

## A centenary squared away



*The Treasurer, Hon. Peter Costello MP, adds the last cube to the centrepiece.*

A landmark announcement from the Federal Treasurer, some theatrical shenanigans and a giant cube were just some of the highlights of the 100th birthday celebrations at ABS House in Canberra on 8 December.

The Treasurer, the Hon. Peter Costello, praised the bureau for charting Australia's progress almost since Federation. "Throughout the last 100 years ABS has been true to its values," Mr Costello said. "It has achieved a consistently high level of integrity, professionalism, relevance, and confidentiality."

He reminded everyone that "what the ABS does really matters – to all Australians".

Mr Costello concluded his address by announcing that, as a tribute to the people of Australia, all statistics on the ABS web site would be free of charge.

"I have great pleasure in announcing that as from next Monday morning, all the statistical information published online by the ABS will be available free of charge," he said.

Australian Statistician Dennis Trewin said the celebration was also an

opportunity to thank the individuals and businesses who have provided data through ABS surveys.

"We are grateful for the support of Australian households and businesses and dependent on their continuing support to produce relevant and useful information," he said.

The formalities came to a sudden halt when a "ringmaster" emerged from the atrium floor gathering and strode onto the stage. She began to announce a potted history of the ABS as more performers materialised, carrying a series of large cubes to the centre of the atrium floor. Dressed as everyday Australians from various walks of life, the performers gradually arranged the cubes to form a giant 3m x 3m cube with each visible side displaying various facets of the ABS and its work.

Soon after this dramatic monolith was completed, staff, who packed the skybridges, let fly with streamers. Mr Costello cut the birthday cake and also helped seal the Time Capsule which is due to be reopened in 2055. A combined ABS choir led the gathering in singing *Happy Birthday*.

Celebrations were not restricted to ABS House, with Regional Offices joining in with their own events on and around 8 December. With about 51 separate events, there was something for every one of the ABS' 3,088 staff members to help celebrate this unique, historic and never-to-be-repeated anniversary.

*Steve Dangaard*

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# ASC/NZSA 2006 Offers an Outstanding Scientific Program

The theme of this year's joint conference of the Statistical Society of Australia and the New Zealand Statistical Association is "Statistical Connections". This theme was chosen to indicate the strong links not only between statisticians in both countries but also more widely in the region. The theme has also had significant impact on the program design in which statistical theory and methodology, computational methodology and applications are linked. The program also aims to increase the connection of young statisticians with each other and existing members of both the Australian and the New Zealand societies.

Putting the program together has involved a lot of work by the members of the program committee: David Scott (Auckland University, who is also the Conference Chair), Chris Carter (CSIRO CMIS), Kerrie Mengersen (QUT), Marti Anderson (University of Auckland), Beatrix Jones (Massey University). We are very grateful for their efforts.

The Scientific Program for ASC/NZSA 2006 includes Plenary Sessions, Invited Paper Sessions, Contributed Paper Sessions and Poster Sessions. Satellite workshops will also be available. The main scientific program will take place over the four days Monday July 3 through Thursday July 6. There will be a plenary session of 75 minutes duration on each day of the conference. We are fortunate to have four outstanding keynote speakers for the plenary sessions.

## Keynote Speakers

### Professor David Donoho

David Donoho is Anne T. and Robert M. Bass Professor in the Humanities and Sciences at Stanford University. He works in mathematical statistics, information theory and computational harmonic analysis. He is currently interested in new multiscale representations lying "beyond wavelets", and in rapidly finding the sparsest solution of systems of underdetermined linear equations. He received his AB from Princeton *summa cum laude* in statistics and his PhD in statistics from Harvard. He has received a MacArthur Fellowship as well as the von Neumann prize of the Society of Industrial and Applied Mathematics, and has served as Wald Lecturer for the Institute of Mathematical Statistics. He is a member of the US National Academy of Sciences and the American Academy of Arts and Sciences. He won the 1994 COPSS Award from the Committee of Presidents of Statistical Societies.

### Professor Peter Hall

Peter Hall is Professor of Statistics in the Centre for Mathematics and its Applications in the Mathematical Sciences Institute, Australian National University. Peter Hall received his BSc degree from the University of Sydney in 1974. His MSc and DPhil degrees are from the Australian National University and the University of Oxford, both in 1976. He taught at the University of Melbourne before taking, in 1978, a position at the Australian National University, where he has been ever since. His research interests range across several topics in probability and statistics. He is a Fellow of the Australian Academy of Science and a Fellow of the Royal Society of London and won the 1989 COPSS Award.

### Professor Xiao-Li Meng

Xiao-Li Meng is Professor and Chair of the Department of Statistics at Harvard University. He received a MA in statistics from Harvard in 1987 and a doctorate in statistics in 1990. Professor Meng held previous appointments at the University of Chicago. His research interests are in statistical inference under complex settings, such as partially observed data, pre-processed data, and simulated data, quantifying statistical information and efficiency in scientific studies, particularly for scientific computation, genetic studies, and environmental problems, statistical principles and foundational issues and effective deterministic and stochastic algorithms for Bayesian and likelihood computation. Professor Meng won the 2001 COPSS Award.

### Foreman Lecture: Professor Ray Chambers

Ray Chambers is Leverhulme Professor of Social Statistics and Director of the Southampton Statistical Sciences Research Institute at the University of Southampton. He is a leading international expert in survey statistics and has close contact with several national statistical offices including the UK Office for National Statistics and the ABS. He will be moving to Australia in early 2006 to take up a research chair in statistical methodology at the University of Wollongong.

## Invited Speakers

The program committee has been delighted with the way in which the invited speaker program has developed and with the willingness of many outstanding statisticians from around the world to participate in it. Our aim was to develop a program in which statistical

and computational methodology relevant to a range of applications was presented and this resulted in two of the main program themes being organised.

The first of these, Statistical Methodology, has within it invited sessions on Bayesian Statistics, Exact Methods of Statistical Inference, Saddle Point Methods in Modern Statistical Inference, Multivariate and High Dimensional Data, Spatial Statistics and Stochastic Processes.

The second major theme is Computational Statistics and this includes sessions on Statistical and Machine Learning, Computationally Intensive Statistics, Statistical Computing and Resampling Methods. Again the emphasis is on methodology that 'over arches' or connects various application areas.

In this era of revolutions in the technology of Biological Science a substantial part of the invited program naturally evolved into a theme on "Statistics in Biology and Medicine". Within this theme there will be sessions on Biological Sciences, Bioinformatics, Statistical Genetics, Forensics, Medical Sciences, Statistics in Ecology and the Environment, and Multivariate Statistics in Ecology. The invited speakers are again impressive and bring talks on theory and applications to this theme.

The tradition of devoting a substantial part of the invited program to the Special Interest Sections of the two Societies will be followed again this year with sessions on Industrial Statistics, Statistical Education, Surveys and Management and Econometrics and Finance.

The invited program would not have come about without the efforts of the Session Organizers who have played a key role in bringing the program together. The Program Committee is very grateful for their efforts.

In the STATISTICAL METHODOLOGY THEME, invited speakers include:

- *Bayesian Statistics (organized by Claire Jordan & Kerrie Mengersen)*. **Christian Robert** (Professor at University Paris-Dauphine), **Robert McCulloch** (Professor of Statistics, University of Chicago).
- *Exact Methods of Statistical Inference (organized by Chris Lloyd)*. **Alan Agresti** (Professor of Statistics, Florida State University), **Chris Lloyd** (Professor of Statistics at the Melbourne Business School) and **Ivan Chan** (Director,

Clinical Biostatistics, Merck Research Laboratories).

- *Saddlepoint Methods in Modern Statistical Inference* (organized by Neville Weber). **Ron Butler** (Professor of Statistics, Colorado State University) and **John Robinson** (Professor of Statistics, University of Sydney).
- *Multivariate and High Dimensional Data* (organized by Robert Kohn). **David Donoho**, (see Keynote Speakers) and **Matt Wand** (Professor and Head of Statistics, UNSW).
- *Spatial Statistics* (organized by Adrian Baddeley). **Christian Lantuejoul** (Centre de Geostatistique).
- *Stochastic Processes* (organized by Ilze Ziedens). **Adam Schwartz** (Professor of Electrical Engineering, Technion Israel Institute of Technology) and **Dirk Kroese** (Mathematics, University of Queensland).

