

Curriculum Vitae

Dr. Katherine Joanna Dobson

Principal Research Interests

- Geoscience applications of laboratory and synchrotron based x-ray and neutron imaging, especially
 - *in situ* 4D determination of volcanic and magmatic processes (from surface to deep earth)
 - 3D and 4D mineralogy and igneous petrology
 - *in situ* imaging and quantification of multiphase flow and mass transfer in porous media
 - formation, extraction and processing of ores
- The application of novel experimental and analytical methods to investigate dynamic micro- and macro-scale processes under geological conditions
- The integration of geo-, engineering and materials science analytical techniques across temporal, spatial and chemical scales to address key questions in the Earth Sciences
- The development of *in situ* techniques to investigate behaviours at temperature, under deformation and during flow
- The combination experimental analysis and numerical modelling to improve our understanding of processes in the physical sciences

Employment & Education

2014- Post-Doctoral Research, Ludwig-Maximilians-Universität, Munich, Germany, working as part of the Explosive volcanism in the Earth System (EVOKES) EU funded project to apply dynamic x-ray tomography methods to understanding magma movement and fragmentation.

2011 – 2014 Post-Doctoral Research Associate. Manchester X-ray Imaging Facility, University of Manchester (based at the Research Complex at Harwell, Diamond Light Source Synchrotron Facility, UK). Funded 100% on Rio Tinto supported IP locked project.

2007 – 2011 Scottish Alliance for Geoscience, Environment and Society Post-Doctoral Research Fellow School of Geographical & Earth Sciences, University of Glasgow.

2006 – 2007 Research Associate Thermochemistry Laboratory, Birkbeck College, University of London

2002 – 2007 Ph.D. *“The zircon (U-Th)/He thermochronometer: development and application of thermochronometers in igneous provinces.”* University of Glasgow. School of Geographical & Earth Sciences.

2001 – 2002 Volunteer for the USGS, Hawaii Volcano Observatory, Hawaii (Gas Geochemistry Group).

2001 B.Sc. (Hons.) Natural Sciences (Earth Sciences & Physics). University of Durham.

Income and grants awarded

over £1,000,000 since 2012

All grant income has been secured while studying for PhD or employed as a Post-Doctoral research associate, and so with only limited funding opportunities under UK research council eligibility rules.

2015 **Swiss Light Source** £60,000 (TOMCAT) *Rheology of two- and three-phase magmas: ultra fast imaging for near real time quantification*

2015 **Swiss Light Source** £60,000 (TOMCAT). *Volcanic Sintering: in situ and real time quantification of aggradation processes*

