Diamond-Pirbright Studentship Advertisement – 18

**Supervisor(s) names:** Dr Sofia Diaz-Moreno (Diamond Light Source, I20 Beamline Principal Scientist); Prof. Kylie Vincent (University of Oxford, Department of Chemistry); Dr Philip Ash (University of Oxford, Department of Chemistry); Dr Stephen Best (University of Melbourne, Department of Chemistry)

**Department(s)/Organisations:** University of Oxford, Diamond Light Source

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**Project Title:** Room temperature high-resolution X-ray spectroscopy of electrochemically-controlled redox metalloproteins at intense beamlines

**Brief description of project (no more than 500 words):** Your description should include

This project addresses key challenges in X-ray absorption spectroscopy studies of metal-containing proteins, namely how to control and protect against photoreduction and X-ray damage and how to generate protein samples in well-defined oxidation states. These questions are highly relevant on beamlines like I20, where the high intensity allows study of low protein concentrations (typical for biological studies) but in turn is more likely to induce damage to the protein. Exploiting expertise of Vincent and Ash in Oxford on electrochemical control of metalloproteins, we explore the applicability of a pulsed solution electrochemical flow approach, demonstrated by Best, to protect proteins during room temperature solution measurements of defined redox states. We will set up this approach on the I20 beamline and aim to generate data on a range of metalloprotein sites which will serve as models for understanding XAS of more complex enzymes.

This will include electron transfer proteins with haem and non-haem iron sites, copper and nickel sites and an iron-sulphur cluster. We then extend the study to a direct electrochemical approach in which the protein of interest is immobilised on a carbon electrode and exchanges electrons directly, enabling fast catalytic oxidation and reduction reactions in an enzyme to be controlled in situ during XAS measurement.

Research will be carried out 50% at Diamond Light Source which is the UK’s national synchrotron science facility, located at the Harwell Science and Innovation Campus in Oxfordshire. The remaining 50% research will be conducted in the Department of Chemistry at the University of Oxford. The Science Transit shuttle provides quick and convenient travel between the University of Oxford Science Area and Harwell Campus.

**Attributes of suitable applicants:** The successful applicant will have a background in Chemistry or a related discipline and an interest in biological inorganic chemistry or biophysics.
Funding notes: This project is funded for four years by the Biotechnology and Biological Sciences Research Council BBSRC. BBSRC eligibility criteria apply (https://www.ukri.org/files/legacy/news/training-grants-january-2018-pdf/). EU nationals who do not meet BBSRC residence criteria are encouraged to contact the programme administrator to check their eligibility for BBSRC funding before submitting a formal application. Successful students will receive a stipend of no less than the standard RCUK stipend rate, currently set at £14,777 per year, which will usually be supplemented by the industrial partner.

This project is supported through the Oxford Interdisciplinary Bioscience Doctoral Training Partnership (DTP) studentship programme. The student recruited to this project will join a cohort of students enrolled in the DTP’s interdisciplinary training programme, and will be able to take full advantage of the training and networking opportunities available through the DTP. For further, details please visit www.biodtp.ox.ac.uk.
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: Kylie Vincent

Electronic Signature: