



Canterbury Branch Royal Society of New Zealand Te Apārangi October 2024 Newsletter

Dear Member

We hope you are or have enjoyed the long weekend and are keeping dry with this rain.

This month's newsletter includes information about the last PM Science Winner talk in Christchurch, the upcoming branch field trip, couple of student grant recipients reports, date of our Annual General meeting, branch Constitution update, and some other plans.

The Prime Minister Science winners talk.

The branch in partnership with Royal Society Te Apārangi, the Prime Minister's Science Prizes Secretariat, will host the last talk on Tuesday, November 12th at 6.30 pm at Ara Institute of Canterbury City Campus.

The silly and serious sides of volcano science communication - CHRISTCHURCH

Professor Ben Kennedy, 2023 winner of the Prime Minister's Science Communication Prize, on his diverse volcano science communication experiences.



The Prime Minister's Science Prizes and Royal Society Te Apārangi in partnership with the Canterbury Branch are delighted to offer a free talk by Professor Ben Kennedy, [2023 winner of the Prime Minister's Science Communication Prize](#).

As a volcano science communicator, Ben's had some very varied experiences from the absurd to the terrifying. Although his comfort zone has always been making volcano fart jokes with 7-year-olds, he is now a Professor in Volcanology at the University of Canterbury, part of a National Science Advisory Group and is an expert witness in ongoing legal proceedings involving the Whakaari White Island tragedy.

In his talk, Ben will recount tales of some of his diverse science communication scenarios and the unique challenges associated with each. These include:

- sensationalising TV documentaries filmed at erupting volcanoes
- international interviews following the Whakaari tragedy
- filming kids TV programmes in front of live audiences
- public talks in bars
- school visits
- legal proceedings
- visits from policemen!

Ben will also emphasise the importance of his science communication whānau, including a diverse team of collaborators including artists, cultural advisors, scientists, students, educators, engineers and, last but not least, family members!

Suitable for a general audience. All welcome. 6:30pm start with tea, coffee and light refreshments. Talks commences at 7pm.

VENUE/DATE

Ara, City Campus - Building DL, Room DLEC
130 Madras Street, Christchurch Central City, Christchurch

You can register at <https://www.royalsociety.org.nz/events/the-silly-and-serious-sides-of-volcano-science-communication-christchurch>

[View map of venue.](#)

Supported by:



Students travel grants.

Awarded.

Funding to an Ara team to attend and present papers to the Australia and New Zealand Social Work and Welfare Education and Research Symposium in Dunedin November 2024.

Reports from grant recipients.

From Jordan Hill

Kia Ora, my name is Jordan Hill, and I'm a first-year PhD candidate studying biomedical engineering at the University of Canterbury. I graduated last year with First Class Honours in Mechanical Engineering and dove straight into my PhD, focusing on low-cost healthcare solutions to improve equity and accessibility. Thanks to the support from RSNZ Canterbury, I had the opportunity to attend and present at three international conferences in Italy and Germany this year.

I presented my recent PhD work at the following conferences: 1) 20th International Conference on Mechatronic, Embedded Systems and Applications in Genoa, Italy (2-4 September 2024); 2) 12th IFAC Symposium on Biological and Medical Systems in Villingen-Schwenningen, Germany (11-13 September 2024); and 3) 58th DGBMT Annual Conference on Biomedical Engineering in Stuttgart, Germany (18-20 September 2024).

My research centres on developing low-cost healthcare devices, particularly PPG-based sensors and respiratory devices. At the first and last conferences, I presented on non-invasive optical sensors that measure arterial-venous oxygen saturation. My first presentation, "*Proof of Concept Arterial-Venous Oxygen Saturation Estimation Through Non-Invasive Optical Sensing*", showcased a low-cost modulation system that induces a pulse in the venous system for detection alongside the arterial pulse. Essentially, it's an inflatable cuff that squeezes the finger at specific pressure and frequency, creating a detectable and differentiable venous pulse. I also had the chance to chair the *Mechatronics in Medical Devices and Healthcare* session, which was a rewarding challenge that encouraged me to engage more deeply with the work of other presenters in similar fields. The feedback I received was invaluable, and the Italian focaccia wasn't bad either!



Josie and I in Genoa and chairing the session.

At the second conference, I presented "*Validation of a Low-Cost, High-Quality, Equity-Enhancing PAP Device*", which compared our 'mePAP' device (multipurpose, equitable positive airway pressure) to a commercially available mechanical ventilator. The 'mePAP' offers an open-access platform to researchers for testing respiratory algorithms, with future potential for clinical use as it supports CPAP, BiPAP, and APAP modes.



