

# Alumni & Friends 2019

Alumni newsletter of the School of Mathematics & Statistics

**Bringing past students together**

School of Mathematics  
& Statistics

## A message from the Head of School

As the year ends, I am very excited to announce the establishment of the new Centre in Data Science at the University of Melbourne (DatUM) which our School hosts jointly with the School of Computing and Information Systems. DatUM, led by Professor Howard Bondell of our School, was set up in recognition of the fact that data is at the centre of most research and, ultimately, decision-making. As data has become more accessible, it has never been easier to do data science badly. Doing data science well is where DatUM firmly sits.

Our School is planning to significantly extend its engagement and outreach programs with the appointment of three new Outreach Fellows (Susan James, Sam Povall and Paul Fijn), and hope that you will actively participate in our programs and share your experience with our students. Our students are among the most talented in the world, for the third year in a row The University of Melbourne was the best performing Australian university in the international Simon Marais Mathematics Competition.

We are also very proud of early career researchers, Matthew Tam (Operations Research), Stephen Muirhead (Probability Theory), Stuart Johnson (Mathematical Biology) and Susan Wei (Data Science), who will soon start their recently awarded ARC Discovery Early Career Award in our School. Fascinating research news this year which made headlines all around the world involved Professor Peter Forrester and his PhD student Jiyuan Zhang who were featured in the Quanta story: Neutrinos Lead to Unexpected Discovery in Basic Math for their work on random matrix theory.

As our School keeps expanding we welcomed several new continuing staff in 2019, including Volker Schlue (Analysis), Xi Geng (Probability Theory), Wei Huang (Statistics), Mario Kieburg (Random Matrix Theory) and Mingming Gong (Data Science). Also joining us this year are research fellows Dr Jared Field, member of the Gomeri clan of the Kamilaroi Nation, who is interested in mathematical biology, as well as Davis McCarthy (Bioinformatics and Cellular Genomics) who is supported by a recent gift from Paul Holyoake and jointly appointed with the St Vincent's Institute.

We are proud to have been able to support two undergraduate students with a prestigious Exceptional Talent Scholarship and have also established a similar scholarship at Master's level. These life-changing scholarships, including also the Ling Xei scholarship for cross-disciplinary research, the Kerry Landman Scholarship for high-achieving mathematics graduates who are passionate about education, as well as the Andrew Sisson and Helen Freeman awards would not be possible without the generous support from our donors.

I would like to conclude with the fantastic news that our own Alison Harcourt (nee Doig) was named as Officer of the Order of Australia. Overall it was an extremely successful year for the School, and I am looking forward to a continuation of that success in 2020!

**Professor Jan de Gier**  
Head of School



## Staff promotions and prizes

Our staff continued to be recognised for their excellence through prizes and promotions in 2019.

Mark Fackrell, Jesse Gell-Redman, Damjan Vukcevic and Lele (Joyce) Zhang have been promoted to Senior Lecturer (Level C). Sue Finch, Jennifer Flegg and Kim-Anh Lê Cao have been promoted to Associate Professor (Level D). Andrew Robinson and Paul Zinn-Justin have been promoted to Professor (Level E).



### Academy of Science Fellows

Professors David Balding and Kerry Landman were elected as Fellows of the Australian Academy of Science in recognition of the significance of their research to their fields.

David is co-developer of the Balding–Nichols match probability formulae which allow for population genetic effects in the evaluation of DNA profile evidence. He is a pioneer of computational methods for inferring demographic history and detecting the effects of selection and has made important contributions to methods for genetic association analyses.



Kerry is a leader in applied mathematics devoted to cross-disciplinary research and real-world problems. She has made crucial contributions to a range of fields, from colloidal fluid mechanics to developmental biology. She developed a broad spectrum of inventive models which provide a fundamental understanding of how complex processes interact to produce experimentally observed behaviour.



### ANZIAM Medal

Professor Peter Taylor has been awarded the ANZIAM Medal, the society's most prestigious award. The award recognises research achievement, wide-ranging activities enhancing the discipline of applied and industrial mathematics and contributions to ANZIAM.

