

Curriculum Vitae for Martin Roy Geach BSc (Hons) FGS FRGS

Education & Career Summary

University of Plymouth
Postgraduate Researcher

October 2011- Present

Worley Parsons Pty Lt, Western Australia
Senior Engineering Geologist

May 2011- October 2011

Cathie Associates, Newcastle Upon Tyne, UK
Engineering Geologist

February 2011 – May 2011

Coffey Geotechnics Pty Ltd, Western Australia
Engineering Geologist

January 2008 –December 2010

Soil Mechanics, Wokingham, UK
Assistant Engineering Geologist

June 2007- January 2008

University of Plymouth
BSc (Hons) Earth Sciences

September 2004- June 2007

Awards & Qualifications

- Acting Chair- British Society for Geomorphology's Postgraduate Forum
- British Society for Geomorphology's Bernie Smith Award for Best Postgraduate Presentation 2013
- Upper Second Class BSc (Hons) Earth Sciences (2004-2007)
- South- West Geological Society prize for best overall performance on the Geosciences Degree scheme (2007)
- Professor Fooke's prize for best overall performance on the Earth Science Degree programme (2007)

PhD Title

'The use of remote sensing and optically stimulated luminescence dating in the quantification of long-term landscape evolution (Quaternary) in semi confined sedimentary basins of the Western Mediterranean.'

This research is focused on developing methods in the quantification of Quaternary landscape response within semi-arid/arid environments (sedimentary basins). Throughout which key extrinsic drivers (tectonics, climate) and intrinsic mechanisms (river capture, lithology) are assessed in terms of their impact upon the landscape. The research approach is multifaceted; with extensive periods of fieldwork (7 months) supplemented by the application of both remote sensing and advanced numerical modelling methods (FLUVER2). All remote sensing work is undertaken in ARCGIS environment, with recent publications focused on the development of landscape reconstruction methods. Furthermore, methods of optically stimulated luminescence (absolute) dating are extensively utilised to develop absolute chronologies to supplement the landscape models generated.

This research is funded by an internal university scholarship of £1500/annum. The following funding has been applied for:

- British Society for Geomorphology Early Career Grant (2011) - £500 (not awarded)
- Plymouth University School of Geography Annual Fund (2012)- £600 (awarded)
- Doctoral Centre Training grant (2013) - £250 (awarded)
- British Society for Geomorphology Conference Grants (2013)- £200 (awarded)

DISCOVER WITH PLYMOUTH UNIVERSITY

5th February 2014

Dear Sir/Madam

I am writing in support of Mr Martin Geach, for his application to the BSRG Steve Farrell fund to enable attendance at the field based Fluvial Archive Groups (FLAG) Biannual International meeting in SE Spain in September 2014.

I can confirm that Martin Geach is a PhD student at the School of Geography, Earth and Environmental Sciences at Plymouth University.

Martin would benefit from attending the FLAG meeting in September as it is an international meeting that will have the leading experts in his field from which he can gain valuable opinion and feedback for the completion of his PhD (Martin entered his third year in November 2013). Martin is an exceptional PhD student and although he has managed to attend the annual British Society of Geomorphologists meeting at Royal Holloway in 2013, where he won the Bernie Smith Award for best postgraduate oral presentation, the limited bench fees attached to the project (£1500 pa), which are meant to cover field work and conferences, have hampered his attendance at International meetings. This opportunity would thus be Martins first opportunity to attend such a meeting, with the benefit that it is field based and integrates both geomorphology and sedimentology. The Steve Farrell award, coupled with subsidies received for assisting at the conference, would enable him to attend, experience, participate and benefit from the meeting in time to also inform his final PhD write up. It will be Martins only opportunity for presentation at such a meeting during his PhD.

I thus support Martins application based on the need for the funding, opportunity and timeliness of the meeting, and the value-added to Martins CPD.

Yours sincerely,



Dr Anne Mather

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1. Overview of Research Aim

Erosional landform features and their associated sedimentary assemblages (river terraces) often provide important records of long-term landscape evolution (Bridgland et al., 2004; Maddy et al., 2001; Vandenberghe, 2003; Westaway et al., 2009). The extensive spatial and temporal data generated from such records has developed our understanding of how external drivers (e.g. tectonics, climate & sea level changes) and internal controls (e.g. lithology, local hillslope processes & local base-level changes) act upon or within terrestrial sedimentary systems. However, the degree to which we can accurately associate landscape system change to one (or more) of these dominating factors is often limited (e.g. Daniels et al. 2008). This is fundamentally an attribute of the time transgressive nature of most landscape forces, with the notion of an equilibrium system (i.e. the time-averaged mass balance of a system being at its optimum) coming under considerable debate (e.g. Nanson and Huang, 2008).

