James G. DuBose

Graduate Student, Bioinformatics
Department of Biology
Georgia Institute of Technology

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Education

Georgia Institute of Technology   December 2022
M.S. in Bioinformatics

University of Central Arkansas   May 2021
B.S. in Biology
Minors: Chemistry and Anthropology

Research

Georgia Institute of Technology   January 2022 – Present
Principal Investigator: Dr. William Ratcliff
Synopsis: In the Ratcliff lab, I am focusing on developing new bioinformatic and statistical approaches to analyze variants in population genomic data. Recent work has shown that many types of variants that were presumed neutral can have large effects. My focus has been developing statistical models that can account for this variability of mutational effects and developing accompanying bioinformatic tools that allow others to implement these approaches as well. My work in the Ratcliff lab has primarily focused on using yeasts (*Saccharomyces cerevisiae*) to develop these approaches, with the intent that they will be applicable to other organisms as well. I have used these approaches to contrast patterns of selection evolution between aggregative and clonal multicellular yeast populations, and I am currently testing how generalizable these models are to other organisms as well.

Georgia Institute of Technology   August 2021 – April 2022
Principal Investigator: Dr. Kostas Konstantinidis
Synopsis: In the Environmental Microbial Genomic Laboratory I combined transcriptomic and proteomic approaches to study the physiology of obligate halogen-respiring bacteria. These soil-dwelling bacteria grow significantly slower than other bacteria, and my objective was to understand what physiological adaptations allow for this lifestyle. Additionally, such bacteria have been implied in bio-remediation efforts, as halogen pollutants pose large risks for the environment.

University of Central Arkansas   2019 – Present
Principal Investigator: Dr. Tammy Haselkorn
Thesis: *The Ecological and Evolutionary Dynamics of Social Amoeba Microbiomes and Key Symbionts*
Synopsis: As an undergraduate student I studied the symbiotic interaction between soil dwelling amoebae, their persistent bacterial symbionts, and their transient bacterial microbiota. My thesis work focused on understanding the key ecological drivers of these symbiotic interactions, including how various symbionts are transmitted, their relevance in shaping their host microbiota, and how abiotic soil factors influence the stability of their interactions. I have continued working with Dr. Haselkorn to study how abiotic and biotic soil factors influence amoeba-symbiont interactions and amoeba ecology in general. Recently, we have also started investigating how host genetics and diet contribute to shaping the gut microbiota of flies (*Drosophila sp.*) that feed exclusively on cactus, aiming to gain a broader understanding of how host diet, genetics, and population structure influence their gut microbiota.

Publications

J.G. DuBose, M. Robeson, M. Hoogshagen, H. Olsen, T.S. Haselkorn. 2022. The complexities of inferring symbiont function: Paraburkholderia symbiont dynamics in social amoeba populations and its impact on the amoeba microbiome. *Applied and Environmental Microbiology.* doi: 10.1128/aem.01285-22

J. T. Pentz, K. MacGillivray, **J.G. DuBose**, P. L. Conlin, E. Reinhardt, E. Libby, W. C. Ratcliff. 2022. Evolutionary consequences of nascent multicellular life cycles. *bioRxiv.* doi: 10.1101/2022.07.21.500805 - In review at *eLife*

J.G. DuBose., Y. Li, G.O. Bozdag, W.C. Ratcliff. 2022. Varanus: A Scalable Pythonic Variant Annotation Program. *GitHub Repository.* - Manuscript in Preparation

Talks and Presentations

ASM South Central Branch 2022, Poster   10/27/2022
Thomas B. Crook, **James G. DuBose**, Luciano Matzkin, Tamara S. Haselkorn. *Comparative Microbiome Analysis of Cactophilic Drosophila Species*

Arkansas INBRE 2022, Poster   10/21/2022
Thomas B. Crook, **James G. DuBose**, Luciano Matzkin, Tamara S. Haselkorn. *The Microbiota of Naturally Acquired Cactophilic Drosophila Species*

Evolution 2021, Talk   06/23/2021
James G. DuBose, Tamara S. Haselkorn. *The transmission and diversity of Paraburkholderia in natural D. discoideum populations and its impact on the D. discoideum microbiome*

Asilomar 2021, Talk   01/08/2021
James G. DuBose, Tamara S. Haselkorn. *The Domination of Paraburkholderia in the Social Amoeba D. discoideum microbiome and its Impact on the Ecological Relevance of the Farming Symbiosis*

Arkansas INBRE 2020, Talk   11/06/2020
James G. DuBose, Tamara S. Haselkorn. *The Genetic Diversity of Bacterial Symbionts in Dictyostelium discoideum Social Amoeba and Their Effect on the Amoeba Microbiome*

