

Dr. Wren Montgomery

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QUALIFICATIONS 2007, **PhD**, Geophysics, “Organic Materials in Proto-planetary Bodies” University of California, Berkeley, USA
2000, **Bachelors of Science**, Physics & Geophysics, California Institute of Technology, Pasadena, CA, USA

EMPLOYMENT **2010-** Postdoctoral Research Associate, Department of Earth Science and Engineering, Imperial College London.

As a senior researcher in the Imperial Organic Geochemistry Lab, I have worked on a number of projects in organic geochemistry including improving the steam-enhanced recovery of heavy oil, advancing life detection on Mars, and measuring position specific isotopes in meteoritic organic material. These projects have required detailed knowledge of quantitative geochemical analysis methods. At the same time, I have carried out my own independent research programme in experimental high pressure organic chemistry, supported primarily by synchrotron beamtime allocation (open-competition, peer reviewed), collaborations and small travel/seed grants. During this time, I have written papers in peer-reviewed journals (open access where possible): 8 high-pressure organic chemistry, and 7 related to grant deliverables. I have maintained a relationship with industrial partners through monthly meetings, technical reports and annual presentations. I have ensured data was reported in compliance with RCUK Open Data guidelines, contributed to laboratory Health and Safety policy and implementation, and mentored MSc and PhD students in lab techniques, experiment design and thesis writing.

Contracts held since 2010:

- 2016-present: “Planetary Origins and Evolution at Imperial” (named investigator)
commercial partners: Protium MS, ProVac
STFC, Value: **£879,190**
- 2015-2016: “Organic matter and the minerals of Mars”
UKSA, Value: **£470,694**
- 2014-2015: “Investigating the relationships between Minerals and Molecules”
Leverhulme Trust, Value: **£175,787**
- 2010-2014: “Subcritical Water Assisted Transformation of Oil: Sulfur and its Reactions”
BP America, Value: **£447,000**

2007-2010 NERC Blue Skies Postdoctoral Research Fellow, Department of Earth and Planetary Science, University of Bristol.

FUNDING SINCE 2007 **Total commercial value (estimated) of synchrotron time (open competition, peer-reviewed) awarded since 2009 (130 days):** **£2.2 million**

- General User Beamtime, B22 Diamond Light Source, 2010, 2017. Estimated commercial value: **£84,000**
- General User Beamtime, SMIS Beamline, SOLEIL Synchrotron, 2011, 2013, 2014, 2015, 2016, 2017. Estimated commercial value: **£705,375**
- General User Beamtime, Beamline 1.3, Advanced Light Source, Lawrence Berkeley National Lab, 2009, 2010, 2015. Estimated commercial value: **£139,987**
- General User Beamtime, Beamline X01DC, Swiss Light Source, Paul Scherrer Institute, Switzerland. 2009, 2010, 2011, 2012. Full economic costing: **£1,332,118**

NERC Blue Skies Postdoctoral Fellowship, August 2007–July 2010. NE/E012485/1: Metamorphism of primitive organic molecules in the early Earth and implications for the origins of prebiotic molecules. **Value: £224,676**

Institute of Molecular Science and Engineering Seed Funding, ICL, (EPSRC), December 2016–March 2017. High pressure investigation of aza-polycyclic aromatic heterocycles and

their role in cosmology and origins of life. Joint with Dr. Matthew Fuchter, Department of Chemistry ICL and Dr. Mark A. Sephton, Department of Earth Science and Engineering ICL **Value: £20,804**

Collaboration Grant, "Testing the importance of organic matter to natural low-temperature dolomitization," Imperial College London, 2014 **Value: £1000**

Arthur Holmes Centenary Research grant in support of travel to the Swiss Light Source, Imperial College London, 2011 **Value: £500**

Synchrotron Proposals:

