**J. Dylan Shropshire**

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**October, 2020**

**EDUCATION**

Doctorate**Ph.D. in Biological Sciences** 2020

**Vanderbilt University**, Nashville, TN

Dissertation title: “Identification and Characterization of the Genetic   
Basis of *Wolbachia*-induced Cytoplasmic Incompatibility”

Committee: Antonis Rokas, Jared Nordman, Ann Tate, Borden Lacy

Advisor: Seth R. Bordenstein

Bachelor**B.S. in Biological Sciences**, magna cum laude 2015

**East Tennessee State University**, Johnson City, TN

**RESEARCH EXPERIENCE**

**NSF Postdoctoral Research Fellow**2020-present

University of Montana, Missoula, MT

Studying the basis of variation in the expression of reproductive parasitism phenotypes across

*Drosophila* species as a postdoctoral fellow in Dr. Brandon Cooper’s lab.

**NSF Graduate Research Fellow**  2017-2020

Vanderbilt University, Nashville, TN

Studied the genetic basis of reproductive parasitism in the tripartite interaction between insects,

bacteria, and viruses as a doctoral candidate in Dr. Seth R. Bordenstein’s lab.

**Ph.D. Student**  2015-2016

Vanderbilt University, Nashville, TN

Studied the role of the microbiome on parasitoid wasps as a Doctoral student in Dr. Seth R.

Bordenstein’s lab.

**CRAWL Undergraduate Research Fellow**2013-201*5*

East Tennessee State University, Johnson City, TN

Studied the social context of behavioral development in flesh flies Collaborative Research on the

Arthropod Way of Life (CRAWL) research fellow in the labs of Dr. Karl Joplin, Dr. Darrel Moore, and

Dr. Edith Seier.

**Curator of ETSU Insect Museum** 2014-2015

East Tennessee State University, Johnson City, TN

Curated a private insect collection expanded yearly by students in an Entomology course.

**Undergraduate Lab Assistant**  2014-2015

East Tennessee State University, Johnson City, TN

Performed insect stock maintenance, cleaning of lab spaces, and organization as a Lab Assistant

in Dr. Karl Joplin’s lab.

**PUBLICATIONS**

*Students mentored*\**; Co-first authorships#; Corresponding authors†*

**In Preparation**

* **Shropshire, J.D.**†, Rosenberg, R.#, & Bordenstein, S.R.† (In review). Cif genotypes and cytoplasmic incompatibility phenotypes: impacts on strain (in)compatibilities and penetrance.

**Peer-reviewed Research Articles**

* **Shropshire, J.D.**†, Kalra, M.#, & Bordenstein, S.R.† (2020). Evolution-guided mutagenesis of the cytoplasmic incompatibility proteins: Identifying CifA’s complex functional repertoire and new essential regions in CifB. PLOS Pathogens. 16(8), e1008794.
* Pugazenthi, S.\*, White, P.\*, Basu, A.\*, Chandrashekar, A.\*, & **Shropshire, J.D.†** (2020). Survey of *Wolbachia* prevalence in Nashville, Tennessee reveals novel infections. *American Journal of Undergraduate Research*. 17(1), 21-29.
* Layton, E.M.\*, On, J.\*, Perlmutter, J., & Bordenstein, S.R.† & **Shropshire, J.D. †** (2019). Paternal grandmother age affects the strength of *Wolbachia*-induced cytoplasmic incompatibility in *Drosophila melanogaster*. *mBio*. 10(6).
* **Shropshire, J. D.†**, & Bordenstein, S. R.† (2019). Two-By-One model of cytoplasmic incompatibility: Synthetic recapitulation by transgenic expression of *cifA* and *cifB* in *Drosophila*. *PLOS Genetics.* 16(6), e1008221
* **Shropshire, J. D.†**, On, J.\*, Layton, E. M.\*, Zhou, H.\*, & Bordenstein, S. R.† (2018). One prophage WO gene rescues cytoplasmic incompatibility in *Drosophila melanogaster*. *Proceedings of the National Academy of Sciences*, *115*(19), 4987-4991.
* LePage, D. P. *#*, Metcalf, J. A. *#*, Bordenstein, S. R., On, J.\*, Perlmutter, J. I., **Shropshire, J. D.**, Layton, E.M.\*, Funkhouser-Jones, L. J., Beckmann, J.F., & Bordenstein, S. R.† (2017). Prophage WO genes recapitulate and enhance *Wolbachia*-induced cytoplasmic incompatibility. *Nature*, *543*(7644), 243-247.
* **Shropshire, J. D. †,#,** van Opstal, E. J.#, & Bordenstein, S. R. † (2016). An optimized approach to germ-free rearing in the jewel wasp *Nasonia*. *PeerJ Preprints*, *4*, e2088v1.
* **Shropshire, J.D.**, Moore, D., Seier, E., & Joplin, K. H.† (2015). Male aggression, limited female choice and the ontogeny of mating behaviour in the flesh fly *Sarcophaga crassipalpis*. *Physiological Entomology*, *40*(4), 325-335.
* Moore, D., Paquette, C., **Shropshire, J. D.**, Seier, E., & Joplin, K. H.† (2014). Extensive reorganization of behavior accompanies ontogeny of aggression in male flesh flies. *PloS one*, *9*(4), e93196.