In the COMPUTATIONAL STATISTICS THEME the invited speakers include:

- *Statistical and Machine Learning* (organized by Matt Wand). **Geoff McLachlan**, (Professor of Statistics, University of Queensland) and **Alex Smola** (Senior Principal Researcher and Machine Learning Program Leader National ICT Australia / ANU).
- *Computationally Intensive Statistics* (organized by Chris Carter). **Xiao-li Meng** (see Keynote Speakers) and **Robert Kohn** (Professor, School of Economics, UNSW).
- *Statistical Computing* (organized by Paul Murrell and Kuldeep Kumar). **Junji Nakano** (Professor, Centre for Development of Statistical Computing, Institute of Statistical Mathematics in Tokyo) and **Bill Venables** (CSIRO CMIS).
- *Resampling Methods* (organized by Marti Anderson). **Peter Hall** (see Keynote Speakers) and **Jiming Jiang** (Professor and Director, Statistical Laboratory, University of California at Davis).

In the STATISTICS IN BIOLOGY AND MEDICINE THEME invited speakers include:

- *Statistics in Biological Science* (organized by Harold Henderson and Simon Barry). **Mark Burgman** (Professor of Environmental Science, University of Melbourne) and **Tony Pettitt** (Professor of Statistics, Queensland University of Technology).
- *Bioinformatics* (organized by Chris Triggs). **Gordon Smyth** (Senior Research Scientist in Bioinformatics, Walter and Eliza Hall Institute of Medical Research) and **Alan Rodrigo**

(Professor, Bioinformatics Institute, University of Auckland).

- *Statistical Genetics* (organized by James Curran). **Emlyn Williams** (CSIRO Forestry and Forest Products) and **Sharon Browning** (University of Auckland).
- *Forensic Statistics* (organized by James Curran, Janet Chaseling and Claude Roux). **James Curran** (Statistics, University of Auckland) and **John Buckleton** (Institute of Environmental Science and Research Ltd).
- *Medical Sciences* (organized by Katrina Sharples and Peter Howley). **Annette Dobson** (Professor of Biostatistics, Head of the Division of Epidemiology and Social Medicine, University of Queensland), **Gita Mishra** (Senior Research Fellow for the Medical Research Council – National Survey of Health and Development at the Royal Free and University College London Medical School) and **Robert Gibberd** (Health Services Research Group, CCEB).
- *Statistics in Ecology and the Environment* (organized by Marti Anderson). **Steve Buckland** (Professor of Statistics, University of St Andrews) and **Rachel Fewster** (University of Auckland).
- *Multivariate Statistics in Ecology* (organized by Marti Anderson). **Brian McArdle** (Statistics, University of Auckland) and **David Warton** (Statistics, UNSW).

SPECIAL INTEREST SECTIONS:

- *Industrial Statistics* (organized by David Whitaker and Ross McVinish). **Nozer Singpurwalla** (Professor of Statistics, Institute for Reliability and Risk Analysis, George Washington University) and **Chin Diew Lai** (Associate Professor, Institute of Information Sciences and Technology, Massey University).
- *Surveys and Management* (organized by Steve Haslett and Robert Clark). **Kirk Wolter** (Professor in the National Opinion Research Center's Center for Excellence in Survey Research, and Professor, Department of Statistics, University of Chicago.) and **Alistair Scott** (University of Auckland).

The program of invited sessions and speakers continues to be developed. For example, we are working on a session on econometrics and time series and one on syndromic surveillance for disease outbreaks. The program will be updated continually at the conference web site (<http://www.statsnz2006.com/>) so please check this for details.

## Program for Young Statisticians

The conference strongly encourages participation by young statisticians and there are two important activities on the program especially for them. As part of the Welcome Reception on Monday evening there will be "young statistician's corner" where those new to the Australian and New Zealand conferences can meet other recent members of the Associations. This will be a great chance to 'break the ice' and meet your fellow younger colleagues.

There will also be a whole session on Monday afternoon (TBC) for young statisticians at which a series of 15 minute presentations on interesting topics encountered by the speakers in their work. This session is being organized by Jason Thomas of Statistics New Zealand and Ian Wood of Queensland University of Technology. Speakers include: Richard Hutchinson (Covance), Peter Kuhnert (CSIRO Mathematics and Information Sciences), Yun Liang (Motu Research), Victoria Wei (Statistics New Zealand), Janice Wooton (Australian Bureau of Statistics) and Rachael Viles (Statistics New Zealand). Additional speakers will be announced in the future. This session is being organized by Mike Brooks and Anna Munday with Kerrie Mengersen.

These sessions have been scheduled on the first day of the conference to maximise networking among young statisticians!

If you are a new to the conference and would like to make a presentation there are options for contributed talks and contributed poster sessions. The poster sessions are a great way to meet other people.

## Official Statistics Day

On Tuesday, the second day of the program, there will be a daylong theme on Official Statistics. This theme will start with the plenary Foreman Lecture to be delivered by Ray Chambers. It will be followed by an invited session organized by the Surveys and Management Special Interest Section. Speakers are Kirk Wolter, sponsored by Stats NZ, and Alastair Scott. There will also be one or two contributed paper sessions devoted to the theme and plans are developing to hold a discussion forum with leading representatives from the ABS and Statistics New Zealand.

*Continued on page 4*



PO Box 5111,  
Braddon ACT 2612  
Phone (02) 6249 8266  
Fax (02) 6249 6558  
Email: [admin@statsoc.org.au](mailto:admin@statsoc.org.au)  
Society Web Page  
<http://www.statsoc.org.au>

#### Editors

**Alice Richardson**, School of ISE,  
University of Canberra,  
PO Box 1, Belconnen ACT 2616

**Michael Adena**, Covance Pty Ltd  
PO Box 5125, Braddon, ACT 2612

#### Correspondence

Please direct all editorial correspondence  
to Alice Richardson.  
Email: [newsletter@statsoc.org.au](mailto:newsletter@statsoc.org.au)

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## Editorial

The urge to complete projects by Christmas is very strong, when the weather is generally getting hotter and anything from a couple of days to several weeks break from work are coming up. Thus the editors are sure you can imagine the pressure the team who produced the SSAI-sponsored review of Statistics at Australian Universities were working under at the end of last year. Congratulations to all concerned for bringing out the document just before Christmas.

Hopefully there were not too many sleepless nights involved in the production of the SSAI review of statistics. One historical-mathematical-statistical figure who did suffer from sleeping problems was Lewis Carroll (1832 – 1898). His loss has been our gain, however, as he published a book entitled *Pillow problems: thought out during wakeful hours*. It consists of exercises in applied probability which should be able to be worked out lying on a pillow i.e. without pencil or paper. Eugene Seneta wrote an article for Newsletter 83 about Lewis Carroll's contributions to statistics, including reference to pillow problems, and in this issue we are pleased to print more on this topic from Jock Mackenzie.

If you would like to write to the newsletter about the review or any other topic of interest to members of the Society, the email address is [newsletter@statsoc.org.au](mailto:newsletter@statsoc.org.au). The Editors look forward to bringing you a variety of reports, news and views in 2006, and we rely on members to help this to happen.

## ASC/NZSA 2006 cont.

### Contributed Paper and Poster Sessions

Contributed Papers presented orally or as a poster have always been critical to the success of past conferences. Accordingly, the Program Committee has planned for plenty of contributed papers and encourages as many attendees as possible to make an oral or poster presentation. We anticipate that most contributed oral presentations will fall into one of the above theme areas and the Program Committee will make every effort to organize the contributed papers to complement and enhance the invited and plenary sessions. Contributed Paper Sessions are of 105 minutes duration allowing for 5 talks of 15 minutes with 5 minutes discussion, plus 5 minutes of changeover time.

We have noticed that Poster Sessions have been increasingly popular at conferences and we expect that there will be a large interest in presentations of this type. They are a great way to generate direct discussions with other participants in a less formal way than in oral presentations. There will be one Poster Session each day during lunchtime when presenters will be expected to be available to discuss their poster.

