

# Ph.D. scholarship in glacial history of Ruapehu and Tongariro volcanoes, New Zealand

School of Geography, Environment and Earth Sciences

Victoria University of Wellington,

in collaboration with GNS Science (New Zealand)

## Background

Southern Hemisphere moraine sequences provide an important constraint on both the timing and mechanism of past climatic changes, and glacial deposits in the North Island of New Zealand (NZ) have not previously been studied in detail. GNS Science

<http://www.gns.cri.nz/> staff in conjunction with the NZ Department of Conservation are undertaking an integrated mapping study of Tongariro



National Park in the North Island of NZ, with the production of a 1:80,000-scale GIS-based geological map. As part of this project, the need and opportunity has arisen to undertake detailed mapping of the late-Quaternary glacial sequences on the Ruapehu and Tongariro volcanoes. Victoria University and GNS Science are providing support for a Ph.D. student who will undertake these studies and develop a comprehensive understanding of the glacial history of these areas. The student will be co-supervised by and working closely with the GNS staff undertaking the field studies, so that the age and climatic significance of the glacial features can be used to inform the mapping process. Developing a high-quality chronology of glacial events is critical to this study, and parallel research into volcanic deposits and histories being undertaken by other staff and students at GNS Science, Victoria and Massey universities, will help to constrain the timing of glacial events.

The student will primarily be supervised by Dr Andrew Mackintosh

(<http://www.victoria.ac.nz/antarctic/staff/andrew-mackintosh.aspx>) within the Antarctic Research Centre at Victoria University of Wellington (<http://www.victoria.ac.nz/antarctic/>), where academic staff, post-doctoral fellows and graduate students are investigating the glacial history of the Southern Alps and Antarctic Ice Sheet in a broader effort to understand Southern Hemisphere glacial cycles. The student will also work within the Volcanology, Petrology and Geochemistry Research Group within the School of Geography, Environment and Earth Sciences (<http://www.victoria.ac.nz/sgees/research/volcanology/default.aspx>)

## Fieldwork

A regional compilation of the existing geological knowledge of the national park has been undertaken as part of the 1:250,000 scale QMAP Hawkes Bay (to be published 2011) and Taranaki (published in 2008) map sheets. The new mapping for this project is at a greater level of detail. In part it builds on the unpublished 1:50,000 scale map of Tongariro volcano

by Ian Nairn and associated studies by Barbara Hobden and Bruce Houghton, and the mapping of the glacial features around the Ruapehu volcano by McArthur and Shepherd. The intention is to map the rest of the park to the same level of detail, including the volcanic ring plains, with GNS staff taking the lead roles. The student is expected to participate in field project and will assist in the identification and mapping of glacial deposits.

### **Sampling**

Little age control is available for the glacial sequences on Mt. Ruapehu or Mt. Tongariro. Underlying lava flows (where dated) and overlying tephra deposits provide some constraint, but significant progress is expected during the course of this project. The student will be involved in new and complimentary work of producing a moraine chronology with surface exposure dating. This sampling will be carried out with the assistance of Dr Andrew Mackintosh. There is potential to reconstruct a glacial history for the last glacial cycle and in particular from the last glacial maximum to the present day.

### **Laboratory studies**

Laboratory studies for exposure dating will be carried out at Victoria University and/or GNS Science and wider NZ/international facilities where appropriate. The student will prepare targets for cosmogenic dating of moraine boulders ( $^{10}\text{Be}$  and/or other isotopes such as  $^{36}\text{Cl}$  or  $^3\text{He}$ ), and will be involved in the measurement of these targets on an Accelerator Mass Spectrometer.

### **Modelling**

The Antarctic Research Centre at Victoria University of Wellington has research strength in the numerical modelling of glaciers. There is the opportunity within this project (depending on the interest and background of the student), to develop a numerical model of the Ruapehu glaciers, past and present, and use it to help understand past climate. See <http://www.victoria.ac.nz/antarctic/research/glacial-modelling/default.aspx> for more information about glacial modelling at Victoria.

### **Timing**

The student can start as soon as possible. The target date for map publication is March 2014, and student work/analysis relevant to the map itself would need to be targeted to this date. Fieldwork is already underway. Analysis of samples needs to start as soon as possible in 2011, with systematic follow-up to match the field mapping. The last round of fieldwork would be done in the summer of 2012/2013. This would be followed by further laboratory studies, writing and compilation of the thesis in 2014.

The project involves a fully funded (fees plus stipend) Ph.D. scholarship, to be overseen by Dr Andrew Mackintosh and colleagues at Victoria University, at GNS Science (Dr Dougal Townsend and Dr Graham Leonard) and tenured in the School of Geography, Environment and Earth Sciences at Victoria University of Wellington. The ideal candidate will have an M.Sc. degree awarded with distinction including Physical Geography/Earth Sciences and chemistry, mathematics or physics. Experience in geochemical and/or glaciological techniques and GIS would be an advantage, as would a publication from the candidate's MSc thesis.

Interested applicants should send a CV and email addresses of two referees to: [Andrew.Mackintosh@vuw.ac.nz](mailto:Andrew.Mackintosh@vuw.ac.nz). Applications will be reviewed as they come in. Start date is as soon as possible.