THE UNIVERSITY OF MELBOURNE

School of Mathematics & Statistics

Alumni & Friends 2021

Alumni newsletter of the School of Mathematics & Statistics

Bringing past students together

A message from the Head of School

As I commenced in my role as Head of School in February 2021, I was acutely aware of some of the challenges that lay ahead, particularly as the pandemic continued. While 2021 was a trying year all around, I am extremely proud of our School and our continued upward trajectory even during these times. Our staff have been working hard and have shown incredible resilience in maintaining our high quality in all areas.

The pivot to deliver online teaching during this time has been remarkable to see and has demonstrated our ingenuity and dedication, although we long for that face-to-face classroom interaction with our students. We are all looking forward to regularly seeing our colleagues and students on campus, whether that be in the classroom, for an extended conversation, or even just a quick wave while passing in the hallway.

Even during this time, our School continues to thrive and expand our international reputation. We are proud of our four new ARC Future Fellows: Jennifer Flegg, Jack Hall, Johanna Knapp, and Marcy Robertson. This is an outstanding accomplishment given that 100 fellowships were awarded nationwide in all disciplines, 12 of them at the University of Melbourne, and four of these coming from our School. Quite an impressive feat!

While the financial challenges brought on by the pandemic have been well-highlighted, our School continues to create opportunities for our staff and students. Despite these challenges, we have been able to provide continued support for early career researchers who remain the hardest hit, enabling them to establish their careers and improve their personal well-being. Some of this support has come from the generosity of our alumni, to who we are extremely grateful.

The School has also maintained our scholarships and student awards thanks to many who support and enable these special programs to happen. It was fantastic to be able to host our Student Awards Ceremony in-person in May. Seeing the families and friends of our students, along with the large staff turnout for this event, was a highlight of the year.

The School looks forward to some new initiatives and new spaces to explore. The Melbourne Connect Precinct was completed early this year. While much of the building houses the Faculty of Engineering and IT, our School has its footprint in the mix with our Melbourne Centre for Data Science and our ARC funded Industrial Transformation Training Centre in optimisation, OPTIMA. This presence allows us to expand our connections across disciplines, while ensuring that Mathematics and Statistics continues to be at the heart of research and industry. Meanwhile, construction will be commencing soon on a new state-of-the-art seminar room inside the Peter Hall Building. This will provide a much-needed space for our colleagues and collaborators to interact and share ideas to shape the next generation.

I wish you all a happy and successful 2022, and we look forward to those ongoing face-to-face interactions that we no longer take for granted.

Professor Howard Bondell
Head of School

Visit the alumni website for news, benefits, offers, volunteering opportunities and to update your alumni details:
alumni.unimelb.edu.au

Staff promotions and prizes

Our staff continued to be recognised for their excellence through prizes and promotions in 2021.

Promotions

- Yao-ban Chan, Mario Kieburg and Matthew Tam have been promoted to Senior Lecturer (Level C).
- Alysson Costa, Nora Ganter, Charl Ras, David Ridout, Nathan Ross and Abd-Krim (Karim) Seghouane have been promoted to Associate Professor (Level D).
- Mark Holmes and Deborah King have been promoted to Professor (Level E).

Prizes

- Associate Professor Jennifer Flegg was awarded the inaugural Faculty of Science Women in Science Emerging Researcher award. The award recognises female researchers who have made outstanding contributions in the physical, health or biological sciences, are leaders of the future, and have engaged with outreach activities in the community.
- Professor Jan de Gier won the 2021 University of Melbourne Award for Excellence in a Priority Area.
- Professor James McCaw, Dr Christopher Baker and Dr James Walker were part of the University of Melbourne Epidemiological Modelling Team who won the 2021 University of Melbourne Award for Excellence in Engagement.
- Professor Kate Smith-Miles has been named as Melbourne Laureate Professor. Melbourne Laureate Professor appointments recognise exceptional academic distinction and performance and represent a significant honour.
- Professors Aleks Owczarek and Kari Vilonen have been named as Redmond Barry Distinguished Professors. Established in honour of Sir Redmond Barry's contribution as founder of the University, the title of Redmond Barry Distinguished Professor recognises outstanding leaders within the University's professoriate.
- Professor Aurore Delaigle has been elected as an associate member of the Royal Academy of Science, Letters and Fine Arts of Belgium, which is the learned society of science and arts of the French Community of Belgium.
- Professor Mark Holmes has been named Fellow of the Institute of Mathematical Statistics in recognition of his wide-ranging and creative research in theoretical and applied probability.

