PROJECT TITLE: When did the Earth’s cratonic lithosphere form? A new look at the record from inclusions in diamonds.
DTP Research Theme(s): Solid Earth

Lead Institution: University of Bristol
Main Supervisor: Prof. Simon Kohn, School of Earth Sciences, University of Bristol
Co-Supervisor: Dr. Ian Parkinson, School of Earth Sciences, University of Bristol
Co-Supervisor: Prof. Michael Walter, Geophysical Laboratory, USA (CASE partner)

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![Diamond image](image1.jpg)

Fig 1 (a) A diamond containing abundant inclusions (b) Cathodoluminescence of a polished diamond showing a central inclusion and complex growth history

Project Background
Diamonds have been used extensively to elucidate the nature and timing of processes deep in the Earth and far back in geological time. Information is preserved in the lattice of the diamond itself and in the inclusions that are trapped at the time of diamond formation. Inclusions in diamonds have a number of key properties: (i) once trapped in diamond, the extraordinarily low diffusion rates in the host completely isolate the inclusion from the external environment; (ii) diamonds are formed over most of Earth’s history, thus providing a potential window into temporal variations in mantle volatile abundances; (iii) developments in analytical techniques allow a wide range of elemental and isotopic abundances, volatile concentrations and radiometric dates to be obtained on single inclusions. Recently, work in our laboratory and elsewhere has cast doubt on some of the dates previously published for inclusions in diamonds. A reappraisal of the history of lithospheric growth based on diamond ages is therefore required.

Project Aims and Methods
The main aim of the project is to produce new, high quality dates for sulphide inclusions in diamonds and to combine the dates with constraints on the temperature-time history of the same diamonds, modelled from infrared data. The work will take account of multiple episodes of growth within a single diamond locality, and will be complementary to related work being performed here and elsewhere on silicate inclusions. Ultimately a new history of lithospheric evolution and the plate tectonic processes that underlie it will be developed by combining the new data with a reappraisal of data in the literature.
The project will combine infrared spectroscopy of zoning within individual diamonds and across suites of diamonds, with very careful characterization of the internal structures of and Re-Os dating of sulphide inclusions. The sample characterization is a key part of the project as it will guide which inclusions are to be dated and the analytical strategy to be used.

**Candidate**
This project would suit a candidate with a strong interest in mantle evolution and isotope geochemistry. Candidates with degrees in geology, chemistry or related disciplines are invited to apply.

**Case Award Description**
The award from the Geophysical Laboratory will enable the successful applicant to take advantage of world class facilities for sample analysis and characterisation, and potentially provide access to additional suites of samples. It will cover the costs of travel and access to facilities as well as a supplement to the stipend. The award is intended to forge closer links between the two laboratories.

**Training**
The student will receive training in characterization of diamonds and their inclusions using methods such as Raman and infrared spectroscopies, X-ray tomography and electron and ion beam analysis as well as the sample preparation and radiometric dating of sulphide inclusions using Re-Os methods.

**References / Reading List**


**Links**

- **School webpage**  [http://www.bristol.ac.uk/earthsciences/courses/postgraduate/](http://www.bristol.ac.uk/earthsciences/courses/postgraduate/)
- **NERC GW4+ DTP Website**:  [http://nercgw4plus.ac.uk/](http://nercgw4plus.ac.uk/)
- **Bristol NERC GW4+ DTP Prospectus**:  [http://www.bristol.ac.uk/study/postgraduate/2017/docrtoral/phd-great-western-four-dtp/](http://www.bristol.ac.uk/study/postgraduate/2017/docrtoral/phd-great-western-four-dtp/)

**Application deadline**:  23.59 GMT, Sunday 7 January 2018

How to apply to the University of Bristol:  [http://www.bristol.ac.uk/study/postgraduate/apply/](http://www.bristol.ac.uk/study/postgraduate/apply/)

**General Enquiries:**
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