

## Dr Guy Harrington

Senior Lecturer in Palaeobiology

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### About

I am a micropalaeontologist and hold a joint position with the British Geological Survey. I study changes in communities over space and time. Cenozoic palynology (pollen, spores and dinoflagellate cysts) is my core expertise with emphasis on biostratigraphy, palaeoecology and geographic distribution. In particular, the response of vegetation to global climate perturbations in the early Palaeogene of North America and Europe has formed the core of my research and the source for my varied research questions.

### Qualifications

- PhD Cenozoic palynology - University of Sheffield
- MPhil Biological Sciences - University of Cambridge
- BSc Geography and Geology - Keele University

### Biography

- Senior Lecturer in Palaeobiology

I am a Senior Lecturer in Paleobiology at the University of Birmingham and the British Geological Survey. Previously I worked at GEES as a Lecturer (2004-14). I have worked as a research fellow at the University of Sheffield (1998-1999), University College Cork (1999-2002), and finally as a Visiting Scientist at The National Museum of Natural History, Smithsonian Institution (2002-2004). I am still currently a Research Associate of the Department of Paleobiology, Smithsonian Institution (2004- present)

### Teaching

- ESCM131 (Fieldskills 1) (20 credits)
- ESCM320/440 (Micropalaeontology) (20 credits) (Lead)
- ESCM502 (Palynology I – pollen and spores) (10 credits) (Lead)
- ESCM503 (Palynology II – dinoflagellates) (20 credits) (Lead)
- ESCM507 (Micropalaeontology project) (60 credits)

### Postgraduate supervision

#### PhD students

- 2012- present: First supervisor (with Prof. Jon Sadler and Dr Carlos Jaramillo, STRI) of Ph.D. candidate Carlos D'Apolito on a thesis examining Miocene biodiversification of the Amazon Basin using pollen and spores.
- 2009-2013: Co-supervisor (with Dr Jason Hilton) of Ph.D. candidate Ben Slater on a project entitled: "Fossil floras of the Prince Charles Mountains, Antarctica".
- 2006-2011: First supervisor of Philip Jardine on a project entitled "Palaeocene vegetation and climate change on the US Gulf Coast"
- 2005-2009: Co-supervisor (with Dr Jason Hilton) of Lil Stevens on a project entitled: "Palaeofloristics of the Loch Humphrey Burn lagerstätten."

#### MSc students

I supervise multiple M.Sc projects in palynology (Pollen, spores, dinoflagellate cysts and palynofacies) on the M.Sc in Applied Petroleum Micropalaeontology.

### Research

#### Research Group

**[Geosystems \(http://www.birmingham.ac.uk/research/activity/geosystems/index.aspx\)](http://www.birmingham.ac.uk/research/activity/geosystems/index.aspx)**

#### Research interests

## • Palynology and palynofacies

- Plant responses to changing environments on geological timescales
- Macroecology in deep-time

## Current/recent research

### *Organic provenance and biostratigraphy*

Palynomorphs such as pollen, spores and dinoflagellate cysts (dinocysts) are highly important for helping to determine depositional environments and age of sediments in the past. I sailed with IODP Expedition 337 (Deep coalbed biosphere off Shimokita) to northeast Japan as team leader for biostratigraphy.

Microfossil work on this expedition helped determine the age model based on Cenozoic pollen and spores (Oligocene-Miocene), and the environment based on palynofacies. I have also undertaken provenance studies and help derive age-models of marine sediments from the Wilcox Group (Paleocene-early Eocene) in the Gulf of Mexico (GoM).

This industrially-sponsored work helps determine the likely source areas of sediments in different parts of the economically-important GoM hydrocarbon fields: Palynomorphs are silt-sized sedimentary particles and can be transported effectively over great distances in rivers, through delta systems and then onto the continental shelf. With the British Geological Survey I work within groups undertaking shale gas research.

### *Palaeogene climate change and plant responses*

Long-standing research has centred on biological responses to the Paleocene-Eocene Thermal Maximum (PETM). This rapid interval of global warming of c. 6°C at ~55.8 Ma is marked by perturbations in climate and environment in both the marine and terrestrial realms from the poles to the equator.

This work has been undertaken from North America in the Bighorn Basin (Wyoming), Williston Basin (North Dakota), Ellesmere Island (Nunavut), and both the eastern and western Gulf of Mexico (Texas, Mississippi and Alabama). We recently cored sections of the Bighorn Basin because it contains the thickest and best terrestrial exposures of late Paleocene – early Eocene rocks globally.