### Satellite Workshops

At the time of printing there are two satellite workshops planned around ASC/NZSA 2006. Brief details are

#### Introduction to Distance Sampling Workshop

presented by Steve Buckland,  
David Borchers and Rachel Fewster  
28-30 June 2006

For further information, see  
[http://www.cream.st-and.ac.uk/  
NZ2006/Enquiries.htm](http://www.cream.st-and.ac.uk/NZ2006/Enquiries.htm)

#### Stochastic Processes Workshop

7 July 2006

For further information, contact

Dr Ilze Ziedins:

[ilze@stat.auckland.ac.nz](mailto:ilze@stat.auckland.ac.nz)

Additional workshops are currently under consideration. As they develop further details will appear on the conference web site.

There is scope for additional satellite workshops and training sessions and anyone who wants to organize one to be held in Australia or New Zealand around the time of the conference is strongly encouraged to do so. Please contact the Organizing Committee with ideas and proposals. We will assist by marketing satellite events through the conference web site and other promotional material.

We hope to see you all in Auckland in July!

*William Dunsmuir*  
Chair: Program Committee.

# President's Corner

## Reviews

I hope that all SSAI members have received a hard copy of the final report of the SSAI-sponsored Review of Statistics at Australian Universities. If anyone has not received their copy, then they should contact Jane Waslin at admin@statsoc.org.au or (02) 6249 8266. The Review Team of Adrian Smith, David Vere-Jones and Ian James have provided a number of extremely thoughtful recommendations grouped under issues relating to the school programme, issues relating to organization and funding within and among universities and issues relating to the image and profile of statistics. They propose a broad range of actions and opportunities through which we can contribute to and influence the future of statistics in our country. Their recommendations will be a major discussion point at the next Central Council Meeting and we look forward to determining how we might implement those pertaining to SSAI and progress others. The recent federal cabinet re-shuffle has slowed attempts to discuss the review with the Minister for Science, Education and Training but efforts to pursue this avenue will certainly continue. This review was set up during Neville Bartlett's period as President and I especially thank him for his efforts in this regard.

Many SSAI members are taking the opportunity to present to the National Strategic Review of Mathematical Sciences Research in Australia (2005-06) as the Committee travels around the country. It is a timely complement to the Statistics Review and we look forward to their report in due course. It is being conducted under the auspices of the National Committee for the Mathematical Sciences of the Australian Academy of Science, with financial support from ARC, the Australian Mathematical Society Incorporated, AMSI and SSAI.

## ANZJS

There have been some changes in the production process for the *Australia and New Zealand Journal of Statistics*. Details will be in the June issue of SSAI Newsletter. At the ASPAI

Central Council meeting in February Jeff Wood was confirmed as the new Applications Editor of ANZJS, and the outgoing Applications Editor, Russell Millar, was thanked for his contribution to the journal.

## Membership

Following representation from the Young Statisticians Section, it was decided at the end of last year to reduce student capitulation to the central body. I see this as a very positive move. Although students will no longer receive a hard copy of our journal, they will receive the Newsletter and all other advantages of membership. Please encourage all students to join SSAI as we feel confident that the networks and opportunities made available to them will ensure that they become full members in due course.



## ASC/NZSA 2006

A varied and interesting collection of keynote and invited speakers have been arranged for the joint SSAI/NZSA Conference in Auckland from 3rd to 6th July 2006. Online registration is now open at: <http://www.statsnz2006.com/> with earlybird registration available before 25th April 2006. I encourage all members to attend and enjoy a stimulating scientific and social program. The Annual General Meeting of SSAI will be held on the Wednesday afternoon during the conference. If you have any items that you would like addressed, please contact me or our Executive Officer Jane Waslin. We would welcome your attendance at this (or any other) meeting of the society.

Kaye Basford

## Awards for Scientific Excellence from the Australian Academy of Science

Each year the Australian Academy of Science invites nominations for its prestigious awards for outstanding research in the natural sciences, including statistics.

Firstly, the Moran medal recognises the contributions to science of the late P.A.P. Moran, FAA. Its purpose is to recognise outstanding research by scientists 40 years and under, except in the case of significant interruptions to a research career, in one or more of the fields of applied probability, biometrics, mathematical genetics, psychometrics and statistics. An honorarium of \$1000 will be paid and in the case of a shared award it will be divided. The award is normally made every two years. The next call for nominations is expected to be in May 2006.

Previous winners who are members of the Statistical Society of Australia include Alan Welsh (1990), Matt Wand (1997), Aihua Xia (2001) and Nigel Bean (2003).

Secondly, the Hannan Medal recognises the achievements in time series analysis of the late Professor E.J. Hannan, FAA. Because of Professor Hannan's broad interests in the mathematical sciences the award is made in one of three areas in turn at two-yearly intervals – pure mathematics; applied and computational mathematics and statistical science. Although work carried out during a candidate's entire career will be taken into consideration, special weight will be given to recent research. The 2005 award was for research in applied and computational mathematics. The next call for nominations is expected to be in June 2006.

Previous winners who are members of the Statistical Society of Australia include Peter Hall and Chris Heyde (1994) and Adrian Baddeley (2001).

The URL for further information is [www.science.org.au/awards](http://www.science.org.au/awards).



# Undergraduate Students

## Are you a Statistical student wanting to attend the Australian Statistical Conference 2006?

The Statistical Society of Australia Inc (SSAI) in conjunction with the New Zealand Statistical Association Conference will be held in Auckland 3-6 July 2006.

CSIRO Mathematical and Information Sciences has a pool of \$4K to contribute to students who need some financial assistance to attend the conference.

If you would like to be considered in obtaining some financial assistance to attend the conference please forward a 1–2 page document addressing the selection criteria.

### Selection Criteria:

- What would be the value to you, both short term and in your developing career, to attend the conference?
- Which aspect of the conference is most interesting to you?
- What is the level of assistance required?
- Provide 2 professional referees.

You will also be required to provide a Report/Seminar on return to your individual department, CSIRO to receive a copy.

Please send your application, addressing the Selection Criteria together with your CV and transcripts or your academic results to:

Executive Officer,  
Statistical Society of  
Australia Inc, PO Box  
5111, Braddon ACT 2612

**Applications close  
Friday 24 March 2006**

**Applications close  
Friday 24 March 2006**

Should you have any enquires please contact Ms Julie Tesoriero, tel: (02) 9325 3157 or email: [Julie.Tesoriero@csiro.au](mailto:Julie.Tesoriero@csiro.au)

[www.cmis.csiro.au](http://www.cmis.csiro.au)

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# Accreditation Update

## New AStats

Congratulations to the many members who have recently been awarded AStat status.

### Accreditation of La Trobe University Major in Statistics

The Society's regulations were amended recently to allow the accreditation of Australian university courses and, following a rigorous assessment process, the first university course has been accredited. La Trobe University's Major in Statistics received Accreditation and students completing this course will automatically satisfy the educational requirements for GStat and AStat.

Congratulations to La Trobe for taking the lead in achieving accreditation.

To achieve accreditation, a course must include a substantial statistical content. The regulations state that students must undertake a minimum of 25% of a year's study in Statistics in total at second year level, and a minimum of 50% of a year's study in Statistics at third year level. The content of the course is also specifically required to include units covering statistical inference, data analysis, communication skills and the use of a statistical package together with a selection of other material from a list of options.

The Accreditation Committee encourages all Australian universities offering a substantial undergraduate statistics course to seek Accreditation. This will have the advantage of raising the profile of our profession within universities as well as enhancing the status of the professional accreditation more broadly.

## Review of Statistics

The recent Review of Statistics included several comments that are relevant to Accreditation. Perhaps the most directly relevant is the call for the importance of statistics as a discipline to be recognised and supported by university managements. Establishing the professional status of statisticians through accreditation will add weight to this argument. The Review committee also suggested that the Society should have a role in maintaining the quality of statistics taught in statistics service courses, which will often be presented under the auspices of a substantive discipline other than statistics. Increased visibility of the statistics profession will also assist in achieving this goal.

## Requirements for individual Accreditation

I have heard some comments from various sources recently that suggest that we have not been as effective as we might in communicating the purpose of the accreditation process. In particular I have heard that there is a perception that a PhD is a prerequisite for Accreditation as an AStat and that research papers are the most appropriate form of evidence to support an application.

Neither of these is accurate. The educational requirement for AStat is identical with that for GStat: a first degree with substantial statistical content. It is of course likely that many professional statisticians will be involved in some form of research as well as their applied work, and so will have a higher degree, but AStat is not an academic qualification. Currently about 70% of AStats have a PhD.