- B22, DIAMOND
LIGHT SOURCE, UK
- [2] “High pressure investigation of aza-polycyclic aromatic heterocycles and their role in cosmology and origins of life,” November 2017, 9 shifts.
 - [1] “Micro-FTIR spectroscopic analysis of high-pressure organo-silicate reactions in possible Hadean crust compositions,” August 2010, 9 shifts.
- SMIS BEAMLINE,
SYNCHROTRON
SOLEIL, FRANCE
- [9] “Helicenes under pressure: vibrational optical rotatory dispersion on molecules,” March 2017, 18 shifts.
 - [8] “Searching for a geobarometer,” October 2016, 18 shifts.
 - [7] “Fourier Transform Infrared and Raman Spectroscopic Mapping of CI and CM Organic Rich Meteorites,¹” October 2016, 12 shifts.
 - [6] “Carboxylic acid – mineral interactions under high pressures,” September 2015, 18 shifts.
 - [5] “RNA monomer and oligomer synthesis under high pressures,” April 2015, 18 shifts.
 - [4] “Organic-mineral interactions under high pressures,” September 2014, 18 shifts.
 - [3] “High pressures and preserving the records of life,” April 2014, 18 shifts.
 - [2] “Survivability of extraterrestrial sugar compounds at high pressures and high temperatures of planetary formation,” March 2013, 15 shifts.
 - [1] “Pressure-Temperature mapping of phase transitions in hydrous chain-silicates of geological importance,” Dec 2011, 18 shifts.
- ADVANCED LIGHT
SOURCE, USA
- [2] “Chemical characterization of nanoporosity of organic residues in artificially matured gas shales,²” Jan-Jun 2015, 8 shifts, Beamline 5.4.
 - [1] “Space dust under pressure: FTIR analysis of organic molecules and minerals in the diamond anvil cell,” Jan 2009- Dec 2010, 60 shifts, Beamline 1.4.4.
During my PhD, I received access to Beamline 1.4.4 on an ad-hoc basis, when time became available due to cancellations.
- BEAMLINE X01DC,
SWISS LIGHT
SOURCE,
SWITZERLAND
- [8] “OH behaviour and phase transitions in hydroxide perovskites: a single-crystal polarised IR study of MgSi(OH)₆ to 20 GPa at 300 K,” September 2012, 6 shifts.
 - [7] “Around the Bend: Exploring the effect of high pressure on chirality,” September 2012, 15 shifts.
 - [6] “Doing the Twist: the effect of high pressures (<10GPa) on amino acids measured by infrared spectroscopy and vibrational circular dichorism,” November 2011, 15 shifts.
 - [5] “High-pressure behaviour of kaolinite: elastic properties of kaolinite-III to 25 GPa and the hunt for the kaolinite-IV phase predicted ab initio,” November 2011, 9 shifts.
 - [4] “Meteoritic sweet tooth: survivability of extraterrestrial sugar compounds at high pressures and high temperatures of planetary formation,” February 2011, 15 shifts.
 - [3] “Astrochemical reactions at high pressures and high temperatures,” April 2010, 15 shifts, .
 - [2] “In-situ FTIR analysis of extraterrestrial materials in the diamond anvil cell: phosphorus chemistry under pressure,” August 2009, 15 shifts.
 - [1] “Space dust under pressure: in-situ FTIR analysis of extraterrestrial materials in the diamond anvil cell,” May 2009, 15 shifts.
Although X01DC is currently not open to general user proposals, I am eligible to use it without going through the proposal system.

¹proposal led by postgraduate, Christian Potiszil

²proposal led by postgraduate, Alexandra Sarney

Publication List:

JOURNAL ARTICLES
(REFEREED)

I have published 21 peer-reviewed articles, of which 12 are first author.

