

GNS Science Geothermal

GNS Science Geothermal Development Advice and Expertise



Kevin Faure

Director Geological Resources, Div.
Avalon Research Centre, Lower
Hutt

Greg Bignall

Head of Department, Geothermal
Wairakei Research Centre, Taupo



GNS Science : Who we are ...



- Independent, New Zealand Government-owned Crown Research Institute.
- New Zealand's leading supplier of earth science research and consultancy services.
- Clients include:
 - private sector (New Zealand and internationally)
 - government organisations
 - international funding agencies
 - research groups in New Zealand / overseas

Core purpose : To understand Earth system processes & resources, and translate these into economic, environmental and social benefits.

GNS Geothermal – What we do ...



- Resource Delineation, Exploration & Development Advice
- Core funded, Multidisciplinary Research
- Permitting / Resource Consenting (Independent Geoscience Opinion)
- Training (student/industry internships)

GNS Geothermal : Commercial

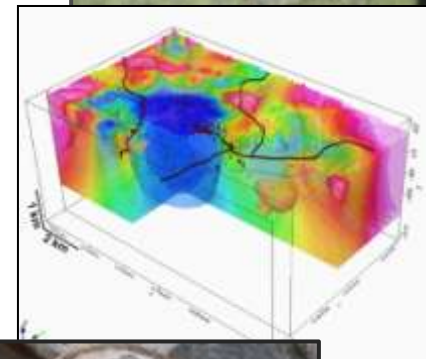
The GNS Geothermal team contracted for commercial services and advice in a range of areas in 2014 -15.

Thank you to our many commercial clients.

We look forward to working with you in the future for services, expert advice, internships and training.

Commercial Services were provided to clients in :

- New Zealand
- Indonesia
- Philippines
- Mexico
- Chile
- USA
- Taiwan
- Comoros
- Kenya
- Japan
- Australia
- Papua New Guinea
- Caribbean



GNS Investment in Analytical Services

New Zealand Geothermal Analytical Laboratory (NZGAL) : **world leader** in geothermal/groundwater analysis.


Expertise is available for all stages of geothermal power and direct use projects: incl. non-routine analyses.

- Refurbishment completed
- Investment in 2014-15 in new analytical tools and techniques
- NZS/ISO 17025:2005 accreditation
- Major Capex Acquisitions Planned for Wairakei in 2015



New Zealand Geothermal Analytical Laboratory

Gas and water analyses for geothermal, volcanic and groundwater environments



NZGAL is a world leader in geothermal and groundwater sampling and analysis. Our domestic and international clients are provided with world class service and benefit from our specialist interpretive services.

We offer a range of routine and non-routine analyses, and can cater for difficult or unusual samples. Specialist treatment methods can be developed for your applications that are beyond our usual analytical methods.

Our laboratory team are supported by in-house multidisciplinary research and interpretation expertise, and can advise on sampling, exploration and monitoring programmes.

at a glance →

- **World-leading**
Analytical facilities ranking amongst the best in the world.
- **Accredited**
IANZ accreditation NZS/ISO/IEC 17025:2005; for analysis of groundwaters and geothermal waters, and for geothermal/volcanic gases.
- **Robust**
Highly qualified technical staff ensuring precision and quality.
- **Fast**
Routine turnaround time of 15 working days from receipt of samples. Priority turnaround can be arranged.
- **Specialist**
Extensive experience handling geothermal and volcanic gas and water samples. Specially developed analysis methods can be developed.
- **Varied**
Supporting projects for the geothermal industry, government agencies, industrial and agricultural clients, consultancies, iwi and others.
- **Integrated**
Analytical services are closely aligned to GNS Science multidisciplinary research programmes.

www.gns.cri.nz

Geothermal Science - Power Renewed.

GNS Geothermal : Our Research

“... environmentally sustainable growth in geothermal electricity generation, including utilisation of the deep (3-7 km) resources, an increase in direct applications, and new industries leveraged from geothermal resources.”

