

Dr Mu Zhu visits Australia

The inaugural visit to Australia by an AusCan Scholar has just been completed. Dr Mu Zhu, Assistant Professor, Department of Statistics and Actuarial Science, University of Waterloo, Ontario, Canada, took some time during his 7-week visit to Australia to answer a few questions about statistics, being a statistician and what his research means to him.

What inspired you to choose a career in this area?

I still remember this very vividly: One day when I was still a freshman in college, my roommate and I were looking through that thick catalog trying to declare a major. I flipped through the pages and saw “statistics.” I immediately said to my roommate, “Look! There is even a major called *statistics*. That must be the most boring subject in the whole world.” Needless to say, I didn’t pick it as my major.

I didn’t really appreciate mathematics for a long time. In high school, a math teacher once encouraged me to train for various math competitions. I wasn’t interested. I was also very afraid of being associated with the stereotype. I didn’t like the image at all and felt very uncomfortable around the “geeks.” I didn’t exactly *dislike* mathematics; I just didn’t care too much about the subject. When I first learned about eigenvectors in my college linear algebra course, for example, I simply could not understand why anyone should care about them. To me, mathematicians just seemed to invent all these funny and useless things.

This all changed when I enrolled in a year-long course in probability and statistics when I was in my junior year. All of a sudden, integrals and vectors all became meaningful and relevant. For me, that course was a real eye-opener; I saw mathematics with real context for the very first time.

After college, I went to work for a litigation consulting firm in New York. The work required very little intelligence



but the working hours were terrible. During a certain period of time which lasted weeks, I was getting off from work at 6 o’clock *in the morning* everyday! I discovered how much I loved to be back in a more intellectual environment and quickly decided that my time would have been much better spent in a graduate program. But I wasn’t sure what I really wanted to do. I knew I enjoyed my statistics courses back in college, and it also seemed to me that statistics would be a very flexible subject as well. So I applied.

Soon after I received that admissions letter, I quit my job in New York and spent three months hiding in a cheap apartment in western Massachusetts, spending most of my time reading philosophy and poetry. Three months later, I flew to California and formally started to do statistics.

What does your job involve?

My job is typical of a junior academic. Even though research is what the job is really about, my duties also involve teaching, supervising graduate students and serving on various committees both within the department and for various statistical societies and professional organizations.

Can you tell us a little about some of your research, and why it is important?

These days, we are all expected to say that our research is important. This is very unfortunate. I think it is much more important for researchers to be able to say that their work is fun. As far as I am concerned personally, the only reason why I should enjoy doing any work is because the work is *fun*, and not because the work is important.

I brought along three seminars on this trip to Australia. Two of them are about works that are quite fun. In one [1], we developed an efficient algorithm using ideas from a board game. In the other [2], we developed a variable selection method by carrying out “Darwinian evolution in parallel universes.”

If I must talk about importance, I think these works are important in two ways. What most people care about is whether these works have any practical value. Fortunately, the answer is “yes”: our algorithms tend to work faster and/or better than competitor algorithms out there on the market, but, for me, this is not the main point and certainly not the main reason why I *myself* am excited about them. What’s important to me is whether they contain any interesting ideas that could lead us to think differently. Again, I think the answer here is “yes”.

In [1], what we showed is that, for a particular type of classification problems, we can “handcraft” a decision function of the support vector machine type very efficiently if we think carefully about the unique nature of the underlying problem. Here, by “handcraft,” I mean we can justifiably specify the model parameters a priori, without having to optimize them, which is very unusual. Of course, there will still be tuning parameters that must be chosen by empirical procedures such as cross-validation, but you can’t bypass this step regardless of what method you are using. Even if you are just using a linear regression model, for example, there is the question of how many variables to put into the regression equation.

In [2], what we showed is that, by using a very simple “trick,” one can “boost up” the performance of an imperfect variable selection criteria such as the AIC. To me, whether our algorithm can beat all the other variable selection methods out there is not the issue; what I find most interesting and the reason why I wrote the paper in the first place is the fact that we can easily “boost up” a wrong criterion.

