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# NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY

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# PUBLISHER'S NOTICE

This newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was edited by Marie Graff and Florian Lehner. Editorial enquiries and items for submission to this journal should be submitted as plain text or LaTeX files with "NZMS newsletter" in the title of the email to newsletter@nzmathsoc.org.nz. LaTeX templates are available upon request from the editors.

The official address of the Society is:

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## NZMS Council and officers



## Other positions of responsibility



## Correspondents



### Web Sites

NZMS homepage: nzmathsoc.org.nz (Webmaster: david.bryant@otago.ac.nz)
The newsletter is available at: nzmathsoc.org.nz/newsletter/
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# EDITORIAL

Kia ora koutou,

The first half of the year has already gone by and there is so much to report! Check our PhD successes and local news. The spotlight in August is on Rod Downey, who received the 2024 Kalman Prize for Best Paper.

We also would like to acknowledge that we received a couple of spontaneous contributions, which add value to this issue, in particular:

- The new headcount of staff in Mathematics and Statistics by Astrid an Huef and Vivien Kirk, to report on the evolution of the numbers in NZ universities;
- As a follow-up on $\pi$-day (see previous issue), John Mahony proposes a fun representation of the decimals of the transcendental number using pies!

If you wish to contribute in the next issue as well, feel free to get in touch before mid-November via email at newsletter@nzmathsoc.org.nz. We are looking forward to seeing many of you at the NZMS colloquium in November.

*Marie Graff and Florian Lehner*

# PRESIDENT'S COLUMN

It is still winter but the days are getting noticeably longer, with the offical start of spring upon us. This means that we are already in the second half of 2025 and the middle of semester two. So what happened since April from the perspective of the NZMS?

You may already be aware that the government's funding for the Advanced Technology Institutes will come in part from further reductions in research funding, including the Marsden fund. While it is not entirely clear how this will affect direct funding for mathematics, science research funding more generally is under increasing pressure. In combination with the simultaneous requirement for Marsden applications to demonstrate direct potential economic, environmental or health benefits, fundamental research in all sciences is under threat. And, as you will have heard, the Marsden Humanities and Social Sciences panels are being disestablished.

These developments are not good for us as mathematicians (and citizens), whether on the pure or the applied side. The Save Science Coalition, of which the NZMS is a member organisation, has been raising awareness of the challenges posed by the changing research landscape; you can find more information about this topic at http://scientists.org.nz/Save-Science-Coalition.

On happier news, we re-registered our Constitution under the new rules, which required jumping over a few last hurdles. Thanks once more to Stephen Joe for managing and completing this lengthy process, which means that we keep existing as a legally recognized society!

Finally, thanks to all who have already submitted nominations for our different prizes. I trust and hope that some more of you will still do so before the deadline of 31 August. Please see http://nzmathsoc.org.nz/awards/ for details.

All the best,

*Bernd Krauskopf*

# EDUCATION

At the beginning of August the Government announced a proposal to scrap NCEA Levels 1–3 and replace it by new secondary qualifications (See https://www.education.govt.nz/have-your-say/consultation-proposal-replace-ncea/details. Scroll down to get links to the Discussion document.). Consultation has opened on the proposal until 15 September, 2025.

The proposed qualifications are:

- Foundational Award by Year 11
- NZ Certificate of Education at Year 12
- NZ Advanced Certificate of Education at Year 13

The Foundational Award replaces the literacy and numeracy requirements for NCEA Level 1, and can be earned any time between years 9-11. All students will be expected to stay at school until at least Year 12 and work towards a certificate.

It feels like a return to the pre-NCEA setup (School Certificate, then Sixth Form Certificate, then Bursay). The example in the discussion document of what a student's record might look like, is similar to an old Bursay certificate: each subject scored out of 100, and a total score out of 500 from 5 subjects.

The new certificates will be standards based like NCEA, rather than norm based like the old bursay. In other words, no scaling of marks to fit some model curve.

What does this mean for mathematics? Many of us would agree with the main points raised in the document. We would support fewer, larger, and more holistic assessments. These points were raised in the review of NCEA three years ago, and it was agreed to drastically reduce the number of achievement standards in each subject.

### Marking

Instead of Achieved/Merit/Excellence grades, student work would be marked numerically and letter grades A, B, C, etc. determined accordingly.

It took me some time to understand how marking was done in the A/M/E system. Questions on a particular topic were set at different levels (an 'achieved question', followed by a 'merit question', etc.). Teachers used things like the pyramid levels on Bloom's Taxonomy[1] to set the level of a question (Does it test basic knowledge? Does it test a deeper understanding? etc. )

If a student could demonstrate excellence on a particular topic in an exam by answering the 'excellence' questions correctly, they did not have to bother answering the 'achieved' questions. Judging by recent exemplars on the NZQA website, this was standard practice. (See https://www.nzqa.govt.nz/nqfdocs/ncea-resource/exemplars/2024/91577-exp-2024-excellence.pdf as an example.)

A mathematics problem has its own mathematical structure that doesn't necessarily fit neatly into an educational schema. Systems like Bloom's Taxonomy are useful to guide the creation of assessments, but when it comes to marking, assigning partial marks is just a lot easier. A student with a deep understanding will generally do better on problems than one with a superficial understanding. Performance should average out so that in the end, the overall mark obtained by a student gives a sufficiently good indication of their level of understanding.

### Conclusion

The new qualifications continue along the path of fewer, larger assessments, as recommended in the review of NCEA. The main change seems to be the return to traditional (numerical) marking. This would be better for mathematics, and also prepare students for the type of assessment encountered at university.

Finally: teachers have been hit with a blizzard of changes in curriculum and assessment over the last few years. The success or failure of these changes depends largely on them, and whether they have the required support.

*Sione Ma'u*

[1] See e.g. https://ltl.lincoln.ac.nz/teaching/plan-your-teaching/learning-outcomes/blooms-taxonomy/

# 2025 HEADCOUNT OF STAFF IN MATHEMATICS AND STATISTICS IN NZ UNIVERSITIES

## Summary

In 2018, the NZMS committed to gather and present data on the gender distribution of academic staff in Schools or Departments of Mathematics and/or Statistics in universities in NZ. We collected data in 2018 and 2019, then every year since 2022. We published summaries of our findings in the NZMS Newsletters in December 2018, December 2019 and August 2022. Below we present 2025 data and compare it to data obtained in 2019 and 2022.

A notable feature of our findings is a significant (10%) reduction in headcount across the country for Mathematics compared with 2019 numbers, resulting from a small increase in headcount for women (5) and a sharp decrease in headcount for men (20); our detailed data suggests the sharp decrease in headcount for men has come about largely through retirements without replacement. Over the same period, the headcount for Statistics has had a more modest decrease (6%) resulting from a decrease in headcount of 5 women and 2 men.

Overall numbers of staff of under-represented genders in Mathematics and Statistics remain low (currently 33% for Mathematics and 37% for Statistics); this is especially the case at senior levels, but these numbers are increasing as women are promoted.

## Methodology

We have retained the same methodology as in previous years. That is, we collected data by looking at university webpages, and then asked an appropriate person in each Department or School (usually the head of the academic unit) to check the data we had obtained. Every year, we have used a census date of March 1st.

Our methodology restricts the type of data we can collect, as follows.

- Our numbers are a headcount and do not take into account the FTE of each staff member. In particular, reduction of an individual's FTE for any reason (including as an outcome of an employment process) is not captured. A number such as 0.5 in our data represents one person split across multiple roles, e.g., 0.5FTE in Mathematics and 0.5FTE in Statistics.
- Over the years we have collected data, many universities have developed Data Science programmes, which typically cross traditional disciplinary boundaries. This blurs the distinction between Mathematics and Statistics in our data.
- We have included fixed-term and permanent employees. We have not included emeritus staff or those with honorary positions.
- Our data groups all staff in teaching-only positions into one category. This is because we do not have access to data about levels within that category for most universities. For instance, at the University of Auckland there are clear distinctions between the roles and responsibilities of staff on the different levels within the Professional Teaching Fellow scale but the level of an individual within this scale is not publicly available.
- We collected data from the following universities: Massey, Auckland, AUT, Waikato, VUW, Canterbury and Otago. Because Lincoln University does not have a School or Department of Mathematics and/or Statistics, we have again been unable to find comparable information for Lincoln University.