Research fellowships

Associate Professor Jennifer Flegg, and Doctors Jack Hall, Johanna Knapp and Marcy Robertson have been awarded four-year Australian Research Council Future Fellowships.

A/Prof Jennifer Flegg

Jennifer's project aims to develop mathematical frameworks that integrate data from multiple sources to facilitate informed decisions in response to the threat of present and future infectious diseases.

The project will advance the tools for incorporating multiple data sources into models of infectious diseases, with a focus on antimalarial drug resistance – a major threat to malaria elimination.

Dr Jack Hall

Jack's project in algebraic geometry aims to develop a better understanding of the algebra underlying the sophisticated geometries that arise in the classification problems that are pervasive in mathematics and its applications to physics.

This new knowledge will then be applied to further elucidate the geometry of these spaces.

Dr Johanna Knapp

Johanna's project aims to study properties of extra dimensions in string theory to uncover new universal features that will have significant impact on string theory and mathematics.

Expected outcomes include answers to conceptual questions in string theory, new types of extra dimensions, and new methods to compute quantum corrections in string theory.

Dr Marcy Robertson

An operad is a mathematical tool for packaging the connection between discrete blocks of information.

Marcy's project aims to reimagine classical objects in geometry and topology as variations of infinity operads. This reimagining will enable new insights into key objects in algebraic number theory, representation theory and topological quantum field theories.

Australian Academy of Science Fellows

Professors John Sader and Gordon Smyth were elected as Fellows of the Australian Academy of Science in 2021.

John Sader developed pioneering measurement techniques that revolutionised the characterisation of materials using the Atomic Force Microscope (AFM). The Sader Method is an international standard for AFM force calibration as is the Sader-Jarvis Method for atomically resolved AFM force measurements. These methods appear in textbooks and are used in commercial instruments. He has also made important contributions in the areas of nano-mechanics, plasmonics, rarefied gas dynamics and fluid-structure interactions ranging from nano to macro scales.

Gordon Smyth is joint Bioinformatics Division Head at the Walter and Eliza Hall Institute and has an honorary appointment in our School. Gordon is well known for his work on statistical computing and statistical modelling. He has made influential contributions to the analysis of genomic data, especially to linear modelling and empirical Bayes methods for the analysis of gene expression experiments. Together with collaborators, he has used genomic data to make important discoveries of relevance to breast cancer, malaria and other diseases.

New professor: Mark Holmes

Mark Holmes received his PhD from the University of British Columbia in 2005. He spent 2 years as a postdoctoral researcher in the Netherlands before taking up a position in the statistics department at the University of Auckland in 2007. After a decade in Auckland, during which he received research awards from both the NZ Mathematical Society and the NZ Statistical Association, Mark joined the University of Melbourne in 2017 as an ARC Future Fellow (and Associate Professor). Mark was named as a Fellow of the Institute of Mathematical Statistics in 2021.

Mark's research interests include a diverse range of topics related to probability and random processes. Among his publications are articles in some of the top journals in probability theory, applied probability, mathematical physics, and combinatorics.

He is known for his creativity, and has made important contributions in several areas of probability theory, including: high dimensional lattice models and their scaling limits (with v.d. Hofstad, Perkins, and others); reinforcement processes (with Kleptsyn and others); and random walks and random media (with Salisbury and others).

Mark is known as an engaging teacher and he particularly enjoys tormenting his students via counterintuitive probability problems. In various stages of life Mark has enjoyed soccer, tennis, cycling, guitar, singing, travelling, and more. He did not enjoy bungee jumping. Currently he likes to do many activities with his daughter Delta, including Purple Dragon martial arts.

New professor: Deborah King

Deb King began her university studies in 1985 at La Trobe University, receiving the David Myers Medal in 1988 for her Honours degree. She completed a PhD at La Trobe University in 1998 and started an ARC postdoctoral research fellowship in 2000, working in dynamical systems and topological dynamics. For the last ten years, her research has focussed on tertiary mathematics education.

