

Undergraduate Research Assistant, Spring 2004 – Present:

Mentor: Dr. Lynda Delph

Introduction to research and greenhouse study, Spring 2004:

I assisted a postdoctoral fellow in the Delph Lab, Dr. Janet Steven, with a quantitative genetic study of *Silene latifolia*. Research was conducted at Indiana University and involved plant care, data collection, data entry, and an introduction to analysis. I worked closely with Dr. Steven and Dr. Delph to become acquainted with relevant theory and analytical techniques in quantitative genetics. Furthermore, I was engaged in lab activities and was exposed to the rigors of research science.

Heritability of secondary reproductive characters in the dioecious species Silene latifolia, Fall 2004:

I continued quantitative research from the previous semester by designing and implementing an experimental procedure. I collected data on a suite of secondary sex-characteristics in *S. latifolia* and utilized techniques to estimate their heritability. I combined an understanding of the breeder's equation ($R=h^2S$), its partitioning into different variance categories (e.g. additive genetic variance, total phenotypic variance, dominance and epistasis) and offspring/parent regression to estimate heritability. I gained valuable research experience and was introduced to grant writing and statistical techniques.

Polymorphism in the mitochondrial cox gene for Silene with different breeding systems, Spring 2005:

For this project I worked as an assistant and technician for Dr. Pascal Touzet, a visiting scholar from France. This research was my introduction to molecular genetics. I extracted, purified, and sequenced mitochondrial DNA (mtDNA) sequences from *Silene* species representing a variety of breeding systems. We tested the hypothesis that observed polymorphism in some mtDNA associated genes, with low mutation rates, is being maintained by negative frequency-dependent selection on cytoplasmic male sterility (CMS) genes located in the mitochondrial genome¹. These CMS factors disrupt pollen production and convert hermaphroditic plants into functional females, thereby playing a significant role in sex determination².

Under the guidance of Dr. Touzet, I performed the techniques necessary to generate sequence data. These techniques included: DNA extraction and purification, gel electrophoresis, primer specific PCR amplification, high-throughput sequencing, and sequence alignment. I gained valuable insight into the scientific process, learned powerful molecular methods, and collaborated with a researcher from outside the United States.

Selective forces leading to population differentiation in natural populations of S. latifolia, Summer 2005:

During this summer I applied skills gained in previous studies to a European-based field experiment. I traveled to rural France with lab postdoctoral fellow Dr. Chris Herlihy, and conducted a three-month field study on *S. latifolia*. We collected data on morphological and physiological traits that were subsequently compared to results obtained in Portugal and previous greenhouse experiments. I learned valuable lessons concerning the logistics and implementation of field research and was mentored by a postdoctoral fellow willing and able to provide guidance on future study. In addition, living in a foreign country continued my exposure to cultural diversity that began in earnest the previous spring.

Characterization of floral scent release in S. diclinis x S. latifolia hybrids Fall 2005 – Present:

Since the fall of 2005 I have been collaborating with a graduate student, Amanda Brothers, on projects centered on pollination syndromes (the suite of plant traits that attract pollinators) and floral volatiles (scent) in *S. latifolia* and *S. diclinis*. Our initial project involves F₁ and F₂ hybrids of *S. latifolia* and *S. diclinis*. *S. latifolia* is a night-pollinated plant with white flowers and a musky odor dominated by lilac aldehydes. *S. diclinis* is a day-flowering plant with reddish-pink flowers and a sweet smell characterized by benzeacetaldehyde. Using analytical techniques including gas chromatography/mass spectroscopy, chemical ionization, and electron impact ionization we are able to determine the scent profile for *S. latifolia*, *S. diclinis*, and their respective hybrids. My primary role in this experiment is scent collection and analysis using the aforementioned chemical techniques. With this information, we can infer genetic relationships between scent profiles of *Silene* and their respective pollinator syndromes. I will directly adapt methods from this experiment to my proposed research project.

Undergraduate Research Intern, Fall 2006 – Present:

Mentor: Dr. Richard Hardy

Fitness affect and population dynamics of virus (Sindbis) infected mosquitoes, Fall 2006 – Present:

In addition to my research in the Delph Lab, I began an interdisciplinary project with Professor Richard Hardy, a virologist at Indiana University. We are infecting *Aedes* spp. mosquitoes with green fluorescence protein (GFP) tagged Sindbis (SNV) virus. As a result of the GFP coding sequence, cells replicating virus can be visualized under a fluorescent microscope. We plan to assay transmission (vertical and horizontal), assess fitness costs to mosquitoes, and determine effect of multiple-infections of avirulent Sindbis strains on fitness. The results will be used to evaluate modern theory on host/parasite interactions. My responsibilities include techniques in advanced virology- e.g. *in vitro* transcription, chemical mediated RNA transfection, tissue culture plaque assay, and titer determination associated with infection. Our research project will be conducted in conjunction with professors in the Evolution, Ecology and Behavior group, including Dr. Curt Lively. This interdisciplinary approach will prepare me for utilizing similar techniques in graduate research and beyond.

Presentations (Talk and Poster):

- The Dilemma of a Plant, a Pollinator, and a Parasite: The Evolution of Cooperation, Midwest Evolution and Ecology Conference (Kent State) Spring 2007
- Population Differentiation in Natural Populations of *Silene latifolia*, Indiana University STARS Symposium: April 2006
- Population Differentiation in Natural Populations of *Silene latifolia*, Hutton Honors College Research Fair: April 2006
- Preliminary results on the Characterization of temporal variation in floral scent release in *Silene diclinis* x *Silene latifolia* hybrids, IU STARS Symposium: September 2006

References:

1. Olson, M. S, and D.E. McCauley. 2002. Mitochondrial DNA diversity, population structure, and gender association in the gynodioecious plant *Silene vulgaris*. *Evolution* **56**:253-262.
2. Stadler, T. and L. F. Delph. 2002. Ancient mitochondrial haplotypes and evidence for intragenic recombination in a gynodioecious plant. *Proceedings of the National Academy of Sciences* **99**:11730-11735.