

extremophile science frontier to the future

Exploring the mega-potential of microorganisms found in extreme geothermal environments



Hot springs, bubbling mud pools, crater lakes, undersea volcanoes and other geothermal environments are without exception 'extreme'.

The only life forms that survive such harsh conditions are unique forms of microorganisms – which are appropriately tagged 'extremophiles'. These microbes thrive where temperatures can be as high as 120°C, the pH can range from highly acidic to strongly alkaline, and there are elevated concentrations of salts and/or heavy metals.

This is biodiversity that science is only just starting to discover. Yet already it is clear that extremophiles could lead to solutions of global importance.

Since 2003, the GNS Science geomicrobiology team has taken samples from around the Taupo Volcanic Zone and the Kermadec Arc – and studied those samples under stringent laboratory conditions.

These are early days in the world of extremophile science: but they are exciting days.

at a glance →

→ **Unique** New Zealand's unique geothermal environments may contain extremophiles that are difficult to find elsewhere in the world. The diversity of geothermal features in New Zealand rivals any other major geothermal area in the world.

→ **Breakthrough** Extremophiles open a new frontier of science. Biotechnology and bioremediation are major growth industries, providing the green technology of the future.

→ **Diverse** We are focusing on diverse bacteria that form the basis of the food web in geothermal

environments: sulphur oxidisers, methanotrophs, hydrogenotrophs, organotrophs, and metal respirers. These extremophiles could provide solutions ranging from new medicines, to more effective bio-fuels, to new ways of treating contaminated wastewaters.

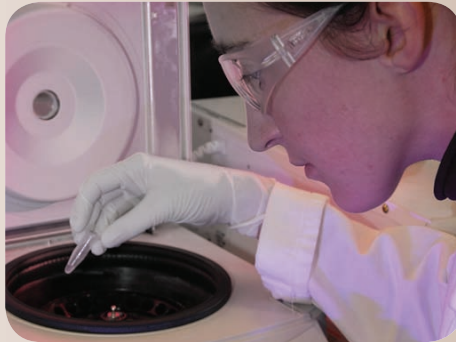
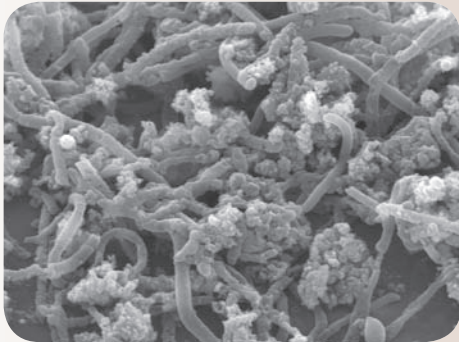
→ **Environmental protection** By researching the biodiversity of geothermal environments, GNS Science is establishing the knowledge to protect those environments. That's important, because if the environments are lost, the opportunities will also be lost.

→ **Credibility** GNS Science is developing knowledge and experience to become a world-leader in extremophile research, reinforcing New Zealand's status as a player in global science.

→ **Linked** Our findings are available to other research teams around the world – adding to international science knowledge and benefits.

→ **Future capability** This is unashamedly science for the future. In years to come the economic return to New Zealand could be significant.

Extremophile science frontier to the future



95% of all microbial species are still undiscovered: the potential uses are beyond imagining.

“New Zealand is possibly the world’s greatest natural laboratory for extremophile research. The complementary geology, microbiology and geochemistry expertise at GNS Science gives us a unique potential to understand how life functions in these exotic habitats.”

*Dr Peter Dunfield
GNS Science geomicrobiology team*

about us →

Our work is based at the GNS Science Extremophile Research Laboratory, headquartered at our Wairakei Research Centre. The team is made up of two specialist scientists and two technicians.

The team have a purpose-built laboratory, which includes equipment for the cultivation of fastidious

microorganisms and equipment for DNA-based research into genetic diversity.

GNS Science works together with private landowners, Maori groups, and scientific partners in New Zealand and internationally.

Whether you are interested in unique geothermal microorganisms from a pure research perspective, or you’d like to know more about the potential applications – extremophiles are fascinating, compelling and very exciting.

contact us →

We would welcome the opportunity to talk with you to discuss our extremophiles research or potential commercial applications.

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