In 2002, she moved to the University of Melbourne to take up a position as a tutor in the Mathematics and Statistics Learning Centre (MSLC) and was Director of the MSLC from 2008-2013. Together with Peter Forrester, Deb introduced active learning white board tutorials to first- and second-year subjects in the School.

Deb was promoted to Senior Lecturer in 2012 and Associate Professor in 2015. She has undertaken various leadership positions such as Director of Teaching for the School and has been Director of the Bachelor Science since 2019. Deb has been a passionate teacher of mathematics for over two decades. Her teaching expertise has primarily been developed in large undergraduate classes, but she has also been involved in teacher training both nationally and internationally. Deb is the recipient of three teaching awards, including a National Citation for Outstanding Contributions to Student Learning, and the David White Award for Teaching Excellence at the University of Melbourne, both in 2016.

Deb has led numerous OLT projects addressing key issues including tertiary mathematics education, the management and organisation of large teaching programs and professional development. In 2012, she established a national network of tertiary mathematics educators, FYiMaths. In 2015, she was Chair of the newly formed AustMS Mathematics Education Special Interest Group. Deb has made University-wide contributions to teaching and learning through her roles as Associate Dean (Undergraduate Programs) and Director of the Bachelor of Science.

Obituaries

Professor Edmund Crampin

It is with great sadness that we report the passing of our colleague and friend Edmund Crampin on 15th May 2021 after collapsing on a bike ride with his close friend and colleague James McCaw.

Edmund graduated with a BSc (Hons) in Physics from Imperial College London in 1996, and a PhD in Applied Mathematics at the University of Oxford in 2000, where he subsequently held a Junior Research Fellowship and a Wellcome Trust Research Fellowship. Edmund moved to the University of Auckland in 2003 to lead a research group at the Auckland Bioengineering Institute and was promoted to Senior Lecturer and then Associate Professor.

In 2013, Edmund moved to Australia and the University of Melbourne to take up the position of Rowden White Chair of Systems Biology, an appointment held jointly between the Schools of Mathematics and Statistics, Chemical and Biomedical Engineering and Medicine.

Edmund was elected as a Fellow of the Royal Society of Biology in March 2021. Edmund was Director of the Systems Biology Laboratory, which is home to an interdisciplinary team of researchers developing mathematical and computational approaches to investigate the molecular networks and biophysical mechanisms underlying complex human diseases.

Some of Edmund's research achievements include the development of energy-based approaches to modelling in systems and synthetic biology; mathematical modelling of heart cells to understand the development of heart disease; measurement and modelling of nanoparticle-cell interactions for nanomedicine; and the development of computational approaches to study the network of genetic interactions underlying breast and skin cancers.

Edmund was a deeply respected member of the school and the wider university community, who will be remembered as a kind and generous colleague, friend and supervisor.

Outside of work, Edmund was a dedicated partner and father, and an accomplished musician and singer (skills for which his young children adored him). He enjoyed cycling and spending time with his family and friends in the outdoors. Edmund is survived by his partner Annalisa and his two children Audrey and Perry.

Dr Richard Brak

It is with great sadness that we report the passing of our colleague and friend Richard Brak on 15th September 2021 after a long illness.

Richard was born on 2nd January 1961 in Johannesburg, South Africa. He obtained a Bachelor of Arts from St Anne's College, Oxford and a PhD from King's College, London in mathematical physics. In 1986, Richard started a postdoctoral fellowship at Oxford University. He moved to Australia in 1989 to join the University of Melbourne as a Lecturer and was promoted to Senior Lecturer.

Richard's research expertise was in discrete mathematics and mathematical physics. In particular, he worked on enumerative combinatorics, statistical mechanics, stochastic processes, critical phenomena (phase transitions), Markov processes, combinatorics, orthogonal functions and polynomials, polymers, and modelling of biological systems.

Richard contributed to the school in many ways such as chairing the IT Committee, developing new subjects, lecture allocations, conference organisation, and designing posters, research group logos and the student prize board.

