NZASE scientist profile

Shane Wright

A river in the Peruvian Amazon rainforest, where Shane worked; Wikimedia Commons

Born where and when

1958 in Whanganui, raised in Raetihi. Maunga - Ruapehu; awa - Whanganui; iwi - Te Ati Haunui, Ngāti Tuwharetoa, Pākehā; hapū - Ngāti Kurawhatia, marae - Paraweka, Pipiriki.

School

Raetihi Primary, Mana College Porirua and Whakatane High School. Shane's only science subject was biology in fifth form; he hoped to study law.

How he got into science

"I loved being in the natural world, seeing complete plant communities and the beauty of ancient forests. There was no great planning in my career."

Training and jobs

BSc University of Canterbury; **PhD** University of Auckland.
"I started studying law, but it was meaningless and I was miserable. Eventually I changed to biology, and started to do well because I enjoyed it."

"My gran, Rumatiki Wright, pushed and pushed; when I got my Bachelor of Science, she said 'When are you doing your PhD?' She was a founding member of the Māori Women's Welfare League and was barred from the USA in 1960 after going to Soviet Russia on a goodwill mission."

1982-85 Campaign activist, Native Forest Action Council "I campaigned against harvesting beech forest for wood chips; we were trying to increase the number and size of national parks."

"I lived in Latin America for from 1986 to 88, which gave me a more international viewpoint; I learned to engage with people even if they initially looked frightening."

Lecturer, **senior lecturer**, University of Auckland, from 2001.

Fields of science

Evolutionary genetics, biodiversity, biosecurity and conservation.

Topics of his research

Quantifying rates of tropical evolution

"I spent months in the in the Solomon Islands, as well as in the Peruvian Amazon, where it took days by canoe to get to the research station. I was overwhelmed by the diversity of life – here we have 25 tree species in a given area – in the Amazon lowlands they have 1,000, and I wondered why."

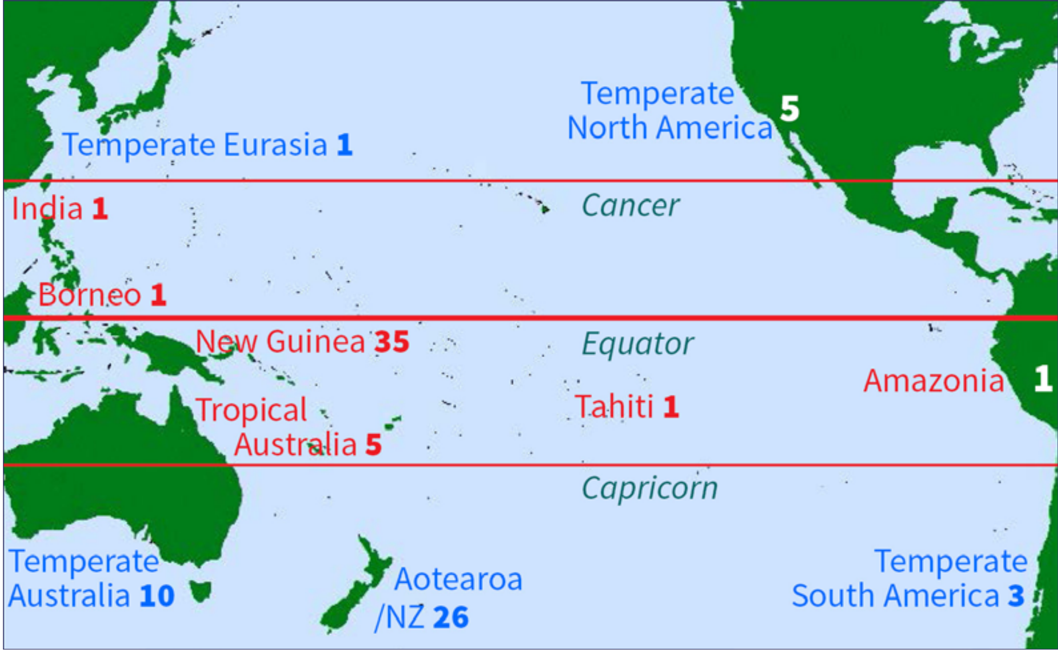
Early evolutionary scientists had theorised that tropical diversity was related to energy, and later scientists had found that hot, high-rainfall, tropical environments produced higher rates of new species and evolutionary change.

