University of Essex

Protein Structure & Function Group, Biomedical EPR Facility, School of Biological Sciences,
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A Fully-Funded 3 Year PhD Scholarship Is Available From October 2017.

Illuminating the catalytic, structural and mechanistic features of a new class of haem peroxidases to dye for

Dye decolourising peroxidases (DyPs) are the most recent family of haem peroxidase to be discovered. The oxidizing potential of these enzymes is driven by the formation of ferryl intermediates, formed on H_2O_2 activation, that enable them to oxidize synthetic dye molecules widely used in the textile industry (Fig. 1). Some DyPs have been implicated in biomass deconstruction through the oxidative breakdown of lignocellulose. Thus, DyPs have vast potential for use in biotechnology applications. At present, detailed catalytic and substrate reactivity information is sparse across the four sub-families (A to D) of DyPs and there is a strong need to address this to maximize future commercial applications.

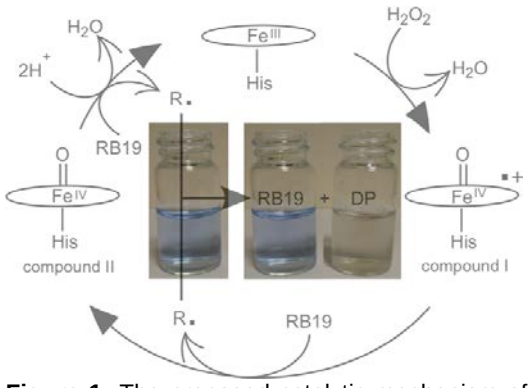

Figure 1: The proposed catalytic mechanism of a dye decolourising haem peroxidase from *Streptomyces lividans*. The anthraquinone dye RB19 is decolourised through a disproportionation mechanism.

At Essex we have identified an A-type DyP from *Streptomyces lividans* and have characterised its catalytic cycle and unusual dye decolourisation properties (Fig.1). Further to this, our X-ray structural work (including in-crystal generation of relevant intermediates) and EPR spectroscopy of transiently formed free radicals and high-valence haem states have informed on potential substrate binding sites and electron-transfer pathways (Fig. 2). The overarching aim of this studentship is to extend these experimental approaches across several DyP sub-families incorporating new structural and fast reaction methodologies, such as state of the art synchrotron beamlines and time-resolved X-ray crystallography as well as rapid freeze-quench EPR for kinetics studies, to characterise the high-valence catalytic intermediates and tailor this knowledge to generate designer enzymes for commercial applications.

Figure 2: The X-ray structure of *S. lividans* DtpA

The successful candidate will work under the supervision of Dr Jonathan Worrall, Dr Mike Hough and Dr Dimitri Svistunenko in the Protein Structure & Function Group in the School of Biological Sciences.

Entry requirements and application procedures

Informal queries may be addressed in the first instance to jworrall@essex.ac.uk or mahough@essex.ac.uk or svist@essex.ac.uk. Applications should be submitted electronically by the **30th June 2017**. See https://www.findaphd.com/search/ProjectDetails.aspx?PJID=86857 for details and the application form. The intended start date for this 3-year, fully-funded PhD studentship is 5th October 2017. This scholarship will be to the value of £12,500 per annum plus UK/EU tuition fees.

Applicants should write 500 words explaining why they are interested in this project and submit this with their CV.

This scholarship is generously supported by a bequest from the estate of Professor Peter Nicholls (https://www.theguardian.com/theguardian/2014/dec/30/peter-nicholls-obituary**)**