The purpose of Accreditation as an AStat is to provide potential users of statistical advice with evidence that a statistician has the appropriate skills to give professional advice

that they can safely rely upon. The major part of the work of the Accreditation Committee is in assessing applicants' experience in applying statistics to real data and real problems. Applicants are best advised to send as evidence reports or publications that demonstrate such applications. The Committee would not recommend award of AStat to someone whose experience was primarily theoretical.

## Reaccreditation

The process of reaccreditation of AStats is operating smoothly.

Reaccreditation reminders and forms are sent to AStats a few months before the expiry of their accreditation – but please don't wait for the reminder if your accreditation is due for renewal (the expiry date is shown on your Certificate). The form is available online at [http://www.statsoc.org.au/info\\_stat.html](http://www.statsoc.org.au/info_stat.html).

The reaccreditation process is straightforward and simply asks for evidence of continuing involvement in the statistical profession. This should be provided in reasonable detail to allow the Committee to fairly assess the extent of involvement and contribution to the profession.

*Ian Saunders, Chair, Accreditation Committee.*



## Introduction to Multilevel Modelling Short Course

22 & 23 June 2006

Presented by  
**A/Prof SV Subramanian**  
**Harvard School of Public Health**

The course will introduce basic theory, general techniques and applications of multilevel modelling. Hands on sessions will be conducted using MLwiN software.

Statisticians, social epidemiologists, data analysts, academics and post-graduate students will benefit from this course.

Tel: (03) 8344 4333  
<http://www.kcwh.unimelb.edu.au/courses/shortcourses/>  
Registration fee: \$935 (incl GST)  
\$715 (full-time students)

# AusCan Scholarship recipient to visit Australia in 2006

The AusCan Scholar program was developed by the Statistical Society of Australia Inc and Statistical Society of Canada to foster young researchers and promote collaborative activities between the societies. A primary objective of the AusCan Scholar program is to promote scientific interaction between the Australian and Canadian statistical communities, particularly in areas of statistics relating to current and important practical problems. Another objective is to provide the opportunity for outstanding young Canadian/Australian researchers in these areas to visit a number of leading research centres in Australia/Canada, to present their current research and interact with a number of researchers in that country. The visit will be of 4-8 weeks' duration, one week in each of a few cities, and extendible if made in conjunction with participation in a national conference. The primary objective is to move around the country to meet people.

The inaugural AusCan Scholar is Dr Mu Zhu. Dr Zhu is an Assistant Professor in the Department of Statistics and Actuarial Science at the University of Waterloo in Canada and has been a member of the department since 2001. Prior to this position, Dr Zhu received his PhD in statistics from Stanford University, which he completed under the supervision of Professors Trevor Hastie, Robert Tibshirani and Jerome Friedman. His current research interests include rare target detection, data mining, multivariate analysis, pattern recognition (namely classification and clustering), dimension reduction and variable selection. A list of his recent publications is provided on his webpage <http://www.stats.uwaterloo.ca/~m3zhu/>.

I will be helping to coordinate Dr Zhu's visit to Australia, which is most likely to occur in September-October this year, and am currently putting together a broad program for his time in Australia. At this stage, he plans

to visit a few cities in the eastern states for a total length of 6 weeks. In particular he has made plans to visit the Australian National University and the University of Melbourne. However, he is open to suggestions in developing a program that will allow him to fulfil the objectives of the scholarship. Any individuals or groups interested in meeting and/or having Dr Zhu spend some time with them during his trip should contact me as soon as possible to register your interest. If you require further details about Dr Zhu's research, I have a two-page document that I could forward on to you.

Finally, further details about the AusCan Scholar program are available on the SSAI webpage ([www.statsoc.org.au](http://www.statsoc.org.au)). An Australian statistician will be given the opportunity to visit Canada during 2007 as part of the program.

Melissa Dobbie  
[Melissa.dobbie@csiro.au](mailto:Melissa.dobbie@csiro.au)  
CSIRO Mathematical and Information Sciences

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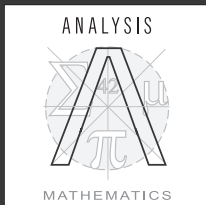
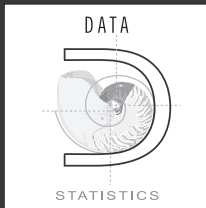
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- A copy of your CV including proof of formal qualifications.
- Names and contact details of 2 Professional Referees.
- What other financial support (if any) would be available to you to attend the conference.

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## Pillow Problem No. 50

On page 12 of the May 1998 issue of *Newsletter* No. 83, Eugene Seneta entertained us with an account of the contributions of C.L. Dodgson (Lewis Carroll) to Statistics. This account culminated with a discussion of the following problem.

There are 2 bags, H and K, each containing 2 counters; and it is known that each counter is either black or white. A white counter is added to bag H, the bag is shaken up and one counter is transferred (without looking at it) to bag K, where the process is repeated, a counter being transferred to bag H. What is now the chance of drawing a white counter from bag H?

Using the theorem of total probability (aka Bayes Theorem), Eugene calculated for each of the 9 possible initial configurations of the counters in bags H,K the probability of the number of whites ( $n=0,1,2,3$ ) in bag H after the second transfer and, by addition, the total probability distribution  $P(n)=(3,30,51,24)/108$  giving the derived chance of finally drawing a white from bag H as  $17/27$ . (A Binomial Distribution is assumed for the initial contents of either bag: WW, WB, BW, BB with equal probability.)

When I tried to solve this problem I found a chance of  $18/27$  and wrote to Eugene seeking some clarification. In reply he kindly sent me his detailed calculations where it became clear that I had incorrectly assumed that a white was also added to bag K before the final transfer. However, Eugene remarked: It is "... difficult to see how it could be done mentally". The object of the following remarks is to show how this might be reasonably achieved.

The first clue follows from consideration of the penultimate stage when the required chance is just one third of the expectation  $E(n)$  of the probability distribution of the final

number of whites in bag H. Now the expectation of a sum equals the sum of the expectations and so we only need, in the first place, the expectation of the final number of whites for each initial configuration of the bags; followed by the mean of the results for each of the nine possible configurations.

The next insight is the observation that the whole calculation is invariant to the symmetry operation in which black and white are interchanged in every initial configuration. (We are not supposed to know the initial contents of the bags). This suggests, what proves to be the case, that in the consideration of some initial configuration it might be profitable to consider, at the same time, the configuration with black and white interchanged. We have not yet done any numerical or algebraic calculation but are about to do so.

We now parameterize the initial contents of the bag H as  $[w,b] = [1+h,1-h]$  and of bag K as  $[1+k,1-k]$ , where  $h, k$  independently take the values  $1,0,-1$  and changing the signs of both  $h$  and  $k$  simultaneously changes the configuration to that with black and white interchanged. Since the configuration with  $h=k=0$  is invariant and stands alone, in calculating the expectation, we take half the sum in order to keep the counting correct. This means that in the calculation below, any terms linear in  $h$  or  $k$  can be neglected.

For a given initial configuration, there are four possible sequences of transfers before the final state is reached. The successive transfers WW (first W and then another W) and BB leave the number of whites in H unchanged while the transfers BW changes the number of whites by  $+1$  and the transfers WB changes the number of whites by  $-1$ .

Now for a typical initial configuration the number of whites in bag H is  $2+h$  after the preliminary addition of a

white. Thus, the configuration of the bags before the first transfer is:-

$$(H : K) = ([2+h,1-h] : [1+k,1-k])$$

Now the sum of the probabilities of the (exhaustive) set of transfers is unity and so, using  $2+h$  as a false origin, the contribution to the mean expectation is  $2+h$  or  $2$  per configuration, on neglecting the first power of  $h$ . There only remains the most difficult part of the mental calculation, namely, the calculation of the contribution of  $+1$  from the transfers BW and  $-1$  from the transfers WB.

Since there are three counters in either bag just before any transfer the denominator in each of the probabilities of transfer is 3 with an overall factor of 9 which can safely be temporarily neglected to concentrate on the algebra of numerators. For the transfer BW, the numerator is  $(1-h).(1+k) = 1 + .. - hk$ , on neglecting linear terms. Similarly, for the transfer WB the numerator is  $(2+h).(1-k) = 2 + .. -hk$ . The contribution to the mean expectation is therefore  $+1-2=-1$ , since the terms involving  $hk$  cancel. The total expectation is the same for all configurations and is  $2-1/9 = 17/9$ . Whence the required chance is  $17/27$ .