N. b.: In the pdf version of this document, doi is a url leading to paper online.

- [21] **Montgomery W.**, E. A. Oberlin, S. H. Royle, S. P. Kounaves, D. Schulze-Makuch and M. A. Sephton, Effects of Oxygen-Containing Salts on the Detection of Organic Biomarkers on Mars and in Terrestrial Analogue Soils. *Astrobiology*, *accepted*
- [20] Verchovsky, A., S. A. Hunt, **W. Montgomery**, and M. A. Sephton, Reaction of Q to thermal metamorphism in parent bodies: Experimental simulation, *Meteoritics and Planetary Science*, 13 December 2018. doi: [10.1111/maps.13231](https://doi.org/10.1111/maps.13231)
- [19] Royle, S. H., E. A. Oberlin, J. S. Watson, **W. Montgomery**, S. P. Kounaves, and M. A. Sephton, Perchlorate driven combustion of organic matter during pyrolysis-gas chromatography-mass spectrometry: Implications for organic matter detection on Earth and Mars. *Journal of Geophysical Research: Planets*, 10 July 2018, p1901-9. doi: [10.1029/2018JE005615](https://doi.org/10.1029/2018JE005615)
- [18] **Montgomery, W.**, J. S. Watson, J. M. T. Lewis, H. Zeng and M. A. Sephton, Role of Minerals in Hydrogen Sulfide Generation during Steam-Assisted Recovery of Heavy Oil, *Energy & Fuels*, 12 March 2018, p4651-4. doi: [10.1021/acs.energyfuels.7b03566](https://doi.org/10.1021/acs.energyfuels.7b03566)
- [17] Schulze-Makuch, D., D. Wagner, S. P. Kounaves, K. Mangelsdorf, K. G. Devine, J.-P. de Vera, P. Schmitt-Kopplin, H.-P. Grossart, V. Parro, M. Kaupenjohann, A. t Galy, B. Schneider, A. Airo, J. Frösler, A. F. Davila, F. L. Arens, L. Cáceres, F. Sols Cornejo, D. Carrizo, L. Dartnell, J. DiRuggiero, M. Flury, L. Ganzert, M. O. Gessner, P. Grathwohl, L. Guan, J. Heinz, M. Hess, F. Keppler, D. Maus, C. P. McKay, R. U. Meckenstock, **W. Montgomery**, E. A. Oberlin, A. J. Probst, J. S. Sáenz, T. Sattler, J. Schirmack, M. A. Sephton, M. Schloter, J. Uhl, B. Valenzuela, G. Vestergaard, L. Wörmer, and P. Zamorano, Transitory microbial habitat in the hyperarid Atacama desert, *PNAS*, 2 February 2018, p2670-2675. doi: [10.1073/pnas.1714341115](https://doi.org/10.1073/pnas.1714341115)
- [16] Royle, S. H., **W. Montgomery**, S. P. Kounaves and M. A. Sephton, Effect of Hydration State of Martian Perchlorate Salts on Their Decomposition Temperatures During Thermal Extraction, *Journal of Geophysical Research-Planets*, 27 November 2017, p2793-802 doi: [10.1002/2017JE005381](https://doi.org/10.1002/2017JE005381)
- [15] Potiszil, C.³, **W. Montgomery** and M. A. Sephton, The Effects of Pressure on Model Compounds of Meteoritic Organic Matter, *ACS Earth and Space Chemistry*, 28 August 2017, p475-82. doi: [10.1021/acsearthspacechem.7b00053](https://doi.org/10.1021/acsearthspacechem.7b00053)
- [14] **Montgomery, W.**, J. S. Watson, C. Potiszil, M. A. Sephton, Sporopollenin, a natural copolymer, is robust under high hydrostatic pressure, *Macromolecular Chemistry and Physics*, 22 August 2016, p2494-2500. doi: [10.1002/macp.201600142](https://doi.org/10.1002/macp.201600142)
- [13] **Montgomery, W.**, G. B. Bromiley, M. A. Sephton, The nature of organic records in impact excavated rocks on Mars, *Scientific Reports*, 5 Aug 2016, article number 30947. doi: [10.1038/srep30947](https://doi.org/10.1038/srep30947)
- [12] **Montgomery, W.**, M. A. Sephton, Pressure Effects in Polycyclic Aromatic Nitrogenated Heterocycles (PANHs): Diagnostic Qualities and Cosmobarometry Potential, *Astrophysical Journal*, 29 February 2016, 64. doi: [10.3847/0004-637X/819/1/64](https://doi.org/10.3847/0004-637X/819/1/64)
- [11] **Montgomery, W.**, M. A. Sephton, J. S. Watson, H. Zeng, A. C. Rees. Minimising hydrogen sulphide generation during steam assisted production of heavy oil. *Scientific Reports*, 11 February 2015, article number 08159. doi: [10.1038/srep08159](https://doi.org/10.1038/srep08159)
- [10] Sephton, M.A., J. M. T. Lewis, J. S. Watson, **W. Montgomery**, C. Garnier Perchlorate-induced combustion of organic matter with variable molecular weights: implications for Mars missions, *Geophysical Research Letters*, 16 October 2014, p7453-60. doi: [10.1002/2014GL062109](https://doi.org/10.1002/2014GL062109)

