



### Message from the Head

Professor Aleks Owczarek

The past year of 2013 has been one of growth and success for the department. Just recently many members have won Australian Research Council (ARC) Discovery grants, ARC Fellowships and NHMRC project grants. This continues our excellent record of grant success rates being well above national success rates. An earlier related highlight was that Professor Peter Taylor, our Chair of Operations Research, was awarded the ARC's most prestigious Fellowship, a Laureate Fellowship.



Our undergraduate and masters programs continue their success. As a consequence the department is continuing with a hiring program. Dr Nathan Ross, who works in stochastic modelling, joined the department in July. Drs Charl Ras and Alysson Costa, who work in optimisation, are joining the department currently. We have also advertised for positions in pure and applied mathematics, and hope that further new academics will be on board in 2014.

Current members have also been promoted, demonstrating their excellence. Associate Professor Aurore Delaigle has been promoted to a full Professor and Dr Iwan Jensen has been promoted to Senior Research Fellow.

Several members have also received honours and prizes. We started the year with news that Professor Peter Hall has been appointed an Officer of the Order of Australia, and later on he was elected as a Foreign Associate of the US National Academy of Sciences. Professor Aurore Delaigle was elected as an Institute of Mathematical Statistics (IMS) Fellow in 2013 and also won an ARC Future Fellowship. Dr Nathan Clisby also won a Future Fellowship in this year's round.

I cannot list prizes without mentioning that Professor Terry Speed, who holds an honorary position in the department and works at the Walter and Eliza Hall Institute, won the 2013 Prime Minister's Prize for Science.

Finally, we continue to improve the Richard Berry Building, which we inhabit. We have started to build a 50 seat lecture theatre for our Master of Science students. It is expected to be ready for use at the start of semester one in 2014.

### THE ALUMNI NEWSLETTER OF THE DEPARTMENT OF MATHEMATICS & STATISTICS, BRINGING PAST STUDENTS TOGETHER.

#### New Professor Aurore Delaigle



Aurore Delaigle studied Mathematics and Statistics at the Université catholique de Louvain in Belgium, where she also did her PhD in Statistics. At the end of her PhD, she undertook a postdoctoral fellowship in the Department of Statistics at the University of California at Davis, funded by the Belgian American Education Foundation. She was later appointed as an assistant professor at the University of California in San Diego, then as a lecturer and a reader at the University of Bristol. In 2007 and 2008, she shared her time between the School of Mathematics at the University of Bristol and the Department of Mathematics and Statistics at the University of Melbourne, where she held a Maurice Belz Fellowship. She moved from Bristol to Melbourne in 2009, when she was awarded a Queen Elizabeth II Fellowship by the Australian Research Council.

Aurore's research interests lie in nonparametric statistics, with special focus on problems involving measurement errors, functional data analysis, group testing, and function estimation. She enjoys transforming complex and highly abstract methods into easy to understand concepts, and developing fully applicable techniques that work in a wide variety of settings. Her work is often motivated by problems arising in a variety of fields such as nutrition, epidemiology, genetic studies, pollution and meteorology. In 2013, she was awarded the Moran Medal from the Australian Academy of Science, and elected a Fellow of the Institute of Mathematical Statistics.

Aurore is an Associate Editor for several major international journals in statistics such as the Journal of the Royal Statistical Society, Series

B, the Annals of Statistics, and the Journal of the American Statistical Association. She is the Executive Secretary for the Institute of Mathematical Statistics and for the International Society for Nonparametric Statistics. She has also served on a number of international scientific committees. In her free time, Aurore enjoys playing the piano and riding her bike.

#### Peter Taylor Awarded Laureate Fellowship



Professor Peter Taylor was awarded one of 17 Australian Laureate Fellowships. Administered by the Australian Research Council, this prestigious fellowship supports outstanding Australian and international researchers to build Australia's ability to make new discoveries, pursue innovative studies as well as mentoring early career researchers.

Peter's research interests lie in the fields of stochastic modelling and applied probability, with particular emphasis on applications in telecommunications, biological modelling, healthcare and disaster management. Recently Peter has become interested in the interaction of stochastic modelling with optimisation and optimal control under conditions of uncertainty.

Peter's Fellowship project is entitled *New Stochastic Models for Science, Economics, Social Science and Engineering*. Stochastic, or random, phenomena are abundant in society. This project will combine advancement of the theory of stochastic models at a deep level with application to problems arising in science, economics, social science and engineering, and outreach to educate members of the public about random processes of significance in their lives.



## Dougal Davis Awarded Bachelor of Science Medal



Dougal Davis has been awarded the 2012 Bachelor of Science Medal as the top-performing student in the Bachelor of Science. Dougal studied 8 third year level mathematics subjects and specialized in pure mathematics in the Bachelor of Science.

Dougal is currently pursuing a Master of Science in Mathematics and Statistics, specializing in pure mathematics. His research project is in the field of moduli theory and involves the study of spaces of geometric objects.