ASM Microbe, Poster   07/2020
James G. DuBose, Hunter Olsen, Tamara S. Haselkorn. *Prevalence and Genetic Diversity of the Burkholderia Bacterial Farming Symbionts in Dictyostelium Discoideum Social Amoeba Populations and their Effect on the Amoeba Microbiome*

ASM South Central Branch, Poster   11/01/2019
James G. DuBose, Hunter Olsen, Tamara S. Haselkorn. *Long-term Prevalence Patterns of the Burkholderia Farming Symbiont in Dictyostelium discoideum Social Amoeba Populations*

Grants and Funding Awards

Computational Biology Graduate Research Assistantship   2022
Proposal: *A multi-omics approach for comparing the physiological differences between slow and fast-growing bacteria*
Award Amount: $4,200 over one semester

UCA College of Natural Sciences and Mathematics Student Research Funding   2021
Award amount: $1,000 over one semester
Proposal: *The horizontal transmission of the Paraburkholderia bacterial farming symbiont and its effects on the microbiome of the social amoeba D. discoideum*

Student Undergraduate Research Fellowship (SURF)   2019 – 2020
Award amount: $4,000 over two semesters
Proposal: *The effects of the Burkholderia bacterial symbiont on its social amoeba host's fitness and microbiome formation*

Advancement of Undergraduate Research in the Sciences (AURS)   2019
Award amount: $5,000 over one semester
Proposal: *Ecological relevance of the amoeba farming symbiosis: the prevalence of the Burkholderia bacterial symbiont in natural populations, and its effect on the amoeba microbiome*

Teaching and Mentorship

Teaching Assistantship
Course: Biological Principles (Georgia Tech: BIOS 1107)   Fall 2022
Description: During the Fall semester of 2022, I was a teaching assistant for the Biological Principles course at Georgia Tech. Aside from grading, my primary responsibilities were to plan and hold recitations sessions to reinforce content covered in the course.

Research Mentorship
Thomas B. Crook: Undergraduate Student at the University of Central Arkansas   Fall 2021 – Present
Description: Thomas is an undergrad in the Haselkorn lab. Over the past two years, I have mentored Thomas on various bioinformatic and statistical components of his honors thesis projects, as well as on designing poster presentations for two academic conferences.

Ying Li: Undergraduate Student at Georgia Tech   Summer 2022 – Present
Description: Ying is an undergrad in the Ratcliff lab. In the summer of 2022, I started mentoring Ying on bioinformatic software development. In the fall of 2022, I am serving as a mentor for Ying's senior research course, where we are developing models to evaluate how the algorithmic complexity of the variant annotation program we made scales with genome size and complexity.

Outreach and Volunteering

Development of Programming Education Resources for Historically Minoritized Groups in Computing
Project Advisor: Dr. Benjamin Rydal Shapiro
Synopsis: DataWorks is a data services provider that employs people from communities that have historically had little access to computational resources and education. By hiring and educating people from these groups, DataWorks hopes to broaden access to computing and foster equitable labor practices. One of the main tasks performed by DataWorks employees is retrieving and organizing information from online locations, a process known as web scraping. I have been working with DataWorks on building educational resources that will teach the employees to how to automate these tasks using Python, as opposed to manual copying and pasting. The primary resource is a comprehensive introductory Python course that is specifically designed for people with no computational experience. Since web scraping is the major task performed at DataWorks, this course teaches Python through the lens of parsing webpages into tabular data.

Employment

Georgia Institute of Technology, School of Biological Sciences   08/2022 – Present
Graduate Teaching Assistant

Georgia Institute of Technology, School of Biological Sciences   01/2022 – 05/2022
Graduate Research Assistant

Arkansas Department of Health, Public Health Laboratories   03/2021 – 07/2021
Laboratory Technician, Molecular Biology Unit, COVID-19 Unit

University of Central Arkansas Tutoring Center   08/2019 – 05/2021
Biology, Chemistry, and Mathematics Tutor

University of Central Arkansas, Biology Department   06/2020 – 08/2020
Research Assistant

References

Dr. William Ratcliff
Associate Professor, Department of Biology
Georgia Institute of Technology
Email: william.ratcliff@biology.gatech.edu

Dr. Tammy Haselkorn
Associate Professor, Department of Biology
University of Central Arkansas
Email: thasekorn@uca.edu

Dr. Benjamin Rydal Shapiro
Assistant Professor, Department of Learning Sciences
Georgia State University
Email: bshapiro@gsu.edu