We have made the critical (but reasonable) assumption that the two initial configurations with black and white interchanged have the same *a priori* probability. This means that provided the probability of WW is the same as for BB in each bag the final chance does not depend on the value of this probability. Moreover, the probability for bag H may even be correlated with that for bag K. However, the detailed probabilities  $P(n)$  do depend on the relative probabilities of WW = BB and WB in the bags.

Jock Mackenzie

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# Three Doors with Borek Puza (Edition 5)

Welcome to the fifth edition of Three Doors. In the last edition I presented The Chess Puzzle and subsequently received several correct solutions. Following a random draw I am pleased to announce Jock Mackenzie as the third winner of the Three Doors prize, again a \$60 dinner voucher as kindly donated by the SSAI. Below is the puzzle and its solution. The next puzzle follows.

## The Chess Puzzle

At a university, 128 students are about to play in a knockout chess competition. The first round consists of 64 games, with the winners progressing to the second round of 32 games, and so on, until an overall winner is declared following the 7th round. In case of a draw the game is replayed until someone wins. If the 128 students are all of equal ability and pairing is random at each round, find the probability that the two oldest students will play against each other at some stage of the competition.

## Solution to The Chess Puzzle

Since each game knocks out one player, and only one player ultimately wins, there must be 127 games played in total. Now, for each game there are  $n = 128(127)/2$  equally likely possibilities for the two students who play it. Thus the expected number of times that the oldest two students will play against each other on any given game is  $1/n$ , and so the expected total number of times that those students will play against each other is  $127(1/n) = 1/64$ . But this total number must be either 0 or 1 and so is a Bernoulli random variable with mean  $1/64$ . Thus the required probability is  $1/64$ .

## The Birthdays Puzzle

In a room there are 20 persons. (a) Find the probability that exactly 6 of these persons have a shared birthday (i.e. a birthday which is the same as at least one other birthday). (b) Then find and tabulate to 5 decimals the complete probability distribution of the number of persons with a shared birthday. (c) Using (b), or otherwise, find the expected number of persons with a shared birthday. (It may be assumed that the 20 birthdays are distributed independently and uniformly over a year with 365 days.)

For one to three chances to win a fabulous mystery prize, send your solutions to [newsletter@statsoc.org.au](mailto:newsletter@statsoc.org.au). (Each part of the puzzle is worth one chance.)

## Member News

Richard Jarrett and his wife Di were enjoying long service leave in western Canada late in June. Driving north from Banff to Jasper, they stopped at the Saskatchewan River Crossing for lunch, prior to visiting the Athabasca Glacier.

Lunch over, they prepared to depart, and then decided to have another cup of coffee, despite the arrival of a coachload of tourists. Standing in the queue, Richard noticed a tall, skinny chap ahead of him. "Looks a bit like Ken Russell," thought Richard. "But Ken wears hearing aids." A few seconds later: "Heh, that guy's wearing hearing aids!" Yes, it was Ken.

Ken was part of the coachload heading south from Jasper to Banff which had stopped for lunch at the same spot!

How many coincidences occur? And how many times do 'near-coincidences' occur, when people are

within a few metres of one another but don't realise it?

Richard and Ken are shown standing outside the café, with snow-capped mountains in the background. They both strongly recommend the natural beauty of western Canada.



## Thinking Statistically

### Elephants Go to School

A UNIQUE TEXTBOOK

By

*Sarjinder Singh*

St. Cloud State University  
Department of Statistics  
St. Cloud, MN 56301-4498  
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Forewords by

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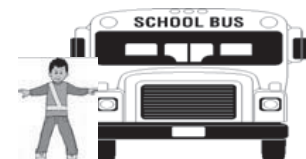
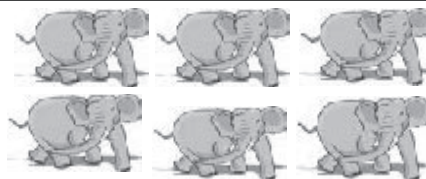
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### BioInfoSummer, ANU, Canberra

Dec 4-8. Contact [BioInfoSummer@cbis.anu.edu.au](mailto:BioInfoSummer@cbis.anu.edu.au)

### 8th Australasian Conference on Mathematics and Computers in Sport, Coolangatta, Queensland

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## SOUTH AUSTRALIA

### Alternative estimators for a rotating panel survey

At the November meeting Philip Bell from the Australian Bureau of Statistics gave his talk to an intimate crowd of about 20 members. Phil leads a small group of methodologists in the South Australian ABS Office, with a current focus on new estimators for household surveys.

Phil's focus of the talk was on monthly surveys based on the Australian Labour Force which have overlapping panels. Overlapping panels referring to the rotation of dwellings in the survey where seven out of eight dwellings are retained in the ABS survey from month to month, and one new dwelling is added. Some concerns for monthly surveys are the movements between labour force states (employed, unemployed, not in the labour force) which are estimated from the change between months. Estimators that are commonly used for the Labour Force surveys are composite estimators which take advantage of correlations between times to improve current estimates. Currently at the ABS, estimates for the Labour Force survey are performed by the generalised regression estimator (GR). Overseas, the US uses an "AK-Composite weighting" estimator and Canada performs the modified regression (MR) technique. It was claimed that the Canadian estimator had produced good standard errors for similar surveys to Australia which motivated Phil to investigate these estimators used by overseas counterparts.

Phil summarised the advantages and disadvantages of each estimator and identified problems when applying them to the Australian setting. In particular the MR technique produces low standard errors but appears to have potential for bias by excluding those that change address which may understate any drop in employment. Phil introduced other alternative estimators, BLUE and B1 (which differed by the type of weights used), which were successful in reducing the potential bias compared to the AK and MR composite estimators. Phil proposed another model, a regression with correlated errors at the person level, which aimed to improve the standard error gain from

the B1 estimator and avoid bias. To Phil's dismay this proposed model has recently shown computational problems and may be inherently flawed which is likely to draw Phil's research into composite estimators in the short-term to a close. Phil concluded that alternative estimators for the Australian Labour Force survey are still not compelling due to the bias they introduce when applied to the Australian setting.

*Janine Jones*

## NEW SOUTH WALES

### Achieving quality in use of medicines: Summary of a consulting job

Incoming NSW branch president Caro Badcock travelled up to the University of Newcastle in August to present a seminar at the inaugural meeting of the NSW branch of SSAI in Newcastle. Despite Caro having a lack of fellow travellers from Sydney, with the notable exception of past NSW branch president John Rayner (who came from Wollongong), the seminar was very well attended by the statistically and quantitatively minded people in the Newcastle area.

Caro, also known as Senior Manager for the Asia Pacific Region of the consulting firm Covance, presented a summary of a large consulting job done by that company for the National Prescribing Service (NPS), a large non-profit, independent and government-funded body which, according to its website, provides "accurate, balanced, evidence-based information and services to health professionals and the community on Quality Use of Medicines (QUM)". The job took eight months to complete and involved data on prescription rates for upper respiratory tract infections and common colds.

The NPS runs a 'commonsense' education program for GPs, which aims to reduce the inappropriate use of antibiotics for common colds, and they wanted Covance to assess the effect of this program on prescription rates. Data over time was obtained from PBS figures collected by Medicare on nine antibiotics. The data had to be extensively 'cleaned' and 'filtered', an extensive time consuming project, before a time series analysis was instigated. Seasonality was apparent and regression models with autoregressive residuals and harmonic seasonal effects

were entertained. Interestingly, results across the most used antibiotics (like Amoxicillin, surely well-known to most new parents like me!) tended to show that prescription rates by GPs started to drop just BEFORE the education program sessions by the NPS were conducted, perhaps suggesting the GPs as a group anticipated their error in over-prescribing. Rates continued to drop after the education program, all of which kept the NPS and the Australian government happy.

The talk was well-received by the audience and inspired a lively discussion afterwards, dominated by the time series modellers and analysts in the audience. Afternoon tea was held immediately after the talk, with much laughter and merriment, as is the tradition among the Statistics group at Newcastle.

