

GUY J. G. PAXMAN

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RESEARCH INTERESTS

I am a glacial geophysicist and geomorphologist with interests in understanding the interactions between solid Earth, Earth surface, and ice sheet dynamics in polar regions. In particular, my research centres on the long-term evolution of subglacial landscapes in Antarctica and Greenland, and how this can be used to infer past ice sheet dynamics. I am also interested in the roles of mantle dynamics, crustal structure, and bedrock geology in governing past, present, and future ice sheet behaviour and how the cryosphere responds to climate change.

Key research achievements include:

- Developed the first process-based models of subglacial tectonic, landscape, and ice sheet development in the low-lying Recovery, Wilkes, and Pensacola-Pole basins of East Antarctica.
- Identified the importance of bedrock erosion surfaces for influencing past and future ice retreat within the Wilkes Subglacial Basin.
- Led the development and dissemination of the first geologically-constrained suite of reconstructions of past Antarctic topography for a series of key time intervals since the onset of glaciation.
- Demonstrated through the use of ice sheet modelling that long-term bed topography evolution in Antarctica has amplified the sensitivity of the Antarctic Ice Sheet to climate change.
- Identified a palaeo-lake basin preserved beneath the Greenland Ice Sheet that potentially contains valuable records of environmental conditions and ice extent in Greenland during past warm climates.

APPOINTMENTS

12/2019–Present **Postdoctoral Research Scientist**

Lamont-Doherty Earth Observatory, Columbia University, Earth Institute, NY, USA
Predicting Coastal Responses to a Changing Greenland Ice Sheet (Navigating the New Arctic Track 1). Funded by the US National Science Foundation.

EDUCATION

2015–2019 **Ph.D. (Physical Geography), Durham University, UK**

Thesis title: ‘Reconstructing the past topography of Antarctica and its influence on ice sheet behaviour’. Funded by the NERC UK IAPETUS Doctoral Training Partnership.

Supervisors: Dr. Stewart Jamieson, Prof. Mike Bentley, Dr. Neil Ross, Dr. Fausto Ferraccioli

2011–2015 **MEarthSci (Earth Sciences), University of Oxford, UK (First Class Honours)**

MEarthSci thesis title: ‘Quantifying tectonic and erosion-driven uplift in the Gamburtsev Subglacial Mountains of East Antarctica’. Supervisor: Prof. Tony Watts

PUBLICATIONS

In press

[11] Paxman, G. J. G. 2021. Chapter 7: ‘Antarctic Palaeotopography’ in ‘The Antarctic Mantle: a petrological, geophysical, geodynamic, and geodetic view’ (Eds.: Martin, A. P. & van der Wal, W.). *Geological Society of London Special Publications*. (Invited contribution).

Published

[10] Paxman, G. J. G., Austermann, J., Tinto, K. J. 2021. A fault-bounded palaeo-lake basin preserved beneath the Greenland Ice Sheet. *Earth and Planetary Science Letters* 553, 116647.

- [9] Napoleoni, F., Jamieson, S. S. R., Ross, N., Bentley, M. J., Rivera, A., Smith, A. M., Siegert, M. J., **Paxman, G. J. G.**, Gacitua, G., Uribe, J. A., Zamora, R., Brisbourne, A. M., Vaughan, D. G. 2020. Subglacial lakes and hydrology across the Ellsworth Subglacial Highlands, West Antarctica. *The Cryosphere* 14(12) 4507-4524.
- [8] **Paxman, G. J. G.**, Gasson, E. G. W., Jamieson, S. S. R., Bentley, M. J. & Ferraccioli, F. 2020. Long-term increase in Antarctic Ice Sheet vulnerability driven by bed topography evolution. *Geophysical Research Letters* 47(20), e2020GL090003.
- [7] **Paxman, G. J. G.**, Jamieson, S. S. R., Hochmuth, K., Gohl, K., Bentley, M. J., Leitchenkov, G., Ferraccioli, F. 2019. Reconstructions of past Antarctic topography since the Eocene–Oligocene boundary. *Palaeogeography, Palaeoclimatology, Palaeoecology* 535, 109346.
- [6] **Paxman, G. J. G.**, Jamieson, S. S. R., Ferraccioli, F., Jordan, T. A., Bentley, M. J., Ross, N., Forsberg, R., Matsuoka, K., Steinhage, D., Eagles, G. & Casal, T. G. 2019. Subglacial geology and geomorphology of the Pensacola-Pole Basin, East Antarctica. *Geochemistry, Geophysics, Geosystems* 20, 2786–2807.
- [5] **Paxman, G. J. G.**, Jamieson, S. S. R., Ferraccioli, F., Bentley, M. J., Ross, N., Watts, A. B., Leitchenkov, G., Armadillo, E. & Young, D. A. 2019. The role of lithospheric flexure in the landscape evolution of the Wilkes Subglacial Basin and Transantarctic Mountains, East Antarctica. *Journal of Geophysical Research: Earth Surface* 124(3), 812–829.
- [4] **Paxman, G. J. G.**, Jamieson, S. S. R., Ferraccioli, F., Bentley, M. J., Ross, N., Armadillo, E., Gasson, E. G. W., Leitchenkov, G. & DeConto, R. M. 2018. Bedrock erosion surfaces record former East Antarctic Ice Sheet extent. *Geophysical Research Letters* 45(9), 4114–4123.
- [3] **Paxman, G. J. G.**, Jamieson, S. S. R., Ferraccioli, F., Bentley, M. J., Forsberg, R., Ross, N., Watts, A. B., Corr, H. F. J. & Jordan, T. A. 2017. Uplift and tilting of the Shackleton Range in East Antarctica driven by glacial erosion and normal faulting. *Journal of Geophysical Research: Solid Earth* 122(3), 2390–2408.
- [2] **Paxman, G. J. G.**, Watts, A. B., Ferraccioli, F., Jordan, T. A., Bell, R. E., Jamieson, S. S. R. & Finn, C. A. 2016. Erosion-driven uplift in the Gamburtsev Subglacial Mountains of East Antarctica. *Earth and Planetary Science Letters* 452, 1–14.
- [1] **Paxman, G. J. G.**, Gregory, B. S., Payne, S. J., Forshaw, J. B., Brady, M. P., Khan, M. D., Avadanii, D., Wardle, G., Wills, J. J., Kovin, O. N., Naumova, O. B., Osovetskiy, B. M. & Naumov, V. A. 2015. Placer Gold Composition and Provenance Studies in the Kuznetskiy Alatau and Western Sayan, South-East Siberia: Results of Field Trip, Summer 2014. *Bulletin of Perm State University: Geology* 1(26): 44–59.

