really, really nervous and made little mistakes; I mean, it went well overall, but I talked fast and was nervous. Even so, it was my first talk and I think I did well, considering it was my first time.

What was your research about? What were your findings?

My research, in a quick synopsis, was about building a phylogenetic tree for the Helenieae — a tribe of a plant family; its best known member is the blanket flower. That's basically what I did, and it was exciting because I was only missing 5 of the 115 species in Helenieae so I currently have the most complete tree of Helenieae to date. We hope that one day we will complete it; 3 of the 5 we don't have are very, very rare and hard to find. Paloocha Trifida is one of them, and it only grows on one particular island in Baja California, and it's super rare even on that island. I don't know if I had Paloocha Trifida in the collection, but we also didn't have that many South American species, since they are very hard to collect. Once we had the tree, we did a standard practice character state reconstruction on a lot of different characters.

Our future goal is to take climate information from every single collection of every single species of Helenieae and map all of that data onto the tree. For the time being, we built a character state matrix and wrote down info for each species. The character state reconstruction gave us rates of distributions of rates in South America, which was my favorite part.

According to my research, the internal transcribed spacer (ITS), an aspect of DNA, said there were 2 clades — clades are groups of organisms that are made up of a common ancestor and its lineal descendants — of South American species, but chloroplast data said that only 1 clade existed, which was confusing. We used our character state reconstruction to look at habitats and other character states in order to map a more complete character state matrix. There is evidence that there could have been two long dispersal events, but it could have been one that speciated, because two long dispersal events are kind of rare. Things are still inconclusive, but we still have a strong baseline for future research.

What is it like working in Moore's lab? Do you enjoy it? What could be improved?

It's wonderful! I love working in Moore's lab, and it is probably one of my favorite spots on campus. It feels safe in the lab and I always feel support there from people who are like me and enjoy the same things as me. I love working there; Moore is wonderful to work with and fun to be around. He is supportive and wants to push you to think about your plans and have a personal connection to the research you're doing. Sometimes

you can lose that aspect of research, but Professor Moore combats that by making each student's project more independent and giving you your own plants to work with, which a lot of research professors don't always do.

Do you plan to continue working in Moore's lab this year, and on the same project? If not, where do you plan on continuing your research?

I am planning on working in Moore's lab this semester and next semester. I started a new project that I've been working on for a couple weeks now, which looks for the presence or absence of gypsum acquisition storage processes using infrared spectroscopy. This was a project that was started a couple of years ago and two people have worked on it so far; Zoey Fedder, who graduated last year, wrote her thesis on this, but only had time to do a decent sampling. So what I'm doing is continuing her work; we just have new questions and samples to work with. We are working with a lot of different samples, not just Helenieae, but instead any and all plants that grow on gypsum and a lot of plants that don't grow on gypsum because the point is to see if the plant's ability to take in and store gypsum is a preadaptation or post-adaptation to living on gypsum.

We have some preliminary findings from Zoey's work that show that the old, wide gypsophiles were very good at storing gypsum as crystals in their leaves, while the young gypsophiles don't do that as much. This is cool because gypsum is poisonous to plants, so we want to see why they are collecting the gypsum inside of their bodies. Zoey had a theory that the species in the mustard family didn't have a lot of gypsum in their leaves and that were using them in their actual chemical mustard compounds. Currently, we aren't certain of this theory.

What was the hardest thing for you to learn when you started doing research with Moore? The easiest thing? What is your favorite process in the lab?

I started research with Moore during the winter term of my freshman year at Oberlin. My first instinct would be to say that the actual protocol for running DNA and PCRs plus learning the actual lab procedures was difficult, but we do have a step by step protocol in the lab, which helps. The easiest thing was probably the ideas behind the procedures; he would explain to me what was going on in PCRs and I immediately got it, but the entire process of doing it is difficult. PCR is my favorite process — I really like it because DNA isolations take a lot longer, and I like the repetitiveness of PCRs. You deal with really small amounts of liquids, and there's a lot of technique involved and you can get really good at it. Using 0.5 ul of DNA is really difficult to dispense because it doesn't even form a droplet. I've broken pipette tips because of the need to scrape it off! I like PCRs because they take finesse.

Do you have any suggestions for underclassmen who are just getting into research on campus? What can they do to ensure that they are being productive and using this experience to its fullest?

I know that the Center for Learning, Education, and Research in the Sciences (CLEAR) does a winter term project that is lab skills-related, which is really good and teaches how to do lab techniques. I'd suggest that if a student wants to do research but doesn't have the experience, try getting involved in that project. In my experience, the number one way to get into a lab is to show interest. Sometimes you need upper-level classes to get in, which you can easily get before your junior or senior year. Talk to people, put yourself out there, and ask if you want research! I submitted so many resumes for winter term; I talked to 7 professors and they all said I didn't have the requirements, but Moore let me in right away.

What are your goals for the near future? What are your career plans? How do you think Moore's research will help you reach these goals?

I don't know, at first I wanted to get a Ph.D. and become a professor of Biology, and then I just wanted to work in a private research company doing research every day and not having to teach anything. At one point I wanted to be a middle school biology teacher because they are underappreciated and it sounded fun, but currently I am looking at genetic counseling because I really like genetics. Moore's lab deals with a lot of genetics, and I feel like it would be really cool to help people figure out more about their genes. I have a genetic blood disorder that nobody explained to me when I was younger, and I would like to explain to people how their genetic background will influence their offspring and/or own individual futures. It's a really great field that is a great conglomerate of all the jobs I really wanted to do. It requires a master's degree in genetic counseling and that's a plus because I can get to work right away after graduating from Oberlin.

Do you have any other comments you would like to share?

I have so much to say! First off, I want to say that I am extremely grateful for the amazing opportunity to go to Botany 2016 and in particular I'd like to thank Professor Moore for all that he has done for me. Secondly, I think that if you're excited about a topic, you should throw yourself into it and see where it goes. Sometimes people don't like that, but if you like it, give it a chance — and that goes for both research and careers. The best way to prepare for whatever future you have is to keep trying things and be interested in things, even if your final career has nothing to do with what you did in college.