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Measurement Standards Laboratory of New Zealand

# e!aborate

## July 2022

### Tēnā koutou

It was so wonderful to see many of you on World Metrology Day in May. We at MSL really appreciated the opportunity to celebrate our community and think together about what the future holds for us. If you missed it, the presentations are available on our YouTube channel – check out the link below.

We are also excited to share that over the past quarter our electrical and time standards have completed the move into their new laboratories. We look forward to fully re-establishing all the associated services, and are on track to deliver a full suite of training courses in August – registrations are still open!

As ever, we are proud to work with all our national quality infrastructure partners in Aotearoa, New Zealand.

Aku mihi nui, noho ora mai | Many thanks, stay well.

Annette Koo
Acting Director and Chief Metrologist


### World Metrology Day Celebration 2022

To our stakeholders, customers and special guests who joined us for World Metrology Day, either in-person or virtually – thank you! We hope you enjoyed reconnecting as much as we did, and found the presentations and laboratory tours informative and interesting.

We would also like to acknowledge and thank our presenters for their time and for sharing their expertise with informative presentations.

Annalyse Ryan and Shairae Taepa, young metrologists in commercial calibration laboratories in Auckland and Lower Hutt respectively, were the two recipients of the Metrology Society of Australasia's Emerging Metrologists of the Year Awards – showing rangatahi the way into STEM careers.

**Presentations can be viewed here**

## Celebrating the end of the McKay Building

On Thursday 2 June, the Gracefield Innovation Quarter (GIQ) Programme team and the MSL team held a celebration ahead of the demolition of the McKay Building.

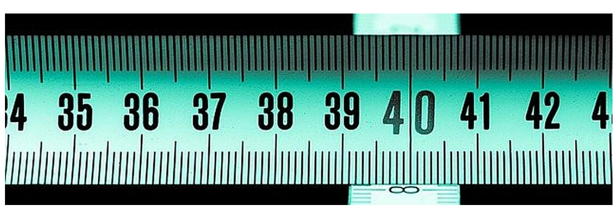
The McKay Building has been at GIQ since the 1940s, and was one of the first laboratories in New Zealand to develop key skills in precision engineering. The volume of work over that period saw as many as 180 staff working at this site, playing a vital part in New Zealand's munition production. Staffed primarily by women during the war era, the first lady of the United States at that time, Eleanor Roosevelt, came down to visit the facilities and open the building!

*Mrs Eleanor Roosevelt visiting the Dominion Physical Laboratory, Gracefield, Lower Hutt, Wellington. Pascoe, John Dobree, 1908-1972 :Photographic albums, prints and negatives. Ref: 1/4-000532-F. Alexander Turnbull Library, Wellington, New Zealand. /records/22810544*

We heard stories from Keith Jones, Laurie Christian and Peter Saunders – all former McKay residents, with Laurie and Keith working on metrology within McKay since the late 1970s.

The demolition concludes the tremendous team effort to coordinate and move the scientific equipment housed there to the Temperature and Electrical Standards' new fit-for-purpose laboratories, all while the team battled lock-downs and continued with their valuable work.

Looking to the future, Callaghan Innovation aims to develop a successful innovation quarter at Gracefield, as we support a modern research, science and innovation system that also aligns with national and regional strategic priorities and vision in this space.




## August Training Courses

Support your laboratory's accreditation and your professional development by attending our measurement training courses. Or perhaps you're keen to branch into a new testing area?

MSL have a variety of practical courses to choose from depending on the area you need to upskill in. These practical, hands-on training workshops present real laboratory situations and demonstrate how to develop new techniques and procedures to ensure constant improvement.

As members of New Zealand's national metrology institute, our trainers are specialist metrologists, world experts in fact, and you have the opportunity to learn from them. The training won't stop at the door on the way out either, because our scientists will continue to support course attendees once back in the laboratory and applying the knowledge.

Find out more


## Conference on Precision Electromagnetic Measurements (CPEM)

For scientists working in this sector, there's no more prestigious conference than CPEM. As co-hosts, it is a wonderful opportunity to showcase New Zealand's metrology expertise on a global stage, and for our young scientists to establish important connections with overseas experts. We're particularly excited to welcome our collaborators and colleagues who have generously helped us over the years.