Dougal is actively involved in promoting mathematics within the university and the general community. Dougal is the Vice President of MUMS (Melbourne University Mathematics and Statistics Student Society). Dougal is involved in the mentoring and outreach programs In2Science (where university students mentor primary and secondary school students) and SciFY (where university students facilitate study groups for first semester Bachelor of Science students). He also works as a casual tutor in the Department and volunteers at the Friday Night School in Richmond.

Dougal hopes to do a PhD overseas when he finishes the Master of Science.

## Statistical Consulting Centre

The Statistical Consulting Centre provides statistical services to business, industry, government and the academic world. The Centre has been running since 1984, and is one of the oldest University Centres established by University regulation. The Centre's Director is Professor Ian Gordon. Below we give an example of one of their projects.

Daniel Haile-Michael is a young African man who grew up in the Flemington high rise estate in Melbourne in the mid-2000s. In 2008, the Flemington & Kensington Community Legal Centre made a complaint of racial discrimination to the Australian Human Rights Commission on behalf of Daniel and a number of other young African men from Flemington and North Melbourne. Their complaints related to being targeted and harassed by the police. After the complaints could not be resolved by reconciliation, the Haile-Michael case went to the Australian Federal Court. Lawyers from Arnold, Bloch Leibler took the case pro-bono. Professor Ian Gordon acted as an expert witness.

How were statistics relevant to this important civil case? The police record details of the

contacts they make in the field, and the data describing contacts with young men living in Flemington or North Melbourne in 2005 to 2008 were examined.

*Did police interact with young men of African ethnicity more than young men of other backgrounds?*

According to the 2006 Census, about 18% of the population in Flemington and North Melbourne were young men of African ethnicity. In the records of police contacts, 43% of the young men had African ethnicity.

*Among young men recorded as offenders in the police data, did young men of African ethnicity commit more crimes than young men of other backgrounds?*

In the police records of offenders, the average number of offences for young men of African ethnicity was 7.8, compared with 12.3 offences for young men of any other ethnicity.

*Did police interact with young male offenders of African ethnicity more than those from other backgrounds?*

About 17% of offenders of non-African ethnicity had no record of field contacts with the police, compared with only 2% of offenders of African ethnicity.

*How did the police describe the field contacts?*

Field contact data includes descriptive information about the contact. Common negative phrases (e.g. "gang", "no reason", "move on" and "negative attitude") were used more often to describe the contact with groups of African ethnicity (16%) than with groups of non-African ethnicity (10%).



Flemington Bridge Station; Housing Commission high rise building in the background.

Image credit: Rhys McCaig / CC-BY-SA-3.0-MIGRATED

Between the expert witnesses in the trial, there were many deep statistical issues, and argument over statistical methods and inferences. These included issues of independence between data, and modelling techniques such as generalized linear mixed models. These subtleties arose because data of different types were collected over time, on individuals who were sometimes contacted by police as individuals, and sometimes in groups. The groups of individuals were sometimes all of one ethnicity, and sometimes mixed ethnicity.

The statistical evidence was consistent with the complaints made by the young African men. The case was settled the day before it was to go to trial in the Federal Court. As a condition of settlement, Victoria Police agreed to invite community comment about, and then undertake an examination of, their policy on field contacts, including the collection of data, and to report the findings in December 2013.

## Master of Science

The two-year Master of Science (Mathematics and Statistics) program was launched in 2009 to replace the one-year honours program as the standard preparation for a graduate research degree in the area. All students enrolled in the University in 2008, the year when the Melbourne Model started operating at the undergraduate level, or later, and willing to proceed to a research higher degree, had to enroll in the newly introduced MSc program. Of course, not all students who were going into our MSc planned to do a PhD afterwards; some were aiming at a higher "entry point" to the professional workforce or just wanted to learn more. For people from that cohort, the Department retained the one-year Postgraduate Diploma that has no research component.

The MSc program has already gone through one round of review and adjustment in 2011 to ensure smooth transition of the graduates completing the "New Melbourne Model" version of the Bachelor program. The Departmental Masters Committee is now doing the second round of reviewing the program, which is likely to result in some changes to the coursework offerings in some disciplines starting from 2015.

Overall our MSc program has been successful. Despite having a very intensive coursework component (the program requires students to do 12 coursework subjects), the "exit polls" show, year after year, that the majority of students enjoyed the challenge and actually liked doing the MSc more than their BSc studies. Starting with five graduating students in 2010, the number of graduates grew by 100% each of the next two years (10 in 2011, 20 in 2012), with 25 students graduating in 2013. The total number of students in the program as of 15 November 2013 was 64 (which included a number of students who were on leave).

The increase in the student numbers has led to a shortage of space. We are combining tutorial rooms F and G to build a new 50 seat lecture theatre.



The old Room F



Work in Progress  
Image credit: Dean Fox