Peter is internationally known for his contributions to the theory and applications of mathematics, particularly in the area of applied probability. He has developed modelling, analytical and computational techniques for mathematical structures that are commonly used in the analysis of real-world stochastic systems.



### Moran Medal

Associate Professor Stephen Leslie has been awarded the Moran Medal from the Australian Academy of Science for his contributions to mathematical genetics and developing methods for analysing modern genetic/genomic data.

Stephen's research focuses on understanding the role of genetics in human disease and how genetics informs studies of human population theory. He applies novel approaches to genetic data to understand the history of populations and infer past migration events. His work on the British population is a landmark in the field, a blueprint for other population studies and a benchmark for understanding natural genetic variation in human populations.



### Ren Potts Medal

Professor Kate Smith-Miles has been awarded the Australian Society for Operations Research top honour, the Ren Potts Medal, for outstanding contributions to the theory or practice of operations research in Australia. Kate is the first woman out of 10 recipients to receive the medal.

Kate's research has focused on many different applications: developing ground-breaking methods to better test algorithms, and working with real-world problems involving transportation networks, cancer, insurance, the stock market, and mobile phones.



### **Future Fellowship**

Professor Howard Bondell has been awarded a four-year Australian Research Council Future Fellowship to conduct a research project on ‘Statistical Modelling in the Era of Data Science’.

This project aims to develop innovative statistical methodology that is interpretable, theoretically justified, and scalable to today’s growing complex data. With the influx of data being collected publicly and privately, making sense of it is a fundamental task. The project will provide techniques to enable research advances and inform decision-making for a broad base of disciplines, including applications to network security, energy

forecasting, environmental monitoring, and public health.



### **Kim-Anh Lê Cao wins three awards**

Kim-Anh Lê Cao has had an extremely successful year, winning three research awards:

- Georgina Sweet Award for female scientists who demonstrate excellence in the area of Quantitative Biomedical Science.
- Moran Medal for her research in developing statistical and computational methods applicable to high-throughput biological data arising from frontier technologies
- Dean’s Award for Excellence in Research (mid-career) in recognition of her outstanding achievements in research.

Kim-Anh has recently been promoted to Associate Professor in Statistical Genomics. Her research lab is based at Melbourne Integrative Genomics and she is also a member of the Centre for Stem Cell Systems. Kim-Anh’s research embraces a multidisciplinary approach at the interface between statistics, bioinformatics and biology, focusing on statistical modelling of diverse and large biological datasets to gain new insights into the molecular mechanisms regulating biological processes.

Kim-Anh is a pioneer in developing methods and tools for statistical and computational data integration arising from novel biological data called ‘omics - transcriptomics, proteomics, metabolomics, metagenomics etc; the study of biological features such as genes, proteins, metabolites, or microorganisms. Large data sets are generated and need to be computationally and statistically analysed in a holistic manner to generate new knowledge.

Kim-Anh is currently on a three week voyage to Antarctica with 94 other women scientists from 35 countries as part of the 2019 Homeward Bound Leadership Program. Homeward Bound is a global leadership initiative which aims to heighten the influence and impact of women in making decisions that shape our planet.

## **New research fellowships**

### **Wurru-wurru Research Fellowship**

The four-year Wurru-wurru Research Fellowship is in recognition of the Wurundjeri people who are the traditional custodians of the land on which the Parkville campus of the University of Melbourne is situated. The name “wurru-wurru” means “sky” in the Woi wurrung language of the Wurundjeri people. This award has been endorsed in collaboration with the Wurundjeri Land and Compensation Cultural Heritage Council Aboriginal Corporation.

One fellowship will be awarded per year to early career researchers.