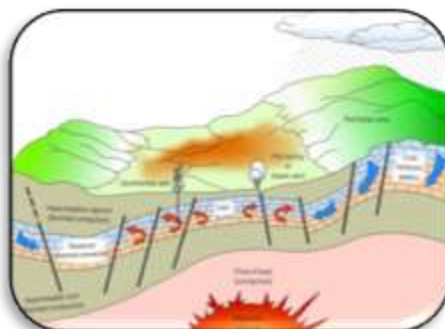
Key elements of success :

- Innovative “problem solving” research
- Sophisticated analytical tools / facilities
- Industry – Researcher – Iwi relationship

- Core funding (\$4.4M p.a.)
- Contestable (\$2.9M p.a.)
- Royal Society of New Zealand
- Univ. supported research
- Industry supported research



Sustainable
Development



System Characterisation
and Science Drilling



Environmental Effects
Low Enthalpy Systems



Geomicrobiology

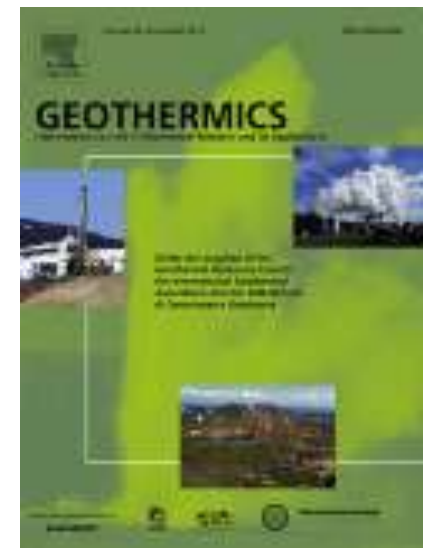
Geothermics Special Issue

Taupo Volcanic Zone Geothermal Systems, New Zealand : Exploration, Science and Development

Volume 59B

Editors: I. Chambefort and G. Bignall

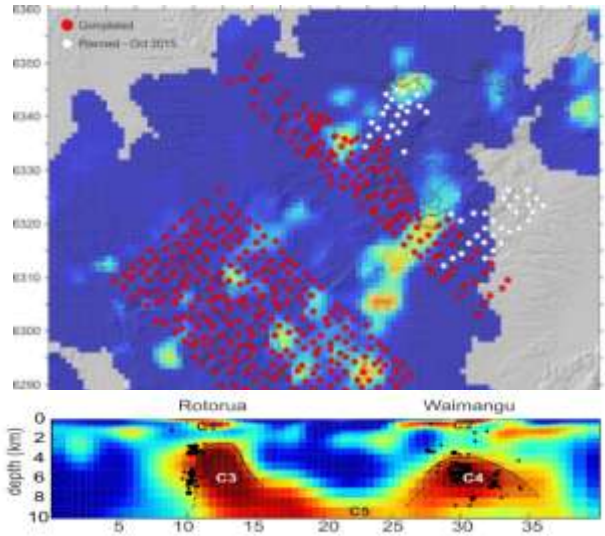
- 7 general manuscripts on TVZ in regard to geothermal (history, volcanology, geophysics, resources, direct use, sustainability and modeling)
- 7 field specific manuscripts (Kawerau, Ohaaki, Rotokawa, Ngatamariki, Rotorua, undeveloped fields, and direct use example in Taupo)



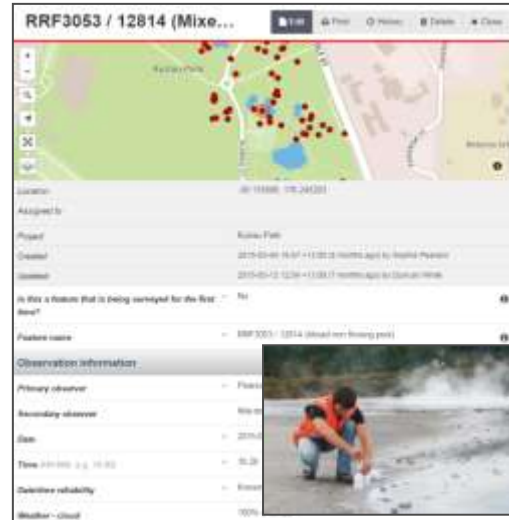
The preface and 13 manuscripts are already online!

