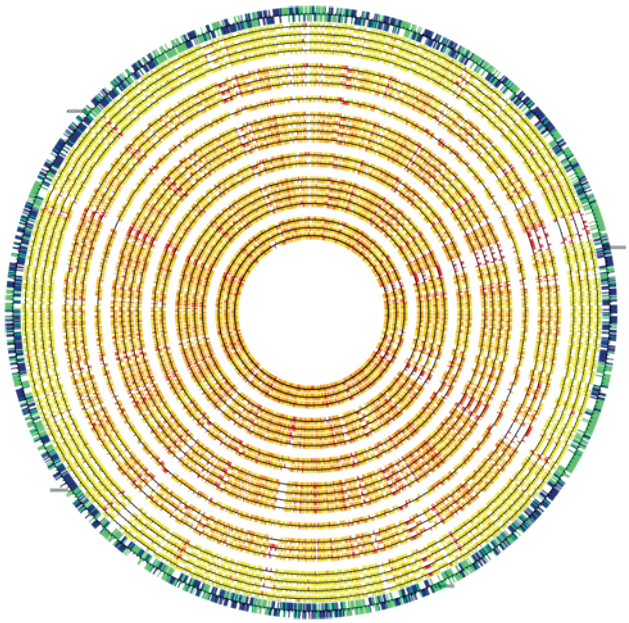
University of St Andrews

PhD Studentship in Computational Biology/ Bioinformatics

The James Hutton Institute

How is microbial diversity maintained?

Microbes are the most ubiquitous life form on Earth, found everywhere from exotic locations - black smokers on the ocean bottom - to the inside of every human's gut. They are essential for nearly all life on the planet, driving nutrient cycling in the environment and contributing to the health of plants and animals. Microbes are also critical to industrial biotechnology, especially for fuel, fine chemical and drug production. Thus, understanding how microbial ecosystems are maintained is essential. Evolutionary processes within microbial communities appear fundamentally different than those at play in macro-organisms, requiring specific understanding.



Comparison of multiple microbial genomes

In this studentship, you will develop artificial life simulations to explore evolution and maintenance of biodiversity in microbial communities. You will use machine learning and mathematical modelling to identify and assess strategies leading to stable communities that also maintain biodiversity. You will explore how communities respond to perturbation, corresponding to phenomena such as provision of antibiotics to a patient, and human intervention in industrial and agricultural systems.

Your work will have applications in many areas. It is increasingly clear that the microbial communities within our bodies are key contributors to health: because the beneficial effects of these communities are in danger from both antibiotics and antibiotic-resistant pathogens, understanding how healthy biodiversity can be maintained in the face of perturbation is essential. Maintenance of soil microbial diversity is important for plant health, and ultimately our food security. Microbial populations in all contexts may share essential features of community assembly, and this project will inform multiple topic areas.

You will gain training in artificial life simulations, genetic algorithms, machine learning, game theory, microbial genomics and metabolism, and mathematical modelling, and will acquire a working knowledge of microbial communities and their importance on our planet.

Your project will take place in St Andrews' Centre for Biology Diversity (CBD) in the School of Biology, and will be jointly supervised by Dr V Anne Smith from the School of Biology (http://biology.st-andrews.ac.uk/vannesmithlab/), Dr John Mitchell from the School of Chemistry, (http://chemistry.st-andrews.ac.uk/staff/jbom/group/) and Dr Leighton Pritchard from the James Hutton Institute (http://www.hutton.ac.uk/staff/leighton-pritchard). All three groups work in complementary areas of computational systems biology and machine learning.

To apply, please direct an initial informal enquiry including your CV and a cover letter explaining your interest in this position to **anne.smith@st-andrews.ac.uk**.

Funding: EASTBIO Studentship covering fees plus stipend for 4 years
See http://www.eastscotbiodtp.ac.uk/how-apply-0 for eligibility