TERM 3 NEWSLETTER 2024

President's Report

Kia ora koutou,

While I have been a long-standing exec member of BEANZ, most of you will be familiar with me as the "exams guy." Stepping into the presidency role this year has been a huge learning curve for me, and it is great to know that everyone in the waka is working towards a common goal – to support, upskill, and be a voice for Biology educators all across Aotearoa.

We enjoy receiving feedback from our members, and we encourage you to send through any you would like to share. Tell us what you want to see more of, what needs improvement or fixing, and what's working well in the classroom – BEANZ is here to support you and all the mahi that you are doing.

My goals for BEANZ are to strengthen our network across Aotearoa, consolidate the progress we have made so far, continue to improve the resources, and add value to your day-to-day teaching. We have a few new things in store, so watch this space!

I would like to thank our outgoing president, Erica Jar. who is still on the exec team, supporting us behind the scenes. I have thoroughly appreciated my journey so far with BEANZ and would like to thank everyone on the exec team for giving me the opportunity to lead such a diverse group of passionate and experienced educators.

Kia pai tō rā

Kenneth Loh

In this issue..

BEANZ subscription increase.

Since 2022 BEANZ has been able to offer our annual membership for just $1 per school. This $149 discount on our $150 annual membership fee has been possible due to funding from the Ministry of Education through Teacher Development Aotearoa (TDA).

As a member you have been able to access all of the resources BEANZ offers via our ever-growing website, and assistance in a wide range of inquiries about teaching senior biology.

Within the next year, funding through the TDA is likely to change. BEANZ Executive committee has decided to have a staggered increase in our membership subscription to $100.

This will help us to ensure that we are able to sustainably produce high quality resources and professional development assistance.

This increase to $100 will be effective from your subscription renewal date

Please ensure that your TIC Biology, HOD Science and school Bursar is aware of this increase. Remember it is a single payment for a school, covering all staff in your school.

If you need to know when your current subscription will expire, please contact Allan (National Administrator) at biologynz@gmail.com .

Forensic Genetics

The unique nature of DNA is the basis of forensic genetics

Using gene tracking technology

Last century, human bodies were identified from fingerprints and dental records. These days DNA profiles of genetic markers are important in narrowing the search.

What is forensic genetics?

The purpose of forensic genetic analyses is to try to match the DNA in biological evidence to a particular person. Although 99.9% of our DNA is shared with other humans, the focus of forensic geneticists is on the remaining 0.1%, which may still vary between different individuals.

Often this work will target genetic markers, a DNA sequence with a known physical location on a chromosome.

Māori perspectives

For Māori, kōiwi (human remains) are the physical embodiment of their whakapapa, connecting present and future generations with their tūpuna and their whenua.
It is important that kōiwi tangata are treated with respect and are returned to iwi for burial on the whenua. ESR acknowledges and takes these perspectives into account in its processes and research.

ESR

In Aotearoa, forensic genetics is carried out by the Institute of Environmental Science and Research, ESR.
When human remains are found, police are called and secure the scene. In some locations police collect the evidence at the scene; in others ESR does this work. A pathologist performs a post-mortem, identifying observable features from teeth, bones and other tissues, such as sex, approximate age, height, build as well as injuries. Samples from the scene and the post-mortem are sent to ESR for analysis to provide information for further police enquiry.

Unknown remains

Unidentified human remains are often associated with tragic events. They may be found in individual sites, common graves (where each body has their own coffin) or mass graves (no coffins). NZ has mass graves from disasters (eg, the Tangiwai rail crash), institutions (Tokanui Psychiatric Hospital), the land wars (Gate Pa in Tauranga) and epidemics (flu in 1918). No remains from NZ mass graves have had their DNA analysed.

When bodies have been in the ground for a while, they often cannot be identified using soft tissues due to their extensive damage. Bones will survive but DNA is difficult to test due to its structure (cells imbedded in a hard matrix) and the effects of decomposition (what little DNA is left is often degraded).

Step 1: DNA analysis

Genetic means of identifying unknown remains has changed markedly over the last 120 years. Early methods included blood grouping (eg, ABO) and tissue typing (eg, HLA).
DNA fingerprinting was developed in 1984. DNA is cut into fragments 10-100 base pairs long. Exposing these on X-ray film gave an image of bands that was unique to each person.
These days, DNA profiles use genetic markers called Short Tandem Repeats (STRs) – repetitive DNA sequences that do not code for proteins. The number of repeated sequences and, therefore, the length varies between individuals. These regions are known to be highly variable, so by targeting many STRs we get a pattern to compare with.

