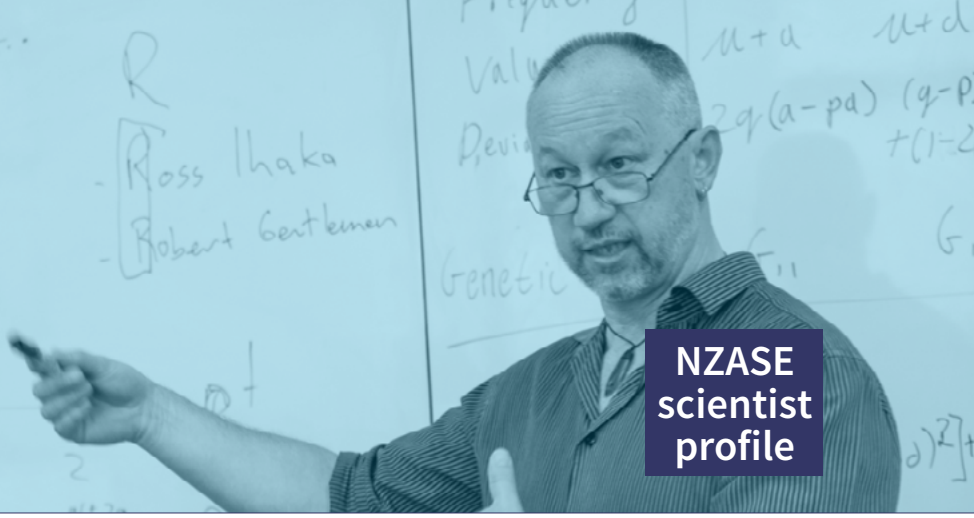
# Quantitative geneticist Phillip Wilcox



NZASE scientist profile

*Photo: Maurice Wilkins Centre.*

## Born

Gisborne, 1963.

## Affiliations

Ko Moumoukai, Whakapunake ngā maunga; ko Te Wairoa hōpupu hōngenge matangirau, Kopuawhara, ngā Nuhaka ngā awa; ko Kahungunu, Tākitimu, Te Rākātō ngā marae; ko Tākitimu, Kurahaupo ngā waka; ko Ngāti Kahungunu, Rongomaiwahine, Ngāti Rakaipaaka ngā iwi; ko Ngāi Te Rakatō, Ngāi Te Apatu, Te Whare Rau o Te Tahinga ngā hapū.

## Schools and subjects

Te Wharau primary, Ilminster Intermediate, and Gisborne Boys High School; "I did Maths, Science and Chemistry; I couldn't study te reo at school, so did it as an adult at Te Whare Wānanga o Aotearoa."

## Training and jobs

**1982-85, BForSci**(Hons) in forestry science, University of Canterbury
**1995, PhD**, North Carolina State University, USA
**From 1981**, **NZ Forest Service trainee**, in Te Urewera National Park and elsewhere, logging, pruning, planting trees and deer culling.
**1985-2015, Scientist**, NZ Forest Research Institute, now Scion
**2015, Senior Lecturer**, then Associate Professor in quantitative genetics, University of Otago.

## Field of science

Genetics and statistics; genomics and te Ao Māori; bioethics.

"Quantitative genetics is the study of the inheritance of traits that could sit anywhere along a range, such as an animal's height or weight, as opposed to traits that could only be one of several distinct options, such as eye colour in humans or flower colour in peas."

## Research topics

### *Pine tree genetics*

For his PhD, Phillip mapped genes for disease resistance in pine trees, mixing quantitative genetics, knowledge about tree breeding, and financial information. He published one of the first cost-benefit analyses of DNA markers for selective breeding in radiata pine.

### *Body mass index (BMI) and diabetes*

High BMI is usually correlated with higher rates of obesity and of diabetes and cardiovascular disease. Phillip was part of a research team that identified a gene that protects against diabetes but increases BMI, breaking this correlation.

"My role was interpretation, providing a more subtle view of the causes of metabolic diseases like diabetes. But there's some biology that doesn't change, regardless of our lifestyle changes, especially in an obesogenic environment – one where unhealthy food choices are cheap and everywhere, while healthy food is dearer and less available."

## How he finds things out

"I use all sorts of different methods, from statistical analysis to community hui. I've spent 20 years developing different guidelines and frameworks for engaging with Māori in research."

## Most valuable results

### *Te Arotūruki*

In 2002, Phillip and his brother-in-law Henari Kani started the process that created Te Arotūruki as part of the forestry research organisation Scion. They wanted to enable non-Māori scientists to better engage with Māori about forestry research, including genetic modification.

"We were trying to join tikanga with science projects," says Phillip. "No one in the forestry world had done anything like that." Te Arotūruki now provides "a step-by-step process for scientists for effective dialogue with Māori".

### *Aotearoa Variome*

Genome databases used by doctors and health researchers around the world were created from people the USA and Europe; Māori and other indigenous genomes are virtually absent, creating what is called the 'genomic divide'.

"The Variome project aims to build a database of genomic variation among Māori; if we don't get involved in this area, Māori health will fall further behind," says Phillip.