- 2014 **NERC Standard Grant** Lee, Lavallee, Holness & Dobson *Shedding new light on volcanoes: real time synchrotron x-ray tomography of magmatic phenomena.* £506,475.
- 2014 **NERC Standard Grant** Law et al (Project Partner) Understanding Radioactive 'Hot' Particle Evolution in the Environment
- 2014 Rio Tinto **£50,000** *Quantification of the effect of Comminution on leaching*
- 2014 Diamond Light Source **£19,188** (i12). 4D imaging of fluid flow in porous rock structures: a systematic study. Col
- 2014 Diamond Light Source **£19,188** (i12). *Sub-second tomography for capturing flow in porous media* PI.
- 2014 University of Manchester, Manchester-Diamond Collaboration **£115,128** (i12). *In situ investigation of three phase magmas using synchrotron tomography* PI.
- 2013 University of Manchester, Manchester-Diamond Collaboration **£95,940** (i13) *The petrophysical structure of deformation bands in high porosity sandstones.* CoPI.
- 2013 Rio Tinto **£120,000**, *Understanding the effect of comminution on leaching efficiency* (KJD written proposal, PI Lee, Neethling, secured 18 months PDRA salary)
- 2013 Diamond Light Source **£95,940** (i12). *Putting magma chambers under the microscope.* PI.
- 2013 Diamond Light Source **£95,940** (i12). *Time resolved imaging of core formation in the early Earth: tomography at extreme conditions.* Col in collaboration with Dr. Geoffrey Bromiley, University of Edinburgh.
- 2013 Diamond Light Source **£19,188** (i13). *3D imaging of the oldest animals: tomography of ~635 million year old infaunal cloudinid fossil.* Col in collaboration with Dr. Stefan Bengtson, Swedish Museum of Natural History.
- 2013 Swiss Light Source **£60,000** TOMCAT. *In-situ rheology of crystal-bearing magmas.* Col in collaboration with M. Pitsone (University of Bristol) & L. Caricchi (University of Geneva) & P. Ulmer (ETH).
- 2013 Swiss Light Source **£20,000** TOMCAT. *Diving into the magma chamber: understanding melt extraction and magma chamber processes using real time in situ experiments.* PI.
- 2012 PSI SINQ **£60,000** ICON. *In-situ neutron imaging of flow through multi-scale porosity.* PI.
- 2012 NERC Standard Grant **£3,000**. *The rheology of crystal mushes.* Project Partner with PI Holness (Cambridge).
- 2012 Rio Tinto **£230,000**, *Initial testing of the effects of comminution on leaching* (KJD co-written proposal but not named on submission. PI Lee & Neethling).
- 2011 Endeavour Fellowship, PI "The interaction of ancient and modern: using thermochronology to understand rifting in eastern Africa". PI, Co I: Prof. A. Gleadow, University of Melbourne **\$23,500 AUD** (non FEC). *Award not taken up.*

Other income, minor grants and bursaries

~ £100,000

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- 2011 NSF Support to attend 3D Quantitative Analysis of Geological Materials Using X-Ray Micro-Computed Tomography Short Course, University of Texas at Austin **\$700** USD.
- 2011 Mineralogical Society Senior Travel Bursary **£400** to attend EGU, Vienna, 2011
- 2011 Exploring the depositional mechanisms of crystal rich ignimbrites using X-Ray Micro-Computed Tomography. University of Manchester, Grant-in-kind **£400**.
- 2010 Department of Geographical and Earth Sciences Research Conference Support Award. **£200** to attend EGU, Vienna, 2010
- 2010 Thermo2010 Conference income **£80,000** (host and lead organiser)
- 2010 VMSG2010 Conference income **£15,000** (host and lead organiser)
- 2009 University of Glasgow Roberts Bequest, £1400. Understanding the viscous brake phenomena. Grant FEC costs **£10,628** Part supported by S.U.E.R.C. grant-in-kind value £5000.
- 2008 Edinburgh electron probe - grant-in-kind value **£700**, Determining the natural variability in apatite composition – implications for fission track analyses of old and complex landscapes.
- 2006 One Day NERC Project Grant for the NERC Ion Microprobe Facility- grant-in-kind – value **£1200**, "U and Th zonation in Fish Canyon Tuff zircons - Implications for a zircon (U-Th)/He standard".

Selected invited lectures, presentations and workshops

- Invited Lecture *“Taking Geoscience to the IMAX: 3D and 4D insight into geological processes using micro-CT”*, School of Earth, Atmospheric and Environmental Sciences, University of Manchester. March 2014
- Invited Lecture *“In situ tomography: geosciences in real time”* University of Durham, February 2014
- Training School Lead, *“Tomography and other imaging methods for geoscience and environmental application”* Environmental Radioactivity network Winter School January 2014 (PI Shaw, Manchester)
- Keynote speaker, *“Tomography and other imaging methods in materials and mineralogy”* Industrial Group of the British Crystallographic Association. November 2013
- Keynote speaker, *“Tomographic applications for geological storage of radioactive waste”*, Nuclear Decommissioning Authority November 2013
- Invited presentation NERC Security of Supply of Mineral Resources, Launch event. February 2013
- Keynote speaker: Theory and Practice of Computer Graphics. *“Seeing the “unseeable”: X-ray tomography and 3D visualisation in current research”*. September 2012
- Workshop contributor: *X-ray tomography: theory and applications* September 2012
- Invited lecture: University of Glasgow: University, *“Geological applications of CT imaging”*, June 2012
- Workshop contributor: *Reconstructing synchrotron data sets* March 2012

