THE UNIVERSITY of EDINBURGH

Job Description

Internship Title: NERC Research Experience Placement - Employ.ed on Campus - Data mining the historic record of Scotland's glacial landscape

Department / School	School of GeoSciences
Reports To	Prof. Linda Kirstein, School of GeoSciences, University of Edinburgh, linda.kirstein@ed.ac.uk

Job Purpose

This project aims to develop a 21st century database from 8 volumes of reports published by the Royal Society of Edinburgh "Boulder committee" between 1871 and 1884. The database will then be used to assess glacial reconstructions by correlating boulder type with in situ rocks exposed across the Scottish landscape

Main responsibilities

- Application of python programming skills to a geological data archive problem.
- Introduction to the geology of Scotland and geological rock types.
- Introduction on how lithology and rheology influence erosion.
- Some field work should conditions allow.

Key contacts

- Prof. Linda Kirstein: School of GeoSciences, University of Edinburgh and
- Dr Rachel Walcott: National Museum of Scotland, Chambers Street

Knowledge Skills and Experience

Person specification

- Python programming skills are essential
- Willingness to explore Scotland's landscapes digitally

Dimensions

This is a 6-week placement with the intention of using research costs to support 1-week field work. Dates are flexible.

Closing date: 19 May 2021
Interview date: to be determined by the supervisor

Start date: flexible between 14 June and 19 July 2021
Hours per week and preferred pattern/restrictions (if applicable): 35 hours per week (part-time option available)
Length of internship: 6 weeks

Additional Information

Host and Project outline

The idea that the world's climate had changed dramatically in the past was first proposed in the mid 19th Century by Swiss and German scientists. They realised that loose, often huge, boulders resting on surfaces with a different rock type, were probably transported there from their sources by glaciers. Glaciers so enormous that they had to have developed in a global ice age. This led to teams of Victorian geologists and amateurs scouring the British countryside looking for such boulders. In Scotland, 8 volumes of reports by the Royal Society of Edinburgh "Boulder committee" were published between 1871 and 1884. They describe where particularly large boulders were found, likely sources and even in some cases sketches of boulders. In one case, the museum have a map annotated by one of the authors (Matthew Foster Heddle 1828-1897) showing his geological excursions.

This project aims to develop a 21st century database from these resources then use it to assess glacial reconstructions by correlating boulder type with in situ rocks exposed across the Scottish landscape, in particular the role that different rock types (lithologies) have on the preservation of the large boulders. If conditions allow, some of boulders will be checked in the field and the dimensions re-measured along with hardness tests to assess how different lithologies have weathered over the last 140 years.

The project is a collaboration between the National Museums Scotland and the School of GeoSciences, University of Edinburgh.

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(2) Walked from Fort William to top of *Ben a Gueaig* (2017 feet) (to connect the traverse of a former year) along ridge to *Meall na Cleireach* (1626 feet). Found near Corunanan House several small boulders of the same syenitic granite, which I found last year in a *trainee* on the top ridge of *Stob Choire a Chearchaill* on the north side of Linnhe Loch (*Seventh Boulder Report*, p. 36), and on *Bein Bhan* on the south side of the loch. The felspar was not so red in these boulders; no other difference.

Found on south spur of *Meall nan Cleireach* a boulder, 4 × 6 × 4 feet, of a peculiar rock, which I learned afterwards had attracted much attention from Mr. Livingston and Professor Duns. The material of the boulder looks like a very vitreous hyaline quartz rock —the grains running into each other. The large amount of felspar in it, has cemented the grains of quartz. Many examples of this boulder were afterwards discovered. The parent rock I have never met with. I named it, for identification, after Mr. Livingston.

Sample text extracted from Boulder report that will be used in the project.

Training

Initial aim is to generate a digital archive of erratic boulders. We propose the following work flow but are open to other ideas on how to maximise the information that can be extracted digitally. The aim is to extract boulder information, specifically rock type, location, other notable characteristics, and record where in the text it is documented for future cross referencing. Note that place names are in italics in the report. Additionally we will geo-reference the original Heddle map and overlay it on topography and geology in Google Earth. The location information on the boulders will be added along with a lithology tag to show how far potential boulders may have travelled. Further work on Google Earth will focus on a specific area close to Loch Linnhe and will locate the boulders in the field area. Finally a 3 day field trip is planned towards the end of the project work with the aim of ground-truthing the work and adding additional data on lithology hardness.

Example work flow:

- Use text recognition tools to generate a database of each boulder, the rock type, and where it is located [see notes below for python libraries to use]

Extract all text

1. Use Tesseract [1] **to extract *all* text** from image

Extract the locality/ place-name

2. Collect word *attributes* using the in-built function WordFontAttributes() from tesseract (see Function 1 at end). This will allow us to extract the locality/ place-name as we can save sentences which contain words written in italics. If Tesseract doesn't work well at the task of detecting words in italics, could instead use Named Entity Recognition – a standard Natural Language Processing (NLP) pre-processing task [2] – once all the text has been extracted using Tesseract, to then extract the place names. Use of the Flair [3] library for implementing these NLP techniques in python.