In this research we aim to further develop the understanding of long-term landscape evolution, with focus on the complex interactions between external drivers and internal controls within the fluvial environment. Throughout the research we use the spectacular erosional and sedimentary records of the Tabernas Basin in SE Spain to evidence process interactions over Quaternary timescales. Although still ongoing, this research has made notable contributions which include:

- Formalising the Plio-Quaternary terrace record for the Tabernas basin (during 7 months of fieldwork); and further developing such records through the application of Optically Stimulated Luminescence dating methods (conducted by myself over 5 months at the Nordic Centre for Luminescence Research in Risø, Denmark). The addition of temporal data has further enabled correlations with neighbouring sedimentary basins (e.g. Sorbas, Carboneras and Vera Basins), and the generation of regional models of drainage network response to both local tectonic and global climatic forces. A notable pattern within the region is the dominance of eccentricity cycles (significant at ~100Ka) upon fluvial systems, with major incisional events typically focused around the warm to cool transitions for Marine Isotope Stages 2/3 & 6/7.
- The development of 3-dimensional landform reconstruction methods through the application of geospatial interpolation techniques. This technique focuses on the generation of paleo-landsurfaces from fragmentary sedimentological records (terraces). The approach has been accepted by process of peer review for publication in *Geomorphology*, and is of value in the representation of landscape change at a range of spatial scales (from a single river reach to sedimentary basin scales). The data generated (i.e. paleo-stream profiles or land surfaces) can be used extensively as primary data in long-term landscape computational models (e.g. FLUVER2 and CAESER). The overall approach aims to reduce modelling errors and further contributes in the calibration of simulated sedimentological and morphological data (field vs. modelled).

The next step in this research is focused on the application of the FLUVER2 model (e.g. Veldkamp and Van Dijke, 2000) in order to reconstruct the influences of major external controls (tectonics and climate) for the Tabernas Basin record. This modelled data will be tested alongside the field record to inform on the applicability of the model when run at a basin scale. It is hoped that the data taken from exercise will help to: (1) constrain tectonic uplift rates across the basin; (2) develop our understanding of the importance of local intrinsic factors within the model environment; and (3) identify the significance of complex extrinsic and intrinsic processes when modelled outcomes digress from the field evidence collected (i.e.

the range of uplift values and climate inputs applied simply do not generate the real terrace record due to the underlying importance on internal factors).

The overall approaches applied within this research aim to add much needed process-form data, which record the complex relationships of internal and external forces within sedimentary basins. We demonstrate the fundamental need for field based evidence in order assess errors and further calibrate any numerically modelled data. The research also highlights the use of long-term landform records, showing that they can be widely applied to inform our understanding of how sedimentary systems respond to multiple forces over a range of spatial and temporal scales. This data is not only of use in the interpretation of geological records, but it also informs our process understanding of semi-arid/arid region drainage systems for current and future land-use purposes.

2. Supporting Statement

This grant application seeks funds to support the presentation of my research titled 'Intrinsic controls Vs. Extrinsic drivers: Lessons learnt from the sedimentological and morphological records of the Tabernas Basin, Se Spain' in both oral and field sessions at the Fluvial Archives Group (FLAG) meeting to be held in Almeria (Spain) in September 2014.

The FLAG meeting is attended by a global collective of researchers specialising in fluvial archives and will provide an ideal platform to present my work. The meeting will be of greatest value in receiving feedback and engaging active discussion of my findings prior to the submission of my thesis in November 2014. Furthermore, my attendance at the post conference field sessions will aid in my understanding and interpretation of Quaternary field sections, with discussion and contribution from leading experts.

To date, this research has been presented at the British Society for Geomorphology's 2013 Annual Meeting in Royal Holloway. It was warmly appreciated for its focus on combined field and modelling approach. I was honoured to receive the Bernie Smith Award for best postgraduate oral session, and hope that this level of success can be maintained at the FLAG meeting this year. Presenting at the FLAG meeting provides the first opportunity to present my findings at an International meeting and explore my research with the leading experts in the discipline. Fundamentally, the meeting will form the culmination of my PhD research providing a great chance to explore further postgraduate opportunities offered across the globe.

3. References

Bridgland, D., Maddy, D., Bates, M., 2004. River terrace sequences: templates for Quaternary geochronology and marine-terrestrial correlation. *Journal of Quaternary Science*, 19(2), 203-218.

Maddy, D., Bridgland, D., Westaway, R., 2001. Uplift-driven valley incision and climate-controlled river terrace development in the Thames Valley, UK. *Quaternary International*, 79(1), 23-36.

Nanson, G.C., Huang, H.Q., 2008. Least action principle, equilibrium states, iterative adjustment and the stability of alluvial channels. *Earth Surface Processes and Landforms*, 33(6), 923-942.

Vandenbergh, J., 2003. Climate forcing of fluvial system development: an evolution of ideas. *Quaternary Science Reviews*, 22(20), 2053-2060.

Veldkamp, A., Van Dijke, J.J., 2000. Simulating internal and external controls on fluvial terrace stratigraphy: a qualitative comparison with the Maas record. *Geomorphology*, 33, 225-236.

Westaway, R., Bridgland, D.R., Sinha, R., Demir, T., 2009. Fluvial sequences as evidence for landscape and climatic evolution in the Late Cenozoic: A synthesis of data from IGCP 518. *Global and Planetary Change*, 68, 237-253.

4. Budget

This research is primarily funded by an internal university scholarship with £1500/annum for bench fees, including conference and field costs. Given the extensive field based nature of this study plus the requirement for OSL dates this budget does not meet my financial requirements. In support of this application the following funds are sought:

Flights: London- Almeria, return cost of £140 including taxes.

Conference Registration fee: ~~£166~~ – **Wavered for contribution in organisation of event**

Conference Accommodation (3 nights): £187

Field Trip registration and hotel: £265

Total Amount sought= £592 however any contributions will greatly assist.