Find out more to keep up to date and view the Conference Programme outline.

Find out more

## Staff Spotlight

This month we bid farewell to **Eleanor Howick.** Eleanor has been with the organisation for more than 30 years and has built a great reputation both locally and internationally through technical leadership in length standards, held a number of roles as an MSL international representative and until recently New Zealand's Chief Metrologist. She has been instrumental in building MSL's strong capability in length standards, including our soon-to-be commissioned world-class coordinate measurement facility. We wish Eleanor all the best for her future endeavours.

**Peter Saunders** has recently been collaborating with the National Research Council in Canada, where they have been using Peter's software to determine a consistent relationship between $T$ and $T_{90}$; i.e, between the real physical temperature and the practical temperature scale that is used worldwide.

This work will eventually be published on the International Bureau of Weights and Measures (BIPM) website and made available for everyone worldwide to use. Peter has also been invited to serve on the International Program Committee (IPC) for the 10th International Temperature Symposium to be held in California in April 2023.

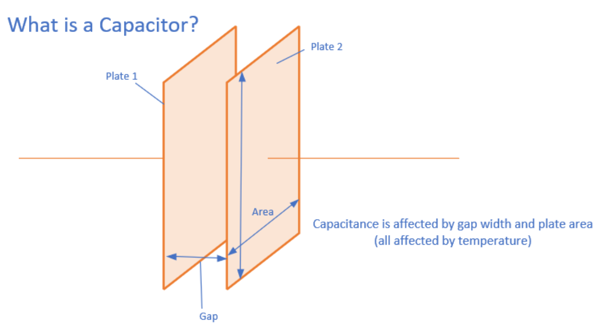

## What is a Calculable Capacitor and how does it support our measurement standards?

The farad is the unit of capacitance, which is a measure of the ability to store and release energy, and at Gracefield capacitance is measured accurately using a calculable capacitor. In the late 1970s, nine countries attempted to build a calculable capacitor, and only four were truly successful – the one here at Gracefield is one of the original four. Andrew Corney was the designer, and Keith Jones played a key role in gaining international confidence in its accuracy.

The purpose of the calculable capacitor is to create a capacitance very accurately, without needing another capacitor to compare it against, which makes it a primary standard and a foundation for measurement.

Made of invar, aluminium, brass and stainless steel, this valuable piece of equipment, while very heavy, is also quite delicate, making it susceptible to damage from physical impact and any tilting. It is also very unlikely to be recommissioned if damaged.

A capacitor is essentially two metal plates separated by a gap. If you know the area of the plates and the size of the gap, then you can work out the capacitance. However, when working at high precision the change in the area of the plates and the size of the gap with temperature is significant, and it is very difficult to account for even tiny temperature changes.




However, if you replace the two plates with four parallel rods of constant cross-section, then with clever electrical and mechanical engineering you can produce a capacitance that is only dependent upon the effective length of the rods. And if you measure this length using a frequency-stabilized laser, you can produce a standard of capacitance with an accuracy of a few parts in 100 million.

There is a lot more metrology wizardry that goes into it, because the capacitance measured is less than a millionth of a millionth of a Farad, but that is what metrologists are good at.

The calculable capacitor now sitting in the new laboratory in Lower Hutt has its origins in the paper published on electrostatics in 1956 by two Australian metrologists, Thomson and Lampard. What's particularly interesting is the way classical physics has been used to create a highly accurate electrical primary standard, unlike the ohm and the volt which require quantum physics.

Primary standards are critical to everything we do in metrology, as they are used to create more usable standards, such as those used to calibrate electricity meters and commercial multimeters.


## Metrology Society of Australasia Conference

The CPS/MSA conference is an opportunity for measurement professionals to meet, discuss, learn, interact, and enjoy a high-quality scientific programme. Registrations opened on 12 July 2022. To find out more and keep up to date, check out the conference programme outline.

Find out more

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Tell us what sort of information you would like to receive in future updates from us by emailing info@measurement.govt.nz



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