Following NZ regulations on gender, individuals are assigned a gender of Male (M), Female (F) or Gender Diverse (X). As the number of individual's in the Gender Diverse category is small and they are likely to be as under-represented as those identifying as Female we group these two categories into a single one (F/X). A weakness in our methodology is that the data we have access to does not identify gender; we continue to record presumed gender. Our hope is that, in the future, universities might be able and willing to share gender data with us.

We welcome comments and advice on better methods for data collection.

## Data

Table 1 shows overall participation rates by gender and academic level. Only 13 (24%) of Associate Professors and Professors in Mathematics are female or gender diverse. However, this is an increase from 11 (18%) in 2019. As part of this, there has been a notable increase in the number of female and gender diverse Mathematics Professors from 3 to 8. In Statistics, 13 (35%) of Associate Professors and Professors are female or gender diverse compared with 11 (35%) in 2019. The number of female and gender diverse Professors in Statistics has increased from 3 (23%) to 7 (44%) over that time.

| 2025 data | Female and Gender Diverse, Maths | Male, Maths | Female and Gender Diverse, Statistics | Male, Statistics |
|---|---|---|---|---|
| Postdocs and research fellows | 3 (33%) | 6 (67%) | 5 (50%) | 5 (50%) |
| Teaching only positions | 16.5 (54%) | 14 (46%) | 14.5 (53%) | 13 (47%) |
| Lecturers (including fixed term) | 2 (22%) | 7 (78%) | 3 (30%) | 7 (70%) |
| Senior Lecturers | 9 (30%) | 21 (70%) | 8 (24%) | 25 (76%) |
| Associate Professors, Readers | 5 (23%) | 17 (77%) | 6 (29%) | 15 (71%) |
| Professors | 8 (24%) | 25 (76%) | 7 (44%) | 9 (56%) |
| **Total** | **43.5 (33%)** | **90 (67%)** | **43.5 (37%)** | **74 (63%)** |

**Table 1:** Overall participation rates by gender and academic level.

Table 2 also shows notable changes from 2019. In Mathematics, Massey University, the University of Otago and the University of Waikato have seen decreases in headcounts of 6 (30%), 3.5 (23%) and 4 (36%), respectively, relative to 2019. In Statistics, Auckland, AUT, Massey and Victoria University of Wellington have seen decreases in headcount by 9 (18%), 1.5 (19%), 5 (29%), and 2.5 (15%), respectively. On the other hand, the Universities of Canterbury and Otago increased headcounts in Statistics by 6.5 (42%) and 4.5 (35%), respectively, since 2019.

Some universities have seen increases in percentage participation rates of females and gender diverse people in Mathematics since 2019, but these appear to be largely driven by greater retirement and resignation rates by males rather than significantly increased hiring of people of other genders. On the other hand, in Statistics, there has been an overall 10% drop in headcount for women and gender diverse staff with an accompanying drop of 2% in percentage participation rate; see Table 2.

As in earlier years, the distribution across ranks is significantly different for different genders.

| | Female and Gender Diverse, Maths | Male, Maths | Female and Gender Diverse, Statistics | Male, Statistics |
|---|---|---|---|---|
| 2019 Auckland | 15 (35%) | 28 (65%) | 24 (48%) | 26 (52%) |
| 2022 Auckland | 16 (34%) | 31 (66%) | 23 (52%) | 21 (48%) |
| **2025 Auckland** | **17 (40%)** | **26 (40%)** | **20 (49%)** | **21 (51%)** |
| 2019 AUT | 4 (29%) | 10 (71%) | 3 (38%) | 5 (62%) |
| 2022 AUT | 6.5 (42%) | 9 (58%) | 2.5 (38%) | 4 (62%) |
| **2025 AUT** | **9 (62%)** | **5.5 (38%)** | **1 (15%)** | **5.5 (85%)** |
| 2019 Massey | 5 (25%) | 15 (75%) | 5 (29%) | 12 (71%) |
| 2022 Massey | 3 (21%) | 11 (79%) | 5 (33%) | 10 (67%) |
| **2025 Massey** | **3 (21%)** | **11 (79%)** | **4 (33%)** | **8 (67%)** |
| 2019 Waikato | 1 (9%) | 10 (91%) | 1 (25%) | 3 (75%) |
| 2022 Waikato | 1 (11%) | 9 (89%) | 1 (17%) | 5 (83%) |
| **2025 Waikato** | **1 (14%)** | **6 (86%)** | **1 (25%)** | **3 (75%)** |
| 2019 VUW | 3 (14%) | 18 (86%) | 8 (47%) | 9 (63%) |
| 2022 VUW | 5.5 (26%) | 16 (74%) | 5.5 (35%) | 10 (65%) |
| **2025 VUW** | **5.5 (28%)** | **14 (72%)** | **5.5 (38%)** | **9 (62%)** |
| 2019 UC | 8.5 (35%) | 16 (65%) | 4.5 (29%) | 11 (71%) |
| 2022 UC | 9.5 (33%) | 19.5 (67%) | 3.5 (22%) | 12.5 (78%) |
| **2025 UC** | **7 (29%)** | **17 (71%)** | **7 (32%)** | **15 (68%)** |
| 2019 Otago | 2 (13%) | 13 (87%) | 3 (23%) | 10 (77%) |
| 2022 Otago | 1 (10%) | 9 (90%) | 4 (27%) | 11 (73%) |
| **2025 Otago** | **1 (9%)** | **10.5 (91%)** | **5 (29%)** | **12.5 (71%)** |
| 2019 Total | 38.5 (26%) | 110 (74%) | 48.5 (39%) | 76 (61%) |
| 2022 Total | 42.5 (29%) | 104.5 (71%) | 44.5 (38%) | 73.5 (62%) |
| **2025 Total** | **43.5 (33%)** | **90 (67%)** | **43.5 (37%)** | **74 (63%)** |

**Table 2:** Participation rates by gender and university. Numbers in brackets show the percentage of all staff in the discipline (Maths or Stats) at that university that fall into each gender grouping.

