Dr Thomas Gernon

Personal Information

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Appointments

2016–present | University of Southampton
Associate Professor of Earth Science
My current role combines research, education and enterprise. I am motivated by bringing interdisciplinary and data-driven approaches to the geosciences, providing new tools to explore interconnections between the solid Earth, surface processes and the climate system. Among other impacts, this approach has led to 8 papers in high-ranking journals over the past five years. As a Turing Fellow, I am leading applications of machine learning to environmental and climate science. I have demonstrated leadership and excellence in research, high-quality innovative teaching and PhD project supervision (11 successfully to completion). My ethos in research and teaching has always been exploring boundaries and making the curriculum and skills we teach (e.g., geospatial analysis) relevant to present-day scientific challenges and industry needs. I have held various administrative roles, including impact officer for the UK Research Excellence Framework and coordinator for the Erasmus program.

2010–2016 | University of Southampton
Lecturer in Earth Science
Designing, developing & delivering modules and supervising research projects, ultimately gaining a Fellowship of the Higher Education Academy.

2008–2009 | Trinity College Dublin
Lecturer in Geology
Research and undergraduate teaching including coordination of four modules. Obtained a certificate in 'Developing a reflective teaching portfolio for professional development'.

2007-2008 | University of Bristol & De Beers Canada
Postdoctoral Research Associate
Detailed geological mapping, data integration and geochemical analysis of the Snap Lake Diamond Mine, Arctic Canada, to inform future development & optimal mining practices.

2004 | CRH Group Quarries
Consulting Geologist
Led an integrated borehole, field mapping and geochemical analytical programme to inform future development of the resource.

Education

2004–2007 PhD in Earth Science, **University of Bristol** & **De Beers** (with Sir Steve Sparks)
Thesis: *Fluidisation and emplacement processes in kimberlite eruptions.*

2000–2004 BSc (Hons.) in Geology, **University College Dublin**, with First Class Honours.

Honours & Awards

2019 Fellowship of The Alan Turing Institute.
2012 Fermor Fund, Geological Society of London.
2011 Curry Fund, Geologists' Association.
2010 President's Award, Geological Society of London.
2010 Distinguished Geologists' Memorial Fund, Geological Society of London.
2009 Clough and Mykura Fund, Edinburgh Geological Society.
2009 Timothy Jefferson Field Research Fund, Geological Society of London.
2004 Cunningham Prize, Geological Survey of Ireland.
2000 Alumni Prize, European Commission's E.U. Contest for Young Scientists.
2000 Young Scientist of the Year award, Republic of Ireland.
1999 Geological Survey of Ireland award, Young Scientist Exhibition, Ireland.
1997 Institute of Physics of Ireland award, Young Scientist Exhibition, Ireland.

Selected Research Grants

My research activities to date have been supported by >£2m of UKRI and industry funds.

2021 NERC grant (NE/W001233/1) on *drivers of global suspended sediment* (Co-I, £796k).
WSI Pilot Project with IBM Research UK on *building data bridges* (PI, £8.4k).
2018 Turing Institute (EP/N510129/1) on *machine learning of seismicity* (PI, £96.3k).
2017 NERC (NE/R004978/1) on *solid Earth drivers of environmental change* (PI, £70k).
2013 NERC (NE/K00543X/1) on *tephra diagenesis in the global carbon cycle* (Co-I, £582k).
NERC IODP CASE (NE/K007386/1) on *arc volcanism in the Caribbean* (Co-I, £73k).
2012 National Geographic Global Exploration Fund grant (GEFNE56-12, PI, €19k).
EPSRC grant for *development of fluid dynamics laboratory equipment* (PI, £39.6k).
NERC Airborne Research and Survey Facility grant (ET12-14, Co-I, £100k).
2011-20 Four NERC Isotope Geosciences Facilities grants (PI; total: £161k):
NEIF-2256.0320 (2020; £38.4k) on: 'Timescales of volcanism in the northern Afar'
IP-1569-1115 (2016; £58k) on: 'Timescales of volcano-tectonic processes in the Ethiopian rift'
IP-1537-0515 (2015; £45k) on: 'Long-term evolution of Montserrat volcanism'
IP-1240-0511 (2011; £19.7k) on: 'Early Cenozoic explosive volcanism in the North Atlantic'

Professional Service

2018-present Member, Academic Advisory Board, Web Science Institute, UoS, UK.
2019–present Member, Natural Environment Research Council's peer review college.
2017–present Proposal Reviewer, The Royal Society.
2013–2016 External panelist for BSc revalidation, University of South Wales (2013, 2016).
2010–present PhD examiner, including at the University of Oxford (2019, 2021).
2007–present Reviewer for international journals (e.g., Nature Geosci., Geology, EPSL, JGR, JVGR).