Some people just don't seem to get this point. They keep on challenging me with different methods: Here is a method developed by so and so; can your method beat it? Our algorithm actually works very well and is certainly very competitive, but of course, no single method can consistently beat everything under all possible circumstances. These people don't care whether your work contains any interesting ideas at all. They are fully utilitarian. They are the American architects of the 1960's who designed all these ugly, concrete buildings that are perhaps very strong but come with absolutely no artistic taste whatsoever! I think this is very sad — and, in fact, very dangerous, because, when these people serve as referees, they can prevent a “Mona Lisa” from being displayed because it is nothing more than an ordinary portrait of an unknown woman. They don't ask whether there is any intellectual value in a piece of work, or whether you can learn anything interesting from it, which, to me, is actually the only criterion that matters and perhaps the only one that should.

What do you like most/least about your job?

I like having some freedom to choose what I want to work on and how I would like to go about doing so. I don't like rude, irresponsible and hostile referees or undergraduate students who care only about their marks and nothing else.

What is the most unusual or fun thing you've done in your job?

I once taught a section of a rather bizarre introductory course which every student hated. Someone had made up some very strict guidelines for the teaching assistants about how they should grade the quizzes, which often contained some rather open-ended questions. For example, if you wrote that “the target population of this study is all Canadians,” you would be wrong; you must say “the target population of this study is all Canadians, past, present and future.” The students used to complain to me bitterly — and I don't blame them. But spending hours everyday listening to complaints from students isn't exactly how I wanted to spend my academic career. In this case, I was particularly annoyed because it wasn't even my fault! It's like someone else had made this terrible decision but I was the one who had to live up with the consequences! So, during one of the quizzes, I sat down in the last row and wrote the quiz myself. On the cover sheet, I simply put down my name as “student” and handed it in; I thought this was particularly appropriate since the quiz was mostly on the t-test. Well, my quiz was graded and I scored something like 87%. I mean, this was very basic stuff — do the t-test, count the degrees of freedom, find the p-value, and so on. There was no reason why anyone with a PhD in statistics should not get 100% on this quiz even if blind-folded! For one question, I put down the model as “ $y_i = \mu + \epsilon_i$ ” but that wasn't correct because I had apparently forgotten to put down “ $i=1, 2, \dots, n.$ ”

Tell us about one of your career highlights.

I'd say that this trip to Australia should make a pretty memorable highlight for my career, don't you think?

Who or what has been an inspiration to you?

This is a hard question to answer. You get inspired by different people in different areas of your life. But for doing the kind of work that I am doing right now, the one person that has influenced me the most has to be Professor Jerry Friedman.

What's the best advice you've been given?

Professor Jeremy Knowles, who was the dean of the Harvard faculty of arts and sciences while I was there, once said [3], “I have the old-fashioned view that we do well at things we enjoy and we tend to enjoy what we do well at.” That, to me, was the best advice I had ever received.

What are your career goals/plans for the future?

I don't really have a concrete career goal. I would like to live a happy life if I can, and, if any of my work can change the way people think, that'll be more than enough for me.

What advice would you give to new statistics graduates?

I am still learning myself, so I don't really have much advice to offer. If anything, I am in great need for some good advice myself.

References

[1] Zhu M, Su W, Chipman HA (2006). LAGO: A computationally efficient approach for statistical detection. *Technometrics* 48(2), 193 – 205.
 [2] Zhu M, Chipman HA (2006). Darwinian evolution in parallel universes: A parallel genetic algorithm for variable selection. *Technometrics* 48(4), 491 – 502.
 [3] Knowles, JR (1991). Speech delivered on September 8th, 1991 at the opening exercises for the Class of 1995, Harvard University.

Melissa Dobbie

Dr Zhu has a PhD in Statistics from Stanford University (1996–2001) AB magna cum laude in Applied Mathematics, Harvard University (1991–1995).

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AusCan 2006 Scholar Visits to Branches

NSW

The AusCan Scholar, Dr Mu Zhu, kicked off his trip around Australia talking to the NSW Branch. Apart from a bit of jet lag Mu entertained us and had us thinking very carefully about our current methods with his talk entitled Darwinian Evolution in Parallel Universes.

Also in September Mu presented the first of the two occurrences of his workshop – Kernels and Ensembles: a short course on statistical machine learning and data mining. Around 40 people attended the Sydney workshop held at the University of Technology. They were mainly from academia but across a number of departments e.g. IT, engineering, mathematics, statistics and econometrics. Other representatives came from Ernst & Young, Covance, NHMRC Clinical Trials Centre and the NSW Department of Environment and Conservation. The workshop proved an excellent venue for those of us interested in being initiated into machine learning and for those who wanted to share their experiences and possibly obtain solutions to their challenges. I would like to personally thank Boris Choy for his help in organising the venue, the refreshments and in particular, taking some of us to an excellent yum cha restaurant for lunch.

