

PERSONAL INFORMATION

Cowie, Patience Anne

Nationality: British

Date of birth: 27.01.1964

• EDUCATION

1992 PhD, Lamont Doherty Earth Obs., Columbia University, USA (supervisor C.H. Scholz)
 1989 MPhil, Lamont Doherty Earth Obs., Columbia University, USA
 1988 MSc, Lamont Doherty Earth Obs., Columbia University, USA
 1985 BSc, Department of Geology, University Durham, UK

• CURRENT POSITION

Apr 2011 – present: Professor of Earth System Processes, University of Bergen, Norway

• PREVIOUS POSITIONS

Sep 2008 – Apr 2011: Professor of Geodynamics, Univ. Edinburgh, UK
 Jan 2003 – Sep 2008: Reader in Structural Geology and Tectonics, Univ. Edinburgh, UK
 Jan 2003– Jan 2006: Adjunct Scientist, Woods Hole Oceanographic Institute, USA
 Oct 1994 – Jan 2003: Royal Society of London University Research Fellow, Univ. Edinburgh, UK
 Feb 1993 – Sep 1994: NERC Post-Doctoral Research Fellow, Univ. Edinburgh, UK
 Feb 1992 – Feb 1993: Post-Doctoral Research Fellow, Univ. Nice, France

• MAJOR RESEARCH INTERESTS AND ACHIEVEMENTS

My current research is focused on the surface process response to active faulting, in particular the physical laws governing river erosion, structural controls on sediment dispersal in rift basins and field testing models for downstream grain-size fining using a source-to-sink approach. My methodology involves a combination of field data collection, theory and numerical modelling.

I have contributed new and fundamental understanding in the following areas (#'s link to my publications):

- Propagation and interaction of faults; variations in fault slip rates over time^{3,4,5,8,9,10,11,13,16}
- Structural development of fault damage zones in high porosity sandstones¹²
- 3D patterns of subsidence in rift basins and the rift-initiation to rift climax transition^{14,17}
- Controls on erosion rates, sediment caliber and sediment routing across rift basin margins^{20,22}
- Fluvial erosion laws in transient landscapes (time varying response of rivers to tectonic activity)^{6,7,15,18,19}
- Reconstructing depositional environments in deltaic settings within rift basins^{2,23}
- Evolution of Late Jurassic rifting in the northern North Sea²¹
- LiDAR and GPR characterization of tectonically active normal faults¹

I have published over 70 peer-reviewed articles in refereed international geoscience journals, many of which are widely cited. Between 2009 and 2012 I was Science Editor for the high impact journal *Geology*. My research is supported by the petroleum industry and research councils in Norway and, previously, in the UK. To date I have successfully supervised 9 PhD students and 5 post-doctoral fellows, most of whom have gone on to successful careers in industry or academia (including one full professor). Several have been awarded prizes for their PhD work from national/international scientific societies. I currently supervise 2 MSc students, 2 PhD students and 2 post-doctoral scientists.

• GRANTS HELD

Statoil-University of Bergen Akademia agreement funded appointment of P. Cowie as Professor of Earth System Processes at UiB.

Norwegian Research Council funded MultiRift (Petromaks) project (Leader for Theme 3). Collaboration between UiB, UiO, Imperial and Manchester Universities, UK. 24m NOK.

LiDAR and field study of surface rupture and post-seismic slip for the 6th April 2009 L'Aquila earthquake (M6.3). NERC Urgency Grant (Co-I) £67K 4/09-5/10.

Testing Theoretical models for Earthquake Clustering using Cl-36 Cosmogenic Exposure Dating of Active Normal Faults in Central Italy. NERC Standard Grant (PI) £450K 10/07-10/10.

Integrated Field and Numerical Test of Stream Erosion Models Using the Transient Response of Bedrock Rivers to Tectonic Forcing. NERC Standard Grant (PI) £150K (2006-2009).

Mechanics of Fault Propagation in the Brittle Crust. Royal Society, £292,384 ('94-'02). Personal Fellowship awarded to Dr. Patience Cowie.

A High-Resolution Long-Time-Scale Fault Activity History, Whakatane Graben, NZ. NERC grant (co-PI) £85355+studentship (ended 03/03) (jointly held with U. Southampton).

Scale Dependence of Groundwater Flow and Contaminant Transport in Fractured Rocks. EU 4th Framework in Environment and Climate £180000 (co-PI) (ended 12/00).

Quantifying Tectonic Strain at Slow Spreading Ridges. NERC (Bridge) (co-PI) £530,000 (jointly held with U. Durham) (1/6/95-31/5/99).

Prediction of Subseismic Faults. Statoil/BP/Saga/Shell £133000 (PI-Cowie) (1/1/97-31/12/98).