Geoscience - Research Highlights

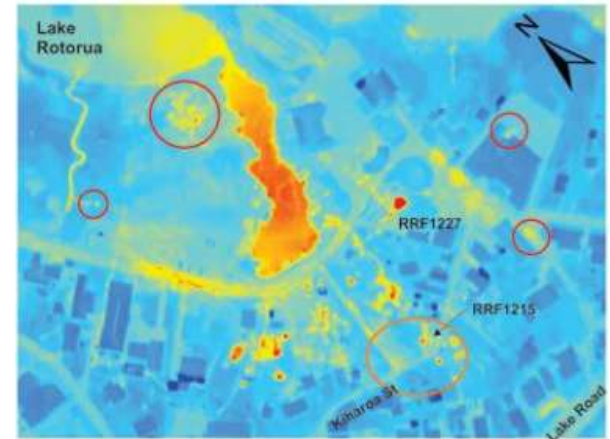
Improved system delineation



Enhanced Feature Monitoring

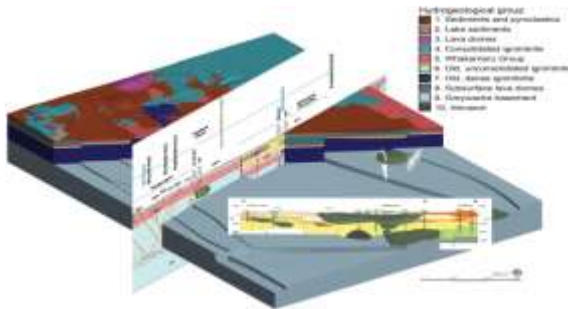


Heat Flow – TIR : Rotorua

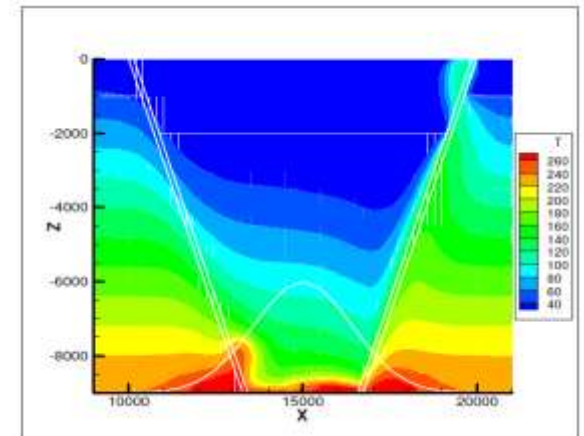
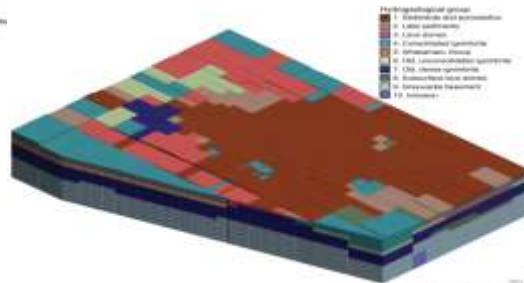