³postgraduate author

- [9] **Montgomery, W.**, Ph. Lerch, M. A. Sephton, In-situ vibrational optical rotatory dispersion of molecular organic crystals at high pressures, *Analytica Chimica Acta*, 9 September 2014, p51-56. doi: [10.1016/j.aca.2014.07.020](https://doi.org/10.1016/j.aca.2014.07.020)
- [8] **Montgomery, W.**, J. S. Watson, M. A. Sephton, An organic cosmo-barometer: Distinct pressure and temperature effects for methyl substituted polycyclic aromatic hydrocarbons, *Astrophysical Journal*, 10 March 2014, 98. doi:[10.1088/0004-637X/784/2/98](https://doi.org/10.1088/0004-637X/784/2/98)
- [7] **Montgomery, W.**, R. W. Court, A. C. Rees, and M. A. Sephton, High temperature reactions of water with heavy oil and bitumen: insights into aquathermolysis chemistry during steam-assisted recovery. *Fuel*, 18 June 2013, p426-34. doi: [10.1016/j.fuel.2013.05.098](https://doi.org/10.1016/j.fuel.2013.05.098)
- [6] Welch, M., **W. Montgomery**, E. Balan, and Ph. Lerch. Insights into the high-pressure behavior of kaolinite from infrared spectroscopy and quantum-mechanical calculations. *Physics and Chemistry of Minerals*, February 2012, p143-51. doi: [10.1007/s00269-011-0469-5](https://doi.org/10.1007/s00269-011-0469-5)
- [5] **Montgomery, W.**, J. R. Tuff, S. C. Kohn and R. Jones. Reactions between organic acids and montmorillonite clay under Earth-forming conditions. *Chemical Geology*, 22 April 2011, p171-6. doi:[10.1016/j.chemgeo.2010.12.023](https://doi.org/10.1016/j.chemgeo.2010.12.023).
- [4] Jennings, E. S.⁴, **W. Montgomery** and Ph. Lerch. The stability of coronene, C₂₄H₁₂, at high temperature and pressure. *Journal of Physical Chemistry B*, 10 November 2010, p15753-8. doi: [10.1021/jp105020f](https://doi.org/10.1021/jp105020f).
- [3] **Montgomery, W.**, J. C. Crowhurst, J. M. Zaug and R. Jeanloz. The chemistry of cyanuric acid (H₃C₃N₃O₃) under high pressure and high temperature. *Journal of Physical Chemistry B*, 12 February 2008, p2644-8. doi: [10.1021/jp073589y](https://doi.org/10.1021/jp073589y).
- [2] **Montgomery, W.**, J. M. Zaug, W. M. Howard, A. F. Goncharov, J. C. Crowhurst and R. Jeanloz. Melting curve and high-pressure chemistry of formic acid to 8 GPa and 600 K. *Journal of Physical Chemistry B*, 109 (41): 19443-19447. Oct 20 2005. doi: [10.1021/jp051967y](https://doi.org/10.1021/jp051967y)
- [1] Goncharov A. F., M. R. Manaa, J. M. Zaug, R. H. Gee, L. E. Fried, **W. B. Montgomery**. Polymerization of formic acid under high pressure. *Physical Review Letters*, v94, no. 6, 18 Feb 2005, pp 065505/1-4. doi: [10.1103/PhysRevLett.94.065505](https://doi.org/10.1103/PhysRevLett.94.065505)

OPEN DATA

Montgomery, W., P. Lerch, and E. S. Jennings (2018). Synchrotron source FTIR data (high-pressure, high-temperature) on chrysene, C₁₈H₁₂. (Data set). Zenodo. doi: [10.5281/zenodo.1309915](https://doi.org/10.5281/zenodo.1309915)

CONFERENCE ABSTRACTS

I am first author on 13 of the 25 abstracts. I presented 13 of these.