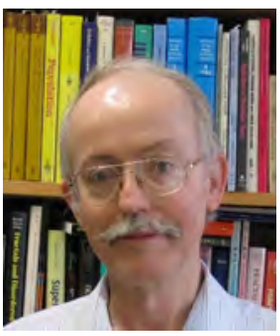
Richard was well known as a deeply caring and supportive supervisor of students; a patient, encouraging and committed teacher and lecturer who showed a great passion for his subject; and a kind and helpful friend and colleague. His colleagues and students will long cherish his memory.

Outside of work Richard enjoyed walking holidays with family and friends, nature photography, classical Greek archaeology and working on archaeological digs, visiting volcanoes and glaciers, science fiction, computers and all things technology. Richard is survived by his wife Rachel and his two children Joseph and Samuel.

Retiring staff members

In 2021, the School farewelled three staff members Professor Barry Hughes (retired in May), Professor David Balding (retired in June) and Dr John Banks (retired in December).

Professor Barry Hughes



Barry started his tertiary studies in mathematics at the University of Queensland. He completed a PhD in applied mathematics at the Australian National University, working on applications of continuum mechanics in colloid and interface science. He spent several years on the post-doctoral circuit in the USA, working on problems related to physics and chemical engineering at the Universities of Rochester, Maryland and Minnesota.

He returned to Australia as a Queen Elizabeth II Fellow at the Australian National University but resigned to take up a lectureship in mathematics at the Royal Military College, Duntroon. In 1986 Barry moved to the University of Melbourne as lecturer in the then Department of Mathematics. During his career at Melbourne, Barry taught many different subjects, but his greatest loves were Accelerated Mathematics 2, which he taught from 2008 to 2020, Integral Transforms and Asymptotics, and Complex Analysis.

Barry always lived out his educational philosophy that teaching mathematics is a performance art, that correct conceptual understanding is essential for mathematical growth, and that contributing to the intellectual formation of young adults is a tremendous privilege.

Much of Barry's research has involved probabilistic aspects of mathematical modelling and in the past two decades his work became increasingly related to problems in biology and medicine. He enjoyed a lengthy collaboration with Professor Kerry Landman, with whom he co-authored 35 research papers and co-supervised five MSc students and five PhD students, but also richly enjoyed collaborations within researchers from a wide range of disciplines. His two-volume book Random Walks and Random Environments (Oxford University Press 1995, 1996) is widely cited.

Barry has served as Head of Department and, as he puts it, was "always the humble servant of the Academic Board", chairing its Selection Procedures Committee for ten years and making a nuisance of himself in committees and forums to save staff and students from the ill effects of silly ideas.

Barry continues his association with the School as an Emeritus Professor and hopes one day to complete a weighty treatise on complex analysis and its applications, on which he has already been working for far too long.

Professor David Balding

David studied Mathematics at Newcastle (NSW) where he was guided by Tony Guttmann towards a PhD to study stochastic processes at Oxford. After Oxford, he undertook a lectureship in London under the patronage of Peter Donnelly, working in the exciting field of mathematical genetics as the genomics revolution was building up. After seven years in London, David was promoted to Professor at the University of Reading, and five years later returned to London, at Imperial College and then University College.

After nearly 30 years in the UK, he returned to Australia in 2014, where he has been Professor of Statistical Genetics in both BioSciences and Mathematics & Statistics. He was the founding Director of Melbourne Integrative Genomics, where he played a key role in recruiting outstanding colleagues: Drs Heejung Shim, Yao-ban Chan and Damjan Vukcevic, and A/Prof Kim-Anh Le Cao (Maths & Statistics), plus Professors Stephen Leslie and Michael Stumpf (joint with BioSciences), Dr Irene Gallego Romero (BioSciences) and A/Prof Agus Salim (joint with MSPGH).

David was made a Fellow of the Australian Academy of Science in 2019, and now chairs a committee assessing new candidates for Fellowship. He organised a meeting on forensic science jointly sponsored by the Academies of Science and Law, which led to the Academy of Science increasing its role in issues related to science in courts.

Regarding plans for retirement, he says: "I've celebrated retirement by working from morning till evening most days, and have submitted papers that had been languishing on my desk: on estimating coancestry coefficients among individuals and populations within a hierarchical structure, on estimating the distribution of heritability in the human genome and how it varies with known properties of the genetic variants, and on methodology for genetic association studies in bacteria."