Ecosystem Restoration

Geochronology – Mineral Mapping



I^{125} Tracer Study
Waste to Wealth



Validating numerical models

Integrated Geology – Numerical Modelling Tools : Supermodels

GNS : Promotion of Direct Use



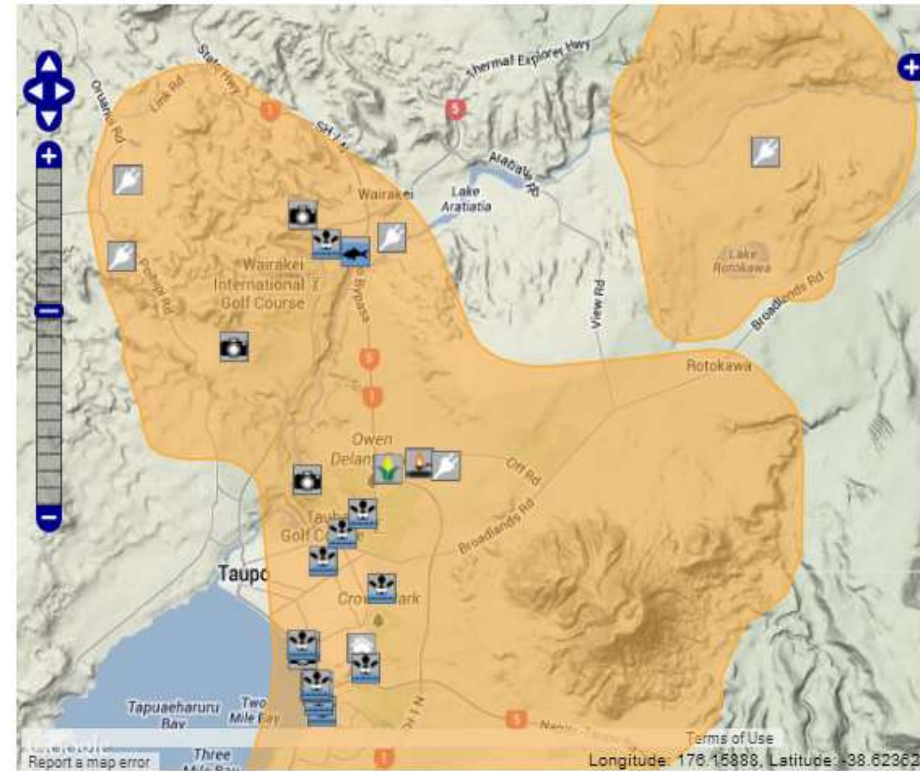
New Zealand Geothermal Use Database

Geothermal use map

www.gns.cri.nz

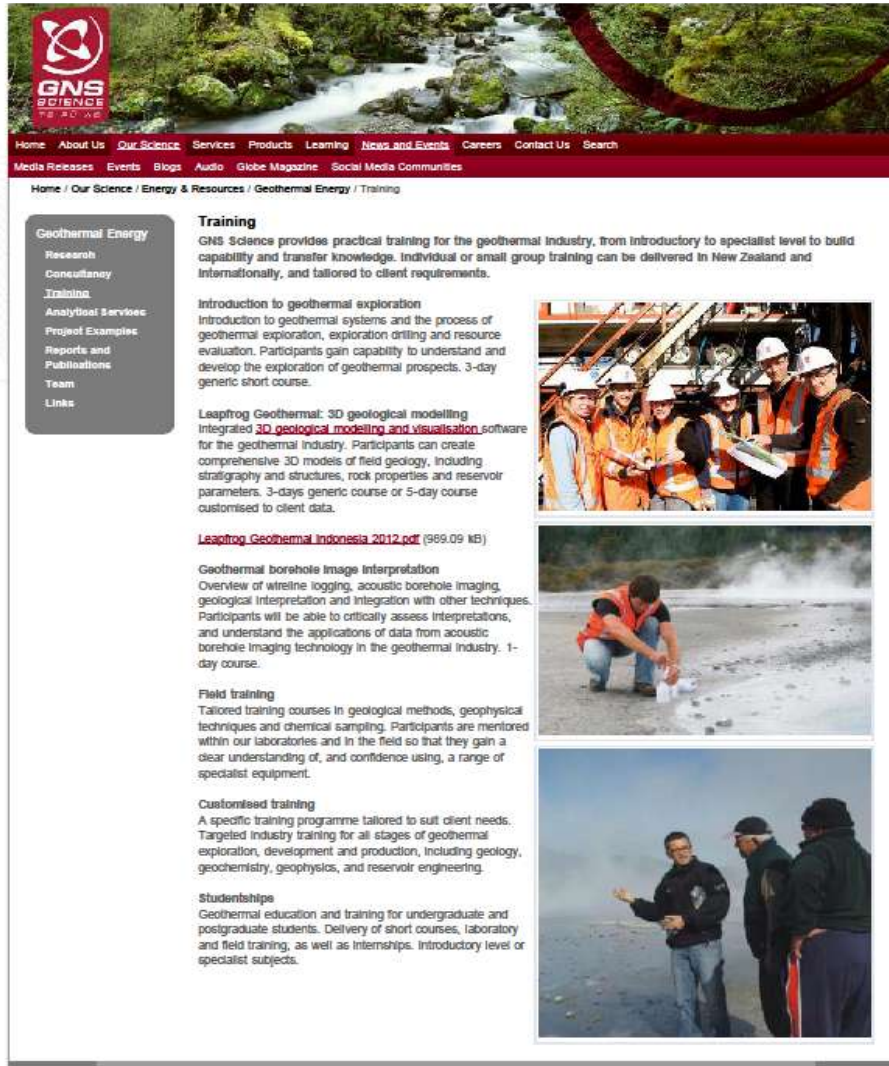


Case Studies



Double-click to zoom in, and drag to pan. Hold down the shift key and drag to zoom to a particular region. Use the layer switcher in the top right hand corner (+ sign) to change map backgrounds.

