

# Asian Oceanian Women in Mathematics (AOWM) Workshop

The University of Auckland

6th - 8th December 2024

## 1 Nau Mai, Haere Mai - Welcome!

Kia ora, welcome to the second AOWM workshop! The AOWM was established in 2022 to facilitate interactions amongst women mathematicians in the Asian-Oceanic region. The workshop will provide a number of career/research development activities and networking opportunities.

The AOWM AGM will be held at the conclusion of the event.

We hope that you enjoy your time in Auckland and make some new connections.

## 2 Sponsors

We would like to thank contributions from the following partners that have made this workshop possible:

- The New Zealand Mathematics Society (NZMS)
- The Committee for Women in Mathematics (CWM)
- The Department of Mathematics at the University of Auckland



**SCIENCE**  
DEPARTMENT OF MATHEMATICS

## 3 Schedule

### 3.1 Where to go in-person

**Talks:** Building 303, Room 155. (Level 1 of building 303). See maps below.

**Breaks, e.g., lunch:** Plaza area on the ground level between buildings 302 and 303. Outside Building 303 Room G15. See maps below.

### 3.2 Joining online via Zoom

We endeavour to have all talks streamed live on Zoom, in particular the invited talks and the AOWM AGM.

Join via this link.

Meeting ID: 930 2237 0998

Passcode: 918720

### 3.3 Friday 6th December

On Friday:

**1.30 - 2.30pm** Registration and a welcome gathering from 1.30pm - 2.30pm in the Basement Foyer of Building 303 (where you enter from Princes Street).

**2.30pm** At 2.30pm we will then walk across Albert Park to the Auckland Art Gallery (entry is free).

One of the organising committee members will remain at the registration desk in Building 303 after 2.30pm, for any who arrive later.

### 3.4 Timetable for Saturday and Sunday

Time	Saturday 7/12	Sunday 8/12
09.30 - 10.30	<b>Vivien Kirk</b> <i>Preparing and applying for promotion in a timely manner</i>	<b>Priya Subramanian</b> <i>Role of self-image and imposter syndrome in shaping academic careers</i>
10.30 - 11.00	Morning Tea	Morning Tea
11.00 - 12.30	<b>Contributed Talks</b> Angelyn Lao Rashi Lunia Riddhi Shah Haru Negami	<b>Contributed Talks</b> Mitra Koley Yukari Ito Lesley Ward Megan van Zyl
12.30 - 14.00	Lunch	Lunch
14.00 - 15.00	<b>Alex James</b> <i>Some data driven insights into academic gender equity</i>	<b>Astrid An Huef</b> <i>Initiatives to foster a community of early career and/or underrepresented researchers</i>
15.00 - 15.30	Afternoon Tea	Afternoon Tea
15.30 - 17.00	<b>Contributed Talks</b> Geetha Venkataraman Mao Shinoda Yasuko Hasegawa	<b>Sanoli Gun</b> <i>The AOWM</i> <b>AOWM AGM</b>

