

**Malcolm Guthrie**

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*May 2023*

**My main scientific interests lie in using extremes of pressure to synthesise new materials and to better understand existing ones. My primary research tool is diffraction: both crystalline and non-crystalline, primarily using neutron and synchrotron x-ray techniques.**

**I have spent a career of some 25 years developing new high-pressure capabilities at large-scale neutron facilities, both in Europe and in the US. Notably I led the neutron science program of a Washington, DC based DOE-funded Energy Frontier Research Centre for 5 years. Subsequently, I was the scientist responsible for high pressure at the European Spallation Source in Sweden for 7 years during its construction phase.**

**I have a particular specialisation in the complex sample-environment systems used to maintain extreme conditions of pressure. My expertise in understanding the interactions of neutron beams with these complex containers is a major component of my current research activities.**

**WORK EXPERIENCE**

**2021- to date: Senior R&D Scientist**

*Oak Ridge National Laboratory, Oak Ridge, TN 37830 USA*

* I lead a project to develop a software package to manage the reduction of data measured on large area detector, time-of-flight diffractometers.
* I have developed novel approaches to correct for the effects of complex sample containers on transiting neutron beams and implement these as user-friendly tools.
* I take a leading role in efforts to impove the user experience of neutron software, making highly technical software accessible and robust for a broad user community. The backbone of this effort is the implementation of a standardised approach to data reduction processes.
* I conduct a research programme studying the physics of hydrogen-rich materials under extreme conditions via using both in situ measurements of their structural and dynamical properties

**2014-2021: High-Pressure Scientific Lead**

European Spallation Source (ESS), Lund, Sweden

* I managed and coordinated high-pressure and engineering sample-environment platforms within the ESS construction project. I was responsible for full scope and a budget of ~€2.1M, while defining the overall high-pressure strategy at the ESS
* I was highly active within the European high-pressure community, organising meetings and promoting neutron techniques and engagement across the entire ESS instrument suite.
* I lead an ongoing research programme in high-pressure neutron science that focuses on diffraction studies of simple molecular systems and 1d carbon materials at unprecedented pressures using state-of-the-art techniques.
* I maintained teaching activities, having been a course director for an Erice International School of Crystallography on high-pressure crystallography in 2016 and lecturing in the International Society for Sample-Environment School. I have co-supervised 2 PhD students.

**2009-2014: Science Thrust Leader, EFree an Energy Frontier Research Center**

*Geophysical Laboratory, Carnegie Institution, 5251 Broad Branch Rd, NW, Washington, DC 20015 USA*

* I was leader of “Structural Limits of Performance” Science Thrust Area within EFree (Energy Frontier Research in Extreme Environments). Dictating the science focus of the Thrust, and running the mission of the Center as a whole as a member of the Executive Committee.
* I was the Geophysical Laboratory Neutron Group Leader. In addition to my own research, I coordinated all neutron activity for the Geophysical laboratory and had direct development and commissioning of new high-pressure instrumentation on the SNAP beamline at the Spallation Neutron Source.
* I Conducted an extensive research programme in high-pressure research, primarily using neutron and x-ray diffraction.
* Organised regular workshops and meetings including the annual EFree meeting and an MRS symposium (Spring 2013). Contributed the high-pressure lecture at the National school on neutron and x-ray scattering for 3 years (2011-2013).

**2008-2009: Staff Scientist, Advanced Photon Source**

*Argonne National Laboratory, 9700 S Cass Ave, Argonne, IL 60439, USA*

* I conducted a research programme examining the structure of low-Z liquids and glasses at high pressure, using predominantly high-energy synchrotron diffraction.
* I developed instrumentation for 3d x-ray tomographic imaging of high-pressure samples.
* I contributed to APS facility operations including significant contributions to the APS Upgrade effort and co-chairing meetings of the Inter-Cat Technical Workgroup.
* I was the lead organiser of the 100 attendee, international HiPreSS workshop.

***2004 to 2008: Postdoctoral Research Fellow***

***University of Edinburgh, Centre for Science at Extreme Conditions***

*ISIS Pulsed Neutron Facility, Rutherford Appleton Laboratory, Chilton, Didcot, Oxfordshire, OX11 0QX, UK*.

* Developing novel experimental techniques for amorphous, glassy and disordered-crystalline diffraction at high pressure at ISIS.
* Developing instrumentation for single-crystal neutron diffraction (SCND) at high pressure at both ISIS and the ILL Reactor Source, Grenoble, France.
* Extensive neutron powder-diffraction studies of hydrogen-bonded systems at high pressure

***2002 to 2004: Post Doctoral Research Associate***

***SNS Project, Oak Ridge National Laboratory***

*IPNS Neutron Source, Argonne National Laboratory, 9700 S. Cass Ave, Argonne, IL 60439, USA.*

* I installed and commissioned Paris-Edinburgh Pressure cells at the GLAD diffractometer, IPNS
* I developed a new approach to x-ray diffraction measurements of glasses, employing large volume moissanite-anvil cells and high-energy x-rays on sector 11-IDC, APS.

**ADVISORY AND ORGANIZATIONAL COMMITTEE ROLES**

Nov 2022 –Workshop Organiser, “UX for neutrons” Oak Ridge National Laboratory, Oak Ridge, TN

June 2022 –Breakout session organiser, American Conference on Neutron Scattering, Boulder CO.

Sep 2019 – Member Program Committee, 57th European High Pressure Research Group annual meeting, Prague, Czech Republic.

Nov 2017 - International Advisory Committee member on high-pressure diffractometer at the China Spallation Source

July 2017 – Organiser “High pressure neutron strategy meeting”, Lund Sweden

Oct 2016 – International Advisory Committee member on high-pressure diffractometer at the China Spallation Source

Apr 2013 – Lead Organiser “Extreme Environments – a route to novel materials” a symposium in the MRS Spring meeting, San Francisco, USA.

Nov 2011 – Organiser, SNAP science and new tools for data analysis workshop, ORNL, USA

**PEER REVIEWING DUTIES**

2008 :*to date* - Contributed peer reviews for 23 prominent scientific journals

2020: *to date* - Member of the Proposal Review Committee for the Materials and Life Science Facility, J-PARC, Tokai, Japan.

2017: 2021 - Scientific reviewer for the Spallation Neutron Source beamtime proposal committee

2010: 2018 - Proposal reviewer for the Department of Energy

**INVITED TALKS**

2023 – Invited speaker “International Union of Crystallography General Congress”, Melbourne, Australia

2021 – Plenary speaker, 58th European High Pressure Research Group annual meeting, Canary Islands, Spain (Contributed remotely)

Oct 2019 – Invited speaker “Exotic forms of ice: in the laboratory and throughout the universe” Chatanooga, TN, USA

Feb 2018 – Invited speaker “Perspectives for science at extreme conditions neutron scattering” symposium, Zaragoza, Spain.

Sep 2015 – Keynote speaker, European Conference on Neutron Scattering, Zaragoza, Spain

Sept 2011 – Invited Plenary, 8th Liquid Matter Conference, Vienna

**EDUCATION**

**1998 to 2002 -** Ph.D. (Physics) at the University of Edinburgh, Edinburgh, UK. (based full-time at the Rutherford Appleton Laboratory, Oxfordshire, UK). *Developments in Single-Crystal Neutron Diffraction at High Pressure.* Supervisor: R.J. Nelmes

**1993 to 1998 -** Master of Physics (Hons.) - First Class. Department of Physics, The University of Edinburgh, Edinburgh, UK.