Graduate Students & Postdoctoral Fellows

Over the past decade, I have **supervised 14 PhD students** (eleven to completion and three in progress), five of these as lead supervisor†. The successfully completed PhDs are: Drs Holly Elliott†, Melis Cevatoglu, Michael Clare, Maya Coussens, John Emeana, Timothy Hughes, Stuart Hatter†, Finnigan Illsley-Kemp, Melanie Siegburg†, James Davey & Ben Callow. The three PhDs currently in progress are: Emma Horn, Emma Watts† and Rhiannon Rees†. I have **supervised three PDRAs**, from 2013–17 (Dr Hayley Manners), from 2018–19 (Dr Jack Longman), and from 2018–present (Dr Thea Hincks).

Media & Outreach Highlights

Media coverage: My research outputs rank in the top 10% for global reach, with many of my papers having significant impact, featuring in *Nature, Science, National Geographic, TIME, Scientific Amer-*

ican, New Scientist, New York Times, BBC, The Guardian, Forbes and over 600 other news articles, including a co-opted piece in *Newsweek*.

Outreach projects: I was awarded the Curry Fund to design, develop and install interpretive panels on the natural history of the Fife coast, Scotland, working with agencies including Fife Council and Scottish Natural Heritage to successfully deliver the project. Seperately, I was part of a team that developed a unique sonification of our NASA impacts data on the lunar surface.

Education initiatives: I was awarded the Royal Dublin Society Demonstration Lecture Bursary to develop & deliver a program of interactive talks in schools.

International Fieldwork

I have carried out **extensive geological fieldwork in sixteen countries spanning six continents, and cumulatively spent over two years in the field gathering data**. Major field localities have included: Tenerife, Aragon & Almería (Spain); the Flinders Ranges & Arkaroola (South Australia); the Boset-Bericha Volcanic Complex (Ethiopia); the IODP Kochi Core Repository (Japan) and IODP Bremen Core Repository (Germany); South Soufrière Hills (Montserrat); Santorini (Greece); south-central Utah (USA); Snap Lake, Northwest Territories (Arctic Canada); Letseng Diamond Mine, Mokhotlong district (Kingdom of Lesotho); Fort à la Corne, Saskatchewan (Canada); Bakening Volcano, Kamchatka Peninsula, Far Eastern Siberia (Russia); Venetia kimberlite, Limpopo province (South Africa), and the Jwaneng & Orapa Diamond Mines (Republic of Botswana).

International Collaborations

- Prof Roger Cooke, TU Delft & Resources for the Future: Understanding climate sensitivity;
- Prof Eelco Rohling, ANU, Australia: Sea level and deep-sea temperature variations over 40 million years;
- Prof Paul Hoffman, Harvard University, US: Geology of Cryogenian glaciations;
- Prof Dietmar Müller, Univ. of Sydney, Australia: Climate tipping points during supercontinent breakup;
- Prof Sue O'Reilly AM FAA FRSN & Prof Bill Griffin, Macquarie University, Australia: Lithospheric chemistry during continental breakup;
- Dr Brenhin Keller, Dartmouth College, US: Statistical geochemistry & origin of the Great Unconformity;
- Dr Sara Mazrouei (University of Toronto), Dr Rebecca Ghent (Planetary Science Institute, Arizona, US) and Dr Bill Bottke (SwRI, Colorado, US): Earth and Moon impact flux over geologic time;
- Prof Ross Mitchell, Chinese Academy of Sciences, Beijing: Orbital forcing on Snowball Earth;
- Prof Chris Spencer, Queens University, Canada: Effect of land plant evolution on crustal composition;
- Dr Finnigan Illsley-Kemp (Victoria University of Wellington, NZ), Dr Laura Wallace (University of Texas) and Dr Katie Jacobs (GNS, NZ): Origin of slow-slip earthquakes in the Taupo Volcanic Zone;
- Dr Sascha Brune & Dr Anne Glerum, GFZ Potsdam, Germany: Geodynamic modelling of rift evolution;

