Chris Talbot – Statement of Purpose, UC-Davis Population Biology PhD

At age 11, I programmed my first Minecraft mod, setting forth my interests in programming and problem-solving and defining my career trajectory. The first in my family to attend college, I studied computer science during my Associate's degree before transferring to the University of Michigan. I declared a major in Ecology & Evolution, seeking to use my quantitative skills to solve environmental crises. I built computational skills in discrete mathematics, algorithms, proof-based real analysis, and linear algebra while engaging in rigorous biological coursework, including macroevolution and genetics.

In Dr. Roberto Márquez's lab at Michigan, I gained hands-on experience developing CRISPR techniques in poison-dart frogs to investigate the mechanisms underlying aposematism. A Biomedical & Life Sciences Fellowship allowed me to research full-time for a summer. After completing that project, I began independent research on spatiotemporal floral community dynamics with Dr. Marjorie Weber, asking whether flowers of a color bloom together. I developed a Python program to extract floral color from thousands of images and used mixed models to analyze relationships among multivariate traits across 1,000+ species. I received Highest Honors for this work and have a first-author manuscript in preparation.

Now, as a computational technician in Dr. Gideon Bradburd's lab at Michigan, I directly engage with population genetics by testing and documenting *gaia*, which leverages Ancestral Recombination Graphs to infer the spatial locations of a population's ancestors. Using *SLiM* simulations, I am examining the impact of temporal sampling schemes on inference accuracy. I am also developing an interactive map dashboard to visualize *gaia* inference. This experience has solidified my passion for population biology and provided expertise in modern techniques, setting me up for success in designing new, robust models of evolutionary processes at UC-Davis.

Driven by my experience and long-standing interests in environmentalism and programming, my research interests now focus on developing computational and statistical methods to study evolutionary adaptation. Using spatiotemporal population genomic data, I aim to infer the relative strength, importance, and timing of evolutionary processes such as selection, drift, and gene flow in natural populations. Assessing evolutionary dynamics using these data will provide unique insights into species' potential to adapt to future climate and other human-induced changes.

I would be excited to develop a research program that centers around the following questions:

1. How do spatiotemporal patterns of genetic variation inform our understanding of population demography and local adaptation?
2. How can insights into the mechanisms of adaptation help predict species resilience under global change?

I have had several conversations with Dr. Graham Coop, who I would be most excited to work with. They have been the most intellectually exciting conversations I've had with a potential advisor, and I'd be excited to collaborate with him on population genomics projects. I am also interested in working with Dr. Jeffrey Ross-Ibarra, whose work in agricultural adaptation closely mirrors the projects I'd love to develop during my career.

Ultimately, I aim to leverage my computational skills to further our understanding of how biodiversity will respond to global change. The Population Biology PhD program at UC-Davis is the best place to leverage my strengths to contribute to biodiversity research. My proposed advisors and other potential collaborators across the department and school provide the optimal network to advance my research program and gain a well-rounded perspective on approaching complex problems in evolutionary biology. Further, UC-Davis stands out as one of the best programs for coursework to enhance my understanding of the field. I hope to contribute to Davis' diverse, rigorous, and forward-thinking academic environment soon.