Participation in the active BBCP (Bighorn Basin Coring Project) examines vegetation changes through the PETM using pollen and spores as a proxy for plants and is in collaboration with a large US-led consortium of universities and research institutes. This research is funded by NSF. A recent project funded by the EU Framework 7 (PEX: Testing for plant extinction across the Paleocene-Eocene boundary) databased all occurrences of late Paleocene- early Eocene pollen and spores records from North America and Europe in order to understand how plant geographic distributions change through climate perturbations in the early Paleogene. With the British Geological Survey I lead a project focused on PETM climate dynamics and biotic response from the North Sea.

### *Plant community dynamics in deep-time*

Our research from the PETM feeds into questions relating to how biodiversity is partitioned and distributed in globally warm periods of Earth history. In addition to understanding how plants respond to climate change, my research, including collaborations with postgraduate students, seeks to understand how plants are distributed over time and geographic space on scales that exceed those of the Quaternary or Holocene time domain that forms the basis for our understanding of plant community dynamics.

This research is from the USA (Paleocene, GoM), Shanwang in China (Middle Miocene) and now from the western Amazon Basin (Miocene-Pliocene). I have also studied in the past outcrops from Oregon (Late Eocene – Oligocene) and early Eocene of the Canadian Arctic. Our research has been funded by multiple sources including the Nuffield Foundation, Mellon-Carnegie Foundation, NSF SYNTHESYS, and CAPES.

## Other activities

I am currently a Director-at-large for AASP The Palynological Society and have previously held the position the Secretary for the Linnean Society Palynology Specialist Group (2006-12). I have also been a council member for the Palaeontographical Society and was co-opted onto Council for the Palaeontological Association as the meeting organiser for 2009.

## Publications

Fraser, W.T., Watson, J.S., Sephton, M.A., Lomax, B.H. **Harrington, G.J.**, Gosling, W.D., & Self, S. 2014. Changes in spore chemistry and appearance with increasing maturity. *Review of Palaeobotany and Palynology*. 201: 41-46. doi:10.1016/j.revpalbo.2013.11.001

Sluijs, A., van Roij, L., **Harrington, G.J.**, Schouten, S., Sessa, J.A., Schneider, L.J., Reichert, G.-J., & Slomp, C.P. 2013. Intense warming, ocean anoxia and sea level rise during the Paleocene/Eocene Thermal Maximum along the US margin of the Gulf of Mexico. *Climates of the Past Discussion* 9:6459-6494, doi:10.5194/cpd-9-6459-2013.

Clyde, W.C. et al. (**BBCP Science Team**). 2013. Bighorn Basin Coring Project (BBCP): A continental perspective on Early Paleogene Hyperthermals. *Scientific Drilling*.16:21-31. doi:10.5194/sd-16-21-2013

Inagaki, F., Hinrichs, K.-U., Kubo, Y. and the **Expedition 337 Scientists**. 2012. Deep Coalbed Biosphere off Shimokita: microbial processes and hydrocarbon system associated with deeply buried coalbed in the ocean. *IODP Preliminary Report*,337 doi:10.2204/iodp.pr.337.2012

Lomax, B.H., Fraser, W.T., **Harrington, G.J.**, Blackmore, S., Sephton, M.A. & Harris, N.B.W. 2012. A novel palaeoaltimetry proxy based on spore and pollen wall chemistry. *Earth and Planetary Science Letters*. 353-354: 22-28.

**Harrington, G.J.** Eberle, J., Le-Page, B., Dawson, M. & Hutchison, H. 2012. Arctic plant diversity in the early Eocene greenhouse. *Proceedings of the Royal Society, London, B*. 279: 1515-1521, doi:10.1098/rspb.2011.1704.

Jardine, P.E., **Harrington, G.J.** & Stidham, T, 2012. Regional-scale spatial heterogeneity in the Late Paleocene paratropical forests of the U.S. Gulf Coast. *Paleobiology*. 38:15-39.

**Harrington, G.J.** 2010. Macroecology in Deep Time. *Palaeontology*.53:1201

Collinson, M.E., Steart, D.C., **Harrington, G.J.**, et al. 2009. Palynological evidence of vegetation dynamics in response to palaeoenvironmental change across the onset of the Paleocene-Eocene Thermal Maximum at Cobham, Southern England. *Grana*. 48: 38-66

Wing, S.L., Bloch, J.I., Bowen, G.J., Boyer, D.M., Chester, S., Diefendorf, A.F., **Harrington, G.J.**, Kraus, M.J., Secord, R. and McInerney, F.A. 2009. Coordinated sedimentary and biotic changes during the Paleocene-Eocene Thermal Maximum in the Bighorn Basin, Wyoming, U.S.A. in Crouch, E.M. et al. (eds.) *Climatic and Biotic Events of the Paleogene (CBEP 2009)*, extended abstracts from an international conference in Wellington, New Zealand, 12-15 January 2009. *GNS Science Miscellaneous Series* 18:157-163.