Invited Presentations

I have delivered over 50 presentations at international conferences (of a total of 95 papers at 65 conferences), workshops, seminars and public lectures. This has included 25 invited presentations:

2021 Invited Seminar, VMSG, UK: 'The role of volcanism in shaping Neoproterozoic snowball Earth'
2019 invited Seminar, Natural History Museum, London: 'Snowball Earth & the Moon's craters'
2018 Invited Seminar, Earth Sciences, University of Oxford: 'Volcanism on Snowball Earth'.
2017 Invited Keynote Speaker at Goldschmidt geochemistry conference, Paris.
2016 Invited Keynote Speaker, Sprigg Symposium, Australian Earth Science Convention.
2016 Speaker at *Earth's Uninterrupted Habitability*, Geol. Soc. London.
2014 Invited Keynote Speaker, Mineral Deposits Studies Group, Geol. Soc. London.
2011 Invited Lecturer, International Diamond School, UCL/Università Padua, Italian Alps.
2009 Guest Speaker to several school groups, Royal Dublin Society.
2008 Speaker, International Kimberlite Conference, Canada: 'Fluidization in volcanic conduits'.

Selected Publications

March 2022: peer reviewed papers, n = 60, total citations = 1,604, h = 24, full list available to download at tinyurl.com/gernon.

Rohling, E.J., Foster, G.L., **Gernon, T.M.**, Grant, K.M., Heslop, D., Hibbert, F.D., Roberts, A.P. & Yu, J., under consideration, 2022. *Comparison and synthesis of sea level and deep-sea temperature variations over the past 40 million years*. **Reviews of Geophysics**.

Spencer, C.J., Davies, N.S., **Gernon, T.M.**, Wang, X., McMahon, W.J., Morrell, T.R., Hincks, T.K., Puhfal, P.K., Brasier, A., Seraine, M., & Lu, G.M., in revision, 2022. *Evolution of land plants changed the composition of the continental crust*. **Nature Geoscience**.

Gernon, T.M., Jones, S.M., Brune, S., Hincks, T.K., Glerum, A., Palmer, M.R., Schumacher, J.C., Primiceri, R.M., Field, M., Griffin, W.L., O'Reilly, S.Y., Keir, D., Spencer, C.J. & Merdith, A., in review, 2021. *Diamond ascent by rift-driven disruption of cratonic mantle keels*. **Nature**. Preprint doi: 10.21203/rs.3.rs-986686/v1.

Gernon, T.M., Barr, R., Fitton, J.G., Hincks, T.K., Longman, J., Merdith, A., Mitchell, R.N. & Palmer, M.R., in revision, 2021. *Mobilization of lithospheric mantle carbon during the Palaeocene-Eocene thermal maximum*. **Nature Geoscience**. Preprint doi: 10.21203/rs.3.rs-333061/v1.

Longman, J., Palmer, M.R., **Gernon, T.M.**, Manners, H.R. & Jones, M.T., 2022. *Subaerial volcanism is a potentially major contributor to oceanic iron and manganese cycles*. **Communications Earth & Environment** 3 (60), p. 1–8; doi: 10.1038/s43247-022-00389-7.

Longman, J., Mills, B.J.W., Manners, H.R., **Gernon, T.M.** & Palmer, M., 2021. *Late Ordovician climate change and extinctions driven by elevated volcanic nutrient supply*. **Nature Geoscience** 14, p. 924–929; doi: 10.1038/s41561-021-00855-5.

Gernon, T.M., Hincks, T.K., Merdith, A., Rohling, E.J., Palmer, M.R., Foster, G.L., Bataille, C.P. & Müller, R.D., 2021. *Global chemical weathering dominated by continental arcs since the mid-Palaeozoic*. **Nature Geoscience** 14, p. 690–696; doi: 10.1038/s41561-021-00806-0.

Mitchell, R.N.[‡], **Gernon, T.M.**[‡], Cox, G.M., Nordsvan, A.R., Kirscher, U., Xuan, C., Liu, Y., Liu, X. & He, X., 2021. *Orbital forcing of ice sheets during snowball Earth*. **Nature Communications** 12, 4187; doi: 10.1038/s41467-021-24439. [‡]Contributed equally.