My oral presentation and supporting others at the conference during the Poster Session.

In Stuttgart, my presentation “*Estimation of Venous Oxygen Saturation Through Non-Invasive Optical Sensing at the Jugular Veins*” used the same optical sensor but focused on the external jugular vein to estimate venous oxygen saturation as blood returns to the heart after delivering oxygen to the brain. This work fitted seamlessly into the Optics session, where medical devices using light were the focus. I joined the Optics Society, networked with leading experts, and received useful resources, including code from colleagues in the field. I also attended the Young Engineers Forum, where I connected with fellow PhD students and explored how to drive change in the medical industry. A tour of Erbe and Bently, two leading medical device companies, was an eye-opener for potential future career paths.

Overall, attending these three conferences was an inspiring experience. Presenting my research to world-leading experts provided invaluable feedback and connections, energizing me for the next steps in my work. I’m incredibly grateful to the Canterbury branch of the Royal Society for their support in making this opportunity possible.

From Ella Guy

Virtual Physiological Human 2024 Conference (VPH24)

Dates: 4th – 6th September 2024

International Federation of Automatic Control Symposium on Biological and Medical Systems 2024 Conference (IFAC BMS 2024)

Dates: 11th – 13th September 2024

Recipient: Ella Frances Sophia Guy (PhD student at the University of Canterbury)

This September I travelled to Germany to attend the Virtual Physiological Human 2024 (VPH) and the International Federation of Automatic Control Symposium on Biological and Medical Systems (BMS) conferences in Stuttgart and Villingen-Schwenningen, respectively. At these conferences, I presented the following papers:

- **Guy, EF**, Clifton, JA, Caljé-van der Klei, T, Knopp, JL, Holder-Pearson, LR & Chase, JG, 2024, ‘The use of rapid expiratory occlusion (REO) to simultaneously identify lung elastance, airway resistance, and muscular effort’, *VPH 2024, Presented 13SEP24*.
- **Guy, EF**, Clifton, JA, Caljé-van der Klei, T, Knopp, JL, Holder-Pearson, LR & Chase, JG, 2024, ‘Rapid Expiratory Occlusion to determine dynamic lung elastance and response to PEEP’, *IFAC-PapersOnLine, To Appear (invited)*.

- **Guy, EF**, Clifton, JA, Caljé-van der Klei, T, Knopp, JL, Holder-Pearson, LR & Chase, JG, 2024, 'Identification of airway resistance in spontaneous breathing with and without CPAP', *IFAC-PapersOnLine*, *To Appear (invited)*.



Figure 1 – Ella Presenting at the BMS Conference

My presented research was focused on establishing identifiable model-based methods of assessing respiratory function and minimising the required assumptions in these models which can lead to demographic inequities. To this end, I presented a method of identification of lung elastance and airway resistance by rapid expiratory occlusion (REO), adapted from the interrupter technique, combined with linear single-compartment modelling of patient respiratory effort (using scaled second-order b-splines). I also presented the performance of this model compared to alternative methods.

I was also able to support my research team as they presented the following coauthored work (as well as other associated research teams presenting on other topics):

- Clifton, JA, **Guy, EF**, Caljé-van der Klei, T, Holder-Pearson, LR & Chase, JG, 2024, 'Identification of expiratory WOB in active expiration with imposed non-linear resistance', *VPH 2024*, *Presented 13SEP24*.
- Caljé-van der Klei, T, **Guy, EF**, Sun, Q, Clifton, JA, Zhou, C & Chase, JG, 2024, 'Pulmonary Elastance Identification and Predictive Methodology for PCV in a Digital Twin', *VPH 2024*, *Presented 13SEP24*.
- Hill, JF, Jackson, S, Uluilalata, M, Sood, S, Clifton, JA, **Guy, EF** & Chase, JG, 2024, 'Validation of a Low-Cost, High-Quality, Equity-Enhancing, PAP Device', *IFAC-PapersOnLine*, *To Appear (invited)*.
- Clifton, JA, **Guy, EF**, Chen, R, Caljé-van der Klei, T, Holder-Pearson, LR Moeller, K & Chase, JG, 2024, 'Simulated COPD in Healthy People with Increasing PEEP', *IFAC-PapersOnLine*, *To Appear*
- Clifton, JA, **Guy, EF**, Caljé-van der Klei, T, Holder-Pearson, LR & Chase, JG, 2024, 'Aeration with increasing PEEP in Smokers, Vapers, and Asthmatics', *IFAC-PapersOnLine*, *To Appear*
- Su, Y, Hill, JF, **Guy, EF**, Clifton, JA, Flett, I, Zhou, C, Holder-Pearson, LR & Chase, JG, 2024, 'Integrating Handwritten Data Entry and Real-Time Data Streaming for Enhanced Medical Device Signal Monitoring and Visualization in Digitalized ICU Charts', *IFAC-PapersOnLine*, *To Appear (invited)*.