"I thought the cause would be well researched, but there were lots of very entrenched, competing positions with no ultimate explanation."

In 1992, one scientist theorised that higher levels of metabolic energy shortened time between generations and increased rates of natural selection, but was unable to test this.

Shane realised that he could. He compared many tropical plant species with sister

The distribution of the 45 pairs of cold climate (blue) and tropical (red) sister species, the DNA of which Shane collected and analysed over several years.



(closely related) temperate species with similar sizes and populations – taking years to collect DNA from forests, live collections and gene banks (see map) - and found that trees like the Borneo kauri evolved 13 times faster than their sister kauri in cooler Aotearoa. He provided the evidence that equatorial plants have higher metabolic rates, leading to more genetic variations, and they also pass these genetic changes much more quickly through generations.

He published this result just three weeks ahead of a rival US team, cracking what *The Guardian* (UK) called "one of the most enduring mysteries since Charles Darwin returned from the Galapagos Islands".

Shane says: "I was lucky to be able to frame testable hypotheses, just at the right time for new genetic technologies, so I could get the data to test it."

Shane later found the same patterns in mammals and amphibians – animals in lower altitudes and warmer climates had faster metabolic rates. Evolution is therefore not the same everywhere – it is ordered by environmental factors including temperature and rainfall, as well as land area and population size.

Quantifying the effect of population size and land area on rates of evolution

After energy, population size is the other half of the story, as larger populations capture more energy, produce more mutations and are thus likely evolve faster.

Shane compared birds in small populations on small islands, with closely related birds living in similar climates with large populations, and confirmed that populations in smaller areas had fewer mutations.

How he finds things out

Using polymerase chain reaction (PCR), Shane creates multiple copies of non-functional sections of plant and animal genomes, which are known to change at a moderate rate.

He compares the rate of mutation in these sections for related plants or animals living in different climates. Shane uses a statistical test that produces a ratio that is positive or negative relative to the rate of equatorial mutations, and which then ranks mutation rates from the biggest to the smallest difference across the latitudes.

Most valuable results

Shane is proud of all his research on evolution, which together illustrates how evolution works in different environments.

Mātauranga Maori

"Being a Māori/Pākehā blended person has been a strength," he says. While he did not approach evolutionary genetics through mātauranga Māori, his familiarity with Māori ways of thinking enabled him to bring what he calls a "fuzzy logic" to his scientific approach.

He and a Pākehā colleague, Len Gillman, last year called for scientists to re-examine processes for naming species that are familiar to indigenous peoples, and already have indigenous names, but which are new to scientists. They also called for re-instating indigenous names for such species long ago labelled with colonial languages.

They argued that under earlier colonial taxonomy, many species were named after "collectors, sponsors, colleagues or employers", who often had nothing to do with the country in which the species were found.

Shane and Len said that these and other names were irrelevant or could be offensive to indigenous peoples whose traditional names for those species are still in use. They called for a wide debate about this new approach, involving indigenous peoples and indigenous scientists.

Under such changes, our forest tree *Prumnopitys taxifolia* could become *Prumnopitys matai*; and the east African riverside tree species *Breonadia salicina* could become *Breonadia matumi*.

What he likes about science

"Science is enlightening; it provides a structure and order for living things. The Linnaean naming system is superb, a binomial system for the huge diversity of all life, where the hierarchy shows the inter-relationships."

Links

- Ngā Pae o te Maramatanga. A NZ scientist wins the race to solve a central riddle about evolution.
- Radio NZ, 2020, Nov 10, Restoring indigenous names in biological species.
- Len Gillman & Shane Wright, 2020, October, Restoring indigenous names in taxonomy, *Communications Biology*.
- Shane Wright, 2005, Energy and evolution, in *Te Ara Pūtaiao: Māori Insights in Science*, 47-59.

Ngā Kupu

From Paekupu & Te Aka Maori Dictionary

Hātai – Temperate
Huinga ira – Genome
Kukuwhatanga – Evolution
Mātai iranga – (study of) Genetics
Mātai koiora – (study of) Biology
Momo – Species
Pītau ira – DNA
Pūnaha whakarōpū – Taxonomy
Pārūrū – Tropical
Whakapae (~tia) – Hypothesis

Prumnopitys taxifolia, matai or black pine; a candidate for renaming under a taxonomic system which gives priority to pre-existing indigenous names of species. From Wikipedia.