Caro Badcock

Queensland

The Brisbane statistical community were fortunate to have the inaugural AusCan scholar, Dr Mu Zhu, visit for a week in early October. Whilst in town, he spent time interacting with statisticians at the University of Queensland, Queensland University of Technology, Department of Primary Industries and Fisheries, and CSIRO Mathematical and Information Sciences. Dr Zhu presented three different talks during the week – at an ordinary meeting of the Qld Branch (see report



Kathryn Lambkin (CSIRO) and Ross Darnell (UQ) at dinner with Mu Zhu.

elsewhere in the newsletter), in a QUT statistics seminar series, and whilst visiting CSIRO Mathematical and Information Sciences Cleveland site. We did give him the weekend off though and introduced him and his family to some Australian animals at Lone Pine Koala Sanctuary.

Melissa Dobbie

South Australia

Our October meeting followed the one day workshop on Statistical Machine Learning and Data Mining which were both presented by Dr Mu Zhu our visiting AusCan scholar. The workshop participants gave Mu rave reviews so we were waiting in great anticipation. Mu's chosen research topic for the branch meeting was Discriminant Analysis in an environmental ecology setting.

Mu introduced his talk by announcing off the cuff that the research he was presenting was less interesting than his other research, but seemed nonetheless to be more favourable to journal referees and much easier to publish than other work! His humour and communication style quickly engaged the audience.

Multivariate techniques are commonly used for environmental ecology, one in particular is Discriminant analysis. One common technique is the Linear Discriminant Analysis (LDA) which assumes normally distributed classes and equal class covariances. Mu presented LDA and compared it to a generalized version of LDA which is referred to as the Likelihood ratio criterion (LR(a)). LR(a) does not need to assume equal covariances but if covariances are the same then the two techniques are equivalent. The likelihood ratio criterion also does not need to make any distribution assumptions. Mu presented results from an example data set which performed both LDA and LR(a). An important result was that LR(a) could show both location and scale differences between classes in two dimensions whereas LDA could only show location difference in two dimensions.

Given the superior nature of LR(a), Mu compared LR(a) to the Sliced Average Variance Estimation (SAVE) technique, another non-parametric technique. These two techniques seemed to emphasise different aspects in two dimensions. LR(a) emphasised location differences whereas SAVE emphasised scale differences. Location differences are likely to be more beneficial to separate classes than scale differences, therefore LR(a) may be there preferred method.

Mu moved on to show how Canonical Correspondence Analysis (CCA) is algebraically equivalent to LDA and then showed how CCA is a direct method to estimate the environmental gradient based on a "weighted sample" model. The weighted sample model produces a weighted distribution which is a function of the response function of the classes. Therefore, if the distribution of classes is multimodal then this will be assumed in the weighted sample model. A vegetation example which was multimodal was then used to compare CCA and LR(a). The conclusions found were that LR(a) produced the most sensible results.

Mu's talk was followed by a few questions then we adjourned to a nearby restaurant to share a Chinese banquet and farewell Mu from South Australia.

Janine Jones

AusCan 2006 Scholar Visits to Branches cont.

Canberra

Mu began his talk - titled "Darwinian Evolution in Parallel Universes" - by outlining the general problem of variable selection. This problem involves a response variable, a set of plausible explanatory variables and an evaluation criterion, such as the Akaike Information Criterion (AIC) or the Bayesian Information Criterion (BIC). The naive approach to solving the problem is to evaluate the chosen criterion for all possible subsets of the explanators and to choose the subset which provides the optimal value of the criterion. However, this approach becomes impractical if the number of plausible explanators is not very small.

To deal with the case of a moderate to large number of explanators, researchers have made use of the genetic algorithm (GA). For this application the GA - which was originally developed as a general search algorithm - starts with

an arbitrary population of candidate solutions and represents each one with a binary 'genetic' code (e.g. 10011, representing the model with variables 1, 4 and 5). It then performs a number of transformations to this code which involve the chosen evaluation criterion and which resemble aspects of natural selection and mutation in biological evolution. The end result is a set of the explanatory variables which may be considered as the most important ones.