CURATED DATASETS

- [1] *Hochmuth, K. & ***Paxman, G. J. G.**, Gohl, K., Jamieson, S. S. R., Leitchenkov, G. L., Bentley, M. J., Ferraccioli, F., Sauermilch, I., Whittaker, J., Uenzelmann-Neben, G., Davy, B., DeSantis, L. 2020. Combined palaeotopography and palaeobathymetry of the Antarctic continent and the Southern Ocean since 34 Ma. *PANGAEA*, <https://doi.pangaea.de/10.1594/PANGAEA.923109> (* = joint lead authors).

RESEARCH AND TRAVEL GRANT AWARDS

07/2019	PAIS travel award to attend XIII ISAES conference in Incheon, South Korea: \$700
07/2019	Hatfield College MCR research award to attend ISAES conference in Incheon, South Korea: £500
09/2018	Royal Astronomical Society grant for working visit to Alfred Wegener Institute, Germany: £250
06/2018	Trans-Antarctic Association grant to attend POLAR2018 conference in Davos, Switzerland: £1000
09/2017	PAIS travel award to attend SCAR PAIS conference in Trieste, Italy: €500
09/2015	POLENET/SCAR-SERCE travel award to attend Glacial Isostatic Adjustment training course: \$500
2015–2019	NERC IAPETUS Doctoral Training Partnership studentship (3.5 years): approx. £75,000

SELECTED CONFERENCE PRESENTATIONS

Paxman, G. J. G., Austermann, J., Tinto, K. J. A fault-bounded palaeo-lake basin preserved beneath the Greenland Ice Sheet. American Geophysical Union Fall Meeting 2020. e-Lightning.

Paxman, G. J. G., Jamieson, S. S. R., Gasson, E. G. W., Hochmuth, K., Gohl, K., Bentley, M. J., Ferraccioli, F. Reconstructions of Antarctic topography since the Eocene–Oligocene boundary and implications for ice sheet behaviour. XIII International Symposium on Antarctic Earth Sciences 2019. Oral (**Keynote**).

Paxman, G. J. G., Jamieson, S. S. R., Gasson, E. G. W., Hochmuth, K., Gohl, K., Bentley, M. J., Ferraccioli, F., Leitchenkov, G. Reconstructions of Antarctic topography since the Eocene–Oligocene boundary and implications for ice sheet behaviour. European Geosciences Union General Assembly 2019. Oral.

Paxman, G. J. G., Jamieson, S. S. R., Bentley, M. J., Ferraccioli, F., Jordan, T. A., Ross, N. Basal Conditions of the Pensacola-Pole Basin, East Antarctica. UK Antarctic Science Conference 2018. Oral.

Paxman, G. J. G., Jamieson, S. S. R., Ferraccioli, F., Bentley, M. J., Ross, N., Watts, A. B., Armadillo, E., Leitchenkov, G., Young, D. A. Long-term landscape evolution of the Wilkes Subglacial Basin, East Antarctica. XXXV SCAR Open Science Conference 2018. Oral.

Paxman, G. J. G., Jamieson, S. S. R., Ferraccioli, F., Bentley, M. J., Ross, N., Armadillo, E., Gasson, E. G. W., Leitchenkov, G., DeConto, R. M. Subglacial geomorphology and ice sheet evolution in the Wilkes Subglacial Basin, East Antarctica, 2017, SCAR Past Antarctic Ice Sheet dynamics conference 2017. Oral.