**Other Peer-reviewed Articles**

* **Shropshire, J. D.†,** Leigh, B., & Bordenstein, S. R.† (2019). Symbiont-mediated cytoplasmic incompatibility: what have we learned in 50 years? *eLife,* 9, e61989.
* **Shropshire, J. D.†,** Leigh, B., Bordenstein, S. R., Duplouy, A., Riegler, M., Brownlie, J. C., & Bordenstein, S. R.† (2019). Models and Nomenclature for Cytoplasmic Incompatibility: Caution over Premature Conclusions-A Response to Beckmann *et al*. *Trends in genetics: TIG.*
* **Shropshire, J. D.** & A. Rokas† (2017). Heredity: The gene family that cheats Mendel. *eLife* 6: e28567.
* Dittmer, J., van Opstal, E. J., **Shropshire, J. D.**, Bordenstein, S. R., Hurst, G. D., & Brucker, R. M.† (2016). Disentangling a holobiont–recent advances and perspectives in *Nasonia* wasps. *Frontiers in Microbiology*, *7*.
* **Shropshire, J. D.†,** & Bordenstein, S. R.† (2016). Speciation by symbiosis: The microbiome and behavior. *mBio*, *7*(2), e01785-15.

**Patents**

* S.R. Bordenstein and **J.D. Shropshire** (2019) “Methods of Cytoplasmic Incompatibility-Based Transgenics for Pest or Vector Control” (Provisional Patent). Attorney Docket Number 10644-064PV1. Application number 62/655,389. VU18134. Equal inventorship.

**PRESENTATIONS**

*Students mentored*\*

**Invited Seminars**

* **Shropshire, J. D.,** & Bordenstein, S. R. (2019). The simple genetic basis of cytoplasmic incompatibility. Animal-microbe symbiosis Gordon Research Seminar. West Dover, VT. (Full travel support)
* **Shropshire, J. D.**, & Bordenstein, S. R. (2019). Identifying bacteriophage genes that manipulate arthropod reproduction. *Austin Peay State University.* Clarksville, TN. (Full travel support)
* **Shropshire, J. D.**, & Bordenstein, S. R. (2019). Identifying bacteriophage genes that manipulate arthropod reproduction. *North Carolina State University.* Raleigh, NC. (Partial travel support)

**National/International Presentations**

* **Shropshire, J.D.,** & Bordenstein, S. R. (2020). Characterizing bacteriophage proteins that hijack arthropod reproduction. The Allied Genetics Conference 2020. Online. Poster.
* **Shropshire, J.D.,** & Bordenstein, S. R. (2019). Identifying and characterizing phage genes that control arthropod reproduction. Entomology 2019. St. Louis, MO. Talk. 2nd place speaking award.
* **Shropshire, J.D.,** & Bordenstein, S. R. (2019). The simple genetic basis of cytoplasmic incompatibility. Animal-microbe symbiosis Gordon Research Seminar & Conference. West Dover, VT. Poster
* **Shropshire, J.D.,** & Bordenstein, S. R. (2019). Discover the Microbes Within! The Wolbachia Project. Undergraduate Biology Education Research Gordon Research Seminar & Conference. West Dover, VT. Poster
* **Shropshire, J.D.**, & Bordenstein, S. R. (2018). A single prophage WO gene rescues cytoplasmic incompatibility. *Wolbachia Conference 2018.* Salem, MA. Talk.
* **Shropshire, J.D.**, & Bordenstein, S. R. (2018). One prophage WO gene rescues cytoplasmic incompatibility in *Drosophila melanogaster*. *Drosophila Conference 2018.* Philadelphia, PA. Talk.
* **Shropshire, J.D.**, Moore, D., Seier, E., & Joplin, K. H. (2014) Effect of social environment on flesh fly behavior. *Entomological Society of America*. Portland, OR. Talk.