Sample 1	site y	4 repeats	ACGTACGTACGTACGT
Sample 2	site y	7 repeats	ACGTACGTACGTACGTACGT ACGTACGT
Sample 3	site y	7 repeats	ACGTACGTACGTACGTACGT ACGTACGT

STR sites show variability. [BCGSC] https://www.bcgsc.ca/news/straglr-new-software-tool-targeted-genotyping-and-repeat-expansion-detection

ESR extracts DNA from bone, teeth, blood and other biological material. Short synthetic sequences of DNA that can target up to 27 specific STRs attach to the DNA. These sequences are known as primers and have a fluorescent dye. Multiple copies of the primed DNA are made using the Polymerase Chain Reaction (PCR). Detecting the fluorescent dye, the length of each STR is measured, and over the multiple sites this creates a DNA profile.

Tubes being placed in a PCR machine [Gener8] https://www.gener8.net/pcr-machines-genetic-testing-clinical-chemistry/

Step 2: Comparison with reference samples

Scientists now have the unique pattern of STRs in the DNA profile from the biological material. They next need to match this with known DNA profiles which may come from:

- A DNA sample of a possible relative. Sometimes observable features and records can help narrow the possibilities. If living relatives can be located, they are asked for a DNA sample, which is taken by running a cotton swab inside their mouth.
- A DNA sample taken from an item known to originate from a missing person, e.g. a toothbrush.
- A databank of DNA profiles, more rarely used. This DNA may come from people who have volunteered a DNA sample or someone charged or convicted of an offence, or others. Familial searches may turn up a related individual who shows a similar pattern in their DNA profile. ESR is the custodian of this database in Aotearoa.

The language that forensic scientists use about this match is quite careful. They say things like there is a x% likelihood of the DNA evidence originating from this specified person rather than a person selected at random.

ESR Examples using DNA profiling

·A DNA profile from semen found on a dead woman undergoes familial searching using the DNA profile databank, leading to the arrest of a suspect and his later conviction for murder.

·Blood left at a burglary scene is linked to an individual on the DNA Profile Databank.

·DNA profiles from post-mortem samples were used to identify victims of the 2011 Christchurch earthquake.

Questions

1. Human remains are found on a building site. How might forensic techniques be used to identify them?
2. How has the identification of unknown humans changed over time?
3. Explain why the use of STR's is a better way to identify remains than previous methods of identification.
4. How are cultural sensitivities taken into account when working with human remains?
5. Explain why DNA is so hard to find in human remains – how does the environment affect it?

References

Ambers, A. (2022) Forensic Genetic Approaches (hyperlink to https://www.thenile.co.nz/books/angie-ambers/forensic-genetic-approaches-for-identification-of-human-skel/9780128157664)

Britannica. DNA Fingerprinting (link to https://www.britannica.com/science/DNA-fingerprinting)

Brown, T. et al (2017). Making Sense of Forensic genetics (link to https://senseaboutscience.org/wp-content/uploads/2017/01/making-sense-of-forensic-genetics.pdf)

Buckley, H. & Petchey, P. (2018). Human skeletal remains and bioarchaeology in New Zealand. (link to https://www.researchgate.net/publication/325833124_Human_Skeletal_Remains_and_Bioarchaeology_in_New_Zealand)

ESR (2023). DNA Techniques (link to https://www.esr.cri.nz/digital-library/dna-techniques-available-for-use-forensic-casework/)

Morling, N. (2004). Forensic Genetics (link to https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(04)17621-6/fulltext)

Rx List. Forensic genetics definition (link to https://www.rxlist.com/forensic_genetics/definition.htm)

This article benefited from help by Kate Stevenson, forensic biology senior scientist at ESR, and teacher Linda Haycock.

The BEANZ Website
A Growing Repository of Resources for Teaching Biology

Including...

* Level 3 practice exams and a scholarship paper
* Student Read Journal Articles
Six articles on funky concepts in biology have either modified from published journal articles or are a meta-analysis created to introduce students to how to read science articles. The articles are written for year 10 or 11 students, come with a glossary and a set of questions that cover 'understand, know, do'.
A great one to start with is ... 'How to Make a Flightless Bird'
* Two Level 1 CB1.3 units – Titled: *Kiwi Genetics* and *BEANZ 1.3 ChemBio Unit of Work* 2
* A Level 1 Sci1.2 unit - Titled: *Predator Free 2050*.
* A Level 1 Sci 1.1 unit – Titled: *School Sores*

You can make it even better.

If you have developed a resource that you think could be useful to other biology teachers. BEANZ would encourage you to submit it. Go to 'Members Resources.' Choose 'Create New Resource'. Click on 'Member Contributions'. BEANZ will pay between $100 - $1000, depending on the time taken to develop it. Don't be shy!