Technical Training and Supervision



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Training

GNS Science provides practical training for the geothermal industry, from introductory to specialist level to build capability and transfer knowledge. Individual or small group training can be delivered in New Zealand and internationally, and tailored to client requirements.

Introduction to geothermal exploration
Introduction to geothermal systems and the process of geothermal exploration, exploration drilling and resource evaluation. Participants gain capability to understand and develop the exploration of geothermal prospects. 3-day generic short course.

Leapfrog Geothermal: 3D geological modelling
Integrated 3D geological modelling and visualisation software for the geothermal industry. Participants can create comprehensive 3D models of field geology, including stratigraphy and structures, rock properties and reservoir parameters. 3-days generic course or 5-day course customised to client data.




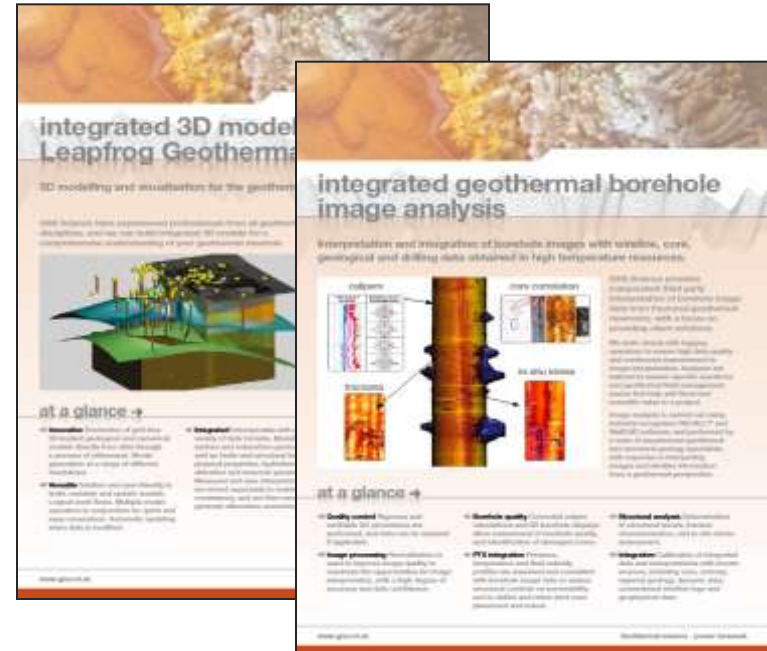
[Leapfrog Geothermal Indonesia 2012.pdf](#) (989.09 KB)

Geothermal borehole image interpretation
Overview of wireline logging, acoustic borehole imaging, geological interpretation and integration with other techniques. Participants will be able to critically assess interpretations, and understand the applications of data from acoustic borehole imaging technology in the geothermal industry. 1-day course.

Field training
Tailored training courses in geological methods, geophysical techniques and chemical sampling. Participants are mentored within our laboratories and in the field so that they gain a clear understanding of, and confidence using, a range of specialist equipment.

Customised training
A specific training programme tailored to suit client needs. Targeted industry training for all stages of geothermal exploration, development and production, including geology, geochemistry, geophysics, and reservoir engineering.

Studentships
Geothermal education and training for undergraduate and postgraduate students. Delivery of short courses, laboratory and field training, as well as internships. Introductory level or specialist subjects.

integrated 3D model Leapfrog Geothermal
3D modelling and visualisation for the geothermal industry

integrated geothermal borehole image analysis
Interpretation and integration of borehole images with wireline, core, geological and drilling data obtained in high temperature reservoirs

at a glance

- 3D geological modelling** Leapfrog Geothermal is a powerful 3D geological modelling and visualisation software for the geothermal industry. Participants can create comprehensive 3D models of field geology, including stratigraphy and structures, rock properties and reservoir parameters. 3-days generic course or 5-day course customised to client data.
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at a glance