**Regional Presentations**

* **Shropshire, J.D.,** & Bordenstein, S. R. (2019) Identifying phage genes that control insect reproduction. Entomological Society of America Southeast Branch Meeting. Mobile, AL. Talk. 1st place speaking award.
* **Shropshire, J.D.**, Metcalf, J., Perlmutter, J., LePage, D., On, J., Layton, E. M.\*, Zhou, H.\*, & Bordenstein, S. R. (2018). Phage genes control bacterial-induced inviability in insects. *American Society for Microbiology Southeastern branch meeting 2018.* Atlanta, GA. Poster.
* **Shropshire, J.D.**, & Bordenstein, S. R. (2018). A single prophage WO gene rescues bacterial-induced infertility in *Drosophila*. *Tennessee Academy of Sciences 2018.* Clarksville, TN. Talk.1st place speakingaward.
* **Shropshire, J.D.**, & Bordenstein, S. R. (2018). A single prophage WO gene rescues bacterial-induced infertility in *Drosophila*. *American Society for Microbiology KY-TN branch meeting 2018.* Murfreesboro, TN. Talk. 3rd place speakingaward.
* **Shropshire, J.D.**, Moore, D., Seier, E., & Joplin, K. H. (2014) Mating in the flesh fly. *Boland Undergraduate Research Symposium*. Johnson City, TN. Talk.

**Institutional Presentations**

* **Shropshire, J.D.**, Metcalf, J., Perlmutter, J., LePage, D., On, J., Layton, E. M.\*, Zhou, H.\*, & Bordenstein, S. R. (2019). Phage genes control bacterial-induced inviability in insects. *Vanderbilt Institute for Infection, Immunology, and Inflammation Symposium*. Nashville, TN. Poster.
* **Shropshire, J.D.**, & Bordenstein, S. R. (2019). Identifying and characterizing the genes that control animal reproduction. *Vanderbilt Microbiome Initiative.* Nashville, TN, Talk.
* **Shropshire, J.D.**, & Bordenstein S.R. (2018) On the genetic basis of bacterial-induced inviability in *Drosophila*. *Vanderbilt BioSci Research in Progress*. Nashville, TN. Talk.
* **Shropshire, J.D.**, & Bordenstein, S. R. (2018). The genetic basis of Wolbachia-induced cytoplasmic incompatibility. *Vanderbilt SuperFly Meeting.* Nashville, TN, Talk.
* **Shropshire, J.D.**, On, J., Layton, E., Zhou, H., & Bordenstein S.R. (2018) A single prophage WO gene rescues cytoplasmic incompatibility. *Vanderbilt Institute for Infection, Immunology, and Inflammation Symposium*. Nashville, TN. Poster.
* **Shropshire, J.D.**, & Bordenstein S.R. (2018) A single prophage WO gene rescues cytoplasmic incompatibility. *Vanderbilt BioSci Annual Retreat*. Nashville, TN. Talk.
* **Shropshire, J.D.**, LePage, D., Perlmutter, J., On, J.\*, Layton, E.\*, & Bordenstein S.R. (2017) A single gene contributes to and prevents embryonic lethality induced by a bacterial symbiont. *Vanderbilt BioSci Annual Retreat*. Nashville, TN. Poster.

**GRANTS RECEIVED**

National Science Foundation Postdoctoral Research Fellowship in Biology. 2020-2022

PI: $138,000 (total), $108,000 (stipend/2yr), $30,000 (indirect)

National Institutes of Health, R01, "The Genetic Basis of Cytoplasmic Incompatibility", 2017-2022

*Coauthor*: $1,951,071 (total), $1,250,000 (direct), $707,071 (indirect)

American Society for Cell Biology COMPASS Outreach Grant. *Co-PI*: $200 (direct) 2019

American Society for Cell Biology COMPASS Outreach Grant. *Co-PI*: $300 (direct) 2018

National Science Foundation, Graduate Research Fellowship Program. 2017-2020

$102,000 (stipend/3yr), $36,000 (Cost of education/3yr)

ETSU Honors College Student Faculty Collaborative Research Grant. *Coauthor*: $600 (direct) 2013

**HONORS & AWARDS**

NSF Postdoctoral Research Fellowship in Biology 2020

Entomology 2019 Speaking Award (2nd place) 2019

Graduate Student Research Excellence Award, Vanderbilt University 2019

Animal-Microbe Gordon Research Conference Speaking Scholarship 2019

Undergraduate Biology Education Research Gordon Research Conference Scholarship 2019