- [25] Hodges, Z. V., **W. Montgomery**, M. Frogley and M. A. Sephton. “The Effect of Topology on Pressure Responses in Polycyclic Aromatic Hydrocarbons” AbSciCon 2019, Bellevue, WA, USA.
- [24] Deshpande, P., **W. Montgomery**, T. Reddyhoff, “High pressure viscosity measurements of lubricants using diamond anvil cell” International Tribology Conference (ITC) 2019, Sendai, Japan.
- [23] **Montgomery, W.**, J.S. Tse, K. Yin, and M. A. Sephton, “The Effect of Pressure on the Prebiotic Carbon of the Early Solar System” AGU Fall Meeting 2018, Washington DC.
- [22] Royle, S. H., E. A. Oberlin, **W. Montgomery**, J. S. Watson, S. P. Kounaves, and M. A. Sephton, “Increasing our understanding of perchlorate salts during thermal decomposition and their implications for life detection on Mars” AGU Fall Meeting 2018, Washington DC.

⁴undergraduate author

- [21] Royle, S. H., **W. Montgomery**, E. A. Oberlin, J. S. Watson, S. P. Kounaves, and M. A. Sephton, “Increasing our understanding of perchlorate salts during thermal decomposition and their implications for life detection on Mars” ZARM-COSPAR, Pasadena, 2018.
- [20] Royle, S. H., **W. Montgomery**, S. P. Kounaves and M. A. Sephton “Effect of Hydration State of Martian Perchlorate Salts on their Decomposition Temperatures during Thermal Extraction” AGU Fall Meeting 2017, New Orleans.
- [19] **Montgomery, W.**, S. H. Royle, E. A. Oberlin, S. P. Kounaves, D. Schulze-Makuch, M. A. Sephton “Effects of oxygen-containing salts on the detection of organic biomarkers on Mars and terrestrial analog soils” British Planetary Science Congress, 2017, Glasgow.
- [18] Potiszil, C., **W. Montgomery**, M. A. Sephton “FTIR and Raman Spectroscopy of Chemically Degraded CM2 Chondrites” British Planetary Science Congress, 2017, Glasgow.
- [17] Royle, S. H., **W. Montgomery**, S. P. Kounaves and M. A. Sephton “Effect of Hydration State of Martian Perchlorate Salts on their Decomposition Temperatures during Thermal Extraction” British Planetary Science Congress, 2017, Glasgow.
- [16] **Montgomery, W.**, J. S. Watson and M. A. Sephton, “The effects of high pressure on organic molecules representative of natural organic matter types observed by synchrotron infrared spectroscopy.” Workshop on Infrared Microscopy and Spectroscopy using Accelerator-based Sources (WIRMS) 2017, Oxford.
- [15] Cousins, C. R., S. Mikhail, F. Foucher, F. Westall, **W. Montgomery**, A. Steele, A. Shahar, “Persistence of microbial biosignatures with increasing metamorphic grade” Microbiology Society Annual Conference 2017 Geomicrobiology, Edinburgh, UK 2017
- [14] **Montgomery, W.**, G. B. Bromiley, and M. A. Sephton, “Organic records in impact excavated rocks on Mars” Astrobiology Society of Britain 6: The Origins, Distribution & Detection of Life in the Universe, London, UK, September 2015.
- [13] **Montgomery, W.**, J. S. Watson and M. A. Sephton, “High Pressures and Preserving the Records of Life” AGU Fall Meeting 2014, Session B24A: (Bio)geochemical Cycles in Extreme Environments III. B24A-08
- [12] Nixon, S. L., **W. Montgomery**, M. A. Sephton and C. S. Cockell, “Recalcitrant Carbonaceous Material: A Source of Electron Donors for Anaerobic Microbial Metabolisms in the Subsurface?” AGU Fall Meeting 2014, Session B13A: (Bio)geochemical Cycles in Extreme Environments I Posters. B13A-0159
- [11] **Montgomery, W.**, M. A. Sephton, J. S. Watson, H. Zheng, “The effects of minerals on heavy oil and bitumen chemistry when recovered using steam-assisted methods” Society of Petroleum Engineers Heavy Oil Conference Canada, Calgary, 2014
- [10] A. B. Verchovsky, S. A. Hunt, **W. Montgomery**, M. A. Sephton “Reaction of Q to Thermal Metamorphism in the Parent Bodies: High Pressure Experiments” LPSC, 2014.
- [9] **Montgomery, W.**, M. A. Sephton, R. C. Court, J. S. Watson, H. Zheng, A. C. Rees “Quantitative Laboratory Assessment Of Aquathermolysis Chemistry During Steam-assisted Recovery Of Heavy Oils And Bitumen, With A Focus On Sulfur” Society of Petroleum Engineers Heavy Oil Conference Canada, Calgary, 2013.
- [8] **Montgomery, W.**, R. W. Court, J. S. Watson, M. A. Sephton, A. C. Rees “Quantitative laboratory assessment of aquathermolysis chemistry during steam-assisted recovery of heavy oils and bitumen” World Heavy Oil Conference, Aberdeen, UK, 2011
- [7] Verchovsky A. B., **W. Montgomery**, M. A. Sephton. “Q Noble Gases in the Orgueil HF/HCl Residue: A High-Pressure Experiment” 74th Annual Meteoritical Society Meeting, Greenwich, London, UK.
- [6] **Montgomery, W.**, E. S. Jennings, Ph. Lerch, and D. M. Sherman, “PAHs Under Pressure: stability of coronene, chrysene and acridine to 10 GPa and 600 K.” AGU Fall