Longman, J., **Gernon, T.M.**, Palmer, M.R., Jones, M.T., Stokke, E.W. & Svensen, H.H., 2021. *Marine diagenesis of tephra aided the Paleocene-Eocene Thermal Maximum termination*. **Earth and Planetary Science Letters** 571, 117101, doi: 10.1016/j.epsl.2021.117101.

Longman, J., Palmer, M.R. & **Gernon, T.M.**, 2020. *Viability of greenhouse gas removal via artificial addition of volcanic ash to the ocean*. **Anthropocene** 32, 100264; doi: 10.1016/j.ancene.2020.100264.

Gernon, T.M., 2020. *A sabbatical reboot*. **Science** 370 (6517), p. 738; doi: 10.1126/science.370.6517.738.

Mazrouei, S., Ghent, R.R., Bottke, W.F., Parker, A.H. & **Gernon, T.M.**, 2019. *Earth and Moon impact flux increased at the end of the Paleozoic*, **Science** 363, p. 253–257; doi: 10.1126/science.aar4058. Associated Perspective: Koeberl, C., 2019. *When Earth got pummeled*. **Science** 363 (6424), p. 224–225; doi: 10.1126/science.aav8480; and News Feature: Voosen, P., 2019. *Moon's craters reveal recent spike in outer space impacts on Earth*, **Science**, doi: 10.1126/science.aaw7085.

Keller, C.B., Husson, J.M., Mitchell, R.N., Bottke, W.F., **Gernon, T.M.**, Boehnke, P., Bell, E.A., Swanson-Hysell, N.L. & Peters, S.E., 2019. *Neoproterozoic glacial origin of the Great Unconformity*. **Proceedings of the National Academy of Sciences** 116 (4), p. 1136–1145; doi: 10.1073/pnas.1804350116. News and Views: Chakravorty, A. (2019), *Did global glaciation cause the Great Unconformity?* **Eos**, 100, doi: 10.1029/2019EO120289.

Longman, J., Palmer, M., **Gernon, T.M.** & Manners, H., 2019. *The role of tephra in enhancing organic carbon preservation in marine sediments*. **Earth-Science Reviews** 192, p. 480–490; doi: 10.1016/j.earscirev.2019.03.018.

Hincks, T.K., Aspinall, W., Cooke, R. & **Gernon, T.M.**‡, 2018. *Oklahoma's induced seismicity strongly linked to wastewater injection depth*. **Science** 359, p. 1251–1255; doi: 10.1126/science.aap7911. ‡Corresponding author.

Gernon, T.M., Hincks, T.K., Tyrrell, T., Rohling, E.J. & Palmer, M.R., 2016. *Snowball Earth ocean chemistry driven by extensive ridge volcanism during Rodinia breakup*. **Nature Geoscience** 9, p. 242–248; doi: 10.1038/ngeo2632. Associated News & Views feature: Fairchild, I. J., 2016. *Ocean chemistry: Neoproterozoic glass-bleeding*. **Nature Geoscience** 9, p. 192–193; doi: 10.1038/ngeo2643.

Blackford, J., Stahl, H., Bull, J., Berges, B., Cevatoglu, M., Lichtschlag, A., Connelly, D., James, R., Kita, J., Long, D., Naylor, M., Shitashima, K., Smith, D., Taylor, P., Wright, I., Akhurst, M., Chen, B., **Gernon, T.M.**, Hauton, C., Hayashi, M., Kaieda, H., Leighton, T., Sato, T., Sayer, M., Suzumura, M., Tait, K., Vardy, M., White, P. & Widdicombe, S., 2014. *Detection and impacts of leakage from sub-seafloor carbon dioxide storage*. **Nature Climate Change**, 4, p. 1011-1016, doi: 10.1038/nclimate2381.

Gernon, T.M., Brown, R.J., Tait, M.A. & Hincks, T.K., 2012. *The origin of pelletal lapilli in explosive kimberlite eruptions*. **Nature Communications**, 3 (832), p. 1–7, doi: 10.1038/ncomms1842.

Gernon, T.M., Gilbertson, M.A., Sparks, R.S.J. & Field, M., 2008. *Gas-fluidisation in an experimental tapered bed: insights into processes in diverging volcanic conduits*. **Journal of Volcanology and Geothermal Research**, 174 (1-3), p. 49–56, doi: 10.1016/j.jvolgeores.2007.12.034. Paper featured in **Nature** (2008), Research Highlights, 451, p. 502, doi: 10.1038/451502a.