Entomological Society for America SEB Speaking Award (1st place) 2019

Vanderbilt University Graduate Student Travel Award 2019

Vanderbilt University Graduate Student Travel Award 2018

Tennessee Academy of Sciences Speaking Award (1st place) 2018

American Society for Microbiology KY-TN Speaking Award (3rd place) 2018

NSF Graduate Research Fellowship Awarded 2017

Ann Bernard Martin Award for Excellence in Graduate Research 2017

NSF Graduate Research Fellowship Program Honorable Mention 2016

Collaborative Research on the Arthropod Way of Life Travel Award 2014

ETSU Biological Sciences Outstanding Senior of the Year Award 2014

ETSU Biology Department Travel Award 2014

ETSU Honors College Travel Award 2014

**COURSES TAUGHT**

**Co-Advisor: Directed Research (BSCI 3861)**  2017-2019 Vanderbilt University, Nashville, TN

Supervised four undergraduate students undertaking semi-independent research projects. Priority was   
given to teaching experimental design, project management, troubleshooting, data acquisition, data   
analysis, and manuscript preparation.

**Instructor: Project-Focused Introduction to Biology Lab (BSCI 1512L)**  2017-2018

Vanderbilt University, Nashville, TN

Responsibilities included full curriculum design, implementation, and assessment. Students conducted

a course-long project that involved the screening and description of arthropods infected with

*Wolbachia*, a commonly found bacteria present in reproductive tissue. Techniques taught included

arthropod collections and storage, identification of collected specimen, DNA extractions, PCR, gel

electrophoresis, data analysis, poster design, presentation, and literature review. The Spring 2018

class has decided to attempt publishing their results in a peer-reviewed journal.

**Co-Instructor: Summer Academy at Vanderbilt for the Young (SAVY)**2018

Programs for Talented Youth, Vanderbilt University, Nashville, TN

Instructed a field ecology course for gifted 5th-6th grade students. Developed lessons to teach   
students how to identify arthropods, understand the role of insects in the environment, and how   
humans fit into our ecosystem. Lessons included numerous active learning techniques to keep

students engaged, such as think-pair-share, jigsaw reading exercises, hands-on microscope activities,

field exercises, among others.

**Teaching Assistant: Introduction to Biology Lab (BSCI 1511L)**  2016

Vanderbilt University, Nashville, TN

Instructed a standard introduction to biology lab. Responsibilities included giving lecture-based   
instruction, providing demonstrations, assisting students, holding regular office hours, grading exams/homework/classwork, and connecting students to resources to get involved in research.

**Co-Advisor: Research Internship (BSCI 3860)** 2017  
Vanderbilt University, Nashville, TN

Facilitated a weekly meeting on assigned literature to prepare a student for the upcoming directed

research course. The student then wrote a review on the reading and related articles and was

subsequently subjected to a pseudo-review process.

**Genetics Tutor** 2014

Student Support Services

East Tennessee State University, Nashville, TN

Met with students twice weekly to discuss content presented in their genetics lecture. Designed

additional assessments to facilitate learning.

**OUTREACH**

**Discover the Microbes Within! The Wolbachia Project**2016-Present

The *Wolbachia* Project aims to bring entomology and molecular biology techniques into schools.

Involvement has included presenting research to students at Hillsboro High School and Vanderbilt

Academy for Science and Math, a question/answer session regarding how one becomes a graduate

student, served as an invited speaker to discuss the *Wolbachia* Project at a teaching workshop

organized by the Bay Area Biotechnology Education Consortium, assisted classrooms with insect

identifications and DNA extractions, and assisted with the design of official course material for the

project.

**Science Club at the Library, Nashville** 2018*-*2020

Funded by the American Society for Cell Biology and the Vanderbilt Microbiome Initiative. Science Club at the Library is a monthly event that brings Vanderbilt researchers to an audience of 4-10 year olds to teach them about science through activities and discussion. Topics have included sealion whisker anatomy, the human gut microbiome, viruses and disease, insect diversity, aquatic microbiology, and food microbiology. As a co-PI on the grants funding this effort, responsibilities have included organizing the venue, advertising, activity design, and assisting with instruction during events.

**Nearly 100 Years Since the Scopes Trial: Teaching Evolution in Tennessee** 2018-2019

Funded by the European Society for the Evolutionary Biology, this effort seeks to create a series of kits that can be provided to rural elementary and middle school classrooms to teach a variety of evolutionary principles. Responsibilities included helping to design a kit to teach students about the impact of reproductive strategies on evolutionary rates.

**Nashville Science Club**  2019

The Nashville Science Club is a diverse group of people including musicians, artists, retail workers, scientists, accountants, and others that are interested in learning more about science. I presented a talk entitled “*The bacteria that hijacks arthropod sex lives.*” I discussed how the bacteria *Wolbachia* is capable of manipulating its host’s reproduction to favour its transmission and how it can be used to curb the spread of mosquito-borne diseases.

