

Nicholas Seifert

Graduation Year: Sophomore

College: Science

Major(s): Biological Sciences, Music

Minors(s): none

Scholar Group Membership: No

Did you received other funding for this project?: FYS Ignite, College of Science

Could you have completed this project without CUSE funding? No

More details on CUSE funding assistance?

Project Title: Research Assistantship: Feder Lab

Project Location: Department of Biological Sciences - University of Notre Dame

ND Faculty Mentor: Dr. Jefferey Feder

Project Type: Research Assistantship

Why did you undertake this project/experience? Deepen your knowledge of a topic or issue, Prepare for graduate school (MA or PhD), Prepare for professional school (MD, MBA, JD), Career discernment and/or preparation

Did your funded experience help you:

[Deepen your understanding of your coursework or field of study]: Yes

[Discern your interests and post-bac goals]: Yes

[Become confident in your ability to set and achieve your goals]: Yes

[Gain a more nuanced view of local, national, or global communities]: Not Applicable

[Improve your written and verbal communications skills]:Yes

Tell us about your experience.

This summer, I worked as an undergraduate assistant for the Lab of Jeffery Feder in the Notre Dame Department of Biological Sciences. My role was to assist in data collection for current and former graduate students in the lab.

I started the summer continuing a project from the spring semester. Glen Hood was a member of the lab, recently graduated with his PhD, and is now a collaborator. He studies the parasitic wasps that infest *Rhagoletis* flies. One of his projects requires the preparation of restriction-site associated DNA (RAD) sequencing libraries from approximately 1000 individuals, previously frozen and stored in the Feder lab. I assumed responsibility for the organization and preparation of these ten 96-well plates in March. I completed two plates during the school year, and the remaining eight in June and July. DNA had already been extracted from many of the samples; I quantified the DNA content of these samples and standardized their concentrations via dilution or vacuum concentration. For some samples, I needed to find the individual in the lab freezer and extract the DNA from that individual before concentrating and plating. This task introduced me to RAD library preparation, and taught me the organizational and technical skills required to prepare samples in 96-well plates for genomic sequencing. I also needed to learn to

lab's DNA extraction protocol to complete this project.

I was also partially responsible for the daily maintenance of our lab *Rhagoletis* populations. Each collected population of fly pupae is kept in a separate cage. We keep track of how many flies and parasitoids eclose (emerge) from each population each day. Depending on the population, they are either frozen for sequencing, or shipped on a weekly basis for odor testing. There, they are exposed to the odors of specific host fruits and their behavioral responses are recorded. I handled these shipments throughout the summer, collaborating with Dr. Charles Linn at a Cornell research lab in Geneva, NY.

Midway through the summer, Meredith (the PhD student in the lab who served as my advisor), Katherine (another undergraduate in the lab) and Dr. Feder went to the Evolution conference in Portland, OR. I used this time as a reading week. I performed literature searches on the impact of transposable elements on speciation, and on insect genomes. I hope to start a project on the impact of transposable elements in the *Rhagoletis* genome in the coming semesters. I also worked on programming in the command line (using Codecademy) and in R-studio (using *A Beginner's Guide to R* by Alain F. Zurr, Elena N. Ieno, and Eirk Meesters). These computational skills will be necessary for data analysis and data visualization at a level above what I will learn through my coursework.

The second half of the summer was centered around processing samples for current graduate student Cheyenne Tait. She studies the odor preferences in the *Rhagoletis* flies, using genetics, physiology, and behavior. After odor testing, the flies that had been sent to Cornell were returned to the Feder Lab. I performed DNA extractions on 500 of the 800 individuals returned. Next semester, I will finish these extractions, and prepare RAD libraries for these samples. Through this project, I learned how to use the QIAAMP column extraction kit (though for cost reasons, we decided not to use this protocol on these individuals) and the Qiagen Genra Puregene DNA extraction protocol. I also learned how to distinguish flies based on sex, since in some cases, this allowed me to fix incorrect labeling.

During the last week of my research period, I finished the rest of the RAD preparation protocol on Glen's samples. This included the restriction digest, ligation of barcoded adapters to samples, PCR amplification of the ligated samples, and pooling the barcoded samples for sequencing. This also allowed me to practice proper laboratory technique and develop familiarity with common research tools, including multichannel pipettes and thermocyclers.

My experience in the Feder Lab this summer introduced me to full-time lab research. This experience will factor largely into my decision of what to pursue after my Notre Dame education. Additionally, I gained new laboratory and computational skills that will allow me to soon begin my own research project in the lab.

Describe the impact this project had, both on you as a student-scholar and on the people you worked with.

This project gave me exposure to working in a laboratory full time. I improved my laboratory skills, both by learning new research techniques (RAD library preparation and multiple DNA extraction protocols), and practicing the basic techniques I have already learned (tending to the lab populations of *Rhagoletis* flies, using the pipette, keeping eclosion records, using the

nanodrop and rotovap machines, etc.). This summer also placed a large emphasis on communication and collaboration in my work. My two main tasks were both pieces of larger projects, with collaborators in Texas, India, and New York. This degree of collaboration forced me to improve my communication skills throughout this research experience. Additionally, I was able to see the REU poster presentations, and how different students communicated the contents of their summer projects

The data generated by my summer research will be used in future journal articles by Dr. Glen Hood, and Cheyenne Tait's PhD dissertation. Performing these tasks allowed other graduate students in the lab to perform their own data analysis. Additionally, since I performed the daily tasks in the fly room, two other members of the lab were able to go on a week-long field collection in the southeast United States to collect Deerberry samples; which we could not have collected without someone staying back in the lab.

Describe how this experience is connected to your plans as a student or future professional.

During the summer, I practiced lab techniques necessary to any genetic research. This both increases my qualifications to perform research, and gives me an advantage in upcoming lab coursework. Having full-time lab experience before sophomore year is largely advantageous to pursuing a future independent research project. It will also stand out on any internship application.

This summer experience will play a large role in my career discernment. Currently, I am unsure whether to pursue medical or graduate school. I now have experienced working in a lab full time. Next summer, I hope to either intern or volunteer at a hospital, so that I can gain experience working in the medical field. Hopefully, comparing these two experiences will help me decide my path after Notre Dame.

What advice would you give other students who are planning to pursue similar projects?

Make sure you look around for Notre Dame's resources. There are departments and organizations on campus that can help students with everything from writing a grant proposal and funding research, all the way to job interviews and networking. So if you have an idea, or want to do something to change your Notre Dame experience for the better, go for it! There are plenty of people to help you along the way. You just need to find them.

I acknowledge that this form has been filled out truthfully and to the best of my ability. I understand that this information will be shared with many different CUSE constituencies. As such, I have provided as much useful information as I was able. I understand that CUSE will not complete my award disbursement until this form is successfully completed. If I have any questions or concerns, I will contact CUSE before submitting this form. To illustrate that you understand all of these points, please enter your Notre Dame email in the box below.
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