Meeting 2009, Session P13: Organics in Meteorites and Dust Particles: Composition, Distribution, Formation and Isotopic Anomalies.

- [5] **Montgomery, W.**, J. R. Tuff, S. C. Kohn, “Formic Acid and Montmorillonite Clay in an Early Earth Environment (<10 GPa, <1000K)” Eos Trans. AGU, 89(53) Fall Meet. Suppl. Abstract MR54A-05, 2008.
- [4] **Montgomery, W.**, J. C. Crowhurst, J. M. Zaug, and R. Jeanloz, “High Pressure Organic Chemistry and the Early Earth” Eos Trans. AGU, 87(52), Fall Meet. Suppl., Abstract VD11D-0618, 2006.
- [3] **Montgomery, W.** and R. Jeanloz, “Life on extrasolar planets: the persistence and stability of cyanuric acid under protoplanetary conditions.” Eos Trans. AGU, 86(52), Fall Meet. Suppl., Abstract SA53B-1173, 2005.
- [2] **Montgomery, W.** and R. Jeanloz, “Planetary Interiors: Parametric Modeling of Global Geophysical Properties.” Eos Trans. AGU, 85(47), Fall Meet. Suppl., Abstract P33A-1014, 2004.
- [1] **Montgomery, W.** J. M. Zaug, A. F. Goncharov, W. M. Howard, M. R. Manaa, R. Jeanloz and C. E. Young, “Liquids in the Diamond Anvil Cell: High Pressure-Temperature Chemistry of Formic Acid.” Eos Trans. AGU, 84(46), Fall Meet. Suppl., Abstract V31D-0962, 2003.

PERSONAL DEVELOPMENT AND DEVELOPING OTHERS **Personal Development**
2018 Active Bystander Training
2017 Introduction to Supervising at Imperial College London
2016 Recruitment and Selection Training at Imperial College London
2014 Mental Health First Aider

Health and Safety Training

- 2017 Pressure Fittings Installation (2017)
- 2013 Connecting Gas Regulators (2013)
- LN₂ handling at: Imperial College London, SOLEIL Synchrotron, Swiss Light Source, Diamond Light Source, Advanced Light Source.
- General Employee Radiological Training (GERT): Diamond Light Source, SOLEIL Synchrotron, Advanced Light Source, Swiss Light Source

MANAGEMENT, ADMINISTRATION AND OTHER VALUE ADDED ACTIVITIES

Public Engagement

- I hosted @geoscitweeps (twitter) 28 Aug to 2 Sept 2017.
- Participant at the Reopening of the Mary Rose, July 2016.

Management and Administrative Activities

- managed installation of hydrous pyrolysis equipment, a small building works project from 2017-8. (Budget: £15K) This required liaising with Campus Estates, Safety, individual building managers, and the manufacturer of the equipment.
- member of hiring committee for PDRA hire (2x, 2108, 2016)
- Departmental Mental Health Champion, 2014-2017 Promoted awareness of Good Mental Health through initiatives such as “Time to Talk Day” and “Mental Health Awareness Week”.
- Created and maintain lab wiki, an online reference manual for laboratory activities, 2012-current.