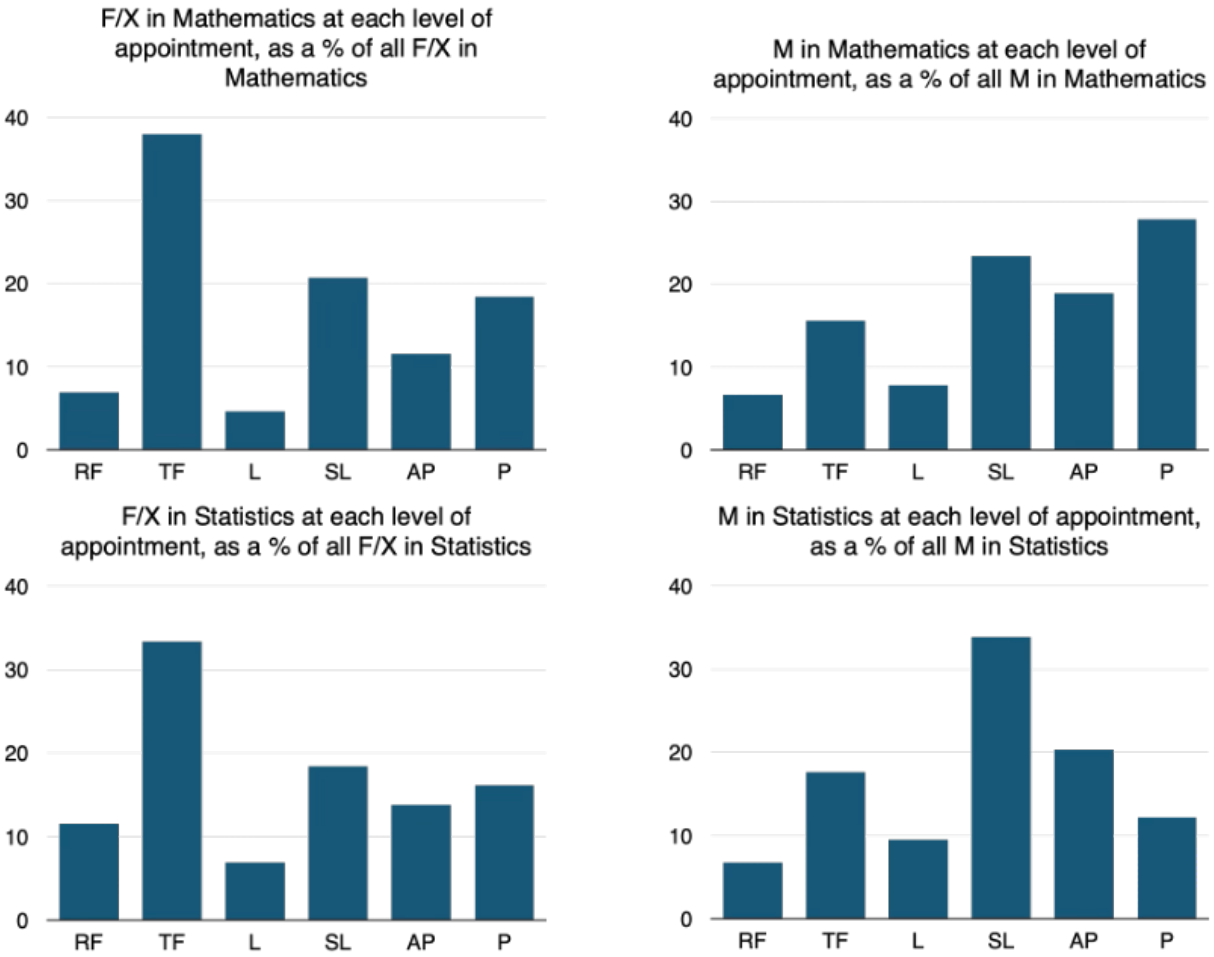



**Figure 1:** Distribution of genders across the academic grades. RF=Postdocs, Research Fellows and Senior Research Fellows, TF=Teaching only positions, L=Lecturers (including fixed term), SL=Senior Lecturers, AP=Associate Professors and Readers, P=Professors. F=Female, X=Gender Diverse, M=Male

The overall percentages for each gender are heavily influenced by numbers at the University of Auckland. Since Auckland is the biggest university, its relatively high proportion of underrepresented genders partially obscures the lower rates elsewhere; see Tables 2 and 3.

| | Female and Gender Diverse, Maths | Male, Maths | Female and Gender Diverse, Statistics | Male, Statistics |
|---|---|---|---|---|
| 2025 Auckland | 17 | 26 | 20 | 21 |
| 2025 Rest of NZ | 26.5 | 64 | 23.5 | 53 |
| 2025 Auckland as a % of NZ total | 39% | 29% | 46% | 28% |

**Table 3:** Overall participation rates for the University of Auckland compared with the rest of the NZ universities.

It remains the case that a large proportion of people employed in teaching-only positions are of underrepresented genders. These proportions have increased in Mathematics and decreased in Statistics since 2019; see Table 4.

| | Female and Gender Diverse, Maths | Male, Maths | Female and Gender Diverse, Statistics | Male, Statistics |
|---|---|---|---|---|
| 2019 Research required | 26 (21%) | 95 (78%) | 34 (34%) | 67 (66%) |
| **2025 Research required** | **27 (26%)** | **76 (74%)** | **29 (32%)** | **61 (68%)** |
| 2019 Research not required | 13 (46%) | 15 (54%) | 14 (61%) | 9 (39%) |
| **2025 Research not required** | **16.5 (54%)** | **14 (46%)** | **14.5 (53%)** | **13 (47%)** |

**Table 4:** Participation by type of position. Numbers in brackets show the percentage of all staff in the discipline (Mathematics or Statistics) with that job type that fall into each gender grouping.

## Conclusion

We are saddened to note the overall decrease in headcount of staff in Mathematics and Statistics in our universities, and the personal and professional loss to our community that this represents.

Given the slow progress towards gender equity demonstrated by this data, we repeat our call on the NZMS and the Schools and Departments of Mathematics and/or Statistics to review their initiatives to recruit, retain and promote people of underrepresented genders.

*Astrid an Huef and Vivien Kirk*

# AN APPOSITE USE OF THE PIE (PI) CHART

A variety of ways have been employed by educators over the years to remember, to some degree of accuracy, the value of the transcendental number $\pi$. In the early days of schooling, students were encouraged often to employ simple integer-ratio approximations such as 22/7 or 355/113 to represent the beast. Of course, it is possible to develop even larger and more complicated integer-ratios to good effect at greater accuracy, but these come at the cost of having to remember the required integer digits and their relative positions. One might then just as well train the mind to remember the digits in $\pi$ to the accuracy required. The purpose of this comment is to develop an aide memoire that will facilitate this process visually. Other, linguistic visual processes have been constructed to do just this to good effect, and these typically employ a sentence construction where the number of letters in each consecutive word of the sentence represents the magnitude and order of the consecutive digits in $\pi$. For example, by Googling the words "Linguistic ways to remember Pi" it is possible to find the expression "May(3) I(1) have(4) a(1) small(5) container(9) of(2) coffee(6) ... ", which produces the approximation 3.1415926. The aide-memoire proposed here is different and draws, not surprisingly and quite appropriately from a linguistic perspective, on the notion and use of a Pie (Pi) Chart, the notion of which will be assumed is well known.

Generally, such charts are circular, graphical artifices showing slices (sectors of a circle) of varying thicknesses that represent magnitudes of the pie's component parts. Such parts represent quantities of interest that depend on the discipline under discussion. For the present purpose, the arc lengths of such sectors will represent the digits of $\pi$ in order of appearance as one traverses the pie circle, once. The number of digits chosen depends on the accuracy to which one wishes to represent $\pi$. An excel spread sheet and its facilities are particularly well suited to the process of producing such charts and the process can be explained with reference to, say, a value of Pi to fifteen decimal places, viz., 3.141592653589793. Here there are 16 digits and they sum to 80. Hence, if they are to be distributed around a circle, the unit of angular separation will be 360/80 (=4.5) degrees. A circle can then be constructed with this angular separation using a spread sheet plot with the option of "Scatter with Smooth Lines and Markers". Then, the first digit, 3, will span 3x4.5 (=13.5) degrees and so on. At the end of each span, a line to the centre of the circle can be constructed, to result in effect, in a series of spokes and markers as shown in the figure below:

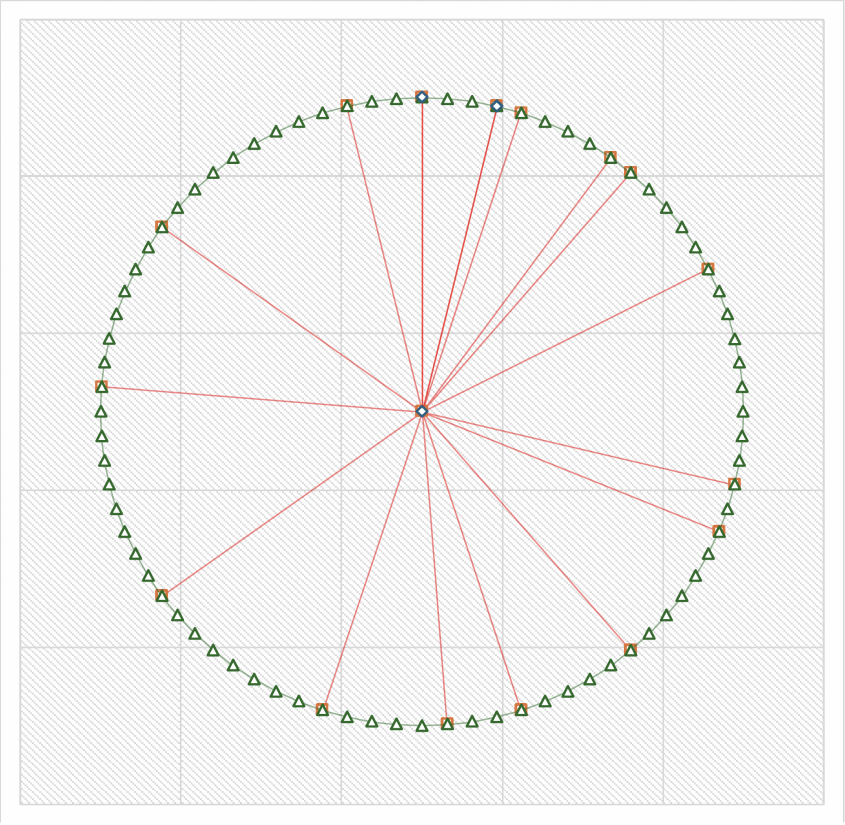


**Figure 2:** A Pie (Pi) Chart depicting $\pi$ to 16 decimal places

A similar exercise can be carried out also to depict $\pi$ to even greater accuracy (20 decimal places), as shown below