However, the GA may not work well if the wrong criterion function is used. Also, the algorithm requires that a 'mutation rate' be specified, and this in itself can be a tricky business. (One encounters similar problems with tuning parameters in Markov chain Monte Carlo applications.) These drawbacks have led Mu to consider a simple 'twist'. The idea is to run a number of GAs in parallel, without allowing each GA to

fully converge, and to consolidate all the information from the individual GAs in the end.

This 'twist' seems to work well for the applications which Mu has examined, and a heuristic explanation is as follows. It is often much worse to omit an important variable than to include a spurious one. Mu's algorithm produces a large number of parallel universes each containing some spurious variables just by chance. But the spurious variables in the various universes will tend to be different (largely because the evolutionary path in each universe is cut short), and therefore it should be possible to eliminate these spurious variables by taking a 'majority vote'. Thus the final result will be a set of only the important explanatory variables. Mu has written a paper on this new approach which is set to appear later this year in the journal *Technometrics* (48(4), 491-502, 2006).

Borek Puza

AusCan Scholar Program

A program to promote scientific exchanges between outstanding young Australian and Canadian statistical researchers

The AusCan Scholar program was developed by the Statistical Society of Australia Inc and the Statistical Society of Canada to foster young researchers and promote collaborative activity between the Societies.

The objectives of the AusCan Scholar program are:

1. Promote scientific interaction between the Australian and Canadian statistical communities, particularly in areas of Statistics relating to current and important practical problems.
2. 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 to interact with a number of researchers in the country visited.

Dr Mu Zhu of the University of Waterloo has recently completed his visit as the inaugural AusCan Scholar.

Applications are invited from young Australian statisticians who wish to be considered for the position of the AusCan Scholar to visit Canada in 2007. The visit will be of 4 - 8 weeks duration, and will involve visiting several cities in Canada. The primary objective is to move around the country to meet people. Applicants should note that the Statistical Society of Canada's 2007 annual meeting is to be held in St. Johns, Newfoundland from June 10 to June 13.

Eligible Scholars will be post-PhD with a strong preference given to researchers who are within five (active research) years

of gaining their PhDs, with a demonstrated strong interest in both theory and applications. Applicants should be members of the Statistical Society of Australia Inc.

The Scholar will be required to provide a brief report within one month of completing the visit, outlining activities carried out, key contacts made, and anticipated follow-up collaborative activities. The report will be published on the two Societies' web sites, and the Scholar may be invited to make a presentation at his/her Society's national conference.

Selection of the 2007 Scholar will be made by a Committee chaired by the Statistical Society of Australia Inc President, and including a representative of the Statistical Society of Canada. The costs of this program will be shared by the two Societies. Funding is available to the Scholar to cover air fares, accommodation, meals and incidental expenses. Scholars will be responsible for their own travel insurance.

Applications (maximum of two pages addressing the eligibility criteria detailed above, current CV and the names and contact details of three referees) should be forwarded to:

Jane Waslin, Executive Officer
Statistical Society of Australia Inc
PO Box 111, Braddon ACT 2612 Australia
or faxed to (02) 6249 6558

Applications close on 31 January 2007.

The Scholar for 2007 will be announced by the end of February 2007, and the visit must be completed by the end of 2007.

President's Corner

One highlight of the various activities undertaken by our members during the last few months was the visit by the Aus-Can Scholar, Dr Mu Zhu, who conducted workshops and presented talks in several States. We hope that the reciprocal Australian statistician who visits Canada next year has as much exposure to and impact on members of their statistical fraternity. A notice about the method of application for this award can be found elsewhere in this newsletter.

Chris Lloyd created the blog, Fishing in the Bay, to provide a forum for on-line statistical discussion. It has proven to be quite popular and can be found at the following address <http://blogs.mbs.edu/fishing-in-the-bay/>. I encourage all members (and non-members) to participate at their leisure.

The current and past Presidents of SSAI and NZSA have been meeting with the Editorial Team (via teleconference) to discuss the future management of the *Australian and New Zealand Journal of Statistics*. We aim to introduce the OnLine Early Service from Blackwell from the start of 2007 and have a session on publication issues at the 2008 Australian Statistical Conference. At that stage, we also intend to present a draft constitution for the new (joint) entity to replace the SSAI publishing arm, ASPAI.

A couple of members of the Executive Committee have been working on our Continued Professional Development (CPD) Program. One useful way to view CPD is as a cyclic program providing a variety of offerings to members at different levels of knowledge to meet differing needs (e.g. new developments, sectional and/or branch workshops, and refresher courses).