Extract key words such as 'boulder'

3. Alternatively, could use a Regular Expressions [4] string search to find all sentences with numerical references to the boulders (i.e. " (2) ") as a way to narrow down the text to sentences of interest.
4. Once we have narrowed down the sentences to ones only including references to boulders collected, start appending the reference numbers in the given sentence (i.e. " (2) ") to one column of the data-frame, and the place names (as extracted in Step 2) which are also mentioned in the same sentence to another column.
5. To extract written information about each of the boulders, could either save the whole sentence to another column, or could just extract the adjectives from the sentence using Part-Of-Speech Tagging (another standard NLP task) [5].

Related Reading:

Reports of the Boulder Committee of the Royal Society of Edinburgh

https://digital.nls.uk/early-gaelic-book-collections/?search_within=75733573%2C76750237%7CEarly+Gaelic+Book+Collections%3EJ.+F.+Campbell+Collection&search_term=boulder+report&inc_transcription=on

http://earthwise.bgs.ac.uk/index.php/Geomorphological_features_of_glacial_or_glaciofluvial_deposition,_Cainozoic_of_north-east_Scotland

http://earthwise.bgs.ac.uk/index.php/References,_Cainozoic_of_north-east_Scotland

https://core.ac.uk/reader/192587115 Map and GIS database of glacial landforms and features related to the last British Ice Sheet

Budget

£450 Research Costs (included) will be used to support the field trip costs to Fort William.

Additional funds from Kirstein algorithm account will be used. Research material primarily in the form of archives from museum collections.

Location

The project student can be based either at King's Buildings or work remotely.

Covid-19 contingency plan

Placement can be done remotely with option to extend by 1 week if field work not feasible.

Programme Information

Research Experience Placement is a summer placement scheme funded by NERC, aimed at undergraduate students to address demographic and diversity-related challenges in the environmental sciences as well as thematic skills gaps (e.g. quantitative skills).

Please see the application instructions and selection process on the REP webpage: Research Experience Placements (REPs) | The University of Edinburgh

Employ.ed on Campus is run by the Careers Service in collaboration with University departments and Schools. It offers exclusive summer internships at the University over the summer for 2nd year to penultimate year undergraduate students studying in an UK Higher Education institution.

As well as great work experience, the Careers Service provides supporting resources, this is combined with a framework to support the development of participants' employability and self-reflection with an Edinburgh Award as part of the internship.

Application Support

For guidance on writing an effective application see our website: CV, Applications and Interview Advice
You can also make an appointment with a Careers Consultant using MyCareerHub.

Eligibility

Students are subject to eligibility criteria to be able to apply for NERC REPs and must:

- Be undertaking their first undergraduate degree studies (or integrated Masters)
- Be applying for a placement in a different department to their undergraduate degree
- Be eligible for subsequent NERC PhD funding, i.e. be either:
    - an UK citizen OR
    - an EU citizen with pre- or settled status under the EU Settlement Scheme OR
    - a non-EU citizen who have obtained the right to remain in the UK - known as 'indefinite leave to remain' (ILR) O

- an International/EU student already studying in the UK and currently under a Tier 4 or Student Route Visa with validity until at least September 2021

REPs do not meet the requirements for a visa request therefore non-UK students who are not currently living in the UK or who are without a suitable UK visa are not eligible to apply.

Internships are ONLY open to 2nd year to penultimate year undergraduate students studying in an UK Higher Education institution and based in the UK. You cannot take part if you are a visiting student, or you have already taken part in the programme before.

Privacy Statement

In addition to the University's HR data privacy statement, please read the Student and Graduate Privacy Statement: Internships and work experience programmes to understand how and why we will use the information you submit for the Employ.ed Programmes

Health & Safety Requirements for the role

Student will be reminded of the occupational health guidance for computer work. Risk assessment for field work will be carried out closer to the time so Covid restrictions can be complied with.

Key Job hazard information specific to the role

This role may result in potential exposure to certain hazards as listed below. These will be risk assessed by the school or department, which may require you to participate in, for example, health surveillance or follow other health and safety requirements.
Field work in the Highlands is a risk in relation to travel and wildlife specifically ticks and midges. LK and RW both have full driver's licences. LK has undertaken driver training in the School. To mitigate for wildlife issues we will check for ticks at end of day and carry tick remover. Spray/lotion will be used to deter midges.

If you require this document in an alternative format please contact Internships and Work Experience Team by email at employ.ed@ed.ac.uk