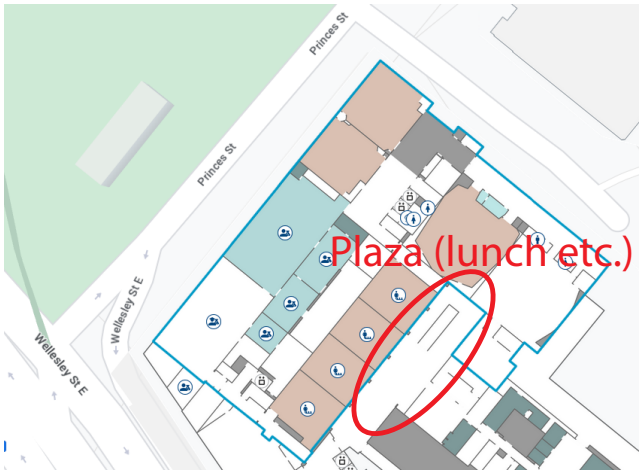
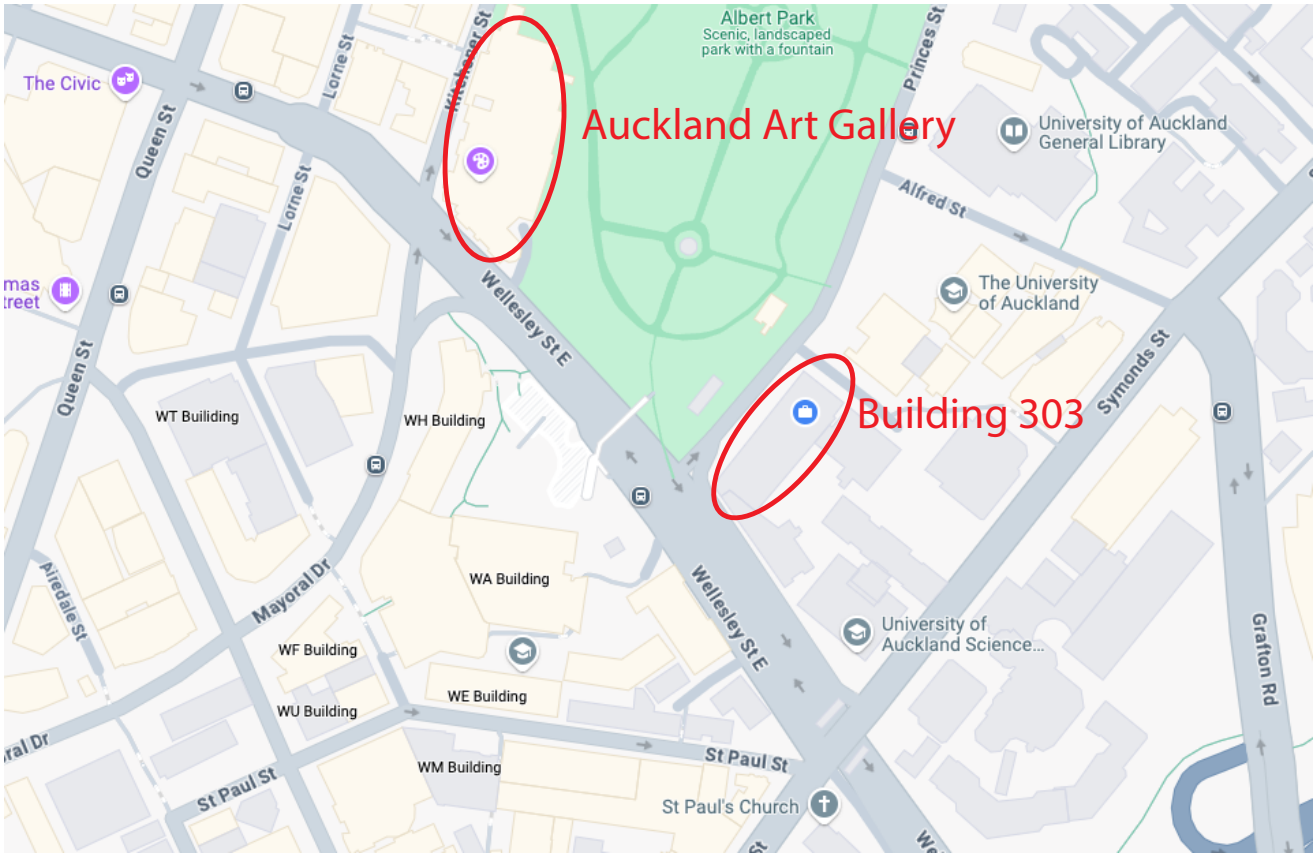
## 4 Getting around

All talks and activities will be held in Building 303 of the University of Auckland City Campus. The building can be accessed from Princes Street. Note that if you enter from Princes Street, you will be on the *Basement* level (one level up to the Ground level, two levels up to Level 1, etc.).

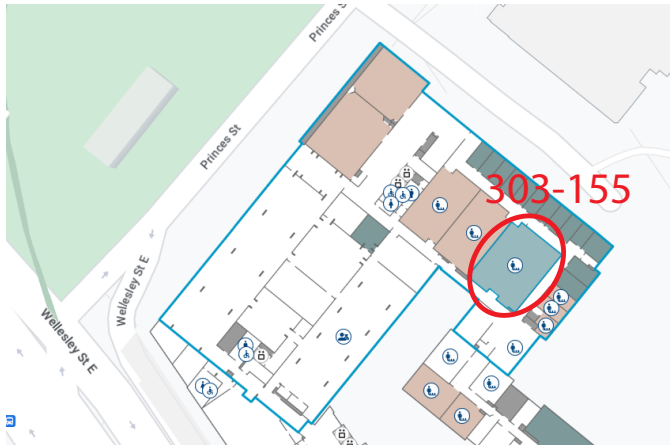
Online campus map: <https://maps.auckland.ac.nz/wayfinding>

Tip: Searching “303-155” will show you the location of Building 303 Room 155 (where we will have the talks).

Across the road from building 303 is Albert Park, and on the other side of the park is the Auckland Art Gallery, where we will be headed on Friday.



Building 303 Ground Level



Building 303 Level 1

## 5 Abstracts

### 5.1 Invited Speakers

**Vivien Kirk**, University of Auckland

*Preparing and applying for promotion in a timely manner*

Academic promotion criteria and processes can be very different from one university to another, but there are some common principles. This presentation will discuss some of the factors that promotion committees might consider and give ideas about how to prepare for, and then apply for, promotion.