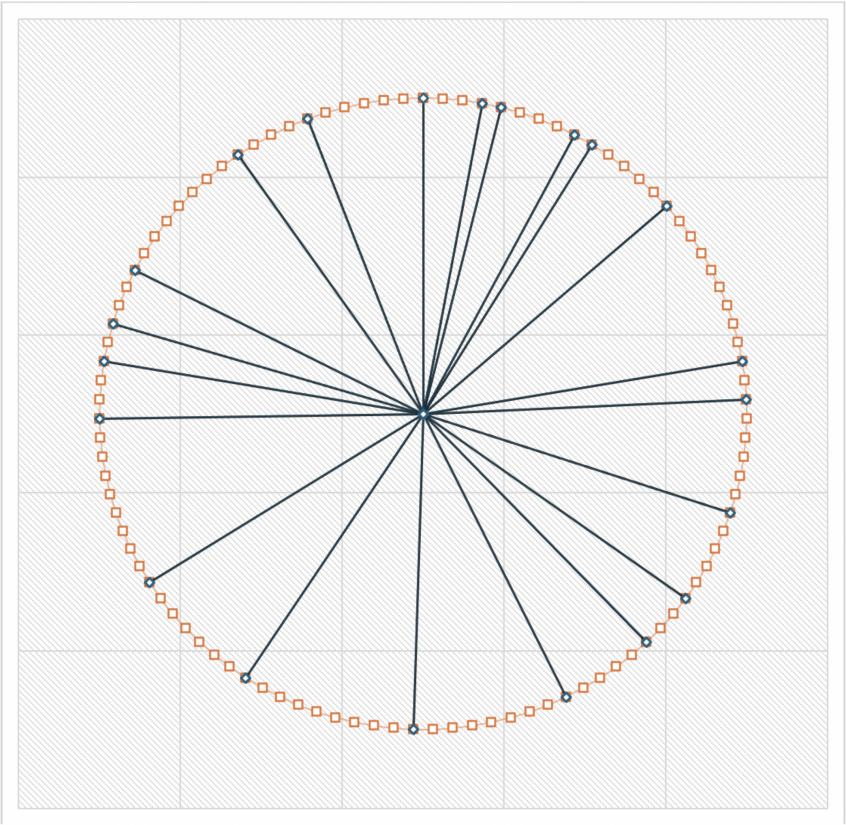


**Figure 3:** A Pie (Pi) Chart depicting $\pi$ to 20 decimal places

A method of depicting the transcendental number $\pi$ as an aide-memoire, to whatever required accuracy, has been described. Of course, it will not be well suited at a very high degree of accuracy because the picture will then loose its definition, unless of course the plot is presented on a very large platform. The above is well suited to mathematical classroom activities and such plots can be reproduced to fit classroom walls or embossed on T-shirts etc. The same process can be employed similarly to develop an aide memoire for other transcendental numbers such as "*e*", etc. Doubtless, it is possible to employ also software facilities other than those enshrined in an excel spreadsheet in order to produce the same aide-memoire.

*John D Mahony*

# PROFILE

## Rod Downey

Rod Downey
*Photo provided by Archives of the Mathematisches Forschungsinstitut Oberwolfach (MFO)*

Rod was born and raised in Brisbane, did his first degree at the University of Queensland, and graduated PhD from Monash University. He then held short-term appointments in the USA and a lectureship in Singapore before taking up a position as lecturer in mathematics at the Victoria University of Wellington in 1986. Over the last four decades he has built an extraordinarily productive and influential career, becoming one of the best researchers in the world in mathematical logic, focusing on the theory of computability and the complexity of computation.

He co-invented with Michael Fellows the field of *parameterized complexity*, based on the insight that many apparently intractable computations become feasible when the design of the algorithm exerts appropriate control over various parameters (e.g. shape, size, topology, engineering restrictions) concerning the input data. Widespread applications of this paradigm shift have been found in biology, medicine, linguistics, coding theory, databases and social choice research. Rod's leadership has made this into an important new branch of theoretical computer science, attracting many millions of dollars in research funding, and having its own international conferences series, books, and special issues of journals. Two large monographs on the subject by Downey and Fellows have attracted nearly 7000 Google Scholar citations.

Rod also initiated a comprehensive development of the study of *algorithmic randomness*, a subject that lies at the junction of computability theory, measure theory, and information theory. This resulted in an 850-page research monograph, co-authored with Denis Hirschfeldt, giving a unifying treatment of several related but historically separate approaches to the question of what makes a sequence of numbers or other symbols random. One connection to computability theory comes through the idea that a sequence can be viewed as being random if there is no short description for it, i.e. any computer program that generates a segment of the sequence must be as long, or

as complex, as the segment itself. There has been an explosion of work in this area in recent years, led by Rod with an army of co-authors, former students and post-doctoral supervisees. The Downey-Hirschfeldt book won the Shoenfield Prize from the Association for Symbolic Logic.

Another cornerstone of Rod's pre-eminent reputation is his large body of work on computable mathematics and the structure of degrees of unsolvability, accounting for around half of the 300-odd research papers, and several more books, that he has written.

A feature of his energetic working style is extensive collaboration and mentoring. He has travelled the world regularly, finding new contacts and co-authors, and attracting to NZ a steady stream of visitors who have contributed greatly to the creation of a vibrant research culture here. His publications involve more than 120 different co-authors. Particularly special is his record of supervision of post-doctoral fellows, 22 of them to date. Many newly graduated researchers in logic and computability from the USA and Europe have chosen to begin their post-doctoral careers by gaining the experience and benefit of Rod's guidance before taking up positions around the world, including at universities such as Berkeley, Bordeaux, Chicago, Illinois, and VUW.

Five students have completed PhD's under Rod's supervision and gone on to successful academic careers. Three received the NZ Royal Society's Hatherton Award for the best scientific paper by a PhD student at any New Zealand university in the physical and mathematical sciences. One also received the Sacks Prize from the international Association for Symbolic Logic for the best PhD thesis in logic of its year worldwide, and was awarded the highly distinguished Miller Research Fellowship to UC Berkeley.

Rod has contributed enormously to the research environment, both within NZ and internationally. This includes long service as chief editor of the leading journal in logic, and many other editorial and committee responsibilities, including chairing the evaluation of grant applications in the MIS area for the Marsden Fund. He currently edits six journals. He has served as NZMS President, and has performed a strong leadership role in initiating and organizing several large international conferences in NZ, partly through his role as a Director of the NZ Institute of Mathematics and its Applications. He was a co-founder of the NZ Mathematics Research Institute, which sponsors the annual NZ summer meetings. He was also a cofounder of the two annual conference series *Computability, Complexity and Randomness (CCR)*, and *International Conference in Paramaterized Complexity and Exact Computation (IPEC)*, which have been running for two decades.

His achievements and excellence have been recognized in numerous awards and honours. They include promotion to a Personal Chair at VUW and election as a Fellow of the Royal Society of NZ, which bestowed on him the Hamilton Award, the Hector Medal, a James Cook Fellowship, and the Rutherford Medal, the country's highest honour for research in any discipline. From the NZMS he has received its Research Award and the Kalman Prize for a jointly authored book in the Princeton Annals of Mathematics Studies series. He has received the prestigious Humboldt Research Prize and the European Association for Theoretical Computer Science's Nerode Prize for outstanding research in the area of multivariate algorithmics. He was the first NZ based mathematician, and the first logician from the southern hemisphere, to be invited to address the International Congress of Mathematicians. He is the only NZ based mathematician to have been elected a Fellow of the Association for Computing Machinery, the only ACM Fellow currently living in NZ, and one of the few to also be a Fellow of the American Mathematical Society. In 2023 he won the S. Barry Cooper Prize from the Association for Computability in Europe. The citation reads:

> "The award is given to a researcher who has contributed to a broad understanding and foundational study of computability by outstanding results, seminal and lasting theory building, and exceptional service to the research communities. Rod Downey has an impressive record of accomplishment on all three fronts, with a breadth of contribution that is truly outstanding."

For his 60th birthday in 2017, Rod's colleagues and students organized a festschrift in his honour, published in Springer"s Lecture Notes in Computer Science series and containing more than 40 research articles covering 750 pages. An international conference in Wellington and a month long special programme in Singapore on Rod's research were also held to mark this occasion. These were fitting tributes to someone who has made a tremendous contribution to the advancement of knowledge and development of the research environment, and has made an exceptional commitment of time and energy to fostering the careers of others and nurturing a new generation of excellent researchers.

