

OXFORD INTERDISCIPLINARY BIOSCIENCE DTP Industrial CASE Studentship Advertisement – 2015/16

Supervisor(s) names: Prof. Mark Howarth and Dr. Mike Bedford

Department(s)/Organisations: Department of Biochemistry, University of Oxford and AB Vista

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Project Title: Designing and evolving ultra-stable enzymes for improved nutrition and reduced environmental damage

Brief description of project (no more than 500 words):

Improved enzymes can contribute to addressing many of society's greatest challenges, from renewable energy to feeding a growing planet. Recombinant enzymes are central enabling tools for research, as well as having multi-billion pound industrial importance. Use of enzymes is very often limited by their instability over time and their irreversible inactivation by harsh conditions. In some cases, enzymes have been painstakingly developed to tolerate tough conditions, but in other cases no enzyme of a specific class can be found with suitable tolerance. We have managed to develop a general approach to confer resilience to harsh conditions on a range of different enzymes, by synthetic biology design and protein re-engineering. This studentship will explore the use of this strategy to make ultra-stable a group of enzymes important in nutrition, widely used in agriculture and with potential against human micronutrient deficiency.

Skills training will be provided in molecular biology, protein engineering and design, genetic selection and screens including phage display, mass spectrometry, circular dichroism, flow cytometry, calorimetry, and bioinformatics. According to the development of the project there may also be the chance to learn fluorescence microscopy and X-ray crystallography.

The project will clone this new class of ultra-stable enzymes, determine and refine their properties through rational and library-based optimisation, and then scale-up to discover the enzyme's nutritional impact. Functional testing will be combined with basic biophysical investigation to discover new principles of enzyme stabilisation. With this integrated platform, we should discover general principles to accelerate the discovery of enzymes with new and powerful activities for diverse bioscience challenges.

The major part of the studentship will be carried out in Oxford University Department of Biochemistry. For the industrial placement (of no less than 12 weeks duration), the student will be trained and supported by Dr. Mike Bedford at AB Vista at their headquarters in Marlborough, UK. At this site there are team members with a range of expertise, including on the industrial use of probiotics and enzymes, microbiome analysis, and business-related training including regulatory requirements. The headquarters in Marlborough is supported by field sites locally and at other sites in the UK for testing of enzyme function. According to the needs of the project, the student may also be given the opportunity to work at AB Enzymes in Rajamäki Finland, a partner company of AB Vista, and one of the world's largest enzyme manufacturers with both R&D and manufacturing operations. AB Enzymes have expertise in enzyme identification, enzyme engineering and large-scale enzyme production.

Attributes of suitable applicants:

Applicants should be predicted or have achieved a first-class or strong upper second-class undergraduate degree with honours (or equivalent international qualifications) in a relevant bioscience subject (e.g. biochemistry, biology)

Statement of project description approval

I confirm that all parties associated with this project have seen and approved the information provided above and are willing for it to be made publically available for the purpose of recruiting a student to undertake this project.

Name: Mark Howarth

Electronic Signature:

A handwritten signature in black ink that reads "Mark Howarth". The signature is written in a cursive style with a large initial 'M' and a long, sweeping underline.