Other Research Skills

Fieldwork, sample preparation and sample characterisation

- Laboratory development commission and management
- Optical and Scanning Electron Microscopy including: cathodoluminescence, charge contrast, BSE, EBSD, WDX and EDAX
- Micro focus methods: Raman spectroscopy, electron and Ion Microprobe analyses
- (U-Th)/He and fission track analyses of apatite and zircon, and in the interpretation of low temperature thermochronological data (7 years' experience)
- Routine maintenance of quadrupole mass spectrometers
- Wet chemistry: Mineral dissolution, isotope concentration, spike calibration and preparation of solutions for ICP-MS analysis
- Development of new laboratory protocols and analytical techniques and implementation of associated H&S procedures
- Fieldwork planning and logistics in a range of environments, with experience at high altitude and in a range of climates

Interpretation, modelling and computational of geological data

- Highly experienced user of Avizo, Blob 3D, Volview, Simpleware, Drishti Paraview, Matlab, ImageJ and other image analysis and CFD/DEM/FEM mesh generation software packages
- Experienced use of LaVision DaVis Digital Volume Correlation software and associated codes
- Use of CFD, DEM and FEM modelling codes for physical simulation of fluid flow heat transport and stress/strain evolutions (e.g. Fluent + in house MXIF codes, Heat 3D (magmatic cooling), 4Dtherm (magmatism and landscape evolution))
- Managing big data
- Development of novel image analysis algorithms for phase and feature extraction
- Proven track record in the interpretation of complex and multi-source datasets, and combining interpretive and modelling techniques
- Excellent knowledge of Windows and Mac platforms and the standard Microsoft Office Suite: Word, Excel, Access, PowerPoint, Outlook, Dreamweaver, CorelDraw, Illustrator
- Ability to use and manipulate GIS software, Midland Valley Move software family and similar
- Experienced HTML, Joomla and T4 and some experience in PHP

Other skills

- Full clean UK driving licence with extensive experience of 4x4 off road driving in difficult terrain
- Experience driving mini buses and towing
- Trained First Aider at Work and Emergency First Aid for Field Work
- Highly experienced horsewoman and can handle pack animals
- Living in Germany and currently improving on GCSE Level qualification.
- Languages: GCSE level French, basic Spanish

Teaching experience & departmental contributions

During the course of both my PhD and postdoctoral career I have been strongly involved with teaching. This has included:

- Current co-supervision of 3 PhD students
- Co-supervision of visiting international PhD students (from France, Germany, Italy, South Africa, Angola), 6 co-supervised students now completed.
- Geological Society Summer Research Student: grant pending for summer 2014
- Training, management and supervision of undergraduate and pre-undergraduate summer students
- Sole supervision of 12 final year undergraduate research projects over three academic sessions (and co-supervision of a further 4 students)
- Training of new post-doctoral research staff for work on experimental deformation rigs, furnaces and associated equipment.
- Development and delivery of applied x-ray tomography training courses for new users with range of backgrounds
- Development and delivery of multi-disciplinary Image analysis courses
- Training a large number of undergraduates, postgraduates and postdoctoral researchers and technical staff in all aspects of x-ray and geochemical laboratory practice
- Class leader and organiser for a range of Junior Honours field classes (structural geology, mapping training, igneous & metamorphic geology)
- Organiser and class leader on Senior Honours field classes (mapping training, igneous geology, physical volcanology)
- Assistant leader on other Senior Honours field classes (courses associated with structural and metamorphic geology courses)
- Experience teaching in classroom and laboratory on optical mineralogy, petrology, geochemistry, advanced analytical methods, image analysis, data management and processing
- Development and delivery of advanced transferable skills training courses for postgraduate students training for School, College and Scottish Alliance for Geoscience, Environment and Society consortia
- Running of "Introduction to Geology and the Geology of the Highland Border Complex" field trip for biologists in Scottish Alliance for Geoscience, Environment and Society graduate school.
- Lectures to adult education classes as part of tectonic geomorphology, thermochronology, landscape evolution and metamorphic courses
- Laboratory teaching at junior and senior honours level (Introduction to the Earth, Mapping Skills, Petrology, Geophysics, Remote Sensing).
- Organisation and leading of field trips for academics (Ardnamurchan, Skye, Mull, France, Italy, Iceland, Brazil).
- Developing new and existing courses for faculty wide postgraduate CPD and undergraduate degree programmes, and implementing new student feedback mechanisms using intranet and internet technologies.
- Member of School Health & Safety, Research and Teaching committees
- Development of online teaching aids for a range of courses
- Joint PI on project to overhaul degree mark calculation database protocols for GES, University of Glasgow.