Numerical Modelling of Fault Populations. Shell Research £25000 (PI-Cowie) (1/6/95-30/5/96).

• COMMISSIONS OF TRUST

Science Editor for GSA publication: *Geology* (2009-2012)

Member of NERC (UK Natural Environment Research Council) Peer Review College (2006-2009)

Associate Editor: *Journal of Geophysical Research* (1998-2002)

Regular reviewer for proposals from national funding agencies in UK and USA.

Regular reviewer for *Nature* and leading specialist journals

Regular consultant for promotions and tenure in UK, Norway, France and USA

• MAJOR COLLABORATIONS

I am part of an international team working on surface processes and active tectonics. Colleagues in this group include: Prof Gerald Roberts (Univ. London, UK), Prof Ken McCaffrey (Univ. Durham, UK), Dr Laura Gregory (Univ. Leeds, UK), Prof Stewart Freeman (SUERC, UK); Prof Tibor Dunai (Univ. Cologne, Germany) Dr Alex Whittaker (Imperial College, London, UK), Dr Mikael Attal (Univ. Edinburgh, UK) and Prof Greg Tucker (Univ. Colorado, USA), Prof Ritske Huismans (UiB) and Prof Rob Gawthorpe (UiB).

• MAJOR ACHIEVEMENTS

Academic Awards

2016 recipient of the Coke Medal (awarded by The Geological Society of London)

Invited presentations to peer-reviewed, internationally established conferences

Keynote Speaker Geological Society of London: Structure, Geomechanics and Fluid Flow in Fault Zones (London, 2008)

Keynote Speaker Geological Society of America: Importance of Sediment Flux in Controlling River Long Profile Evolution (Denver, 2007)

Keynote Speaker European Geosciences Union: Importance of Sediment Flux in Landscape Evolution (Vienna, 2007)

Keynote Speaker EGU Special Session: Migration of fault activity in extensional settings (Vienna, 2006)

British Geophysical Association Meeting: Scale Invariance and Scale dependence in Earth Structure and Dynamics (London, 2006)

DAHLEM Workshop: Dynamics of Fault Zones (Berlin, 2005)

InterMARGINS Workshop: Modelling the Extensional Deformation of the Lithosphere (Switzerland, 2004)

Organisation of international conferences

Earth System Processes - GSA and Geol. Soc. Lond. Meeting (Edinburgh, UK, 2001)

Fall AGU (special session) (USA, 2000)

• PUBLICATIONS

Total of 74 peer reviewed publications. Citations (Google scholar): 5312 citations (since 2010: 2229) - H-Index: 35 (i10-index = 58). Full publication list with citations at:

<https://scholar.google.no/citations?user=3Vr9cw4AAAAJ&hl=en&oi=ao&cstart=0&pagesize=20>

*Selected recent publications and most highly cited (in bold *= number of citations) relevant to this proposal:*

1. Bubeck, A., M. Wilkinson, G. P. Roberts, P. A. **Cowie**, K. J. W. McCaffrey, R. Phillips and P. Sammonds, The tectonic geomorphology of bedrock scarps on active normal faults in the Italian Apennines mapped using combined ground penetrating radar and terrestrial laser scanning. *Geomorphology*, 237, 38-51, doi:10.1016/j.geomorph.2014.03.011, 2015.