A team of Curriculum Representatives will assess it and decide if it will be published on the website.

Criteria for publication will include some (not all) of ...
* Is it something different or something we don't currently have on offer for our members?
* Would the resource add value for our members.
* Does it have relevance for teaching the NZ curriculum'?
* Does it have clear scope and sequence?
* Does it have a range of teaching and learning approaches?
* Does it have clear learning objectives/outcomes?
* Are all external sources adequately referenced and acknowledged? (copyright conditions and permissions are met)

BEANZ Feature Article

It has long been suspected that a small pāua (known as abalone, ormers or ear-shells overseas) found around a remote island chain north of Aotearoa New Zealand differs from all other pāua.

Our earlier **genetic research,** using **pioneering methods** to extract ancient DNA from shells, provided the extra evidence needed.

We could now formally name and describe the **new species of pāua** from the Three Kings Islands/Manawatāwhi.

The scientific name of the Manawatāwhi pāua, *Haliotis pirimoana,* was proposed by Ngāti Kuri, who hold historic and territorial rights over the islands (mana i te whenua). Its name means "the pāua that clings to the sea".

A national treasure

Pāua live on shallow reefs around the world, where they graze on algae. Globally, there are about 70 pāua species, ranging from "button" to "beret" in size.

Globally, few wild-caught abalone fisheries remain due to overfishing and a "**withering disease**" that has, fortunately, not been detected in Aotearoa New Zealand.

The newly named Manawatāwhi pāua. Jean-Claude Stahl/Te Papa

In New Zealand, we now recognise **four living pāua species**. Three of these – the black-foot pāua (*Haliotis iris*, which grows to about 200mm in size), the yellow-foot pāua (H. australis, 120mm) and the virgin pāua *(H. virginea,* 70mm) – are distributed broadly along the coast of mainland New Zealand.

Pāua are a **taonga** (national treasure). Their opalescent shells are iconic: they form the eyes of carvings, were used in traditional fishing lures, and feature in contemporary art and jewellery.

Surprisingly, these wonderful colours are not caused by different pigments. Instead, they result from a layer of shell made of a special form of calcium carbonate that splits light into its component parts, like oil on water.

Recreational harvest of pāua as kaimoana (seafood) is a **national pastime** (as is debate over the best ways to tenderise and cook them). Black-foot pāua are also the focus of growing **aquaculture** and pearl industries.

Black-foot (left), yellow-foot (centre) and virgin pāua (right).
Jean-Claude Stahl, Melissa Irving, Kerry Walton/Te Papa

Why This Matters

It's not every day we discover a new species, although **it happens** more often than you might think.

Species discovery is seldom punctuated by a clear "Eureka!" moment. More often, it's a muted thought that something looks a little different. So it was with the discovery of the Manawatāwhi pāua.

The Manawatāwhi pāua grows to just shy of 40mm. It is unlikely to have any commercial value or require conservation efforts. However, this species is another in the list of taonga (treasures) unique to Manawatāwhi specifically, and to Aotearoa more broadly.

The Three Kings Islands/Manawatāwhi are a rugged island chain to the north of New Zealand. Kerry Walton

The Manawatāwhi island chain lies roughly 60km northwest of Cape Reinga/Te Rerenga Wairua, the northern tip of the North Island. The **islands are rugged**, remote and beautiful.

Surrounded by deep water, and directly in the path of the Tasman Front which brings warm water from Australia but results in the localised upwelling of cold water, Manawatāwhi teems with life. Many of the islands' coastal and terrestrial species occur nowhere else on Earth..

A dense population of pāua at the Chatham Islands/Rēkohu. Kevin Burch

Manawatāwhi is not "pristine", but the region remains a benchmark showing what much of Aotearoa used to be like. Ngāti Kuri are keenly aware of the importance of the taonga in their rohe (tribal area), and they are **active** in restoration, research and conservation efforts.

Biodiversity research, expertise and reference collections are critical for understanding the structure of regional ecosystems and predicting how they might respond to human activities and the changing climate. Such research provides the evidence necessary for effective fisheries, biosecurity and conservation management. It can ultimately contribute significantly to the economy.

We are in a global **biodiversity crisis**. Species are going extinct faster than we can discover and name them. The Museum of New Zealand Te Papa Tongarewa and the National Institute of Water and Atmospheric Research (NIWA) recently partnered with **Ocean Census** to **discover hundreds of new species** from deep water off southern Aotearoa.

There are, however, **thousands of species** we have already discovered, which are still awaiting formal names. There are very few **biodiversity scientists** left in Aotearoa to do this work.

This research reflects our obligation towards future generations so they, too, can enjoy the wonderful richness of our biodiversity.

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