### **Harcourt-Doig Research Fellowship**

The four-year Harcourt-Doig Research Fellowship is in recognition of the contributions of Dr Alison Harcourt AO. Despite recently turning 90, Alison continues to make a difference to the lives of our students as a sessional tutor in undergraduate statistics subjects at the University. She was formally recognised for her contributions to society with a Doctor of Science (honoris causa) in 2018, 2019 Victorian Senior Australian of the Year, and was made an Officer of the Order of Australia (AO) in the 2019 Queen’s Birthday Honours List.

Up to two fellowships will be awarded per year to early career researchers.

**For more information about the research fellowships, see [ms.unimelb.edu.au](https://ms.unimelb.edu.au).**

## Staff updates



### **New Professor - Andrew Robinson**

Andrew Robinson is a graduate of the Department of Statistics, having done a BSc in Statistics at the University of Melbourne from 1984 to 1988; Norm Smith was his honours supervisor. He has found it a pleasant privilege to work with some of the staff who taught him; Ray Watson and Ken Sharpe in particular (now both retired), as well as contemporaries such as Graham Hepworth and Christine Mangelsdorf.

Andrew is Managing Director of the Centre of Excellence for Biosecurity Risk Analysis (CEBRA), a bilateral centre supported financially by Australia's and New Zealand's biosecurity regulators. This position provides an unparalleled opportunity to curate, manage, and carry out research that makes a material difference to national well-being for both countries. CEBRA's research staff of about 14 comprises mathematicians, economists, quantitative ecologists, programmers, modellers, and, naturally, a statistician.

Andrew's research interests include quantitative biosecurity, risk analysis and management (not financial, though), forest biometry, forest inventory, ecology, applied statistics, and the statistical validation of models.

Andrew has been a representative on the Australian Department of Agriculture Plant Health Surveillance Consultative Committee and is founding chair of the Biosecurity Data Analytics Working Group, which brings together data analysts from the federal biosecurity regulators of Australia, Canada, New Zealand, and the USA. In 2015, Andrew received the university award for Excellence in Engagement in Public Value.

Andrew completed his PhD in forestry at the University of Minnesota in 1998. Prior to moving to the USA, he was a Lecturer in forest mensuration at the Australian National University from 1991 to 1994. He was assistant professor at the University of Idaho from 1999 to 2004 and an associate professor in 2005. He returned to Australia and was appointed at the University of Melbourne as Senior Lecturer in 2005 and promoted to Reader in 2015.



### **New Professor - Paul Zinn-Justin**

Paul Zinn-Justin studied at Ecole Normale Supérieure (Paris), where he received his PhD in 1998. After two short post-doctoral positions in the US, he was hired as junior scientist by France's national research organisation CNRS in 2000. While at CNRS he worked at various institutes in Paris and in Moscow. In 2013 he was promoted to CNRS senior scientist, and in 2016 joined the University of Melbourne for his ARC Future Fellowship.

Paul's research interests lie at the intersection of mathematical physics, algebra and combinatorics. He specialises in applying the modern tools that physicists have developed to analyse models from statistical mechanics and quantum field theory, to the realm of pure mathematics, and in particular to problems of combinatorial nature. He has proved several famous conjectures from the 1980s and uncovered new connections between seemingly unrelated subjects - in recent times, between quantum integrable systems and enumerative geometry. Paul has also dabbled in random matrix theory, knot theory, and representation theory. Paul also has an interest in algorithm design and programming, and contributes to open source software, in particular the Macaulay2 programming language for computations in commutative algebra and algebraic geometry.

When he's not working or travelling, Paul likes to work on his French cooking skills, and to spend quality time with his cat.



### **Retiring staff member - Susan Wilson**

Susan completed a BSc (Hons) degree majoring in applied maths in 1979 and a DipEd in 1980, both at Monash University. She also completed a MSc at the University of Melbourne in 1997.

From 1981 to 1987, Susan taught maths and science at five secondary schools in Victoria, from Ouyen to Glen Waverley. Wanting to focus on teaching maths, Susan joined the Department of Mathematics at the University of Melbourne as a tutor in 1988, working for Daphne Morley. Susan is the longest serving staff member of the Mathematics and Statistics Learning Centre, working for all of the Directors - Frank Barrington, Karen Baker, Deb King and now John Banks.