Such a program would aim to be at least self-funding, preferably with a small surplus. CPD activities are generally run by a committed and enthusiastic individual (or team). If I am describing you, please let us know what you can offer.

Some other members of the Executive have been working on an SSAI Benefits Statement. Please read what they have written (elsewhere in the Newsletter). If you have feedback or want to discuss any of the direct or indirect benefits of membership, we would be happy to interact with you.

A brief reminder that the Young Statisticians Section will be holding a conference at University House on the ANU campus in Canberra on 13-14 April next year. The theme will be "We're Young and We Count". It is open to all, from young and early career statisticians to those not so young but with an interest in supporting young statisticians.

Finally, I wish you all the best for a safe and enjoyable festive season.

Kaye Basford

E-mail: k.e.basford@uq.edu.au



SSAI Staff News

Jane Waslin, SSAI's Executive Officer, was recognized for her education, experience and contribution to the not-for-profit sector by receiving Accreditation from the Australian Society of Association Executives (AuSAE) (the "SSAI" for Association Executives).

Photo: Jane Waslin receiving her Accreditation from David Hocking, FSAE, a Director of AuSAE.



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**DEADLINE FOR
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Editorial

The first AusCan Scholar made his visit to Australia in September and October, and this newsletter features reports of Dr Mu Zhu's time here. The Editors hope that as many of you as possible were able to attend his talks and workshops, as well as socialize. If you can contribute to Canadian statistical life in a similar way, and would like to experience Canadian hospitality too, why not apply to be the first Australian AusCan scholar? Information about the program is in this newsletter.

This newsletter also carries reports of a range of Branch activities, including regular meetings and workshops. Many workshops and conferences are still to come however, scheduled for the academic break from lectures from December to March. If you attend an interesting conference or workshop in the next few months, please consider writing a short report for this newsletter – the Editors would love to keep all Society members informed about statistical activities both local and international. Check out the list of conference elsewhere in this issue.

Finally, by the time this newsletter arrives, the silly season will be under way. The Editors would like to take this opportunity to wish all Society members a happy Christmas, and a pleasant New Year. We would also like to thank all those who have contributed to the newsletter, whether by writing reports, taking photos or entering competitions. Thankyou also to the organizations who have supported the activities of the Statistical Society and its members – your input into successful Society activities is much appreciated.

The deadline for copy for the next newsletter is 10 February 2007 – enjoy the summer!

Member News Michael A. Martin

Michael Martin is Associate Professor in Statistics in the School of Finance and Applied Statistics at the Australian National University in Canberra, Australia. He holds a Bachelor of Science (Hons) degree from the University of Queensland (1986) and a PhD in Statistics from the ANU (1989). He held the position of Assistant Professor of Statistics at Stanford University from 1989 to 1994 and was Annenberg Distinguished Assistant Professor in Statistics at Stanford from 1992 to 1994. In 1994, he accepted a position as Lecturer in Statistics at the ANU, where he became a Senior Lecturer in 1995, and Reader in 2003. He has over 45 publications in refereed journals, including papers in *Biometrika*, *Journal of the Royal Statistical Society, Series B*, and *JASA*. His research interests include resampling, likelihood-based methods and statistical graphics, while he also has done significant applied statistical work in areas as diverse as pollution mortality modelling, modelling of business value from information and computer technology, and mortality and morbidity associated with breast cancer. His teaching career includes as highlights the Dean's Award for Distinguished Teaching, School of Humanities and Sciences at Stanford University in 1992-3, the Faculty of Economics and Commerce Award for Excellence in Teaching at the ANU in 1998, the ANU Vice-Chancellor's Award for Excellence in Teaching in 2000, and being named a finalist in the Australian Awards for University Teaching in 2000. He has also served periods as Associate Editor for the *Journal of the Royal Statistical Society, Series B*, the *Journal of Statistical Computation and Simulation*, and the *Australian and New Zealand Journal of Statistics*, as well as serving as referee for numerous journals and granting agencies. His selection as Fellow of the American Statistical Association in 2006 was based on all elements of his academic career, research, teaching and service to the profession.



We're Young and We Count

As chair of the Young Statisticians Section of the Statistical Society of Australia I am pleased to announce "The 2007 SSAI Young Statisticians Conference – We're Young and We Count".



