

## Edinburgh Geological Society Fieldwork Grant Report

2020- Ratagain Complex, NW Highlands, Scotland

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After a summer spent in lockdown due to the COVID-19 pandemic, in late August 2020 I was able to undertake my long-awaited final field session at the Ratagain Complex in the NW Scottish Highlands with support from the Edinburgh Geological Society.



*Figure 1 Shoreline outcrops and the view across Loch Duich from Ratagan*

As a disabled PhD student with Asperger's syndrome (an autism spectrum disorder) I rely on my parent carers to help me manage my everyday life. The grant awarded to me by the Edinburgh Geological Society enabled both myself and my parent carers to complete my detailed sampling of the Ratagain Complex and bring the total haul for the project up to the milestone figure of 100 block samples.



*Figure 2 An oriented block sample in-situ*

My research is concerned with the petrogenesis and emplacement of the Ratagain Complex, a composite Late Caledonian intrusion. Late Caledonian intrusions in Scotland present an ideal opportunity to study the growth of continental crust by the emplacement of granitic bodies. These intrusions were generated during the late stages of the Caledonian Orogeny, and are interpreted to have formed in the Silurian, following the subduction of the Iapetus oceanic crust beneath Laurentia. However, their detailed petrogenesis and structural emplacement is the subject of much debate.

Recent studies suggest that the granitoids show evidence of being generated through a combination of melting a compositionally heterogeneous mantle followed by crustal assimilation of local Lewisian and Moine rocks and fractional crystallisation (AFC) processes. However, as yet, none of the numerous tectonomagmatic models proposed can fully explain how this diverse and enigmatic set of granitoids was generated and emplaced.



*Figure 3 Highly irregular boundary between Lewisian country rocks and the Ratagain intrusion. Hammer for scale*

Ratagain is of particular interest as it has compositional features transitional between the alkaline syenites in the NW highlands and the more common metaluminous calc-alkaline granites in more central and eastern parts of Scotland,

which may have implications for the plate tectonic environment during Late Caledonian times. The intrusion is also unusual in that it exhibits extreme enrichments of the trace elements Strontium (Sr) and Barium (Ba).

Therefore, my future work will include detailed geochemical and structural analysis of the 100 samples that I have gathered across four field sessions at Ratagain. The geochemical methods used will be X-Ray Fluorescence (XRF) spectrometry and Inductively coupled plasma mass spectrometry (ICP-MS), whilst the structural studies will involve the anisotropy of magnetic susceptibility (AMS) and thermomagnetic analysis, both of which are powerful indirect tools used to study intrusive rocks like granites that often lack visible fabrics.



*Figure 4 View over the five sisters of Kintail from Bealach Ratagan*