Jardine, P.E. & **Harrington, G.J.** 2008. The Red Hills Mine flora: a diverse swamp palynoflora from the Late Paleocene of Mississippi. *U.S.A. Palynology*. 32:183-204.

**Harrington, G.J.** 2008. Palaeocene-Eocene paratropical swamp palynofloras from Alabama and Mississippi, USA. *Palaeontology*. 51: 611-622.

Jaramillo, C.A., Pardo-Trujillo, A., Rueda, M, **Harrington, G.J.**, Bayona, G., Torres, V. & Mora, G. 2007. Palynology of the Cerrejon Formation (Paleocene), Northern Colombia. *Palynology*. 31: 153-189.

Clechenko, E.R., Kelly, D.C., **Harrington, G.J.** & Stiles, C.A. 2007. Terrestrial records of a regional weathering pattern at the Paleocene-Eocene boundary in the Williston Basin of North Dakota. *GSA Bulletin*. 119: 428-442.

**Harrington, G.J.** & Jaramillo, C.A. 2007. Paratropical floral extinction in the Late Palaeocene–Early Eocene. *Journal of the Geological Society of London*. 164: 323-332.

Wing, S.L., **Harrington, G.J.**, Smith, F.A., Bloch, J.I., Boyer, D.M. & Freeman, K.H. 2005. Transient floral change and rapid global warming at the Paleocene-Eocene boundary. *Science*. 310: 993–996.

**Harrington, G.J.**, Clechenko, E.R & Kelly, D.C. 2005. Palynology and organic-carbon isotope ratios across a terrestrial Palaeocene/Eocene boundary section in the Williston Basin, North Dakota, USA. *Palaeogeography Palaeoclimatology Palaeoecology*. 226: 214-232.

Haughton, P.D.W., Praeg, D., Shannon, P., **Harrington, G.**, Higgs, K., Amy, L., Tyrrell, S. and Morrissey, T. 2005. First results from shallow stratigraphic boreholes on the eastern flank of the Rockall Basin, offshore western Ireland. In: Doré, A.G. and Vining, B. (eds), *Petroleum Geology: North-West Europe and Global Perspectives - Proceedings of the 6th Petroleum Geology Conference*. Geological Society, London. p.1077-1094.

**Harrington, G.J.**, Kemp, S.J., & Koch, P.L. 2004. Palaeocene–Eocene paratropical floral changes in North America: responses to climate change and plant immigration. *Journal of the Geological Society of London*. 161: 173–184.

**Harrington, G.J.** 2004. Structure of the North American vegetation gradient during the Late Paleocene/early Eocene warm climate. *Evolutionary Ecology Research*. 6: 33–48

**Harrington, G.J.** 2003. Wasatchian (early Eocene) pollen floras from the Red Hot Truck Stop, Mississippi, USA. *Palaeontology*. 46: 725–738.

**Harrington, G.J.** 2003b. Geographic patterns in the floral response to Paleocene–Eocene warming. In: Wing, S.L., Gingerich, P.D., Schmitz, B., & Thomas, E. (eds.), *Causes and consequences of globally warm climates in the early Paleogene*. Geological Society of America, Special Paper. 369: 381–393.

Wing, S.L., **Harrington, G.J.**, Bowen, G.J., & Koch, P.L. 2003. Floral change during the Initial Eocene Thermal Maximum in the Powder River Basin, Wyoming. In: Wing, S.L., Gingerich, P.D., Schmitz, B., & Thomas, E. (eds.), *Causes and consequences of globally warm climates in the early Paleogene*. Geological Society of America, Special Paper. 369: 425–440.

Wing, S.L. and **Harrington, G.J.** 2001. Floral response to rapid warming at the Paleocene/Eocene boundary and implications for concurrent faunal change. *Paleobiology*. 27: 539–563

**Harrington, G.J.** and S.J. Kemp. 2001. US Gulf Coast vegetation dynamics during the latest Palaeocene. *Palaeogeography Palaeoclimatology Palaeoecology*. 167: 1–21

**Harrington, G.J.** 2001. Pollen assemblages and Paleocene–Eocene stratigraphy in the Bighorn and Clarks Fork Basins. In: Gingerich, P.D. (ed.), *Paleocene-Eocene stratigraphy and biotic change in the Bighorn and Clarks Fork Basins, Wyoming*. University of Michigan Papers on Paleontology. 33: 89–96

**Harrington, G.J.** 2001b. Impact of Paleocene/Eocene greenhouse warming on North American paratropical forests. *Palaios*. 16: 266–278

