

Part II: Project Proposal

Project title — Effect of a temperature-sensitive mutation on bang-sensitive mutants in *Drosophila melanogaster*

Faculty Mentor — Christopher Jones, Associate Professor of Biological Sciences

Student Researcher — Brandon Dimick

Project duration — 10 weeks, Tuesday May 31 through Friday August 5

Description of the project —

Studying bang-sensitive mutations in the fruit fly *Drosophila melanogaster* has been a long-term focus of my laboratory. Any one of these mutations results in the fly displaying seizures and paralysis upon violent stimulation (e.g. “banging” the container it’s held in, thus the name of the mutant class). Although researchers are still at an early stage in the study of these genetic lesions, they hold promise for better understanding human seizure disorders such as epilepsy.

A temperature-sensitive mutation is one which has no effect at normal temperatures but which causes the organism to display a mutant phenotype upon raising the temperature. One such mutation, called *nap^{ts}*, causes flies to become paralyzed upon exposure to 37°C; this paralysis dissipates upon returning the animals to room temperature. Interestingly, this mutation has been shown to *suppress* the bang-sensitivity of those eponymous mutants. This project will repeat those results and extend it to include newly-discovered bang-sensitive mutants.

Roles and responsibilities —

Brandon will be responsible for background research (reviewing what has been published about bang-sensitive mutants and *nap^{ts}*), designing the crosses to bring *nap^{ts}* into various bang-sensitive mutant backgrounds, growing and maintaining the appropriate fly stocks, planning and carrying out the experiments, and analyzing the results.

My role will be to guide Brandon’s background research, coordinate the various aspects of the project (I will have a better idea than Brandon how much time will be required for the different stages and so will need to plan for how to best optimize the limited time we’ll have) and to serve as a voice of experience, having conducted many *Drosophila* behavior projects myself.

Weeks 1–3: Literature research and review; decide on crossing strategies, establish fly stocks and begin to collect virgin females for crosses, carry out paralysis assays with mutant and wild-type flies to become familiar with normal results.

Weeks 4–8: Test various bang-sensitive/*nap^{ts}* combinations in paralysis assays, varying parameters such as age and gender as appropriate.

Weeks 9–10: Begin to prepare results for presentation at Scholars Day, the NCUR conference, and the Drosophila Research Conference (if appropriate).

Student engagement in discipline-appropriate scholarly research —

The experiments proposed here are all standard for behavioral research using model organisms. Brandon will be carrying out the necessary review of the existing literature, familiarizing himself with the behavioral assay, growing and maintaining different mutant fly stocks, testing these stocks, and recording and analyzing his results. Hopefully we will go on to publish his results, which will further expand his experience with discipline-appropriate research.

Student contributions to the discipline —

If the project is successful, I fully expect that we will be able to publish Brandon's results, contributing directly to our knowledge of behavior genetics. I also expect this work to suggest further research avenues, contributing indirectly to the discipline but directly to the opportunities for students to carry out research in my laboratory in the future.

I anticipate that Brandon's work will be more than sufficient to merit presentation at regional and national conferences. In years past my SOAR students have presented their work at the regional Beta Beta Beta convention (Tri-Beta is the undergraduate biology honor society), the National Council for Undergraduate Research conference, and at the national Drosophila Research Conference.

Part III: Student Statement of Purpose

Project title — Effect of a temperature-sensitive mutation on bang-sensitive mutants in *Drosophila melanogaster*

Student Researcher — Brandon Dimick, Biology major, expecting to graduate May 2017

Faculty Mentor — Christopher Jones

Housing requested — no

Ever since I was a student in high school, I was fascinated with the biological sciences. I would listen in awe as my high school science teachers talked about cells, morphology, evolution, etc. I was most deeply intrigued with genetics. It is truly amazing how a molecule has such a profound impact on life. It was due to this intrigue and amazement that I decided to become a Biology student.

When I transferred to Moravian College as a Junior, I had the privilege to have Dr. Jones as my Genetics professor. I remember feeling as if I had the same inspiration and fascination that I did back in high school. It was then that I realized that I decided what I wanted to do with my career. I wanted to be a Geneticist. I felt that this field in the sciences had experienced a plethora of

amazing discoveries in the past few decades, and I wanted to be on the “front-lines” with other Geneticists making new discoveries.

I heard about the SOAR program while doing my transfer school search after receiving my Associate's degree. It was one of the points that ultimately made me decide to apply to Moravian College in the first place. It is truly rare to find a school that places such an emphasis on undergraduate research, and it was something that I wanted to look further into. Now, as I am working on my undergraduate degree in my Junior year, I feel that it is time for me to start experiencing research for myself. The SOAR program would be a great opportunity for me to experience research in Genetics. I want to apply what I have learned in the classroom through a meaningful project so that one day I can be an accomplished, experienced, and knowledgeable researcher. Also, it would be a great opportunity to make a contribution to the scientific community. Ultimately, I want to go on to graduate school, and my experiences in the SOAR program would be an asset that would allow me to be successful in graduate school.

It has been revealed that there is a gene in *Drosophila melanogaster* that, when under certain temperature ranges, has a suppression effect on the seizure phenotypes of bang-sensitive (BS) mutants, whom display a seizure phenotype when subjected to shock. The gene being analyzed is called no-action-potential (nap[ts]). Through this project, I aim to successfully combine nap[ts] with the BS mutants to analyze and measure the effects of the mutation on seizure phenotypes. It is worth noting that I would also be combining nap[ts] with mutants with one of the newest BS mutations, sara3, to measure the effects it has on this new mutation. This has never been tested so I would be making a new contribution.

After this project is completed, I would have acquired many skills, as well as knowledge, that would be beneficial to me as a Geneticist. Through the guidance of Dr. Jones on this project, I would learn more about how genes interact inside of organisms. I would also apply techniques that I acquired in the classroom and in labs such as PCR (polymerase chain reactions), genetic crosses, and genetic analysis with *Drosophila melanogaster* as a model organism. These techniques are important for the aspiring geneticist to be successful. Finally, this project would allow me to work on my presentation skills, which is of vital importance for a scientist (or any person for that matter), by presenting my results and conclusions to the community. By the end of this project, I expect to be another step closer to fulfilling my dream of being an experienced Geneticist making meaningful contributions to the world's knowledge.

Part IV: Expense Proposal

Expenses for this project (e.g. routinely-used laboratory supplies, fly food ingredients, specialized equipment) will be covered by the Department of Biological Sciences.