Paxman, G. J. G., Jamieson, S. S. R., Ferraccioli, F., Bentley, M. J., Forsberg, R., Ross, N., Watts, A. B., Corr, H. F. J., Jordan, T. A. Uplift and tilting of the Shackleton Range in East Antarctica driven by glacial erosion and normal faulting. European Geosciences Union General Assembly 2017. Oral.

TEACHING

2020	West Antarctic Ice Sheet history and dynamics, Colorado College; <i>guest seminar speaker</i> .
2017–2019	Handling Geographic Information (BSc Level 2), Durham University; <i>GIS demonstrator</i> .
2016–2019	Sea Level Change (BSc Level 3), Durham University; <i>tutor and demonstrator</i> .
2016–2019	Introduction to Geographical Research (BSc Level 1), Durham University; <i>field demonstrator</i> .
2016–2018	Physical Geography (BSc Level 1), Durham University; <i>tutor and mentor</i> .
2016–2017	Glacial Geology and Geomorphology (MSci), Durham University; <i>field demonstrator</i> .
2016–2017	Oceans Past and Present (BSc Level 3), Durham University; <i>practical demonstrator</i> .
2015–2019	Mountain Landscapes (BSc Level 2), Durham University; <i>GIS demonstrator</i> .
2015–2019	Scientific Research (BSc Level 2), Durham University; <i>GIS and MATLAB demonstrator</i> .
2015–2018	Glaciers and Glaciation (BSc Level 2), Durham University; <i>MATLAB and field demonstrator</i> .

ACADEMIC AWARDS AND PRIZES

2019	Awarded the Certificate for Excellence in Physical Geography Postgraduate Teaching, Durham University (nominated by students and module leaders).
2017	‘Best Student Poster’ winner at British Geophysical Association postgraduate conference.
2016	‘Best Student Poster’ runner-up at UK Antarctic Science conference.
2015	Shell prize for best overall performance in fourth year Earth Sciences, Oxford University.
2015	Schlumberger prize for best performance in fourth year geophysics, Oxford University.
2014	Burdett-Coutts prize for best overall performance in third year Earth Science, Oxford University.
2014	AWE prize for best performance in third year geophysics, Oxford University.
2013	BP prize for best overall performance in second year Earth Sciences, Oxford University.
2013	Tony Doyle award for high achieving second year science student, St. Edmund Hall.
2012	ISC prize for best performance in first year mathematics and geophysics, Oxford University.
2012–2015	Academic Scholarship, St. Edmund Hall.

SCIENTIFIC SERVICE

Scientific working group activities

- Lead contributor to the ‘Antarctic palaeotopography and palaeobathymetry’ working group of the Past Antarctic Ice Sheet dynamics (PAIS) scientific research programme of the Scientific Committee on Antarctic Research; responsible for the production of Antarctic palaeotopography reconstructions.

University administrative activities

- MGG-SGT division seminar series coordinator, Lamont-Doherty Earth Observatory (2020–2021).
- Research Postgraduate Committee representative, Durham University (2017–2018).
- Earth Sciences Library assistant, University of Oxford (2013–2015).

Conference session organisation

- Session co-convenor and Outstanding Student Poster Award liaison for ‘Applications of gravity and magnetic field surveys of the cryosphere’, AGU Fall Meeting 2020.

Invited reviewer for scientific journal articles

- Geochemistry, Geophysics, Geosystems; Geophysical Research Letters; Gondwana Research; Journal of Glaciology; Nature; Palaeogeography, Palaeoclimatology, Palaeoecology; Remote Sensing.

MEMBERSHIPS

2017–Present European Geosciences Union
2016–Present American Geophysical Union
2016–Present Association of Polar Early Career Scientists

IT SKILLS

- **GIS, databases, and data visualisation:** ArcGIS, QGIS, Geosoft Oasis Montaj, ERDAS Imagine, Microsoft Office, Adobe Illustrator, Affinity Designer.
- **Programming and scripting:** Matlab, Unix/Linux, Generic Mapping Tools, LaTeX, Python, Fortran.
- **Numerical Earth systems modelling:** potential field modelling (Geosoft GM-SYS), landscape evolution modelling (TopoToolbox), Earth deformation and rheology modelling (Very Broadband Rheology calculator), isostatic adjustment, flexure, and sea level modelling (Matlab).

EXTRACURRICULAR ACTIVITIES AND INTERESTS

- Accomplished cricketer. Member of my local village club, Everton CC (Bassetlaw District) for 18 years.
- Qualified cricket umpire (ECB Association of Cricket Officials Stage 2).
- Experienced hiker. Have ascended 137 of the 214 ‘Wainwright Fells’ in the English Lake District. Have completed the Yorkshire Wolds Way (127 km) and Coast To Coast (309 km) long-distance hiking trails.
- Qualified Minibus driver (MIDAS) (June 2016). Full clean UK driving license.

REFEREES

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