**Alex James**, University of Canterbury

*Some data driven insights into academic gender equity*

Some highlights from research by myself (and others!) into the academic gender pay gap and what drives it. Spoiler alert - It's not just babies!

**Priya Subramanian**, University of Auckland

*Role of self-image and imposter syndrome in shaping academic careers*

Becoming an academic usually involves years and years of living an uncertain doctoral and post-doctoral life before finding a permanent role. Through these years, and actually from even before, our self-image of ourselves is shaped to resemble the academics that we cross paths with. I want to talk about how a strong identification with our self-image as our identity might both help and harm us as we progress through our career.

From there I want to talk about another common experience that we go through: that of feeling like an imposter, undeserving of the heights we find ourselves to have attained. Why do we feel this so often in our careers? What does it take to become an expert at what we do? And why is it time-consuming and sometimes extremely difficult to become an expert in the roles that we have in academia?

I want to convince you that understanding and manipulating these two issues of self-image and imposter syndrome can help us (and me) have more control in designing a unique career path for ourselves, instead of going with the flow.

**Astrid An Huef**, Victoria University of Wellington

*Initiatives to foster a community of early career and/or underrepresented researchers*

I will talk about three initiatives to improve well-being and retention of early-career and/or under-represented researchers in Operator Algebras. Specifically, I will talk about

- **YMC\*A**: an annual conference organised for and by master/Ph.D.-students and postdocs in von Neumann,  $C^*$ -algebras and related areas, with the goal of fostering scientific and social interaction between young researchers.
- **Women in Operator Algebras**: 3 one-week workshops (so far) at Banff International Research Station where groups work on research problems.
- **Operator Algebra Mentoring Network**: committed to fostering gender diversity within mathematics, particularly in the field of operator algebras. Established in response to the need for mentorship and support for underrepresented individuals facing abuse or harassment, OAMN operates on a three-tier structure—senior mentors, junior mentors, and mentees.

### 5.2 Contributed Talks

**Angelyn Lao**, De La Salle University

*Comparison of reaction networks of insulin signaling*

In this study, embedded networks are used to show the presence of a structural “bifurcation” in the signaling process between INSMS (INSulin Metabolic Signaling) and INRES (INSulin RESistance). Their concordance profiles show a high propensity to remain monostationary. Moreover, the concordance properties allow us to present heuristic evidence that INRES has a higher level of stability beyond its monostationarity. Finally, we discuss a new way of analyzing reaction networks through network translation.

**Rashi Lunia**, Chennai Mathematical Institute

*Extreme values of  $L$ -functions*

In 2008, Soundararajan introduced the resonance method and studied extreme values of certain families of  $L$ -functions at the central critical point. In this talk we will discuss some recent results obtained in the context of non-vanishing and extreme values of such  $L$ -functions at the central critical point. This is based on joint work with Professor Sanoli Gun.

**Riddhi Shah**, School of Physical Sciences, Jawaharlal Nehru University, New Delhi, India

*The structure of Cartan subgroups in connected Lie groups*

A Cartan subgroup in a connected Lie group  $G$  is a maximal nilpotent subgroup  $C$  of  $G$  with the property that if  $L$  is any closed normal subgroup of finite index in  $C$ , then  $L$  has finite index in its own normaliser in  $G$ . Cartan subgroups are classical objects defined by Chevalleys in 1955. We will discuss properties and the structure of Cartan subgroups and its relation with the behaviour of power maps on the Lie group  $G$ . We extend the notion of Cartan subgroups on connected locally compact groups. (Joint works with Arunava Mandal: *Mathematische Zeitschrift* 299 (2021), 1587-1606 and <https://arxiv.org/abs/2310.15564> (2023) preprint.)

**Haru Negami**, Chiba University

*Construction of unitary representation of braid group*

Multivariable KZ-type equations are associated with braid groups since the fundamental group of the domain is isomorphic to pure braid groups. In this talk, we will introduce the Long-Moody construction, a well-known construction method of representations of braid groups, and its relation to the middle convolution of multivariate KZ-type equations. Furthermore, by applying the knowledge on KZ-type equations, the construction of unitary and irreducible representations of the braid group will be presented.

**Geetha Venkataraman**, Dr. B. R. Ambedkar University Delhi

*Groups defined on graphs: Hierarchies and Inheritances*

All the graphs discussed here have the elements of a group  $G$  as their vertex set. The *power graph* of  $G$  is denoted by  $\text{Pow}(G)$  and two vertices  $x$  and  $y$  have an edge if either  $\langle x \rangle \leq \langle y \rangle$  or vice-versa. In the *enhanced power graph* denoted by  $\text{EPow}(G)$ , two vertices  $x$  and  $y$  have an edge if  $\langle x, y \rangle$  is cyclic and in the *commuting graph* denoted by  $\text{Com}(G)$ , the elements  $x$  and  $y$  have an edge if  $xy = yx$ .