Figure 2 – Respiratory Research Group (Lui, Ella, Jaimey, Jordan, and Trudy)

As a research team, we have been focusing on the development of models and control systems for respiratory testing and treatment devices, to alleviate the clinical time burden of their operation and provide more equitable, informative, and interpretable metrics.

The key topic of the VPH conference was ‘Data-driven Simulation Technologies for Clinical Decision Making’ which aligned well with our goals for the application of our models. Thus, it was interesting to be able to learn from other implication approaches discussed, which were primarily focused on other physiological systems but encountered similar difficulties in data collection, validation, and integration with clinical practice.

At BMS both presentations were included in the ‘Advancements in Cardiovascular and Lung Mechanics’ invited session. Where we were able to discuss model approaches and receive feedback from experts in the field as well as commercial representatives for respiratory device manufacturers.

I would like to express my thanks and gratitude towards the Canterbury Branch of the Royal Society for enabling me to attend these events in person and present my work, receive feedback, hear the latest developments from my peers and discuss future work with collaborators. Ngā mihi nui



Figure 3 – Research group and collaborators attending the BMS conference

Branch Constitution

As mentioned in the last newsletter, the council is reviewing the constitution. A group of branch councillors will be considering what changes we need to undertake and bring them to the next council meeting so we can put them to the members for approval at the Annual General Meeting next year.

However, this is your branch, so let us know what you think of the current constitution (you can read it on our webpage, or we can send you a copy) and any changes you like us to consider.

Next Annual General Meeting

The 2024 Annual General Meeting will be held on the Wednesday March 26th. Venue to be decided.

How about thinking about coming on to the council and join the team. Next year will be exciting as more of the plans are implemented, more talks/conversations held, field trips.

Your input, help, support and ideas will be welcomed.

Branch Podcast

As mentioned in the last newsletter, plans for our podcasts are coming together. Not only with the series on AI, but others want to contribute, with the last PM winner Prof Parry Guilford but some School Science fair winners offering to be interviewed, so watch this space.

You Tube

As you might know, there's a lot of stuff on this media, many of the universities, colleges, institutions, and even Television organisations, have their own YouTube channels. Some of their content might be interest you. Below are some content that has appeared over the past few days.



<https://www.youtube.com/watch?v=AQfK7dZZAmY&pp=ygUlbnlnaHQgbGlnaHRpbmcga2lsbGluZyBiaXJkcyBpbjB0ZXhhcw%3D%3D>

2,194 views Premiered Oct 17, 2024 [#LightsOutForBirds](#) [#BringBirdsBack](#)

For millennia, Texas' skies have cradled a remarkable spectacle – the migration of birds. Guided by the stars and the planet's magnetic field among other cues, these fearless travelers embark on odysseys of epic proportions. Yet, against cities' radiant nighttime backdrops, a poignant tale unfolds – the disorienting web of light pollution that distorts their cosmic guides. This film is a tale of redemption, where science and action harmonize in unity. Applied and research science join hands with conservation and education, pledging to safeguard these fragile wanderers. Data from the US weather surveillance radar network weave into a tapestry of understanding. Modern machine learning unfurls secrets,

reshaping how we perceive the pulse of the planet's spring and fall rhythms. Yet, the true lesson lies in the partnership among conservation groups, the government, and the private sector. United in purpose, they craft a symphony of compassion – a simple yet profound dimming of lights. It is my hope that after watching this film, with every light we dim, a beacon of hope is kindled. With special gratitude to the creatures gracing our skies,

Daniel Sheire, Producer, Cornell Lab of Ornithology



<https://www.youtube.com/watch?v=EbYxgnG1xKk>

58,946 views Oct 18, 2024

A mysterious landscape known as Crowberry Bog on the Olympic Peninsula is like no other place in Washington. It's a bog that sits like an inflated bladder, rising higher than the surrounding forest. To walk here is like walking on a waterbed chock full of rare and surprising life.



