Two Researchers awarded MSCA Individual Fellowships

18.02.2019

Geography at NUI Galway is delighted to announce a double success at the Marie Skłodowska-Curie Actions programme. Our own Dr. Audrey Morley, Lecturer in Physical Geography, has been awarded an MSCA Individual Fellowship and Dr. Gordon Bromley will host incoming MSCA Fellow Dr. Maggie Jackson from the United States.

Dr. Audrey Morley (NUI Galway, iCRAG, & Ryan Institute) has been awarded funding of €94,686.80 under a Marie Skłodowska-Curie Individual Fellowship for her project ARCTICO. Audrey will be hosted for 13 months by the MARUM - Centre for Marine Environmental Sciences, Bremen University, and will leave for a 3 months secondment to the Alfred Wegener Institute, Hemholtz Centre for Polar and Marine Research (AWI) in Bremerhaven.

Entitled "ARCTICO: Uncovering the Magnitude of Arctic Climate Change", Audrey's research focusses on a key challenge in climate change science: the provision of informed constraints on the magnitude of future climate change. Uncertainties associated with such predictions remain large due to the shortness of our observational records (at best 150 years) and the absence of large climate shifts therein to serve as an analogue for future change. This is especially problematic when estimating Arctic climate change because the response in the Arctic is amplified relative to the global mean, making the Arctic the most sensitive and vulnerable environment with regards to global warming. Efforts to assess the magnitude of past (e.g. pre-industrial) climate changes using climate proxies are thus crucial to further our understanding of how the Arctic system will respond to continued global warming.

Audrey's programme of work seeks to constrain the magnitude of Arctic amplification by quantifying the influence of the carbonate ion concentration of sea water on the temperature signal recorded in the Arctic planktonic foraminifera *Neogloboquadrina pachyderma sinistral* (NPS). Using NPS shells collected from stratified plankton samples (Labrador Sea), Audrey will combine established and new analytical techniques in trace element and isotope geochemistry to derive and isolate carbonate system parameters from the climate signature recorded in NPS.

This approach is innovative and interdisciplinary as it takes advantage of cutting-edge knowledge in proxy development without compromising on the benefit of a seasonally and spatially constraint dataset. This will provide a holistic understanding of how changing hydrological and other environmental conditions impact not only NPS lifecycle but also the geochemical signal recorded in their shell. Given the uncertainties associated with available paleoceanographic tools this will provide a major advancement in the field of paleoceanography and climate change science.

Meanwhile, newly minted Dr. Maggie Jackson has been awarded a €184,590.72 Marie Skłodowska-Curie Individual Fellowship for her project CoNTESTA, during which she will be hosted by Gordon Bromley. Maggie, who recently completed her PhD in Earth Sciences at Dartmouth College, will be based primarily in Galway for the 24-month duration of her fellowship, but will conduct fieldwork in the Peruvian Andes and lab analyses at the Centre de Recherches Pétrographiques et Géochimiques (CRPG) in Nancy, France.

"CoNTESTA: A geologic approach to resolving critical uncertainties in the impact of geomagnetic variance on *in situ* cosmogenic nuclide production" doesn't exactly roll off the tongue, but the premise of the project is straightforward. Maggie will be using lava flows in Peru's Western Cordillera to calibrate the production of cosmogenic nuclides over the last ~50,000 years, thereby enabling us to date tropical glacier records with unprecedented accuracy and precision. During her doctoral work in Uganda's Rwenzori Mountains, Maggie developed the first Late Quaternary glacier-climate chronology for equatorial Africa and identified key periods of natural global warming and cooling. Establishing the cause(s) and geographic extent (regional or global?) of these climate events

is a central theme of Maggie's ongoing research programme, but several large uncertainties in the cosmogenic dating method first need to be resolved.

Cosmogenic nuclide dating has revolutionised our ability to date geomorphic processes and the climate events causing them, yet it remains unclear how nuclide production varies with time and elevation. The problem is particularly acute in the tropics, where fluctuations in Earth's geomagnetic field are greatest and topographic relief is very high. To address these shortcomings, Maggie will use noble gas mass-spectrometry (at CRPG) to measure cosmogenic helium-3 in pyroxene minerals from lavas ranging from 500 to 100,000 years in age. By comparing the 'exposure' ages of these lavas to their eruption ages (derived independently), she will calculate helium-3 production rates for different periods and assess long-term variance. Maggie's fieldwork will take her to the spectacular Valley of the Volcanoes, where volcanic cones and Inca ruins vie for attention, and 6450 m-high Nevado Coropuna.

Alongside her calibration work, Maggie will be working with Gordon to complete the glacial-geologic record for Nevado Coropuna, which is based on cosmogenic dating of glacial deposits, and to reconstruct environmental conditions in the High Andes during the end of the last ice age. The majority of her research will be carried out in NUIG's Palaeoenvironmental Research Unit (PRU) and will provide the first real test for our new cosmogenic preparation facility.

~~~~~~~~~~~~~~~~~~~

Both projects are funded by the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Actions programme.
~~~~~~~~~~~~~~~~~~~