For a group  $G$ , it is known that  $E(\text{Pow}(G)) \subseteq E(\text{EPow}(G)) \subseteq E(\text{Com}(G))$  where  $E(\Gamma)$  denotes the edge set of the graph  $\Gamma$ . Results are also known about when equality holds for finite groups. We will prove a necessary and sufficient condition for equality of two of the above for groups in general. For both the generalised quaternion group and the dihedral groups of 2-power order their respective power graphs and enhanced power graphs are equal. In the case of the generalised quaternion group the commuting graph is also equal to the other two whereas this is not the case with the dihedral group. We show that the same relations between the graphs are carried forward to their infinite counterparts in the locally quaternion group and the locally dihedral group respectively. Whereas if we consider the infinite quaternion group that contains all the dicyclic groups and hence all the generalised quaternions then the relations between the graphs break down. This is based on recent joint work with Surbhi.

**Mao Shinoda**, Ochanomizu University

*Ergodic optimization for continuous functions on non-Markov shifts*

The aim of Ergodic optimization is to describe invariant probability measures that maximize the integral of a given function. For a wide class of intrinsically ergodic subshifts over a finite alphabet, we show that the space of continuous functions splits into two subsets: one is a residual set for which all maximizing measures have "small" entropy; the other is contained in the closure of the set of functions having uncountably many, fully supported ergodic maximizing measures with "large" entropy.

**Yasuko Hasegawa**, The Jikei university school of medicine

*Some topics on the Eisenstein series as a type of automorphic forms*

Various analytic and number theoretic properties could be revealed by the Fourier expansion of the automorphic forms. I would show some results obtained by computing the Fourier expansions of the Eisenstein series which are the examples of the automorphic forms.

**Mitra Koley**, IISER Thiruvananthapuram, India

*Groebner deformations and F-singularities*

For a commutative ring  $R$  of prime characteristic  $p > 0$ , the map  $F : R \rightarrow R$  sending  $r \rightarrow r^p$  is a ring endomorphism, called the Frobenius morphism. The Frobenius morphism plays an important role in studying singularities of such rings. The singularities that have been defined in terms of the Frobenius map are called F-singularities. In this talk we will look at how F-singularities behave along Groebner deformations. This is my joint work with Matteo Varbaro.

**Yukari Ito**, The University of Tokyo

*Resolution of quotient singularities*

Let  $G$  be a finite group in  $GL(2, C)$ , the minimal resolution of the singularity  $C^2/G$  gives several interesting relations between the group representation of  $G$  and geometry of the resolution. I would like to show these relations with easy example in this talk.

**Lesley Ward**, University of South Australia

*From the Marriage Bar to the Hypatia Scholarship: Women working in mathematics in Australian Universities*

The first woman lecturer in the Australian mathematical sciences was appointed in 1921, almost 70 years after the first Australian university was established in 1852. Since then the proportion of women among mathematical sciences students and academic staff has gradually increased, though it has not reached 50% even at the bachelor's completion level. Why so low, and why so slow? I'll outline some of the history of women working in the mathematical sciences in Australian universities, with a focus on the national Women in Mathematics Special Interest Group (WIMSIG, founded in 2012) of the Australian Mathematical Society. I'll offer insights into our evolving understanding of why women and others have been underrepresented, and the initiatives we've used to address inequity. In addition to describing the Australian historical, societal and legal contexts, I'll consider broader explanatory factors that have acted to inhibit participation of women and other underrepresented groups worldwide. Juicy topics such as the marriage bar and its impact, the female minimum wage, and the Jennifer and John correspondence study will be addressed.

**Megan van Zyl**, The University of Waikato

*Post-Quantum Computing Applications in Cyber Security*

This project is dedicated to developing a proof of concept for online security frameworks in a post-quantum computing era, focusing on password authentication schemes and cloud-based private key usage. By leveraging the no-cloning property of qubits, it extends existing research to introduce storing private keys in quantum form on the cloud, mitigating quantum attacks. Strategies include task allocation between quantum and classical computers to optimise efficiency and accuracy while addressing quantum computing inaccuracies caused by noise. Evaluation methods include the challenger method for accuracy assessment and cryptanalysis to identify mathematical security weaknesses. The goal of the project is to conduct further research into practical solutions to facilitate the security of asymmetric cryptography in a post-quantum era.

## 6 Organising Committee

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- Lauren Smith (University of Auckland) Email: [lauren.smith@auckland.ac.nz](mailto:lauren.smith@auckland.ac.nz)