<https://www.youtube.com/watch?v=ly6eAE3hmas><https://www.youtube.com/watch?v=ly6eAE3hmas>

461,263 views Sep 19, 2024

The latest research shows we've long underestimated the intelligence of insects. Bumblebees, for example, succeed at behavioral tests also passed by intelligent crows. They use tools to reach nectar in an artificial flower. Behavioral biologist Elizabeth Tibbetts is amazed at the paper wasp's capacity to learn and understand. "They may not be universal geniuses like artists, but they're brilliant in their fields," says the researcher at the University of Michigan. The animals can memorize faces, eavesdrop on fighting rivals to assess potential opponents and think strategically. They can master brain teasers that even small children can't solve. Bumblebees, along with their relatives bees and paper wasps, are just three of almost a million insect species worldwide. But when it comes to these species, science agrees that the image of robotic creatures with no intelligence, that only exist to eat, be eaten or produce offspring, is outdated. Below, above and alongside us live tiny animals capable of learning and acting with intelligence. They are able to store images, shapes, colors and experiences in their brains. For a long time, it was generally believed that intelligent behavior in insects was superfluous, as most only live for a few weeks. Earwigs live for about a year; as babies, their mothers apparently teach them how to nurture their own brood. What's even more surprising: insects from the same clutch can develop different personality traits. In horseradish flea beetles, for example, some are braver than others. And, as evolutionary biologist Elizabeth Tibbetts says: "Paper wasps are as bitchy as the protagonists of Game of Thrones." The animals plot, betray colleagues and fight to the death to be queen. The insect world is much more complex than

previously thought. One reason is that any species with a wide range of diverse individuals can better adapt to climate changes - an evolutionary advantage for survival.

The question is would you like to see this type of content available on our Facebook page or another medium that you would use. Please let us know what you think and we'll look at what we can do.

Link and Alert newsletters

<https://www.royalsociety.org.nz/fellows-and-members/link-news/2024/july/>

Don't forget you can subscribe to the RSNZ Te Apārangi weekly Alert newsletter shares events, news, and opportunities for those interested in exploring and discovering knowledge or reading past issues at <https://www.royalsociety.org.nz/whats-happening/alert-newsletter/>.

Upcoming Branch talks, field trips, and related activities

Christchurch talks

November

Prof Ben Kennedy University of Canterbury, The Prime Minister's Te Puiaki Whakapā Pūtaiao Science Communicator 2023.

See above for talk details.

Suitable for a general audience. All welcome. 6:30pm start with tea, coffee and light refreshments. Talks commences at 7pm.

VENUE/DATE

Ara, City Campus - Building DL, Room DLEC
130 Madras Street, Christchurch Central City, Christchurch

You can register at <https://www.royalsociety.org.nz/events/the-silly-and-serious-sides-of-volcano-science-communication-christchurch>

Timaru talks

No events planned

Upcoming field trips

Christchurch

Saturday 9th November 1.30pm-3.30pm
University of Canterbury Campus

Come and learn about the restoration of the waterways that flow through the campus, past, present, and into the future with Prof Seamus Moran and others. It will be a combination of talk and tour.

Also, we believe the new Geo- Garden at the campus will be opened by then so we might add this to the visit. We will limit this to 20, so if you want to come, email r.fagg@xtra.co.nz to register.

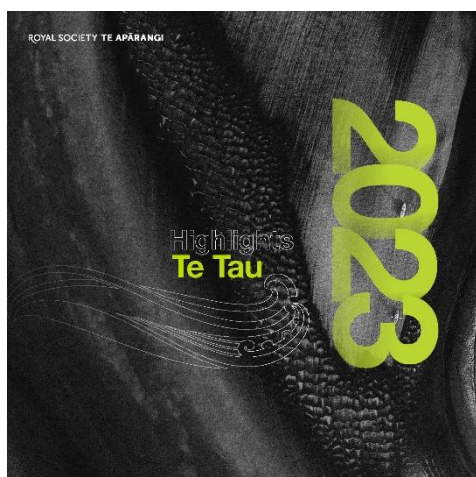
If you know anyone who might be interested, bring them along too.

And don't forget our CO2 monitor you can borrow. Contact us and we'll arrange for you to pick it up. A guide to recommended CO2 measurements can be found at <https://www.rnz.co.nz/news/in-depth/470690/whose-breath-are-you-breathing>.

All we ask in return is that you post your findings on either the branch's Facebook page or Twitter.

From other branches and RSNZ Te Apārangi

From Royal Society Te Apārangi



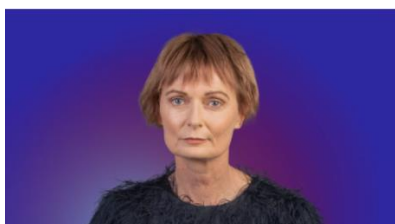
[Te Tau Highlights 2023](#)

View Te Tau Highlights 2023 – our year in review!