David plans to start winding down, but not yet. He continues to supervise postdocs and PhD students, he remains Section Editor for Methods at PLOS Genetics, and will be 2022 President of the International Genetic Epidemiology Society. He has booked some cycling trips, the highlight a week-long bike tour of Central Australia: Alice Springs, Kings Canyon and Uluru.

Dr John Banks

John Banks left Rosebud High School at the end of Year 10 (Form IV in those days) in 1972 and completed an apprenticeship in Carpentry and Joinery (no, he doesn't want to help with your home renovations after retirement). He subsequently worked in the building industry.

After a few years, some friends suggested that he might enjoy university study. At that time, universities offered various entry programs for people without standard entry qualifications and John started an Arts degree at La Trobe University in 1981 under one of these schemes, fully intending to change the world. He became distracted from that objective, however, having enrolled in a first-year mathematics subject and ended up co-majoring in Sociology and Mathematics, completing an Arts degree in 1983.

After a few attempts to avoid the inevitable, he completed a mathematics PhD during 1990 to 1994 in the field of topological dynamics, under the supervision of Dr. Arthur Jones.

He took up a position as Associate Lecturer (Tutor) at La Trobe and was promoted to Lecturer in 2002. During this period, he continued his research in topological dynamics, but took a more active interest in teaching.

In 2014, he took up the role of Academic Manager of the Mathematics and Statistics Learning Centre. At that time, several staff were on the path to retirement, so his priority was to build a strong team to carry the work of the MSLC forward in future years. The success of this endeavour has been amply demonstrated by the magnificent response by the MSLC in adapting to online teaching and assessment in the past two years.

John has enjoyed a range of activities outside of work, including musical performance and composition, skiing (both cross country and alpine).

He fully intends to devote way more time to these things in retirement. He might even have time to explore some additional areas of mathematics. Travel plans are on the agenda too. John also looks forward to an ongoing association with the school in an honorary capacity and is particularly interested in the MSLC's NextGen tutorial rooms project.

Mathematics and statistics outreach

During 2021 the outreach team continued to deliver virtual programs aimed at increasing student engagement and participation in Mathematics and Statistics. The Research Competition for school students in years 5 to 12 attracted entries from hundreds of students and schools across Australia. Sixteen teams were selected to participate in a virtual Finals Presentation. The finalist teams came from Victoria, New South Wales, Queensland and Northern Territory. In 2022 the competition will expand again by opening it up to students from New Zealand.

Outreach also continued to run the Micro Mathematicians programs virtually. These selective school holiday and after-school programs for highly able students in years 5 to 10 have become extremely popular. The outreach team are now working on new ideas on how to accommodate the growing demand for extension programs and activities.

Outreach are continuing to grow our suite of offerings. A new Enrichment Series for students studying VCE mathematics (or their state equivalent) began in October. These seminars are aimed at demonstrating that mathematics and statistics are not only creative and engaging but are essential as they underpin the society and world in which we live. So far there have been three interactive virtual seminars. In future, it is hoped that these will be able to run in dual mode, both on campus and on Zoom, to allow students from regional areas and other states to participate.

The above are just some of the programs we run to help strengthen school student engagement in mathematics and statistics and to demonstrate how studying maths and statistics can help to equip students with important skills for their future careers.

If you would like to be involved in outreach, by giving a presentation or providing a career profile or have an activity for us, please contact ms-outreach@unimelb.edu.au. We would love to hear from you.

OPTIMA

Optimisation is the mathematics of decision-making. In today's fast-paced world there is a growing need for advanced decision-making tools to support industry to enhance global competitiveness by reducing financial and environmental costs while improving efficiency, quality, and agility. Such decisions typically involve finding the optimal combination of thousands of variables, with constraints on their permissible values, to simultaneously satisfy several conflicting objectives. Finding optimal solutions is impractical using trial-and-error enumeration methods, even for the fastest computers. However, smart mathematical techniques can help eliminate the parts of the huge search space where optimal solutions provably do not exist, allowing computing resources to be used more efficiently to explore the most promising regions.

A recent public lecture by Professor Kate Smith-Miles and Dr. Alison Harcourt AO provided an introduction to the field of optimisation, and some of the breakthrough advances – including the branch-and-bound method pioneered by Alison and her collaborator Ailsa Land in 1960 – that laid the foundations for the optimisation software used to tackle today's large-scale industrial optimisation problems.

