

ARIES DLA COMPETITIVE PHD STUDENTSHIP

The structure of organic carbon in carbonaceous asteroids in comparison to terrestrial recovered meteorites

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Scientific background

Organic compounds in asteroids contain information about the delivery of volatiles and organic components to the early Earth. The Hayabusa2 and OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, and Security–Regolith Explorer) missions have returned pristine regolith samples from the carbonaceous asteroids Ryugu and Bennu, respectively (Nakamura et al. 2022; Lauretta and Connolly et al. 2024). This project aims at providing an account of the impact of asteroidal alteration processes on the organic and mineralogical compositions of the returned asteroidal samples, and to properly address the nature of the primordial carbonaceous material and their spatial distribution on primitive asteroids.

Research methodology

The successful candidate will study and compare the mineralogy and organic content of space mission returned asteroidal samples (asteroid Ryugu – Hayabusa2 sample; asteroid Bennu – OSIRIS-REx samples) to terrestrial recovered CI chondritic meteorites, such as the Ivuna meteorite - the most recent and sizable CI meteorite fall. Using polished thin sections and raw (unprocessed) chips of samples, we will use a broad range of analytical techniques, such as scanning electron microscopy (SEM) combined with energy-dispersive spectrometry (EDS), Fourier Transform-Infrared (FT-IR), Raman spectroscopy, and scanning transmission X-ray microscopy (STXM) X-ray absorption near edge structure (XANES), to characterise the mineralogical and organic distribution of these specimens.

Training

The successful candidate will be primarily located at Royal Holloway, and also be hosted at the Natural History Museum for a minimum period of 3 months during the project, where the student will have access to world-leading meteorite and mineral collections and state-of-the-art analytical facilities. In addition to the mandatory cohort training events organised by DTP, the successful candidate will be given training for transferrable skills such as wet chemical and clean lab techniques, extraterrestrial sample handling techniques, mineral identification, spectroscopic data interpretation, and the analytical methods necessary for the implementation of this project at RHUL and NHM. The student will be trained by specialists on a 1:1 bespoke basis on meteoritic sample preparation and the use of analytical instruments including SEM, FTIR, Raman spectroscopy, and STXM-XANES. The student will also have access to other training opportunities at RH such as inSTIL teacher training programme accredited by the Higher Education Academy.

Person specification

We are looking for an individual with interest in laboratory analysis, and with a passion for organic geochemistry and meteoritics. Candidates should have a degree in Geology/Chemistry/Physics (or equivalent), preferably with knowledge of mineralogy and geochemistry. Laboratory experience and some knowledge of meteorites is desirable but not essential.

ARIES is awaiting confirmation of funding under the BBSRC-NERC DLA award scheme, which is expected shortly. Funding for this studentship is subject to this confirmation and [UKRI terms and conditions](#)