*Richard Gerlach*

## QUEENSLAND

### November Branch meeting

Dr Adelle Howse was the speaker at our final meeting for the year and spoke about "Financial Performance and Risk Metrics in the Construction Industry". Adelle is a graduate of the



*Dr Ian Woods and his wife, Wan.*

University of Queensland and has a Doctorate in Mathematics. Currently she is the Development Manager for the John Holland Group and works in the Corporate Development division. At present her role has a focus on Public Private Partnership transactions in Australia, including the North South Bypass Tunnel here in Brisbane which is in bid phase.

Recent events of corporate collapse and profit downgrades in both Australian and international construction



*Dr Clair Alston, Dr Tony Swain and Mrs Swain, Professor John Eccleston (Branch President) – left of table; Dr Ross Darrell – on the right.*

companies provide substantial proof of firstly the existence of risk and secondly the need for business tools and processes to adequately deal with such risks. Construction companies, like other businesses, require a certain level of capital adequacy to enable them to absorb losses which may arise following the realization of some of the risks that are inherent and characteristic of the industry. The actual capital position of a construction company should take into account its overall risk profile and strategy. This information is also of interest to parties investing in publicly-listed entities. Statistical models are well developed for this type of assessment in other traditional areas such as banking and insurance. This approach

can similarly be applied to construction and Adelle presented an introduction to the approach and discussed benefits of such methodologies.

The branch Christmas dinner was held following the meeting at a nearby Thai restaurant. Over twenty statisticians joined the speaker for a meal of delicious food interspersed with lively conversation. A couple of statisticians from NSW happened to be visiting Brisbane at the time, so also joined us at dinner. We encourage all statisticians visiting Brisbane throughout the year to keep an eye on the Queensland Branch website for future meeting dates and details and if convenient, join us at a monthly meeting and/or dinner.

*Miranda Mortlock*



*Professor Tony Pettit, Dr Ross Darnell (centre) from Queensland Branch Council.*

## CANBERRA

### Hidden Markov models by Peter Thomson

At the monthly meeting of the Canberra Branch of the SSAI on Tuesday 22 November Dr Peter Thomson of Statistics Research Associates Ltd (based in Wellington, New Zealand) gave the 2005 Knibbs Lecture titled "Hidden Markov Models: Some Examples of Their Application and Reflections on Their Use". Peter was introduced by the Canberra Branch president, Dr Brent Henderson of CSIRO, and his two discussants were Dr Daryl Daley and Professor Peter Hall, both of the Centre for Mathematics and its Applications at the Australian National University.

Peter Thomson began by describing how a hidden Markov model (HMM) involves blocking time series data into consecutive time periods (regimes) and modelling the unobserved regimes using Markov chains (MCs) or variants thereof. He then provided an example of a HMM which could be used to model a variety of stationary macroeconomic or financial time series. In this example the states form an unobserved stationary MC and, conditional on the states, the data follow a Gaussian AR(1) with state-dependent means and variances. To illustrate the model, Peter showed a graph of simulated quarterly GDP growth rates with two hidden persistent states having unequal means where the regime switching between those states is clearly evident. Another example with simulated daily returns also exhibited clear switching, this time between two states with the same mean but different variances. A third example with hidden independent states exhibited a less evident switching pattern.

The fitting of HMMs can be done via maximum likelihood with the aid of the EM algorithm and goodness of fit diagnostics such as the AIC. An important quantity when fitting HMMs is the probability that the hidden MC is in a particular state at a particular time given the data. This probability can be estimated efficiently using a forward-backward algorithm devised by Baum et al. in 1970.

Peter next applied HMMs to the analysis of share price time series, in particular daily returns of ANZ share prices on the New Zealand Stock Exchange in 2004. Another example involved quarterly growth rates of New Zealand aggregate GDP from 1978 to 2002. Peter used



*Brent Henderson, Peter Thomas, Peter Hall and Daryl Daley.*

these and other examples to illustrate the strengths and weaknesses of various modelling options, with a discussion involving autocorrelation, the number of parameters to be estimated, and the principle of parsimony. One conclusion drawn was that HMMs are likely to be more useful for risk forecasting than point forecasting, and they may do better than AR(1) models when forecasting turning points. Two other examples involved multistate daily rainfall data with spatial dependence and weekly hydro inflows data, respectively.

Peter concluded by noting some of the advantages of HMM's, including distributional versatility, sample path flexibility and ability to handle diverse time scales, as well as some of their drawbacks, notably the present scarcity of HMM software packages and the consequent need for care when programming and fitting. A major virtue of HMMs is their open structure which allows for more physical models which can engage statisticians, scientists, economists and clients alike in productive model development.

In the subsequent discussion, Daryl Daley raised the problem of how the proximity of two MCs can be measured, and Peter Hall suggested a related alternative approach with an estimation scheme involving the Yule-Walker equations.

### **A study of heroin supply by Michael Smithson**

At the monthly meeting of the Canberra Branch of the SSAI on Tuesday 25 October 2005 Dr Michael Smithson of the School of Psychology at the Australian National University gave a talk titled "Impact

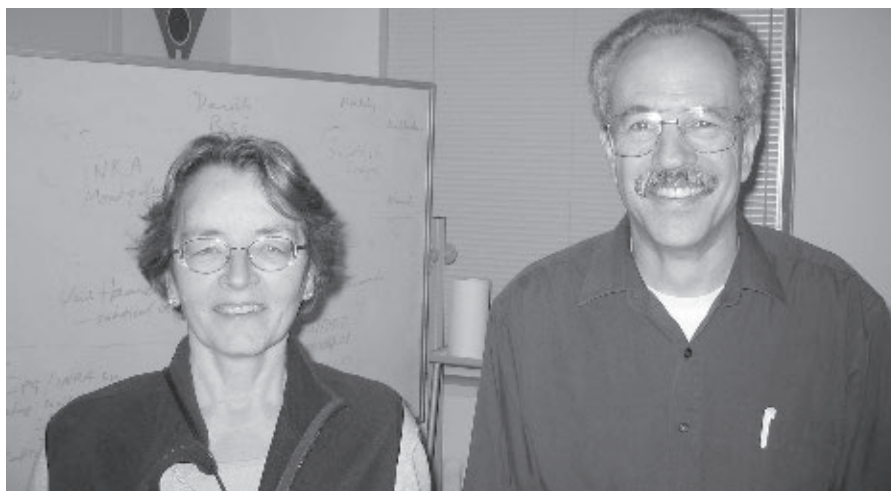
of Federal Drug Law Enforcement on the Supply of Heroin in Australia". His presentation was a summary of recent research conducted jointly by him together with Michael McFadden and Sue-Ellen Mwesigye of the Australian Federal Police (AFP). Following the talk several members of the audience met for dinner at a local restaurant.

Michael began by noting the dramatic reduction in heroin supply in Australia circa 2000 and raising the question of whether this reduction could be due to changes in various crime and health outcomes. He then described the two sets of data which he has used to address this question. One dataset comprises details of heroin seizures in Australia over the period 1987-2003 and lists the weight of heroin seized on each of 2907 irregularly spaced dates. The other dataset lists the weight and purity of heroin seized by the AFP on given dates in the Australian Capital Territory (ACT) during the period

1999-2003. The latter dataset exhibits an overall reduction in purity from about 70% to somewhere between 25% and 30%, and it was thought appropriate to use this purity level as a proxy measure of supply. Thus the question boiled down to whether heroin purity levels in the ACT could be predicted by heroin seizures nationally.

This question was addressed in two different ways. First, a Bayesian change-point model was solved using Markov chain Monte Carlo (MCMC) methods to discover: (a) whether there has been a substantial increase in heroin seizures by the AFP; (b) if so, when this increase began; and (c) whether the hypothesized increase occurred after increased funding to the AFP for the purpose of drug law enforcement. Results of this analysis supported the hypothesis that both the mean and variance of heroin seizures rapidly increased about one year before the estimated decline in heroin purity and after the increased funding to the AFP. The MCMC methods were implemented using the WinBUGS package and involved five separate chains whose behaviour was monitored via Gelman-Rubin convergence diagnostic statistics.

Secondly, standard Box-Jenkins time series methods were used to determine whether fluctuations in heroin seizure weights or the frequency of large-scale seizures after the aforementioned changes in seizure levels predicted fluctuations in heroin purity levels in the ACT, after the removal of autocorrelation from the purity series. The autoregression models suggested that 10%-20% of the variance in the residuals of the heroin purity series was predicted by appropriately lagged residuals of the seizure-number and log-weight series, after autocorrelation had been removed. The overall results are



*Ann Cowling and Michael Smithson.*



consistent with the hypothesis that large-scale heroin seizures by the AFP reduce street-level heroin supply a year or so later, although the short-term dynamics suggest an 'opponent' response to residual fluctuations in seizures. It appears that this is the first time a connection has been identified between large-scale heroin seizures and street-level supply.