EVIDENCE OF ESTEEM

Invited Talks

- 05/2017 Department of Earth Science Friday Seminar, Cambridge University, UK
- 01/2017 Birkbeck Students’ Geological Society, Birkbeck University of London, UK
- 11/2016 School Research Seminar Series, School of Earth and Environmental Sciences, University of Manchester, UK
- 10/2016 Centre for Science at Extreme Conditions, University of Edinburgh, UK
- 04/2012 Weekly seminar, SOLEIL Light Source, Paris, France
- 02/2011 Workshop on IR spectro-microscopy, Swiss Light Source, Villigen, Switzerland
- 06/2009 European Laboratory for Non-linear Spectroscopy (LENS), University of Florence, Italy
- 06/2009 Materials Research and Engineering Research Institute, Sheffield Hallam University, UK
- 11/2007 Center for Integrative Planetary Science, University of California, Berkeley, USA
- 04/2007 NASA Ames Astrochemistry Group, USA

External Visibility

Recent papers have been covered online by outlets including: [The Sky At Night web magazine](#), [IFLScience](#), [Physics World](#), [IoP member magazine](#) as well as mainstream newspapers. [In-line weblinks provided in digital version.]

Professional Activities

- Consultant to Tribology Group, Department of Mechanical Engineering, Imperial College London, 2018. Contributed to experimental design leading to EPSRC grant application, with publications planned.
- Mental Health First Aider, 2014-current
- Fellow of the Royal Astronomical Society
- Co-coordinator, Annual Meeting of the British Organic Geochemistry Society, 2016
- Reviewer for AIP, ACS journals, NASA External Review Pool, UKSA Review Pool.
- Co-chair, oral session, “Life Under Pressure”, AGU Fall Meeting 2008.

Assistant Supervisor, PhD, Imperial College London

- Zoe Hodges, “Building a Habitable Icy Moon” Estimated Completion Date: December 2020
- Christian Pötzsil, “Chemical Attack on Fragments of Asteroids” Completion Date: December 2016

Postdoctoral Teaching Experience

- deliverer of undergraduate module 1.15, “Mathematics for Geoscientists,” Imperial College London (Fall 2018)
- marker, MSci theses, Imperial College London (January 2017, January 2018) Four theses marked, including sitting on vivas.
- deliverer of undergraduate module, “Research Conference,” Imperial College London (Spring 2017, Spring 2018)
- [Fellow of the Higher Education Academy, \(HEA\)](#) since September 2017.
- co-supervisor for proposed PhD, “[Preservation of biosignatures in the Martian subsurface: should future missions target meteorite impact sites?](#)” at Department of Geosciences, University of Edinburgh
- marker, final exams, Modules: 4.05 Biogeochemistry, 5.27 Earth Systems, Imperial College London (Spring 2017)
- Contributor to the supervision of PhD (8) and summer undergraduate researchers (2) in the Imperial Organic Geochemistry Laboratory (2010-present).
- Supervised MSci students Sorcha Cotter (2013-2014), Luke Daly (2011-2012) at Imperial College London.
- Tutor, Year 2 academic tutorials, Imperial College London (2012).
- Featured speaker, Frontiers of Earth Science (Year 4 seminar course), University of Bristol (November 2009).
- Tutor for students in the first year Environmental Geosciences (lectures only) course, University of Bristol, (2009-10).
- Supervised two summer undergraduate research assistants, University of Bristol (Summer 2009).

Graduate Student Instructor n.b.: in the US, this is a more autonomous position than “demonstrating”, acting as head of class for small group (up to ≈ 20 students) teaching complementary to the lectures, holding weekly drop-in sessions, and marking of all coursework and exams. For course descriptions, please see Appendix to Teaching Statement.