Despite such advances though, there are still barriers to industry uptake. To tackle this, the School of Mathematics and Statistics is leading a new $8m interdisciplinary centre to support industrial transformation through increased uptake of trusted and sophisticated optimisation technologies. Officially commencing in September 2021, the ARC Training Centre in Optimisation Technologies, Integrated Methodologies, and Applications (OPTIMA) aims to advance an industry-ready optimisation toolkit, while training a new generation of industry practitioners, and over 120 young researchers who will vanguard a highly skilled workforce of change agents for industrial transformation over the next five years.

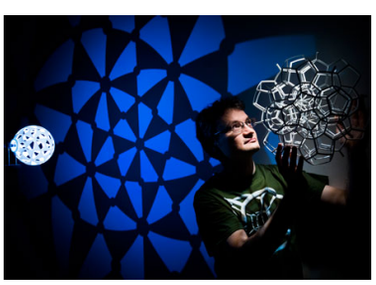
OPTIMA is a partnership between the University of Melbourne, Monash University, three international universities, and 11 industry partners spanning the manufacturing, energy resources, and critical infrastructure sectors. Partners include Boeing Aerostructures Australia, AGL Energy, South East Water, MECCA, Future Fibre Technologies, AusNet Services and Melbourne Water.

With problems as diverse as aircraft design, optimising renewable energy generation, and balancing water dispatch to consumers while protecting the habitat of animal species in rivers, OPTIMA will be delivering tailored commercial outcomes for industry partners, while simultaneously advancing optimisation techniques for broader impact via PhD projects.

OPTIMA is headquartered at the new Melbourne Connect building, and is led by Melbourne Laureate Professor Kate Smith-Miles (University of Melbourne) as the Centre Director, supported by Professor Peter Stuckey (Monash University) as Deputy Director. An additional 16 chief investigators across Melbourne and Monash Universities ensure OPTIMA's expertise spans the many fields that contribute to optimisation technologies: mathematics, statistics, computer science, economics and engineering.

The School of Mathematics and Statistics has a long tradition of teaching operations research and optimisation techniques, and is delighted to be offering this pathway to industrial impact for our students and academics.

Public lecture



Left: Dual half 120-cell and 600-cell designed jointly with Saul Schleimer Right: Henry Segerman by James Glossop

In March 2021, the School hosted a public lecture via Zoom entitled 'Artistic Mathematics: Truth & Beauty', by Dr Henry Segerman. The talk was well attended and was streamed live into several secondary school classrooms.

Henry was a former research fellow in our School and is now an Associate Professor at Oklahoma State University.

Henry talked about his work in mathematical visualisation: making accurate, effective, and beautiful pictures, models, and experiences of mathematical concepts. He discussed what it is that makes a visualisation compelling, and showed many examples in 3D printing, as well as some work in virtual reality and spherical video.

MUMS

Melbourne University Mathematics and Statistics Society (MUMS) is a student-run club affiliated with the University of Melbourne Student Union. We currently have 741 members composed of both undergraduate and postgraduate students. MUMS exists to bring together students with an interest in mathematics and statistics in a supportive and fun environment. We strive to expose students to a diverse range of topics and potential careers and to further interest in mathematics.

In 2021, MUMS held a wide variety of events and activities for our members, including educational events such as maths competitions and seminars, as well as social events like games nights and women-in-maths coffee catch ups. Although Covid-19 posed a significant challenge to our club, we quickly adapted to online events and social media platforms so that we could connect and support our members through these difficult times.

The School Maths Olympics and University Maths Olympics were a great success with 180 high school students and 78 university students participating virtually in these competitions. Our game nights and movie nights also experienced great turnouts, as students loved the opportunity to socialise in person and make friends within the maths community.

MUMS is planning to host more events than ever in 2022 as we transition to on-campus learning. We are continuing the time-honoured traditions of the Puzzlehunt, Paradox magazine and trivia nights while offering more support to under-represented maths students through regular catch ups and career events. We hope to bring more maths enthusiasts together and further the interest of our valued members in the upcoming year.

To find out more about MUMS, visit https://www.melbunimathsstats.org/ or contact us at mu-ms@ms.unimelb.edu.au.