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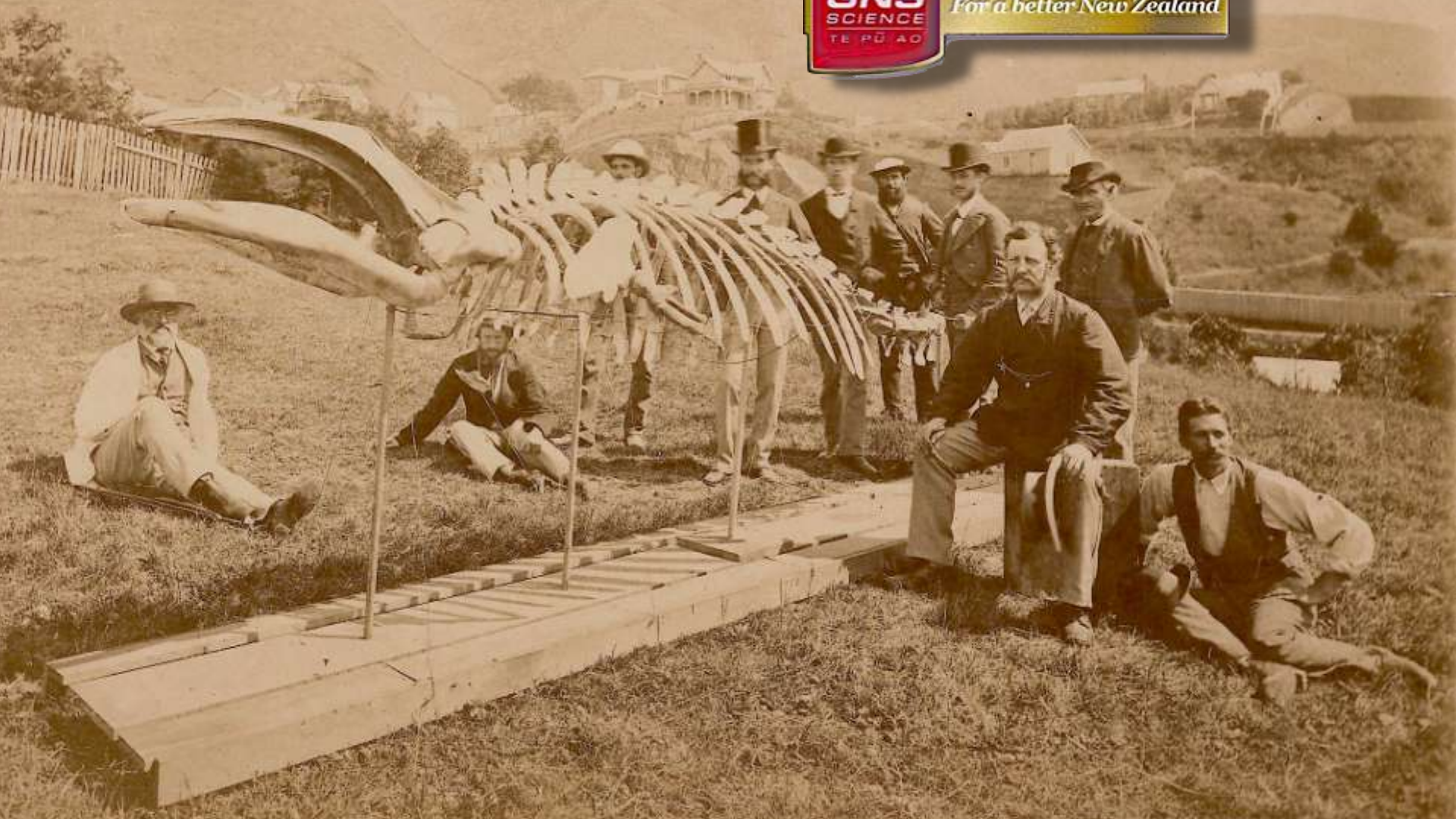


New Zealand Geological Survey establish in 1865



**150 YEARS
of SCIENCE**

For a better New Zealand





Dr. Kevin Faire

GNS Science
Avalon Research Centre
Lower Hutt, NEW ZEALAND

<http://www.gns.cri.nz>

k.faire@gns.cri.nz

Thank you