Learn more about the activities of Royal Society Te Apārangi in 2023, arranged under our four strategic priorities determined by our [long-term strategy](#):

- Knowledge Pathways
- Influence and Impact
- People and Partnerships
- Independence and Growth.

[Read more](#)



[PM's Chief Science Advisor job open since July](#)

A significant situation vacant is causing concern in the science world and beyond. The government won't say whether it's keeping the role of Prime Minister's Chief Science Advisor; a job that has been empty since July.

Checkpoint @RNZ



[Applications for STLP 2025 \(commencing Term 3, 2025\) - Live now!](#)

We are pleased to announce that applications for 2025's second Science Teaching Leadership Programme cohort commencing in Term 3 are now open. Tono mai and apply now!

STLP provides opportunities for primary schools, secondary science departments and their nominated teachers to enhance the teaching of science within school communities.

STLP is funded by the Ministry of Business, Innovation and Employment with an aim to transform science education in schools by:

- Enhancing science programmes to better engage students and develop their science knowledge and skills
- Contributing to the professional learning and development of teachers
- Building links between schools and practising scientists

[Find out more and apply!](#)

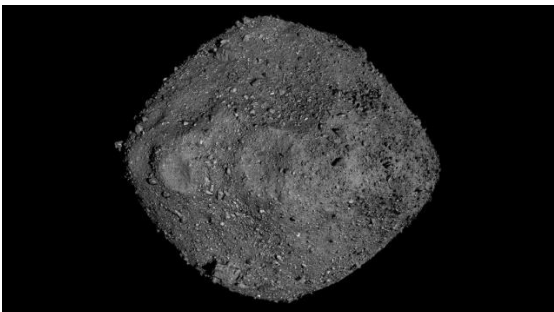
["Hawke's Bay Scientists on Air" radio broadcasts](#), which we support, now go to air each second Monday after the 10:00 am news.

"Talking About" is the Otago Institute's podcast series. It features topical conversations about anything and everything from the worlds of Arts, Sciences, and Mātauranga Māori.

<https://oar.org.nz/oi-podcast/>

Other items of interest

From Science News



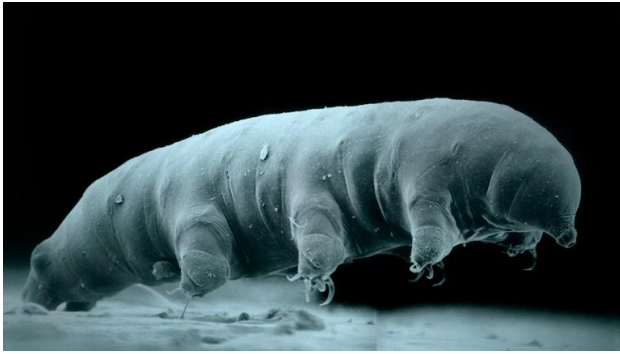
[A near-Earth asteroid offers clues to one dark matter theory](#)

Data from the OSIRIS-REx mission to Bennu place a ceiling on the strength of a hypothetical fifth force that could explain dark matter's origins.

[Read More](#)

The asteroid Bennu (shown) was carefully tracked as part of NASA's OSIRIS-REx mission, allowing scientists to check its orbit for signs of a hypothesized fifth force. Goddard/NASA, Univ. of Arizona

From Nature



The new species is similar in appearance to this *Hypsibius* sp. tardigrade, photographed using an electron microscope.
Credit: Robert Schuster/Science Photo Library

[Water bear genes provide radiation shield](#)

A newly described species of tardigrade (*Hypsibius henanensis*) is giving scientists insights into what makes these tiny eight-legged creatures so resistant to radiation. Scientists sequenced the genome of this new species and identified [thousands of genes that become more active when exposed to radiation](#). These processes point to a sophisticated defence system that involves protecting DNA from the damage that radiation causes and repairing any breaks that do occur. They hope that these insights could be harnessed to protect humans exposed to radiation during space missions or to improve cancer treatment.

[Nature](#) | [4 min read](#)

Reference: [Science paper](#)

From Science News



Polar bears are being exposed to more pathogens as the climate warms

Polar bears have been exposed to more viruses, bacteria and parasites in recent decades, a new study shows, possibly acquiring the germs in their diet.

[Read More](#)

That's all for this month. Don't forget you can keep updated on the branch's Facebook page Canterbury RSNZ Branch or Twitter @CanterburyRSNZ.

If have any suggestions for speakers, field trip ideas, or even contribute something to the newsletter please contact us and if you want to help us, please contact us, your input is valued. and we are always willing to discuss anything regarding the branch with you.

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