2. Pechlivanidou, S., Vouvalidis, K., Løvlie, R., Nesje, A., Albanakis, K., Pennos, C., Syrides, G., **Cowie**, P. A., Gawthorpe, R. L.,. A multi-proxy approach to reconstructing sedimentary environments from the Sperchios delta, Greece. *The Holocene*, 24 (12), 1825-1839, 2014.
3. **Cowie**, P. A., C. H. Scholz, G. P. Roberts, J. P. Faure Walker and P. Steer, Viscous roots of seismogenic faults revealed by geologic slip rate variations, *Nature Geoscience*, 6(12), 1036-1040, doi:10.1038/ngeo1991, 2013.
4. Faure Walker, J. P., G. P. Roberts, P. A. **Cowie**, I. Papanikolaou, I., A. M. Michetti, P. Sammonds, P., M. Wilkinson, K.J. McCaffrey, R.J. Phillips, Relationship between topography and strain rate in the actively extending Italian Apennines, *Earth Planet. Sci. Lett.*, 325/326, 76-84, doi:10.1016/j.epsl.2012.01.028, 2012.
5. **Cowie**, P.A., G. Roberts, J. Bull and F. Visini , Relationships between fault geometry, slip rate variability and earthquake recurrence in extensional settings, *Geophysical Journal International*, 189, 143-160, doi:10.1111/j.1365-246X.2012.05378.x, 2012.
6. Attal, M., P. A. **Cowie**, A. C. Whittaker, D. E. J. Hobley, G. E. Tucker, and G. P. Roberts, Testing fluvial erosion models using the transient response of bedrock rivers to tectonic forcing in the Apennines, Italy, *J. Geophys. Res. Earth Surface*, 116, F02005, doi:10.1029/2010JF001875, 2011.
7. Hobley, D. E. J., H. D. Sinclair, S. M. Mudd, and P. A. **Cowie**, Field calibration of sediment flux dependent river incision, *J. Geophys. Res. Earth Surface*, 116, doi:10.1029/2010JF001935, 2011.
8. Bonnet, E., O. Bour, N. Odling, P. Davy, I. Main, P. **Cowie** and B. Berkowitz, Scaling of Fracture Systems in Geological Media, *Rev. Geophys.*, 39, 347-383, 2001. (*552)
9. **Cowie**, P. A. and C. H. Scholz, Physical Explanation for Displacement-Length Relationship for Faults using a Post-Yield Fracture Mechanics Model, *J. Struct. Geol.*, 14, 1133-1148, 1992. (*420)
10. **Cowie**, P. A., and C. H. Scholz, Displacement-Length Scaling Relationship for Faults: Data Synthesis and Discussion, *J. Struct. Geol.*, 14, 1149-1156, 1992. (*413)
11. Scholz, C. H. and P. A. **Cowie**, Determination of Total Strain from Faulting using Slip Measurements, *Nature*, 346, 837-839, 1990. (*250)
12. Shipton, Z. and P. A. **Cowie**, Damage Zone and Slip-Surface Evolution over Micro- to Kilometre Scales in High-Porosity Navajo Sandstone, Utah, *J. Struct. Geol.*, 23, 1825-1844, 2001. (*222)
13. **Cowie**, P. A., A Healing-Reloading Feedback Control on the Growth Rate of Seismogenic Faults, *J. Struct. Geol.*, 20, 1075-1087, 1998. (*186)
14. Gupta, S., P. A. **Cowie**, N. H. Dawers and J. R. Underhill, A Mechanism to Explain Rift Basin Subsidence and Stratigraphic Patterns through Fault Array Evolution, *Geology*, 26, 595-598, 1998. (*146)
15. Whittaker, A. C., P. A. **Cowie**, M. Attal, G. E. Tucker, and G. P. Roberts, Bedrock channel adjustment to tectonic forcing: Implications for predicting river incision rates, *Geology*, 35(2), 103-106, 2007. (*131)
16. **Cowie**, P. A. and G. P. Roberts, Constraining Slip Rates and Spacings of Active Normal Faults, *J. Struct. Geol.*, 23, 1901-1915, 2001. (*126)
17. **Cowie**, P., S. Gupta, N. H. Dawers, Implications of Fault Interaction for Early Syn-Rift Sedimentation: Insights from a Numerical Model, *Basin Res.*, 12, 241-262, 2000. (*110)
18. Attal, M., G. E. Tucker, A. C. Whittaker, P. A. **Cowie**, and G. P. Roberts, Modelling fluvial incision and transient landscape evolution: influence of dynamic channel adjustment, *J. Geophys. Res. Surface Processes*, 113, F03013, doi:10.1029/2007JF000893, 2008. (*87)
19. **Cowie**, P. A., A. C. Whittaker, M. Attal, G. P. Roberts, G. E. Tucker and A. Ganas, New constraints on sediment flux dependent river incision: Implications for extracting tectonic signals from river profiles, *Geology*, 36(7), 535-538, 2008. (*79)
20. Whittaker, A.C., P. A. **Cowie**, M. Attal, G. E. Tucker and G. P. Roberts, Contrasting transient and steady state rivers crossing active normal faults: New field observations from Italy, *Basin Research*, 19, 529-556, 2007 (*72).
21. **Cowie**, P. A., J. R. Underhill, M. D. Behn, J. Lin and C. Gill, Spatio-temporal evolution of strain accumulation derived from multi-scale observations of Late Jurassic rifting in the northern North Sea, *Earth Planet. Sci. Lett.*, 234, 401-419, 2005. (*51)
22. **Cowie**, P. A., M. Attal, G. E. Tucker, A. C. Whittaker, M. Naylor, A. Ganas, and G. P. Roberts, Investigating the Surface Process Response to Fault Interaction and Linkage Using a Numerical Modeling Approach, *Basin Research*, 18(3), 231-266, 2006. (*50)
23. Mortimer, E. J., S. Gupta, and P. A. **Cowie**, Clinoform nucleation and growth in coarse-grained deltas, Loreto Basin, Baja California Sur, Mexico: a response to episodic accelerations in fault displacement, *Basin Research*, 17, 337-359, 2005. (*36)