

PhD Scholarship at the University of Waikato

Project Title:

Understanding the Influence of Horizontal Gene Transfer on Intra-Species Genomic Variations in Natural Bacterial Communities

Project Description (max 700 words):

Natural bacterial populations are known to exhibit extraordinary intra-species genomic variations, an inconvenient truth not satisfactorily explained by the conventional framework for evolution, where natural selection acts on individual organisms exhibiting traits rather than directly on trait-conferring genes. Recent studies, however, have reported gene-specific selective sweeps of advantageous mutations across bacterial populations. This suggests that our current operational definitions of bacterial “species” do not in fact delineate bacterial populations that respond to natural selection in a cohesive manner, and that horizontal gene transfer, which is prevalent in bacteria, needs to be explicitly considered when defining bacterial “species”.

Using geothermal microbial communities in the Taupō Volcanic Zone as a model system, we will attempt to resolve this paradox by examining the ecological population theory, which postulates that ecologically cohesive microbial populations are delineated by gene-flow boundaries. We hypothesise that ecological populations of bacteria exhibit behaviours analogous to metazoan populations, and we will test our hypothesis by answering three questions: (1) how do ecological populations respond to changes in environmental conditions; (2) do ecological populations exhibit biogeographical and dispersal patterns like those observed in metazoan populations; and (3) can we understand the mechanisms maintaining ecological populations by tracking them through a time series?

A PhD scholarship is available from the University of Waikato to study the role of horizontal gene transfer in creating and maintaining intra-species genomic variations in geothermal microbial communities. The PhD candidate will work with Dr. Charles Lee and Prof. Craig Cary (as well as Prof. Martin Polz at the Massachusetts Institute of Technology and Dr. Matt Stott at the University of Canterbury) to isolate and sequence targeted microorganisms from geothermal hot springs within the Taupō Volcanic Zone, carry out comparative genomic analyses to identify ecological populations, and identify and profile the role(s) of horizontal gene transfer on intra-species genomic variations in natural microbial communities.

Applicants must have a MSc or BSc Honours (or equivalent) in a relevant field. Experience with comparative genomics, metagenomics, isolation and characterisation of environmental microorganisms, and geochemical analyses of environmental samples is preferred but not essential. The successful applicant is expected to undertake laboratory and field research associated with the project, so a reasonable degree of physical fitness is required.

Funding Notes (max 100 words):

This scholarship is fully funded by the New Zealand Marsden Fund and open to qualified individuals of any nationality or gender, but it is the successful applicant's responsibility to secure a student visa to New Zealand. Applicants must meet all entrance requirements for the PhD programme at the University of Waikato. The scholarship covers both tuition fees and living expenses for three years.

Applications will close on 30 April 2018 (New Zealand Time).

Contact Information:

Please submit CV/bibliography and contact information of three references to Dr. Charles Lee at charles.lee@waikato.ac.nz

Alternatively, submit your enquiry at <https://www.findaphd.com/search/ProjectDetails.aspx?PJID=95894>