**MegaMicrobe** 2017-2018

Nashville, TN

Sponsored by the Vanderbilt Microbiology initiative and Vanderbilt Institute for Infection, Immunology, and Inflammation, MegaMicrobe is a yearly event that bring researchers together to create activities for K-6 students. These activities emphasize the importance of microbes in our world and highlight why researching them is necessary. Involvement has included two years of activity design and co-instruction.

**Skype-a-Scientist**2017*-*2020

Nationwide

Skype-a-Scientist matches scientists with classrooms around the world to give scientists an opportunity to translate their science and students a chance to learn of it. Involvement has included numerous skype sessions, one with Dr. Mark O. Martin’s Microbiology class at the University of Puget Sound in Washington, a BioEngineering class at MESA Charter High School in New York, and biology class at

**MENTORSHIP**

**Postdoctoral trainees**

* Brittany Leigh (2018): Postdoctoral researcher. Trained on *Drosophila* handling and genetics under my supervision.

**Graduate students**

* Maggie Grau (2017): MSTP rotation student assisting with experiments testing cytoplasmic incompatibility genes.

**Postbac researchers**

* Emily Hamant (2020): U. of Montana postbac researcher.

***Undergraduate students***

* Erin Markham (2020): U. of Montana Class of 2022.
* Mahip Kalra (2018-Present): Vanderbilt Class of 2022. SyBBURE Searle undergraduate research fellow.
* Emily Layton (2016-2020): Vanderbilt Class of 2020; Coauthor on two papers identifying genes that cause and rescue cytoplasmic incompatibility: LePage et al. 2017 *Nature* and Shropshire et al. 2018 *PNAS*. Emily first authored an article published in *mBio* 2019. SyBBURE Searle undergraduate research fellow.
* Aakash Basu (2018-2020): Vanderbilt Class of 2021; Goldwater Scholar.
* Sangamithra Pugazenthi (2018-2020): Vanderbilt Class of 2020
* Phoebe White (2018-2020): Vanderbilt Class of 2021
* Rachel Rosenberg (2019): Vanderbilt Class of 2021
* Helen Zhou (2017-2018): Vanderbilt Class of 2018; Coauthor on the identification of genes that rescue cytoplasmic incompatibility: Shropshire et al. 2018 *PNAS*. Now a law student at Columbia Law School.
* Jungmin (Danny) On (2016-2017): Vanderbilt Class of 2016; Coauthor on two papers identifying genes that cause and rescue cytoplasmic incompatibility: LePage et al. 2017 *Nature*, Shropshire et al. 2018 *PNAS,* and Layton et al. 2019 *mBio*. Now a medical student at the Medical College of Georgia.
* Melissa Halstead (2016): Vanderbilt Class of 2019; Volunteered for a semester working on the influence of the microbiome on *Nasonia* wasps.
* Katie Carbonell (2016): Vanderbilt Class of 2019; Volunteered for a semester working on the influence of the microbiome on *Nasonia* wasps.

**High school students**

* Fiona Broadie (2016): Volunteered for a summer to learn how to rear *Nasonia* and dissect reproductive tissues.

**ADDITIONAL EDUCATION**

Making figures in R for beginners, Vanderbilt University, Workshop 2019

Introduction to GitHub, Vanderbilt University, Workshop 2019

Certificate in College Teaching, Center for Teaching, Vanderbilt University 2018  
Students as Research Collaborators: Managing Students & Resources, American 2017

Society For Microbiology, Webinar

Peak performance: Work-life balance, Vanderbilt University, Workshop 2017

Making Sense of High-Throughput Gene Expression Data, CQS Summer Institute, 2016

Vanderbilt University, Certificate

Noldus Observer XT, East Tennessee State University, Training 2014

**SERVICE**

Communication Chair & Co-founder, American Society for Microbiology VU Student Chapter 2018-2019

Secretary of Education, Biological Sciences Graduate Student Association 2017-2018  
Treasurer, Biological Sciences Graduate Student Association 2016-2017

*Reviewed for:* PLOS Pathogens (x1), mBio (x1), Frontiers in Microbiology (x1), Microbial Ecology (x1), Proceedings of the Royal Society B (x1), Molecular Genetics and Genomics (x1), PLOS One (x1), Young Scientist: A High School Research Journal (x3).

**PROFESSIONAL ASSOCIATIONS**

Genetics Society of America

Insect Genetic Technologies Research Coordination Network  
Entomological Society of America  
Society for the Study of Evolution  
American Society for Microbiology  
Union of Concerned Scientists  
American Academy for the Advancement of Science