- EPS3, The Water Planet, Spring 2006
Introductory course for non-majors (200 students). Responsible for marking of homework assignments and exams, holding drop-in sessions (“office hours”), keeping course records, and setting up in-class demonstrations.
- EPS120, Quantitative Analysis of Environmental Data, Fall 2005, 2006
Upper-level (post-graduate) statistics and data-analysis course (100 students). Head of class for lab section in the use of JMP statistics package; ran drop-in session for students; marked homework and exams.
- EPS2, Gems and Gem Materials, Fall 2003, Summer 2003, Fall 2002
Online course for non-majors. In addition to maintaining the web site, marking term papers and administering exams, I led an optional hands-on lab.
- EPS108, Geophysics, Fall 2001
Responsible for marking of homework assignments and exams, holding weekly drop-in session and course organization for this introductory geophysics course for Earth & Planetary Science majors (10 students).
- EPS60, Linear Algebra for Earth Scientists, Fall 2000
Responsible for marking of homework assignments and exams, holding weekly drop-in sessions and course organization for this required upper-level (and postgraduate) mathematics (linear algebra and introductory differential equations) course (20 students).

APPENDIX TO
TEACHING
STATEMENT

All courses were offered at the University of California, Berkeley between 2000 and 2007. EPS60 is no longer offered, due to the retirement of the professor, and students are required to take an additional semester of advanced mathematics from the mathematics department instead.

Course Title	Course Description	Date Taught
EPS120: Quantitative Analysis of Environmental Data	Three hours of lecture and three hours of laboratory per week. Prerequisites: One year of calculus or consent of instructor. Fundamentals of exploratory data analysis and hypothesis testing for environmental scientists, with emphasis on characterising and evaluating uncertainty. Introduction to selected topics relevant to environmental analysis, including error propagation, design of experiments, and Monte Carlo methods. Computer laboratories, using real environmental data, explore concepts and techniques presented in lecture. Upper-level statistics and data-analysis course for advanced undergraduates and graduate students. As the GSI, I was responsible for holding office hours (tutorial work to elaborate on material covered in lecture), grading assignments, and leading computer laboratory work using the statistics package JMP on real data sets.	Fall 2005, 2006
EPS3: The Water Planet	Two hours of lecture per week. An overview of the processes that control water supply to natural ecosystems and human civilisation. Hydrologic cycle, floods, droughts, groundwater. Patterns of water use, threats to water quality, effects of global climate change on future water supplies. Water issues facing California. Introductory course in earth science for non-science majors. I was responsible for grading of homework assignments and exams, holding office hours, keeping course records, and setting up in-class demonstrations. Course involved about 300 students and was organised with Blackboard.	Spring 2006
EPS2: Gems & Gem Materials	One to three hours of session per week. The primary goal of the course is to present some introductory earth science and to provide students with a solid understanding of gemology. The course covers (1) processes leading to the formation of gems in the Earth, (2) how gems are identified, (3) factors that affect the appearance and value of gems, (4) processes used to enhance the appearance of gems, (5) materials used to simulate common gemstones, and (6) issues associated with the synthesis of gems. Information about each of the main gem groups is provided. Additional credits require a term paper and practical (laboratory) work. Web course for non-science majors. In addition to maintaining the web site, grading term papers and administering exams, I was responsible for the optional hands-on lab. This course used WebCT, one of the predecessors of Blackboard and other online course organisation tools.	Fall 2003, Summer 2003, Fall 2002

Course Title	Course Description	Date Taught
EPS108: Geophysics	Three hours of lecture and one hour of discussion per week. Prerequisites: EPS 60, Physics 7A, or Mathematics 53, 54. Basic principles in studying the physical properties of earth materials and the dynamic processes of the earth. Examples are drawn from tectonics, mechanics of earthquakes, volcanology, etc., to augment course material; intended for upper-level majors and graduate students lacking geophysics. I was responsible for grading homework assignments and exams, leading discussion sections, holding office hours, and performing course organisational duties for this introductory geophysics course for Earth & Planetary Science majors. Course was taught primarily from Turcotte & Schubert and Fowler.	Fall 2001
EPS60: Linear Algebra for Earth Scientists	Three hours of lecture and one hour of discussion per week. Multivariable calculus, linear algebra, differential equations and other selected mathematical topics relevant to geology, geophysics and planetary science. Required for all undergraduate geology and geophysics majors, and graduate students entering without strong mathematics backgrounds. I was responsible for grading of homework assignments and exams, leading discussion sections, holding office hours and performing course organisational duties.	Fall 2000