Rod officially retired in April 2023, giving him more time for his eclectic hobbies, including teaching Scottish country dancing, surfing and oenology. But he has continued to engage in research and writing, with a seventh book due to be published. The following references contain further details of his life and career.

- Rod's own homepage, including his full CV and autobiographical writings:

  `https://homepages.ecs.vuw.ac.nz/~downey/`

- Wikipedia page about Rod: `https://en.wikipedia.org/wiki/Rod_Downey`

- Geoff Whittle, *Centrefold: Rod Downey*. Newsletter of the NZ Mathematical Society, Number 91. August 2004:

  `https://nzmathsoc.org.nz/wp-content/uploads/2024/03/NZMSnews91_Aug2004.pdf`

- Robert Goldblatt, *Cameo of a Consummate Computabilist*. In *Computability and Complexity: Essays Dedicated to Rodney G. Downey on the Occasion of His 60th Birthday* (Adam Day et al., eds.), Lecture Notes in Computer Science, vol. 10010, Springer, 2017, pp. 3–8.

  `https://doi.org/10.1007/978-3-319-50062-1_1`

*Rob Goldblatt*

# LOCAL NEWS

## AUCKLAND UNIVERSITY OF TECHNOLOGY

### SCHOOL OF ENGINEERING, COMPUTER AND MATHEMATICAL SCIENCES

#### Events

*The 1st AUT - CJLU Webinar on Mathematical Modelling and Data Analytics*

The College of Sciences at China Jiliang University and the Mathematical Modelling and Analytics Research Centre at Auckland University of Technology hosted a Webinar on Friday 18 July 2025. This session will follow the journey from both Universities into nurturing further research collaborations, highlighting real-world transitions and experiences.

*SMB MathNeuro Mini-Conference 2025*

On 12–13 June 2025, the Mathematical Neuroscience Subgroup of Society for Mathematical Biology hosted the **Virtual MathNeuro Mini-Conference**, bringing together researchers in mathematical neuroscience from across the globe. The meeting was organised by **Hammed Fatoyinbo (Auckland University of Technology)**, alongside other subgroup officers, Cheng Ly (Virginia Commonwealth University, US), Chitaranjan Mahapatra (University of Bordeaux, France), and Yangyang Wang (Brandeis University, US). The two-day programme featured four sessions spanning multiple time zones, with invited talks from leading international researchers including **Janet Best, Amitabha Bose, Carlo Laing, Rodica Curtu, Pulin Gong**, and others. The event provided a platform for the SMB Mathematical Neuroscience Subgroup to showcase new developments in modeling neural dynamics, from cellular processes to large-scale networks, and to strengthen international collaborations in the field.

*New Zealand Team Macleans College Wins Top Honour at International Mathematical Modelling Challenge Led by Dr. Kerri Spooner*

The New Zealand team from Macleans College has been awarded the prestigious International Outstanding Award at the 2025 International Mathematical Modelling Challenge (IMMC) Summit, held in Hong Kong. The team shares this top honour with South Korea's Minjok Academy.

The New Zealand team—Wai Lap (Alston) Yam, Jay Zhao, Bruce Zhang, and Zhiwei (Michael) Lu—was supported by Faculty Advisor Carl Fourie. Jay and Alston joined the team in Hong Kong after competing in the International Mathematical Olympiad (IMO), where Jay was awarded a Silver Medal.

This year's IMMC problem challenged students to design a model for "What would a good global sports league scheduling system look like?" The New Zealand team's innovative and rigorous approach earned them international recognition among the top 10 teams globally.

*Dr. Kerri Spooner*, New Zealand IMMC Coordinator and academic at Auckland University of Technology, was in Hong Kong with the team. "A truly exceptional result from a group of exceptional young men—and a very proud faculty advisor and teacher," she said. "There's a lovely irony in this year's outcome—the faculty advisor for the South Korean team is a former student of Macleans College. A win-win for Macleans!"

Since 2016, Dr. Spooner has led the IMMC programme in New Zealand, providing students with opportunities to develop their mathematical modelling skills and compete on the world stage. "The achievements of the teams are entirely their own. I simply provide the opportunity," she said.

Developing mathematical modellers equips young minds to tackle complex, real-world problems with clarity, precision, and creativity. Their skills contribute to smarter decision-making across industries, strengthening a country's innovation, resilience, and global competitiveness.

New Zealand's consistent success at IMMC includes Outstanding Awards in 2025, 2022, Meritorious Awards in 2021, 2019, 2016, and teams regularly receiving Honourable Mentions."

#### Overseas Visit

Prof. Jiling Cao returned from his Research and Study Leave in July. In late May, he participated in the 5th International Conference on Applied and Industrial Mathematics and Statistics 2025 (ICoAIMS) in Kuala Lumpur, with the theme Synergies in Mathematics, Statistics, and Data Science. After that, he visited Prof. Ji-Hun Yoon at Pusan National University in South Korea for three weeks to work on a research project in financial mathematics. In late June, he went to Verona in Italy to participate in the 12th General Advanced Mathematical Methods for Finance Conference before he came back to Auckland. After a long period of service as the HoD for the Department of Mathematical Sciences at AUT, he enjoyed his conference and research trip.

Dr. Cathy Hassell Sweatman has recently returned from a visit to the Systems Modelling Research Group,

Department of Mathematics, Faculty of Science and Technology, Universitas Airlangga, Surabaya, Indonesia. Cathy gave a plenary talk at the SYMOMATH 2025 International Symposium on Biomathematics, had discussions with staff and students, and gave a seminar to medical staff at the Rumah Sakit Universitas Airlangga teaching hospital.

*Cathy is presenting a seminar talk at SYMOMATH 2025, July 2025*

*Cathy is presenting a seminar talk at at the Rumah Sakit Universitas Airlangga teaching hospital*

### Conference Attendance

Dr. Shu Su attended the Crypto Winter 2025 Conference in Queenstown, which brought together regulators, academics, practitioners, and industry experts. The event featured in-depth discussions on taxation and regulatory frameworks for digital assets and blockchain technology. It also served as a valuable platform for professional networking and international knowledge exchange.

*Wenjun Zhang*

## UNIVERSITY OF AUCKLAND

### DEPARTMENT OF MATHEMATICS

### Staff News

Eamonn O'Brian received the Humboldt Research Award from the Alexander von Humboldt Foundation. This prestigious award recognises his lifetime academic record and his significant contributions to group theory. Specifically, Eamonn's research focuses on the development, implementation, and application of algorithms in group theory. His work has been instrumental in solving complex problems within the field and has been incorporated into widely used computational algebra systems like GAP and MAGMA. The award includes funding for research stays in Germany, enabling collaborations with German researchers.

Marston Conder was the invited speaker in the (online) Ural Seminar on Group Theory and Combinatorics, on 15 April, and an invited keynote speaker at the 8th conference on Graph Embeddings and Maps on Surfaces (GEMS 2025), at Trenčianske Teplice (Slovakia) 22–27 June, and an invited session speaker at the 2025 Conference on Theoretical and Computational Algebra, at Évora (Portugal) 29 June – 3 July.

Hinke Osinga and Bernd Krauskopf, with PhD students Sam Doak and Sanaz Amani participated in the 30th International Conference on Difference Equations and Applications (ICDEA 2025 https://icdea2025.sciencesconf.org/) 15-19 July in Guanzhou, China. Hinke gave a plenary lecture and Bernd, Sam, and Sanaz all gave talks in a special session on "Geometry of and dynamics on complicated invariant sets".

Steven Galbraith organised an online event on 11 August 2025 to celebrate 40 years of Elliptic Curves in Cryptography. During the event he interviewed Neal Koblitz and Victor Miller, whose papers in 1985 initiated this subject. Steven's co-organiser Tanja Lange managed the video platform and broadcast the event on youtube.

**Other News**

The International Conference on Experimental Continuation in Nonlinear Dynamics (XCON) brings together experts in the fields of experimental continuation and control-based nonlinear vibration testing. Bernd Krauskopf is considered one of the pioneers in this relatively new field and he has been invited as keynote speaker of this first meeting on innovative testing approaches for nonlinear systems. XCON will be held 28-29 August at the University of Liège, Belgium:

http://www.s3l.be/en/xcon

Several members of the dynamical systems group in the department banded together to surprise Bernd Krauskopf and Hinke Osinga with a group T-shirt to mark the spirit and camaraderie in the group at a moment when long-time members Dana C'Julio and Renzo Mancini will be leaving soon. We fully expect to see members wearing their T-shirts at the upcoming NZMS Colloquium.