*Borek Puza*

## VICTORIA

### Sampling theory for vegetables

At the October meeting of the Victorian Branch Professor Adrian Baddeley presented an exciting and entertaining seminar as the Belz Lecturer for 2005. The tone of presentation was clear at the very beginning, from the catchy title 'Sampling Theory for Vegetables'.

Adrian then started to focus on modern sampling theory and drew attention to an embarrassing error in neuroscience. Until 1995 it was widely believed that 'the human brain progressively loses neurons (nerve cells) with age'. Numerous studies had apparently demonstrated a decline in neuron density with age. These were based on samples of brain tissue. Later it was realised that the preparation of brain tissue for microscopy causes shrinkage of the tissue, and that younger brain tissue tends to shrink more. The observed decrease in density of neurons appears to be just an artefact of the preparation technique.

The subtleties of this problem introduced the main topic, Stereology. This originated as a technique for obtaining 3-D information from a single 2-D microscopic image. The

this Adrian chose an experiment that involves making a salad using 3 large red tomatoes and 3 small green tomatoes. Now, suppose that we place these six tomatoes on an evenly spaced ruled chopping board and slice them along the ruled lines. Then mix the slices to make the salad. Soon it would be clear that even though we started with 50:50 Red/Green tomatoes, the salad does not consist of 50:50 Red/Green tomato slices. This illustrates the important result that the number of particle profiles seen on a section of a rock/mixture of tomatoes depends on both (i) the number of particles and (ii) sizes of particles. The mathematical difficulty is that there is no easy way of reversing the relationship to estimate the number of particles from (i) and (ii).

A solution to the problem uses the 'disector rule', which involves applying principles of sampling theory. The ideas that underlie this were used to illustrate estimation of the number of neurons in the brain. Finally, these were related to intricate ideas and methods in modern stereology. The ideas were illustrated using photographs of chopped apples, carrots, and broccoli.

Stereology contains similar techniques for measuring volumes of individual cells, surface areas of membranes, lengths of filaments, thicknesses of membranes, average sizes of grains, and the connectivity of a network of tubes. It has an enormous range of applications to different sciences, particularly geological, material and biological science.

The main message of the talk was that sampling techniques make it possible to estimate 3-D quantities from measurements on 2-D plane sections, but the methods are not obvious. Finally, for anyone interested in reading more about this, Adrian's recent monograph is highly recommended: A. Baddeley and E.B Vedel Jensen (2005). *Stereology for Statisticians*. Chapman and Hall/CRC Press: Boca Raton.

*Mervyn Silvoapulle*

### A workshop on the R system

On 23-24 November 2005 the Victorian Branch sponsored a highly successful two-day workshop on the R statistical package, presented by John Maindonald from the Centre for Bioinformatics Science, Mathematical Sciences Institute, Australian National



*Adrian Baddeley, the 2005 Belz Lecturer, and an image from the Mahabharata  
Photo: Brian Phillips*

It certainly was not Vege-Stats. Adrian started with an entertaining revisit to some of the ancient history relating to sampling theory referred to in the Mahabharata (400 AD): for example, how Rtuvarna demonstrated his skill with numbers by applying sampling theory to estimate the number of fruits and leaves in a Vibhitaka tree by examining only a few twigs. I do not know of any references to statistical ideas extending as far back as 400 AD!

geologist Delesse (1847) argued that the composition of a 2-D plane section is representative of the composition of the 3-D object, for example a rock. Thus the fraction of quartz by volume can be estimated from the fraction by area on a section.

While this relationship is fairly simple, there is no general relationship between the number of particles in 3-D and that seen on a 2-D plane section. To illustrate

University. The workshop was held at the Swinburne University of Technology in Hawthorn, and was fully subscribed with 20 participants. It replaced the regular November Branch meeting, which has attracted variable attendance in recent years. The experiment was a clear success.



*John Maindonald  
Photo: Brian Phillips*

The workshop was designed to be at the level of professional development for consultant statisticians, although there were several participants from other backgrounds. The first day consisted of an introduction to the use of *R*, and a relatively advanced introduction to the use of graphics in *R*. This included the use of trellis graphics. The second day placed more emphasis on the use of *R* for statistical applications such as general linear models, generalised linear models and hierarchical multi-level models.

A wonderful aspect of the workshop was the infectious enthusiasm of John Maindonald and his extensive knowledge of the *R* system. As the majority of participants were sophisticated users of statistical methods, John received many 'more in depth' queries. John was able to answer these, without hesitation, in an insightful manner. He was able to extend topics well beyond the prepared material.

Finally, the participants had much fun learning from John. Prizes of *R* T-shirts for the most insightful questions and queries helped this. Thank you, John, for a great workshop.

*Kym Butler*

## WESTERN AUSTRALIA

**September 2005**

Dr Christoph Lange from the Department of Biostatistics, Harvard School of Public Health presented the September talk to the WA Branch of the SSAI. His talk was titled "On genome-wide association studies in family-based designs: Genomic-screening and control using the same data set". In this talk Dr Lange discussed a method that he has been involved in developing to address the multiple comparison problem in genetic association studies. This method has been implemented in a piece of software called PBAT, where the effect of single nucleotide polymorphisms (SNPs) and haplotypes on biological traits can be tested within family data.

In genetic association studies, large numbers of genetic polymorphisms and biological variables (or phenotypes) are often tested for association in a single study, which can result in a severe multiple testing problem. Christoph explained that standard methods to address multiple testing issues often fail to find associations that reach overall significance. His method attempts to look at the data without biasing the significance level by selecting the most promising combinations of polymorphisms and biological variables, that is, those combinations where the strongest genetic effect is observed.

The PBAT software uses a conditional mean model to estimate the genetic effect size within a proband. Christoph explained that this model uses the genotypic information from the parents of a proband to calculate the expected value of a biological trait of that proband. PBAT then uses this estimate of the genetic effect size to select the most promising combinations of SNPs and phenotypes, based on conditional power calculations. Once the most promising combinations of traits have been selected, the algorithm uses a family-based test (FBAT) statistic to test the selected phenotypes for association with the SNP.

PBAT can be used to test the association of SNPs and haplotypes with a biological trait. The remainder of Christoph's seminar discussed the interesting results obtained using the software to analyse genetic

associations with body-mass index in the Framingham Heart Study. The significant results obtained in this study using PBAT were replicated both using different software, and in different populations. Christoph explained that the PBAT method of addressing the multiple comparisons problem in genetic association studies provided a powerful approach to detect significant associations, a flexible technique to screen for significant genetic predictors of a trait in a variety of outcome types, and under a variety of genetic models. The software implementation of the algorithm is fast and parallel.

The seminar sparked much interest in the algorithm and the software, and the WA branch of the SSAI felt very fortunate to have Dr Lange visit from Boston. A small group continued the discussion over dinner at a nearby restaurant.

*Pamela A. McCaskie*

**October 2005**

Ariology – a symphonia of matrices and mixed models in QTL's. The unfinished symphony!

A night at the opera.



Maestro Ari Verbyla from BiometricsSA was gracious enough to accept our invitation to speak at the Western Australian Branch meeting on Tuesday 11 October, 2005 whilst visiting WA that week. The evening was crisp and a good random crowd of devoted SSA members was anxious to hear from the bearded conductor (after a few glasses of red wine to warm his vocal chords).

I sat at the back row just like the good guys who sit at the back of the church except that the door was at the front of the lecture room! But more importantly, it gave me the best view of all that was to be offered and to make sure that no-one could fall asleep in this *Arabesque* performance! Ah, it is good to be a writer, you can use poetic license to invent a word to describe the Arabesque mosaic above and relate it to the maze of mathematics that followed and that in fact it is not ending! It will go on for ever just like the mosaic! The analogy here is that the speaker is trying to find an outlier or needle in a haystack, similar to finding the chipped or cracked tile in the mosaic? Can you see it? Can we see the answer in our data or is it in the hands of people with far more know-how than I can imagine.

