

MEMORANDUM

DATE: 10/17/2024

TO: Faculty and Students

FROM: Professor(s) Jesse Taylor
Chair/Co-Chairs of Aiden Lewis
Defense for the MA in Mathematics
Committee Members Nicolas Lanchier
Sharon Crook

DEFENSE ANNOUNCEMENT

Candidate: Aiden Lewis

Defense Date: Wednesday, October 30, 2024

Defense Time: 11 AM

Virtual Meeting Link: <https://us04web.zoom.us/j/2505300064?pwd=FOPXa1m7opK823SACu5gFGwvFnZSXe.1>

Location: Tempe Campus, WCLR 206

Title: Investigating the impact of antagonistic selection in vector-transmitted parasitic diseases

Please share this information with colleagues and other students, especially those studying in similar fields. Faculty and students are encouraged to attend. The defending candidate will give a 40-minute talk, after which the committee members will ask questions. There may be time for questions from those in attendance. However, guests are primarily invited to attend as observers and will be excused when the committee begins its deliberations or if the committee wishes to question the candidate privately.

ABSTRACT
-See next page-

Abstract

A model of a vector-transmitted parasitic disease, based primarily on *Plasmodium*, was developed to simulate its behavior on both the macroscopic population and microscopic individual levels, with a specific focus on different fitness advantages for parasites' alleles in different populations. The main contexts simulations were performed for were (i) host advantage only, (ii) vector advantage only, and (iii) antagonistic advantages favoring one allele in the host and the other allele in the vector. A control simulation with no advantages was also performed. Contexts (i) and (ii) behaved as expected, with the advantaged allele demonstrating higher fitness overall in both cases, and it was found that vector advantages are generally much weaker than host advantages. Antagonistic advantages saw neither allele achieve the same degree of dominance it would have done on its own; however, the host-favored allele was still generally more prevalent than the vector-favored allele in both populations, albeit to a lesser degree in the vector relative to the host. Similar long-run behavior was observed for selection and transmission advantages, but selection advantages generally acted much more quickly than transmission advantages did.