The Mathematics Department hosted jointly with Engineering Science a group of staff and students from Northeastern University in Qinhuangdao for two weeks. The six undergraduate students got the opportunity to attend some undergraduate courses in Mathematics and Engineering Science, while the staff were able to interact with lecturers and find out more about our teaching. Dr Yuanyuan Xing gave a research seminar on "Some Problems on the Well-posedness of Euler-Poisson Equations".

The department also hosted the following visitors in the second quarter of the year:

- Clemens Dieter Puppe, Karlsruhe Institute of Technology
- Madhavan Venkatesh, IIT Kanpur
- Wojciech Jerzy Kaminski, Frankfurt
- Jakin Ng, Massachussets Institute of Technology
- Yuanyuan Xing, Dalian University of Technology
- Fernando Rodriguez Villegas, Abdus Salam International Centre for Theoretical Physics, Trieste

*Pedram Hekmati*

## UNIVERSITY OF WAIKATO

### DEPARTMENT OF MATHEMATICS AND DATA ANALYTICS

Abstract submission for the 2025 NZMS Colloquium is now open. A separate notice about the Colloquium appears elsewhere in this Newsletter. Apart from the Colloquium, it has been a quiet time for us.

A former University of Waikato graduate, Sean Irvine, was appointed in May as the Managing Editor of the On-Line Encyclopedia of Integer Sequences (OEIS). In this role he has taken over most of the daily tasks previously performed by Neil Sloane, the creator of OEIS. The OEIS now contains over 375,000 entries.

The last column reported that a Statistics Consulting Group had been established in the School of Computing and Mathematical Sciences. Seong Yoon has now joined this Group as a Lecturer in Statistical Consulting. His research interests encompass biostatistics, survival analysis, longitudinal data analysis, and survey sampling. He is particularly interested in developing statistical methods for time-to-event and longitudinal data, as well as collaborating with clinicians and multidisciplinary researchers on various biomedical research problems.

*Stephen Joe*

## MASSEY UNIVERSITY

### SCHOOL OF MATHEMATICAL AND COMPUTATIONAL SCIENCES

In May 2025 Indranil Ghosh and David Simpson attended the SIAM Conference on Applications of Dynamical Systems in Denver, Colorado. In August 2025 Indranil will complete his post-doc on hybrid dynamical systems at Massey University and start a new postdoc on mathematical neuroscience at University College Dublin.

Winston Sweatman participated in the Mathematics and Statistics in Industry New Zealand Study Group (MINZ) that was held in July at the University of Canterbury. He moderated a challenge brought by Fonterra. His son, a mathematics student at the University of Auckland, also joined him on this project.

Annalisa Conversano gave a 1-hour invited talk during the "Workshop on application of model theory to complex geometry and differential algebra" held at the Institute for Mathematical Sciences of the National University of Singapore, 7-11 July and a 1-hour invited talk at the conference "Model theory of tame expansions of topological fields" held at the University of Naples Federico II in Italy, 14-18 July.

In July Chris Tuffley attended the 2025 International Mathematical Olympiad on the Sunshine Coast in Queensland, Australia, as a member of the Problem Selection Committee. He flew to Australia two weeks before the start of the IMO to help prepare the shortlist of 31 problems from which the six problems for the contest papers were chosen, then took part in the exam marking process as joint Problem Captain for problem one ("sunny lines"). It was a fun and rewarding but at times very intense experience.

The IMO happening so close to home was also a great opportunity for us to host a joint pre-IMO training camp with several other teams, and in the months leading up to the IMO Chris handled the logistical arrangements for a camp with the Colombian, Netherlands, New Zealand and Portuguese teams at St Cuthberts College in Auckland. All four teams had a wonderful time. New Zealand had a very successful IMO, winning two silver medals and three bronze, and placing 38th of 110 teams — our fourth best ever percentile ranking.

In April PhD student Na Zhao returned to the South China University of Technology after spending a year studying with Carlo Laing.

After 23 years in a purpose-built building the maths group at Albany is preparing to move into the Innovation Complex. This is part of the "campus consolidation" project, involving putting more people in fewer buildings and leasing newly-vacant space in order to provide income to the university. For example, the New Zealand Police now use facilities that used to be physics laboratories. Whether we will become more innovative remains to be seen.

*Carlo Laing*

## VICTORIA UNIVERSITY OF WELLINGTON

### SCHOOL OF MATHEMATICS AND STATISTICS

We have some interesting news from Te Herenga Waka in Wellington:

Prof. Rod Downey and Dr. Alexander Melnikov have published a new book titled Computable Structure Theory, released by Springer and available at https://link.springer.com/book/9783031924323. This is the first book to present a unified theory for both countable and uncountable computable structures. The work covers computable linear orderings, graphs, groups, and Boolean algebras, integrated with computable metric and Banach spaces, profinite groups, and related structures. Moreover, it provides the first treatment of these topics that leverages effective versions of dualities, such as Stone and Pontryagin dualities. Central themes include effective classification and enumeration.

In recognition of Dr. Petro Feketa's skills and valuable research, Kiel University in Germany offered him a full professorship, which he accepted. Prof. Feketa will continue serving as a lecturer in Applied Mathematics at VUW until 20 August 2025, after which he will move to Germany. Petro's research focuses on synchronisation phenomena and the multi-cluster behaviour of complex dynamical networks. His work seeks to deepen our understanding of the internal organisation of neuro-inspired oscillator networks by exploring the interplay between the dynamical behaviour of oscillators, the adaptation mechanisms of their couplings, and the interconnection topology of the network. In addition, he is interested in the mathematical theory of multi-frequency oscillations, analytical and computational approaches for stability and safety verification of cyber-physical systems, and the interaction between control and machine learning algorithms.

The School of Mathematics and Statistics at VUW has new leadership. Prof. Richard Arnold has been appointed Head of School, and Prof. Stephen Marsland will serve as Deputy Head of School. We extend our thanks to both of them for accepting these roles.

Finally, we have a conference announcement. On December 1-5, VUW will be hosting the 47th Australasian Combinatorics Conference (47ACC) organised by Dr. Nick Brettell (VUW) and Prof. Dillon Mayhew (University of Leeds). The Australasian Combinatorics Conference (ACC) is the annual conference of the Combinatorial Mathematics Society of Australasia (CMSA). It covers all areas of combinatorics in mathematics and computer science. It began in 1972, and was previously called the Australasian Conference on Combinatorial Mathematics and Combinatorial Computing (ACCMCC). For more information please see https://sms.wgtn.ac.nz/Events/ACC47/WebHome?redirectedfrom=Events.47ACC.

*Dimitrios Mitsotakis*

# UNIVERSITY OF CANTERBURY

## SCHOOL OF MATHEMATICS AND STATISTICS

Over the July school break, we brought 118 MATH199 students onto the UC campus for the annual Elaine P Snowden workshop. These students – hailing from across the country – got the chance to explore the campus, do some maths, and make new friends. They were hosted near the city centre, and brought on campus daily for a range of activities, tours, labs, and guest speakers. We'll see many of these students again next year as they begin undergraduate studies.

MATH199 students.

### Erskine visitors

We have several Erskine visitors:

- Prof. Vladimir Estivill (Gabor)
- Prof. Rafael Meza-Rodriguez (Miguel)
- Asst. Prof. Zhiwei Peng (Minfeng)
- Prof. Kim Plofker (Phil W)
- Prof. Alberto Roverato (Marco)
- Dr Bridgitte Stenhouse (Clemency)
- Prof Fernando Rodriguez Villegas (Felipe)

### Celebrating Women in Science

Clemency also attended L'Oréal's Parliamentary Showcase "Discover the Beauty that Moves the World" alongside NZUWiL colleagues Annemarie de Castro, Leanne Gibson, and Margaret Morgan. The event celebrated over two decades of L'Oréal's global commitment to uplifting women in science, aligning with NZUWiL's mission to empower women in university leadership. The evening featured an inspiring address by Hon Erica Stanford MP, highlighting the vital role of women's leadership in science and education in shaping Aotearoa's future.

### Nerd Nite: Maths, Metaphysics, and Ghosting

In a lighter outreach moment, Clemency delivered "What If Maths Just Ghosted Us?" at the monthly Nerd Nite at A Rolling Stone, turning a local bar into a space for exploring maths, metaphysics, and everything in between. The talk playfully explored what life might look like without numbers, reminding attendees how deeply maths is woven into civilisation – from ancient tally sticks to TikTok algorithms.