Susan took on the very important role of Tutorial Manager and was responsible for organising and staffing tutorials, casual tutor payments and student class registration. Her encyclopaedic knowledge of the School's policies and practices, meticulous attention to detail, hard work and dedication ensured that everything ran smoothly. Over the years, Susan has taught and been the tutor coordinator of almost every first and second year pure and applied maths subject taught in the School. Her classes and consultation sessions were greatly appreciated by students.

In her early years, Susan was a keen triathlete, once completing the NSW Ironman Triathlon competition (3.8km swim, 180km bike, 42.2km run) in 12.5 hours. Nowadays, she spends her time quilting, sewing, doing jigsaws and solving puzzles.



### Retiring staff member - Steven Carnie

Born and raised in Melbourne, Associate Professor Steven Carnie obtained his undergraduate and postgraduate degrees from Monash and the Australian National University, respectively, in 1977 and 1980. His PhD thesis was in the area of chemical physics from the iconoclastic Applied Mathematics Department of Barry Ninham. After postdoctoral positions in New York and Canada, he became a Lecturer in Physical Chemistry at the University of Western Australia, then in Mathematics at Curtin University of Technology and finally at Melbourne in 1991. He became Associate Professor in 2011.

His primary reward in research was in helping experimental groups understand their findings, by developing new mathematical models to capture the observed phenomena. This originally involved the statistical mechanics of liquids but later included continuum models for the motion of drops and bubbles and microfluidics. He published about 70 papers in areas such as biophysics, macromolecules, chemical physics, fluid mechanics and surface chemistry. His entire career was in interdisciplinary research and he was a nano-scientist before the term was coined.

In his farewell speech, he stated that what he would miss the most in retirement were the students at Melbourne, and that it had been a privilege to teach students in this School. He had a goal of knowing the name of every student in 3rd Year Numerical Methods, so they couldn't hide in lectures and labs. He supervised eight PhD students, sometimes rescuing those who were forced to change projects. He is very proud of having created the new (and unique) subject Mathematics for Biomedicine in 2013.

In retirement he has published one paper with plans for more. He has just passed the Chinese Proficiency Test HSK Level 1 and is working towards Level 2. He now has five national silver medals with his barbershop quartet, is re-stocking his wine cellar and planning numerous adventures overseas.

## Public lectures



In 2019 the School hosted four public lectures. The first was in April, titled 'Maths in the Work of M.C. Escher', by Dr Marcy Robertson of our School. This talk was tied in with the exhibition Escher x Nendo at the National Gallery of Victoria. Marcy talked to a packed theatre about the geometry and topology that can be found in Escher's work.

The second talk was the 2019 Behrend Memorial Lecture in Mathematics, held in August. This lecture series is funded by a donation from Daisy Behrend, the wife of Associate Professor Felix Behrend, who was a staff member in our School. This year the lecture was presented by Associate Professor Stephen Leslie of our School and was titled 'Genetics and Geography: Using genomic data and mathematical models to infer population history and demography'. The talk was about Stephen's research on the distribution of genetic information in the British Isles, and how that can be used to inform discussion about historical migration patterns.

The third talk was 'Mathematics: From Seeing to Discovering', by Professor Tianxin Cai, from Zhejiang University in China. In addition to being a mathematician, Tianxin is an award winning poet, essayist and photographer. Drawing on classical and modern painting, photography and daily life, he talked about the similarities between mathematics, art and poetry, and how they affect people's lives. This talk attracted a different crowd to our usual audience, with a large number of artists and art historians attending.

Our final public talk, held in December, was part of the 2019 Mahler Lecture Tour, which is funded by a bequest from Professor Kurt Mahler. The series is co-sponsored by the Australian Mathematical Society (AustMS) and the Australian Mathematical Sciences Institute (AMSI), and occurs every two years. This year, the Mahler Lectureship was awarded to Dr Holly Krieger from the University of Cambridge, who gave a talk titled 'A Tour of the Mandelbrot Set'.

