NERC Centre for Doctoral Training in Oil & Gas (2018 start)

Project Title: Twenty years on: the Paleocene Planktonic Foraminiferal Atlas re-imagined

Host institution: University of Birmingham

Supervisor 1: Dr Kirsty Edgar

Supervisor 2: Dr Tom Dunkley Jones

Additional Supervisor (s): Prof. Bridget Wade (UCL)

Project description: Microfossil taxonomy and biostratigraphy is one of the main cornerstones of petroleum geology providing; critical absolute and/or relative age controls on sediments, the main means of correlating sediments spatially, and paleoenvironmental information, essential for building geological models for hydrocarbon exploration and production. One of the key groups employed are the marine microfossils, foraminifera. In 1999, the Atlas of Paleocene Planktonic Foraminifera (Olsson et al., 1999) was published, synthesising >50 years of work (including disparate taxonomic schools and zonation schemes). This text rapidly became a staple for micropaleontologists globally. However, 20 years on, our conceptual framework, the quality and scope of materials available for study, and our technological capabilities have significantly evolved. Further, extensive ground testing of the work has highlighted a number of areas requiring significant revision, e.g., disconnects between carbonate microfossil zonal schemes, e.g., because species concepts are poorly constrained or are not well calibrated.

Here the student will apply novel high-throughput morphometric, imaging and statistical techniques to Paleocene planktonic foraminifera to: [1] constrain problematic species concepts, [2] assess stability of morphospecies sub-divisions with biostratigraphic utility, and [3] assess the reliability of existing and proposed datums in sediments with top-quality (astronomical) age control. Initial work will focus on sediments from the Naturaliste Plateau recovered during International Ocean Discovery Program (IODP) Expedition 369 in late 2017, close to the active petroleum producing Perth Basin, NW Australia, with other recently drilled sites incorporated as necessary. We also aim to reduce uncertainties between workers by producing high-quality, 3-D stereo-light microscope images (how specimens are viewed by workers on a day-to-day basis) in addition to standard high-resolution scanning electron microscope images of all species investigated. Ultimately this work will provide impetus for the release of a new Paleocene Planktonic Foraminiferal Atlas but, for immediate impact, will feed directly into the **dynamic, open-access** planktonic foraminiferal database *Mikrotax* (http://www.mikrotax.org) utilised for taxonomy and stratigraphy by industry, academia and students alike globally. This work will provide an up-to-date reference source for workers leading to improved stratigraphic control in the Paleocene for understanding the evolution and structure of marine sedimentary basins.

CDT Research theme(s): This work spans multiple themes but directly addresses *"Extending the life of mature basins"* by working towards a better understanding of the stratigraphic setting throughout the in regions of active petroleum exploration and production. It addresses the Global Challenges objective – ***Data Driven Economy*** by providing a key resource for workers.

Research context:

This project addresses a **key skills gap** within the energy sector as there is a global shortage of trained micropalaeontologists, with many workers close to retirement and a lack of skilled young people in the system. As the UK's largest and most diverse micropalaeontology group, and as host to the UK's only micropalaeontology MSc, the University of Birmingham provides a dynamic and internationally diverse environment for the student to train in, and gain exposure to both industry and academic micropalaeontologists.

Research costs: Dedicated Research Microscope £3,500; Consumables for processing and specimen cataloguing/storage £1500; SEM time 60 hrs over 4 years @ £40 per hour £2400
Career routes: Biostratigrapher/Micropalaeontologist, Exploration Geologist

Submissions must conform to this single-sided A4 format. The Awards Committee reserves the right not to consider submissions that do not adhere to this condition.