### MINZ Success

Over the mid-year break, the School hosted another uccessful Mathematics in Industry NZ (MINZ) workshop. Kudos to James W, Miguel, and Scott for organising this vibrant event, with challenge setup support from Fabian and leadership from Christina Dunker (Nova Systems). The workshop brought together academics, postgraduates, and professionals from across New Zealand to tackle industry challenges provided by Fonterra, Nova Systems, and EECA, with over 50 attendees from eight universities, including a visiting PhD student from UCLA. Lisa Thomasen delivered a plenary address on behalf of Fonterra, and Graeme Wake shared reflections on his longstanding involvement with MINZ and the mathematics community. We look forward to seeing another university host MINZ next year, ensuring UC staff and students continue to advance industry applications of mathematics.

### Smart ideas success

Congratulations to Dr Leighton Watson, whose MBIE Smart Ideas proposal was announced successful this week. His project, Next-Generation Volcanic Monitoring with Fibre Optic Technology, pioneers the use of fibre optic cables to monitor volcanic activity in real time. This innovative approach transforms fibre optic sensing into dense seismometer arrays, detecting subtle signals previously invisible to monitoring systems. Leighton's aspiration is to develop cutting-edge tools and take them into industry, making a tangible impact on how we monitor volcanoes in Aotearoa and globally. Mīharo, Leighton!

Details of funded proposals and Leighton's public statement can be found here.

*Chris Stevens*

# UNIVERSITY OF OTAGO

## DEPARTMENT OF MATHEMATICS AND STATISTICS

*Ting Wang* recently led a workshop in Wanaka, which brought together researchers and modellers from New Zealand, Australia, Japan and China to advance earthquake forecasting methods. The workshop is linked to two major research programmes: the MBIE-funded Forecasting Megaquakes on New Zealand's Biggest Fault project, and a Marsden Fund-supported project

focused on improving aftershock modelling and understanding earthquake patterns. These initiatives involve collaborators from the University of Otago, Victoria University, GNS Science and Massey University, alongside international partners.

Congratulations to Statistics Honours student *Zoë Halls*, this year's recipient of the Proteus Scholarship in Ecological Statistics. The $3,000 award is provided by Proteus, a Dunedin-based statistical consulting company specialising in ecological and wildlife applications, whose Director, Darryl MacKenzie, is an honorary associate professor in our department. Zoe's research applies advanced statistical models to study white-faced capuchin monkeys.

The Division of Sciences has launched the Pacific Sciences Leadership team Tala Haus to ensure Pacific aspirations, values and priorities are embedded in divisional policies, initiatives and research strategies. Chaired by Sciences Associate Dean Pacific Edmond Fehoko, the group comprises members from several Departments, among them *Tilman Davies* from Maths & Stats.

Finally, congratulations to *Petra Fisher*, a former Honours student supervised by Robert Van Gorder. Petra has been awarded the Otago Institute Prize. Established in 1983, this prize recognises outstanding academic ability in the final year of a BSc (Hons) or PGDipSci. Petra will soon begin PhD studies at the University of Cambridge as a Woolf Fisher Scholar and will join Trinity College, whose alumni include Ernest Rutherford.

*Jörg Hennig*

# PhD SUCCESSES

## **Xavier Coulter** (University of Auckland. 2025)

**Title**: Topological Recursion, Deformations, and Interlacing.

**Supervisors**: Pedram Hekmati (University of Auckland) and Norman Do (Monash)

**Abstract**:
The theory of topological recursion has proven to be a powerful unifying force in the areas of enumerative geometry, integrability, matrix models, enumerative combinatorics, and mathematical physics more generally. As a "classical" example, using the Weingarten calculus for unitary groups, the large N asymptotics of the Harish-Chandra-Itzykson-Zuber matrix integral was shown to recover the monotone Hurwitz numbers, which are governed by the Chekhov-Eynard-Orantin topological recursion. This result can be generalised to a broader correspondence between weighted Hurwitz numbers, the Kadomtsev-Petviashvili hierarchy and the topological recursion, facilitated by the representation theory of the symmetric groups. Motivated by the above example, this thesis concerns itself with the large N asymptotics of matrix integrals over certain quotients of the unitary and orthogonal groups, which may be identified with complex and real Grassmannians, respectively. By interpolating between the asymptotics of the unitary and orthogonal integrals via a parameter $b$, a two-parameter deformation of the monotone Hurwitz numbers is obtained and shown to be an example of a weighted $b$-Hurwitz number. As a consequence of this interpolation, a family of $b$-dependent operators arise from a purely combinatorial construction, which appear to mimic the behaviour of the Jucys-Murphy elements in the symmetric group algebra and recover them when $b = 1$. The aforementioned correspondence with topological recursion for general bis not yet explicit—promising developments such as the refined topological recursion of Kidwai-Osuga are discussed. To conclude, conjectures are made on the root structure of the two-parameter deformation of the monotone Hurwitz numbers—namely, that at $b = 0$, their roots are real and interlace. It is suggested that this observation may be a general phenomenon, arising from the topological recursion applied to certain families of spectral curves.

## **Bartek Ewertowski** (University of Auckland. 2025)

**Title**: Relative BGG Cohomology, Cartan Holonomy Reductions and Group Cohomology.

**Supervisors**: Rod Gover and Pedram Hekmati (both University of Auckland)

**Abstract**:
We investigate tractor de Rham sequences of tractor valued differential forms, the related BGG sequences (in the parabolic case) and what occurs to these in the setting of a curved orbit partition of Cartan geometries. The prototypical example is a projective geometry equipped with a parallel tractor metric, resulting in a partition into twp submanifolds with semi-Riemannian geometries, and a submanifold with conformal geometry. We construct a relative tractor de Rham triangle with respect to pullback along a curved orbit inclusion. In the case where both the Cartan geometry and a curved orbit carry a parabolic geometry, we define a differential BGG pullback operator mapping between the corresponding BGG sequences. This becomes a cochain map in the flat case, allowing us to construct a relative BGG triangle, which we prove to be cochain homotopy equivalent to the corresponding tractor de Rham triangle. Moreover, if a curved orbit is a separating hypersurface, then we construct a Mayer-Vietoris sequence in tractor de Rham or BGG cohomology. In the setting where the Cartan geometry or any of its curved orbits is a classifying space for a discrete group then we have a relationship to group cohomology. By adapting the techniques of Gover & Sleigh, we construct a non-zero relative tractor de Rham cocycle with respect to the boundary inclusion of a projectively compact hyperbolic manifold. We also slightly generalise a few results of the aforementioned authors. Along the way, we prove a few other interesting results, such as calculations of all BGG splitting operators for all symmetric powers of projective cotractors, a generalised curved orbit partition result, and a left adjoint to the associated bundle functor.

**Sam Bastida** (Victoria University Wellington. 2025)

**Title**: Two Problems at the Second Level of the Polynomial Hierarchy.

**Supervisors**: Nick Brettell (Victoria University Wellington) and Dillon Mayhew (University of Leeds)

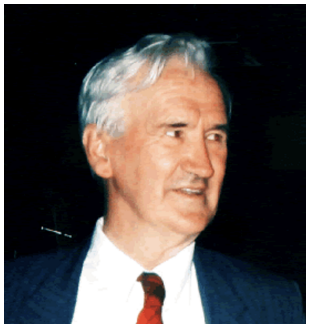
**Abstract**:
Few natural problems are found in the second level of the polynomial hierarchy. In this thesis we examine k-choosability, a graph theory problem which is known to be $\Pi_2$-complete; and transversal contraction, a matroid theory problem in $\Sigma_2$. We obtain a classification of the 2-connected graphs with maximal local edge-connectivity k that are not k-choosable. This classification gives rise to a polynomial-time algorithm for recognising $k$-choosability among such graphs. We then show that when the input graph need not be 2-connected the problem becomes $\Pi_2$-complete. We also obtain a polynomial-time algorithm to determine whether a 1-element contraction from a transversal matroid remains transversal. If the contraction is transversal our algorithm provides a representation.

# OBITUARIES

## Dr Alex McNabb MSc (NZ), BA (Camb), DSc (VUW), FRSNZ

## January 1930 – July 2025

### Introduction and Personal Reflections



Dr Alex McNabb has a world-wide reputation as a mathematician. He was one of New Zealand's leading applied mathematicians with a career that spanned over six decades.