Outreach & Public Engagement

- “I’m a Scientist, get me out of here” major STEM outreach event, Zone November 2014
- “Pint of Science” May 2014, Oxford & Manchester
- Contributor, and science team leader on Discovery Channel segment on tomography to be filmed at Diamond Light Source Mar 2014
- Geoscience consultant for BBC Scotland
- Science, Technology, Engineering and Mathematics Ambassador taking geosciences into the classroom with children at primary and secondary schools
- Invited lecture: Edinburgh U3A “*The Hebrides and the opening of the North Atlantic*”. July 2011
- BBC Science Communication three day residential course, February 2010. Course covered the issues and methods used by scientists and journalists to present science through newspaper, radio and television coverage.
- Point of contact for all volcanology based enquiries to the Geological Society of London and the Mineralogical Society of Great Britain
- Organisation and leading of extra-curricular outreach programmes.
- Member of the Scottish Geodiversity Forum
- Part of initial group providing feedback on Midland Valley Exploration Field Move with an aim of integration with UK undergraduate field training courses and postgraduate and academic research

Contributions to the wider research community

2015-2018 Volcanic & Magmatic Studies Group Special Interest Group Committee Member

2012 onwards - reviewer for NSF grant proposals

2011 -2014 Member of the EPSRC Manchester X-ray Imaging Facility peer review panel

2008 - 2015 Secretary of the Volcanic & Magmatic Studies Group Special Interest Group of the Mineralogical Society of Great Britain & Ireland, and the Geological Society of London.

- Oversight and management of the UK volcanology community network
- Assisting in developing UK research and science policy for the Volcanic & Magmatic Studies Group parent bodies
- Managing and administering student research and travel support funds and conference support funds
- Point of contact for all UK volcanology and magmatic enquires, facilitating engagement between government, media, general public and the research community
- Remaining on committee for further 3 years (until 2018) after term as secretary ended

2010 - Lead organiser and co-convenor of Thermo2010 – International Conference on Thermochronology, Glasgow, over 200 international delegates

2010 - Co-convenor & lead organiser of 44th Volcanic & Magmatic Studies Group Annual Conference, Glasgow

2008 - 2014 Editor of OnTrack, the newsletter of the International Thermochronology Community

2006 - 2007 Acting Secretary of the British Society for Geomorphology.

2005 onwards - regular reviewer for Earth and Planetary Science Letters, Journal of the Geological Society of London, and Geochimica et Cosmochimica Acta, Tectonophysics, and others

Current Society Memberships

Mineralogical Society of Great Britain & Ireland, European Geochemical Society, American Geophysical Union, Volcanic & Magmatic Studies Group, Geological Society of London Tectonics Studies Group, Mineral Deposits Studies Group, International Association of Volcanology and Chemistry of the Earth’s Interior, Young Earth Scientists Network.