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Research Profile

I use isotope geochemistry to understand the origins of planets and the present day natural behaviour of the Earth by utilising mass spectrometry to measure small natural variations in atomic abundance. The main causes of such variations are radioactive decay, mass dependent fractionation, cosmic ray interactions and nucleosynthetic effects inherited from other stars. Such measurements provide powerful constraints on: (1) ages and rates of past processes, for example, the age of the Moon or the rate of cooling of the Earth; (2) the conditions under which certain objects form, for example, the past temperatures of the world's oceans and (3) the origins of various reservoirs, a kind of forensic fingerprinting of, for example, the nature of the source of the basalt magma being erupted in Hawaii.

Recent developments in this subject have been dominated by innovations in mass spectrometry that permit the study of elements previously inaccessible to precise analysis, facilitate more precise measurements, or achieve better spatial resolution. Most of my efforts in recent years have focussed on MC-ICPMS, a technique that combines the ionisation efficiency of the ICP source with the precision achievable with magnetic sector multiple collector mass spectrometry. This method has resulted in the first precise measurements of the isotopic compositions of many elements in the small quantities found in natural materials. The first such instrument formed the basis for our programme at the University of Michigan and the first large geometry MC-ICPMS was designed for our lab at the ETH in Zurich. In Oxford we have established new facilities for chemistry and mass spectrometry and these are shared with Gideon Henderson, Don Porcelli and Ros Rickaby. The new suite of labs and instruments is the largest of its kind world-wide, including six MC-ICPMS instruments.

Selected Publications

- Nielsen, SG, Prytulak, J, Halliday, AN, (2011) 'Determination of Precise and Accurate V-51/V-50 Isotope Ratios by MC-ICP-MS, Part 1: Chemical Separation of Vanadium and Mass Spectrometric Protocols', *GEOSTANDARDS AND GEOANALYTICAL RESEARCH*. pp. 293-306 doi: 10.1111/j.1751-908X.2011.00106.x

- Prytulak, J, Nielsen, SG, Halliday, AN, (2011) 'Determination of Precise and Accurate V-51/V-50 Isotope Ratios by Multi-Collector ICP-MS, Part 2: Isotopic Composition of Six Reference Materials plus the Allende Chondrite and Verification Tests', *GEOSTANDARDS AND GEOANALYTICAL RESEARCH*. pp. 307-318 doi: 10.1111/j.1751-908X.2011.00105.x

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- Gutjahr, M, Frank, M, Halliday, AN, Keigwin, LD, (2009) 'Retreat of the Laurentide ice sheet tracked by the isotopic composition of Pb in western North Atlantic seawater during termination 1', *EARTH AND PLANETARY SCIENCE LETTERS*. pp. 546-555 doi: 10.1016/j.epsl.2009.07.020
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