In addition, Professor Arun Ram from our School presented a series of public lectures in Sydney, Melbourne, Wonthaggi and Bendigo in August with pianist Joshua Hooke from the Melbourne Conservatorium of Music. The talks, entitled 'Maths and Music in Berlin 1828', discussed music and mathematics; the sounds of Beethoven, the elliptic orbits of the planets, and the thrill of the Kosmos. The lectures were sponsored by National Science Week and the Faculty of Science.

## What are our alumni doing now?



### Andrew Elvey-Price wins Chancellor's Prize

Andrew Elvey-Price was awarded one of six Chancellor's Prizes for Excellence in PhD Thesis in 2019 for his thesis entitled 'Selected problems in enumerative combinatorics: permutation classes, random walks and planar maps'. Andrew tells us about his journey to a career in mathematics.

*"I have liked mathematics for as long as I can remember. From a young age my parents gave me maths problems to solve, which to me were like puzzles, and in a way, I haven't grown out of that mindset. The problems I work on have steadily become harder, through high school where I did competitions like the International Mathematical Olympiad, up to now where I work on unsolved problems. As always, I spend time both trying to solve individual problems*

*as well as discovering and developing techniques that can be applied more generally. Although from my perspective my current problems are just very difficult puzzles, they also have close links to computer science and physics, and their solutions have potential implications in those areas.*

*I did all of my higher studies in mathematics at Melbourne University. As an undergraduate, I did some vacation scholarships in combinatorics, which I very much enjoyed. For masters I tried something different: geometric group theory, but I decided to come back to combinatorics for my PhD. I still work on combinatorics, now as a post-doc in Bordeaux. My familiarity with the style of combinatorics done in Melbourne has already come in handy numerous times, as have my experiences with both geometric group theory and Olympiad mathematics. I am particularly indebted to my PhD supervisor, Tony Guttmann, for introducing me to many of my other collaborators including Mireille Bousquet Mélou and Kilian Raschel, who I now work with in France."*



### Maya Ramakrishnan

*"I arrived at Melbourne University back in 1997 to do a double degree in Commerce and Science. It wasn't long before I focused in on maths within my Science degree, specialising in stochastic processes and operations research. From early on, I enjoyed both the theoretical and practical aspects of maths. My honours was joint work with CSIRO focusing on the application of queuing theory to better understand the dynamics of emergency departments in hospitals.*

*After a brief foray into the corporate world, I commenced my PhD with Peter Taylor and Andre Costa in 2003, focusing on non-linear optimisation within telecommunications networks.*

*During my postgraduate years, I was involved in the Statistics and Mathematics Postgraduate group, tutored several first and second year statistics subjects (teaching has always been something that I've loved) and was technical editor of the Journal of the Australian Mathematical Society for a period.*

*I spent the second half of 2006 as a post-doctoral fellow and lecturer in the department, before moving to the US. In the US, I moved away from academia and worked on an equity derivatives desk with Macquarie Group in New York. The financial crisis was certainly an interesting and eye-opening time to be in New York. While my role at Macquarie was in business, it was useful to understand the maths underpinning the quantitative models and 'speak the language' of our quant teams.*

*I arrived back in Melbourne in 2010, and in 2011, made the move to the Victorian Public Service (VPS). Since joining the VPS, I have held roles in the Department of Premier and Cabinet and Family Safety Victoria – an entity established to drive Victoria's family violence reforms. I am currently a Director at the Department of Treasury and Finance, where I look after health and human services policy. One of the main reasons I enjoy working in the VPS is the genuine commitment amongst staff to the public good. While I am not using the maths of my PhD, some of the skills that I honed during my studies – critical and logical thinking, communication of complex ideas – are still relevant. And as the availability and richness of data grows, I am seeing more interesting applications of quantitative techniques to bring evidence to bear to policy making."*