Vice-president Brenton Clarke (vbc) (another three letter acronym) introduced the topic (a mouthful) "The analysis of QTL by simultaneous use of a full linkage map – a joint working paper!" Fortunately, my colleague at work had given me a paper in the early afternoon on "An introduction to markers quantitative trait loci (QTL) mapping and marker-assisted selection for crop improvement: the Basic concepts!" What, "Another long title" or ALT. Let's stop (hALT) these three letter acronyms.

The slide presentation began with a series of examples in real-life that stressed why this work is important. Ari gave us a holistic approach illustrating that a farmer wants to grow wheat with good qualities (high yield and high quality), the consumer wants access to "good" food, and the country will benefit by high export dollars. The focus in the talk was on the modelling of data collected from a crossing experiment from 2 parents of wheat.

So what are QTLs? I am not working in this field so I have the utmost respect for the players in this game but I keep hearing in my mind (I am sure I heard it from Professor Terry Speed years ago when this debate started) the conflict between models versus search algorithms to find the "outliers" or needle in a haystack on huge datasets which can be collected from a moderate number of individuals.

To quote from Collard et al.

*Many of the agricultural traits such as yield, quality and various forms of disease resistance are controlled by many genes and are known as "quantitative traits". The*

*regions within genomes that contain genes associated with a particular trait are known as "quantitative trait loci (QTLs)."*

*Since the development of DNA or molecular markers in the 1980s, there has been an enormous amount of data generated, and scientists have tried to construct linkage maps. A linkage map is a road map of the chromosomes derived from two different parents. Linkage maps indicate the position and relative genetic distances between markers along chromosomes, which is analogous to signs or landmarks on a highway.*

*The most important use for linkage maps is to identify chromosomal locations containing genes and QTLs associated with traits of interest. QTL mapping is based on the principle that genes and markers segregate via chromosome recombinations (called crossing over) during sexual reproduction, thus allowing the analysis of the progeny. Genes or markers that are close together will be transmitted from parent to progeny more frequently than genes or markers that are further apart.*

*In a segregating population, there is a mixture of parental and recombinant genotypes. The frequency of recombinant genotypes can be used to calculate recombinant fractions, which may be used to infer the genetic distance between markers.*

*By analysing the segregation of markers, the relative order and distances between markers can be determined—the lower the frequency of recombination between two markers, the closer they are situated on a chromosome (conversely, the higher the frequency of recombination between two markers, the further away they are situated on a chromosome). Markers that have a recombination frequency of 50% are described as 'unlinked' and assumed to be located far apart on the same chromosome or on different chromosomes.*

So following on from this you can see that the language used in this QTL business starts to get extensive and as the slide presentation proceeded I started to sink in the "puddles of models and molecular genetics". The people in this game refer to finding the "outliers" which are the interesting results of all the data. So we should rewrite in our standard statistics textbooks that the outlier in your data is a good thing!

Ari described how the basis of linkage studies is this recombination fraction,  $r$ , where for any 2 parents A, B the recombinant fraction  $r$  is given by (using Mendel's laws I think)

| Marker | 2 |     |
|--------|---|-----|
|        | A | B   |
| 1      | A | a b |
|        | B | c d |

$$r = \frac{b + c}{a + b + c + d}$$

The talk presented some data from controlled genetic study using double haploids which I understand allow scientists to map the markers from the parents easily and the collection of these fractions. I am not sure how one does this but we were bombarded with an elaborate series of 6 working models ranging from regression approaches, to mixed models and then leading us to mixture models which required Monte Carlo methods to solve the problem. As always with modern papers we must end up with a simulation study to compare the various models proposed. It looked interesting but which is right?

Wow, I am sure many others in the audience were just flooded with the magnificent development of a series of models and its associated problems of course, which I believe never get proper attention in such a presentation, i.e. the many hours of toil (the opera!). How impressive that all this hard work has taken years to synthesise the machinery behind trying to find the outlier in the data for which I am having difficulty seeing?

So without giving too many secrets away on what are the approaches since it is a working paper, we anticipate Ari and his team of authors will soon publish some anthology of these workings. My mere summary cannot do much justice here since in the hour that I have sat here it has blown me out of the water, and it might take me years to understand the mathematical models and genetics.

At the end the chords were straining but Sir Ari had polished off the performance like a good conductor looking tired but happy. There were 49 slides that had flashed past our eyes!

Questions from the floor further impressed upon the convergence problems in the area of using EM and Gibb sampling for this type of problem,

and that follow-up data is needed to test the findings.

The final word of course went to the Vice-President who chaired the meeting and relayed the story (as was given in correspondence from one Daniel Cuthbert) that the late R.A. Fisher had looked at a Genotype x Environment x Year study with barley and that the best yielding variety that he had selected had the poorest beer qualities! So the moral of the story is that finding the right music of life is a personal choice and each and everyone of us must find the right music otherwise you will be lost in the cacophony that is the machinations of the world.

Bravo, Ari !

References:

**An introduction to markers, quantitative trait loci (QTL) mapping and marker-assisted selection for crop improvement: The basic concepts**

B.C.Y. Collard, M.Z.Z. Jahufer, J.B. Brouwer & E.C.K. Pang. *Euphytica* (2005) 142: 169–196

Modelling QTLs – the unfinished opera! Verbyla, A.P., Cullis, B.R. and Thompson, R. plus other actors on this stage (in preparation).

Mario D’Antuono

## November 2005

With a reference to his imminent departure to New Zealand, Martin Hazelton used ‘The Travelling Statistician Problem’ to introduce his topic on Statistical Methods in Transportation Research. After reminding us all of the real importance of transportation research – economically, environmentally and socially – Martin raised three problems for statisticians:

1. Speed estimation.
2. Estimation of trip matrices.
3. Modelling day to day dynamics of traffic flow.

Speed Estimation. Assume that you wish to estimate the mean vehicle speed during an interval. An automated vehicle detector in roads, could, for example, count the number of vehicles ( $n$ ) during a time interval and the total amount of time that the detector is occupied ( $y$ ) during that same time interval. After accounting for the length of the detector in the road, a simple estimator of speed can be calculated as the average effective vehicle length divided by the average time per vehicle that the detector is ‘occupied’ during

the interval. This may sound simple – but because of the variability of vehicle lengths (e.g. compare a road train to a car!) this estimator of speed *does not equal* the average of the estimated speed on a *per vehicle* basis. Moreover, the failure to properly account for variation in vehicle lengths provides a noisy estimate.

Trip Matrix Estimation. This time the problem is to estimate traffic flows between a set of origins and destinations, where there are multiple routes to take between the origins and destinations. The only data that is usually available are traffic counts on links (which make up routes) rather than entire routes themselves. The difficulty is that multiple patterns of route flows will be consistent with any single pattern of link flows, making it impossible to derive a good estimate of a trip matrix from aggregate link flows only. However, a statistician could develop a link between the variance and mean flows from a *sequence* of sets of link counts to improve methods of dynamic estimation of trip matrices by making use of the variation.

Modelling Day to Day System Dynamics. To model how traffic will distribute over a network requires both a travel demand model (or trip matrix) and also a traffic assignment model. Traffic assignment models typically involve a focus at the individual traveller level by assuming that travellers will choose the shortest or “lowest cost” route available. The key role of the statistician is to recognise that differences between individuals’

perceptions and experiences of travel costs (such as journey time) make it natural to model the day to day dynamics of the network as a random process.

Historically, most transport models have been largely deterministic and ignored inherent variability. This approach leads to missing extreme events such as traffic jams and produces biased estimates and predictions. Martin’s talk proved to us all that there are many opportunities for statisticians to make large contributions in the area of traffic and transportation research.

Anna Munday

*Re Martin Hazelton’s Contribution to the SSAI-WA Branch*

We have much to thank Martin for during his stay in Western Australia and particularly for his excellent work on the committee of the SSAI-WA Branch, where he served diligently and with competence as Vice President for 2 years, then as President for 2 years and finally as a committee member on standing down from the presidency, during Alope Phatak’s reign as president for 2 years. He has excelled as a committee chairman and has instilled a sense of humor into the meetings without detracting from a sense of order. The committee and the branch will miss the Bayesian-Frequentist banter between Martin and his colleague of these last few years, Berwin Turlach. We all wish him well in his new abode again still in the antipodes from his country of origin.

Brenton R. Clarke



Caption