

PhD Studentship Details

Lead organisation: University of Bristol

Collaborating organisations: Bangor University

Title: Break'N open the black box – Understanding microbially mediated N dynamics to improve soil health and agriculture

Duration: 3.5 years

Start date: September 2026

We are seeking a highly capable analytical chemist for an exciting PhD opportunity to use ^{15}N -stable isotope probing (SIP) methodologies, including stable isotope and high resolution mass spectrometry to investigate how the elucidate how the biosynthesis of soil organic nitrogen, which underpins plant nitrogen supply and nitrogen losses, may be exploited to improve the health of our soils.. This studentship is part of Leverhulme-funded project running for 4 years to determine the mechanistic controls on microbial organic nitrogen biosynthesis and transformations in natural and agrarian environments, led by Professor Ian Bull, at the University of Bristol.

With a move towards more sustainable agricultural practices and land restoration to address the challenges of N pollution of waterways, it has become increasingly necessary to focus on the organic N pool in soils. This pool has previously been inaccessible to investigation at the mechanistic level due to methodological limitations. However, we are now able to progress through our development of new compound-specific ^{15}N -SIP approaches. Using ^{15}N -labelled compounds, we can trace the production of new soil organic N through the amino acids newly biosynthesised microbial proteins. In this project you will exploit this approach to help determine which soil microbes are central to the production and cycling of organic N across different soil types. You will investigate this using a unique mountain-to-sea transect that offers a range of natural, seminatural and agricultural land-use types. This new view of the N cycle will explicitly elucidate the role of microbes in stabilising N in the soil, thereby informing new strategies for minimising N pollution and quantifying the role of soil organic N in soil storage.

We have pioneered the application of compound-specific ^{15}N -SIP, which you will use to understand the impact of adding inorganic forms of N to to soil mesocosms, following their transformations into other forms of N, traced and quantified using stable isotope ratio mass spectrometry. Tou will focus on amino acids, the building blocks of protein and the largest soil organic N pool. This highly sensitive and selective approach will enable you to add substrates at environmentally relevant concentrations to minimise perturbation of the soil N cycle. You will trace the fate of inorganic N (ammonium and nitrate), relevant both as a fertiliser but also for N deposition, testing how differences in soil pH and C content influence microbial assimilation. This will feed into wider project activities involving the application of organic N forms and the use of advanced genomic and transcriptomic approaches to determine the microbial species responsible for soil N functions and the fate N in soils across a wide range of environments.

Thereby obtaining an explicit understanding of microbially mediated N dynamics to improve soil health and agriculture.

This opportunity will provide a prodigious level of training with access to state-of-the-art analytical facilities and instruction in advanced hyphenated mass spectrometric techniques (e.g. GC-C-IRMS, GC-Orbitrap MS, LC-Orbitrap MS) and biogeochemical methods. The successful applicant will also gain experience in working within a multidisciplinary research team with opportunities to collaborate with partners and present at national and international conferences.

You will be expected to meet the following criteria:

- hold or expect to obtain at least a first-class or upper second-class honours degree in, chemistry, environmental science or related discipline;
- have excellent laboratory skills and some experience with analytical techniques;
- demonstrate strong organisational and time management abilities;
- proficiency at analytical development, both instrumental and laboratory based; and,
- have good mathematical, coding and statistical skills.

This project will be supervised and led by [Professor Ian Bull](#) and co-supervised by [Professor Richard Evershed](#) and [Dr Michaela Reay](#), all at the University of Bristol. It will also benefit from collaboration with project partners at Bangor University. The student will join a dynamic research environment, of international standing, based in the [Organic Geochemistry Unit \(OGU\)](#) in the School of Chemistry at the University of Bristol and will also visit Bangor University to take advantage of training and research opportunities.

For informal enquiries, please contact Professor Ian Bull (ian.d.bull@bristol.ac.uk).

Candidate Requirements

Applicants must have obtained, or be about to obtain, a First or Upper Second Class UK first degree, or the equivalent qualifications gained outside the UK, in chemistry or in a related discipline (biochemistry, biogeochemistry, environmental sciences).

How to Apply

Please make an online application for this project at the following page [How to apply | Study at Bristol | University of Bristol](#).

Funding

A full studentship will cover UK tuition fees, a training support fee and a stipend (£20,780 p.a. in 2025/26, updated each year) for 3.5 years.

Getting in Contact

We encourage you to make an informal enquiry to Ian Bull (chidb@bristol.ac.uk) if you have any queries or would like to discuss project.