In modern parlance, Alex was a "team player". Certainly, he could have "gone solo" and prospered, but he really valued his co-workers. He always ensured that all members of the team were fully acknowledged. He paid particular attention to emerging scientists and facilitated their development. He was quiet and unassuming in manner, and very kind to his co-workers. His leadership shines: it is reflected in the scientists that he mentored and his teams' contributions to science.

### Professional Career

#### The DSIR Applied Mathematics Division (1952-1988)

Alex worked for the Applied Mathematics Laboratory (AML) from 1952 to 1988. Under the supervision of Bill Taylor, he was invited during the 1952-53 Christmas vacation to the DSIR Applied Mathematics Laboratory to work on the diffusion of preservatives into green timber. The results were written up in 1953 as AML Reprint 036. This experience motivated Alex, who later wrote: "This exercise did more for my mathematics education in three months than three years at university had done previously or managed to do in the next three years." The next year Alex was invited back to AML as a graduate vacation student. He began full time employment at AML on 5 February 1954 as a mathematical physicist with the understanding that he could study overseas, on leave without pay. Alex used this opportunity to keep his connection with DSIR but broaden his education at Cambridge.

Upon returning to New Zealand Alex resumed his employment with the AMD which was renamed the Applied Mathematics Division in 1964. This was another fruitful period for his research. At DSIR, he rose to head the mathematical physics section. Alex stayed with the DSIR until his retirement in 1988, though he did take up another visiting research position at the University of Southern California from 1967 to 1969. Like his Cambridge years, he negotiated this with the DSIR as leave without pay.

Alex obviously enjoyed working at the Applied Mathematics Division, writing "Over the years, I have visited a number of research groups in Australia, America and the United Kingdom, but nowhere have I found a mathematical physics group with such vital contacts with experimental groups in other disciplines.". Alex was pivotal in establishing many of these contacts.

### Post retirement

Alex retired from the DSIR, but like most mathematicians, he continued his work. Post retirement Alex accepted a few research fellowships. In 1988 he came to Massey University in Palmerston North as a research fellow. In 1998 he moved to Auckland to take up another fellowship at the University of Auckland. Alex also travelled to Australia for extended periods to do further work on problems from industry. A quick glance at Alex's publication list shows that he was very productive post-retirement.

## Scientific Achievements and Contributions

### Research

Alex made many notable contributions to applied mathematics and also pure mathematics. Although he is primarily remembered as an applied mathematician, Alex was a pioneer in the theory of comparison theories for partial and ordinary differential equations. His research provided a framework for the theory of existence and uniqueness of solutions to differential equations. This work alone made Alex a "name" amongst researchers in the vast field of differential equations. Another notable contribution in pure mathematics was his work on the factorisation of operators. He wrote a series of papers on this topic and showed to solve an equation in operator form by splitting it into a number of easily computable steps. Like most of his work, these results have both theoretical and practical significance.

In applied mathematics, Alex worked on a number of problems, including geothermal modelling, soil compaction, diffusion of heat and water in trees, iron ore reduction, ore forming processes, hydrogen embrittlement, deformation of fired ceramics, stability of railway engines, gymnastics, and radioactive transport at Mururoa atoll. His research often explained previously unknown behaviour, showing that disparate system behaviour could be understood and predicted using mathematics. Certainly, Alex chose fields that were relevant to modern industry. In this sense he helped foster New Zealand's role in "maths in industry". Many of Alex's papers are elegant, and inspirational. He was particularly adept at identifying non-linearity in a system and quantifying its affect.

Several of Alex's earlier modelling papers were controversial, but over the decades, have now become standard. For example, his paper explaining how large deposits of copper occur in the upper parts of geothermal fields, is now universally accepted. Similarly, his foundational work on geothermal models, has provided the basis for reliable resource assessments, which have been vital in developing New Zealand's liquid-dominated geothermal fields.

In later years Alex continued working on problems from industry. For example, he studied the dynamics of top loading washing machines and showed that such machines will always have a wobble somewhere in their cycle. "You cannot get rid of it" he said, "it will always be there". We (largely Alex) went about proving this and this led to the company focussing on front-loading models, where the axis of spin is horizontal as opposed to top loaders where the axis of spin is vertical. Alex did not ignore more theoretical problems. For instance, we injected stochasticity (quantified uncertainty) in a couple of projects leading to a concept called "mean action time". This work was fundamental with many applications.

These are excerpts from a full obituary in this website published by the Royal Society of NZ.
https://www.royalsociety.org.nz/who-we-are/our-people/our-fellows/obituaries/fellows-obituaries/alex-mcnabb/

This was written by a team including Associate Professor Bruce van Brunt (Massey University), Adjunct Professor Graham Weir (Massey University) and myself.

*Graeme Wake*
*Emeritus Professor of Industrial Mathematics , Massey University*

# GENERAL NOTICES

## Queer and Trans Mathematicians in Combinatorics 2025

**Event:** Queer and Trans Mathematicians in Combinatorics
**Dates:** 5 November 2025 - 7 November 2025
**Venue:** The University of Queensland
**Location:** Brisbane
**Website:** https://queertransmath.com/
**Funding application deadline:** 1 September 2025
**Registration deadline:** 31 October 2025
**Description:** The Queer and Trans Mathematicians in Combinatorics conference (QTMC) is a research conference aimed at the diversification of combinatorics. The main focus of the QTMC is to promote retention and inclusion of queer and trans mathematicians in combinatorics, especially early career researchers, by bringing visibility to an otherwise invisible minority within maths. The QTMC will allow for queer and trans mathematicians to network, learn and present their research to one another.

The QTMC conference will run for roughly two days, featuring two invited talks, approximately 14 contributed talks, and panel discussions, together with ample time for informal discussion, conference dinner and informal socials.

**Organisers:**
Benjamin Burton – University of Queensland
Aram Dermenjian – University of Sevilla
Adam Onus – Queen Mary University of London
Lucy Tobin – University of Sydney

# NZMS NOTICES

## NZMS Colloquium 2025

Abstract submission is now open for the NZMS Colloquium 2025.

It will take place from Wednesday, 26th November until Friday, 28th November in S Block on the Hamilton campus of the University of Waikato. The conference registration also includes a welcome function from 5-7pm on 25th November and a conference dinner in the Gallagher Academy of Performing Arts (on the Hamilton campus) on the evening of Thursday, 27th November.

Please promote the Colloquium within your University.

Website: https://www.ivvy.com.au/event/COTEX6/home.html

**Keynote Speakers (more to come):**

Prof Henk Dijkstra (Utrecht University, Netherlands) Marine and atmospheric research, oceanography. https://www.uu.nl/staff/HADijkstra
Dr Marie Graff (University of Auckland) Numerical analysis and inverse problems for wave propagation phenomena. https://profiles.auckland.ac.nz/marie-graff
Prof Karen Meagher (University of Regina, Canada) Extremal set theory, algebraic graph theory, design theory. https://uregina.ca/~meagherk/

**Key dates:**

Early registration deadline: 31st October
Abstract submission deadline: 10th November

*Stephen Joe*

## NZMS Awards, Prizes and Fellowships

The deadline is approaching for nominations for Fellows of the NZMS and the NZMS Research Award, the NZMS Early Career Research Award, the Gillian Thornley award, the Kalman Prize and the NZMS award for teaching excellence. Nominations need to be emailed to the NZMS President Bernd Krauskopf (b.krauskopf@auckland.ac.nz) on or before the **31st August 2025**.

Please note that the NZMS council has updated the rules governing these prizes, making the application process much simpler for several of the prizes. To find out more, click on the name of the award at https://nzmathsoc.org.nz/awards/. For more information about Fellowship, see ttps://nzmathsoc.org.nz/about-the-nzms/becoming-a-fellow-of-the-nzms/.

Any unsuccessful applicants from last year are warmly encouraged to update their applications and resubmit.

*Geertrui Van de Voorde (Secretary)*

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- Support outreach to students
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- Career resources

*"SIAM has long been a bedrock for applied mathematicians, providing crucial support, recognition, and connections. As we confront new challenges—explosive growth in data science, shifts in computational science, and financial complexities—I am committed to helping SIAM meet these challenges while maintaining its extremely high-quality and successful activities. With collective support, we'll navigate these changes and ensure that SIAM remains the go-to hub for applied mathematics by embracing excellence and fostering a welcoming community."*

— Carol S. Woodward, SIAM President
Lawrence Livermore National Laboratory

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