He co-leads this project with a clinical geneticist; "we both know genomic science and I bring experience in designing research projects that incorporate Māori values and processes. Of course, Māori governance and control over the use of their data is crucial."

He says that genome data is enhanced by Māori and Pasifika ancestral knowledge of whakapapa links between hapū and iwi around the motu and between Pacific islands.

"Once we have a database of Māori people with rare diseases, for example, we can get faster diagnosis of problems and better treatment, by tailoring drugs for particular conditions, like warfarin for heart problems. We could hopefully understand why some whānau get diabetes and others don't."

### *Rakeiora*

This test project links data about DNA and health status from two populations. One combines the genomic data of 500 people in rural Tairāwhiti (East Coast), with health records from their GPs; the other involves genetic and specialised hospital data from Aucklanders undergoing cancer treatment. Hopefully, the project will show how particular genetic factors influence the way in which different Māori, Pasifika and Pākehā people respond to different treatments and drugs.


*Phillip with his daughter Rawinia, after a very successful dive at Moturata, off the Taieri River mouth.*

"DNA plus whakapapa and health data can provide better estimates of people's risk of disease, especially for polygenic conditions, than looking at DNA or health data alone," says Phillip.

"We're creating tools where Māori permissions are inherent in the data, and Māori priorities at the centre." The project aims to co-develop with Māori the basis of a national research structure for genomic databases that are specific to the New Zealand population.

### *Ira Rangahau Māori workshops*

Phil started the first workshop on genetics-based research by Māori in 2018, where Māori geneticists presented their work in health, whakapapa, agriculture, horticulture and te taiao. He helped organise a second workshop in 2021, which included a lab tour and hands-on workshop.

He was also behind an organisation for Māori geneticists. "We bring a different lens and do things differently as practitioners. For us, it's fundamentally important to operate in an appropriate way. We have to get the tikanga right first, otherwise projects fall over."

### *Community-based genetics education*

In 2016, Phillip, Katharina Ruckstahl and Maui Hudson started the Summer Internship for INdigenous peoples in Genomics (SING) programme, an annual, week-long internship wānanga that provides participants with experience in wet labs (biological samples and DNA), dry labs (computer analysis and biostatistics) and simulation labs (cultural and

*Phillip with PhD student Jordan Horsiaux (left) and Katharina Ruckstahl at the Summer internship of INdigenous peoples in Genomics (SING) Aotearoa 2017.*

ethical scenarios).

"We've had over 100 interns through that programme; 20 percent pakeke (community adults) and the rest graduates. It's one of the best things I've experienced." SING has now become an international alliance with branches in the USA, Canada and Australia.

In 2018, Phillip developed and presented a genetics module for pre-NCEA high school Science students in marae wānanga that had been run by the University of Otago since 2007; it is now run by others with his oversight.

"We draw the link from whakapapa to DNA. It's about making ākonga feel that genetics is a normal science that Māori have always done. We try to make it relevant and fun, showing the kids how to extract DNA from a strawberry."

## Mātauranga Māori

"Mātauranga Māori is a knowledge system just like Western academia; I think people lose sight of that." Public discussion about mātauranga Māori is not well-informed, he says. "Some of the participants are speaking from ignorance; a bit like me making public statements about quantum physics.

Pākehā opposition to mātauranga Māori has led to "some pretty negative experiences of online trolling and abuse", he says. "It's not all goodness and light, despite the fact that in many aspects of science, mātauranga Māori makes science research better."

For example, in genetics, whakapapa knowledge – of waka, hapū, iwi, and whānau relatedness – makes predictions of the risk of disease more accurate, as well as being cheaper than DNA. "Traditional Māori ecological knowledge is also a gold standard for designing sampling strategies in searching for environmental DNA (eDNA)" to tell what animals have been in waterways and other environments.

Phillip includes Māori concepts and values frameworks in all the university genetics papers he teaches. As well as all his work developing frameworks in different sectors for research with Māori, Phillip has been a technical advisor for his iwi, Ngāti Rakaipaaka, on the Rakaipaaka Health and Ancestry Study.

## What he likes about science

"Science is a way to express our curiosity about things. It enhances wairua; I like training others because their joy in discovery becomes my joy. There are some good ethical practices; being honest, pono, being tika relates to tikanga. At the interface between Western knowledge systems and mātauranga Māori, the commonalities are our pathway.

Science has potentially emancipatory results – you can reverse the negative outcomes of colonisation if you wrap science in tikanga. If we'd done science in that way for decades, we wouldn't have climate change. And I love getting meaningful answers from my stats and analyses."

## Links

*Otago Daily Times*, 2022, Covid 19 genomics animated video, SING Aotearoa.
University of Otago, Science wānanga videos.
Phillip Wilcox, 2021, Indigenous genomics: Two case studies.

## Ngā Kupu

*From Paekupu*

**Huaira** – Genetic trait
**Mātai iranga** – Genetics (field of study)
**Rangahau inerahi** – Quantitative research
**Raraunga tatau** - Quantitative data
**Raweke ira** – Genetic modification
**Tauanga** – Statistics
**Tikanga tauanga** – Statistical technique