This exciting event will be held at University House, Australian National University in Canberra on Friday 13 April and Saturday 14 April 2007. The conference will consist of sessions covering a broad range of topics including careers, study opportunities, interesting statistical projects from a variety of fields and presentations following the theme "We're Young and We Count". There will also be poster sessions, four experienced statistician keynote speakers and many opportunities for early career statisticians to network. The call for papers registration information is available now. The conference is by no means restricted to early career statisticians. More experienced statisticians are also welcome to attend and/or present.

By definition a young statistician is someone who is studying statistics or has graduated in the last five years and working or studying in a statistics related area (or wants to be!). You don't have to be young to be a young statistician (our current age range is 22-35) – just new to the profession. I especially encourage those who consider themselves to be a young statistician to come along to the young statisticians conference next year and/or join the Young Statistician Section of the SSAI.

The Young Statisticians Section of the SSAI is an Australia-wide network of early career and student statisticians. Our aim is to help young statisticians meet their peers and provide a venue for the discussion and sharing of statistical work, career and academic guidance. Our members are academics, survey statisticians, social statisticians, biostatisticians, marketing scientists, statistical ecologists, financial advisers, students, plus plenty of other titles.

The Young Statistician Section organises events at both the national and local levels. The special two day young statisticians conference mentioned above is organised by us and is held every couple of years. We also organise invited young statisticians sessions at the Australian Statistical Conference held every two years. There are young statistician representatives in all branches of the SSAI who organise local events such as special young statistician dinners, workshops, career nights and other social gatherings. We also promote the interests of young statisticians to the Central Council of SSAI.

The Young Statisticians Section is always chaired by a young statistician. I certainly fit the definition! I completed my honours degree in mathematics majoring in statistics at the University of Wollongong in 2003. Since then I have worked as a statistician at the ABS (Australian Bureau of Statistics) in Canberra. I have been involved in a variety of interesting statistical projects while at the ABS. The most exciting of these was a project where I helped develop and evaluate a new cell perturbation confidentiality method to be applied to all 2006 Census tables of counts. I recently started a part-time PhD in statistics at the Australian National University.

For more information about the young statisticians conference and any other upcoming events please contact me. Also if you have any ideas for activities or would like to organise a young statisticians activity please let me know.

Janice Wooton,
Chair, Young Statisticians Section
janice.wooton@abs.gov.au

Conferences

Australasian GenStat/StatGen Conference 2006

5-8 December 2006, Victor Harbour, South Australia <http://www.biometricssa.adelaide.edu.au/genstat2006/>

SSAI's Young Statisticians' Conference 2007

We're Young and We Count – 13-14 April 2007, Canberra, <http://www.statsoc.org.au/Conferences/>

ISI 56th Session

22-29 August 2007, Lisbon, Portugal, <http://www.ine.pt>

IBS Australasian Region, 'Biometrics on the beach'

2-6 December 2007, Coffs Harbour, New South Wales, <http://www.biometrics.org.au>

Australian Statistical Conference 2008

June 2008, Melbourne, <http://www.statsoc.org.au>

International Society for Bayesian Analysis (ISBA) conference, Hamilton Island, Queensland

21-25 July 2008, <http://www.maths.qut.edu.au/asba/docs/isba08>

Workshop: Challenges of Running Clinical Trials in Oncology

This workshop was held at the Macquarie Graduate School of Management, October 27 and was targeted at anyone working or interested in the field of oncology clinical trials. The workshop was organised jointly by the SSAI NSW Branch and the Australian Pharmaceutical Biostatistics Group. Other sponsors included ARCS (Australian Regulatory and Clinical Scientists Association), Covance, Eli Lilly and Roche. In addition to the 11 speakers throughout the day there were 73 attendees. Attendees came from a variety of backgrounds – data management, statistics, clinical research, regulatory affairs, medical writing and health economics. Many of the sponsor companies with products in the oncology area were represented e.g. Eli Lilly, Roche, Bayer and Novogen; companies who work with the sponsor companies e.g. Covance, Datapharm, Novotech, NHMRC Clinical Trials Centre and Kendle; and organisations who work with patients e.g. Peter MacCallum Cancer Centre, Nepean Cancer Care Centre and Cancer Services at St George Hospital.

The aim of the workshop was to allow people to share their experiences while also learning more about the therapeutic area and its challenges. The sessions started off more general and became more targeted as the day progressed. The first session was on the design and logistical challenges. There were three speakers, a statistician (Robyn Attewell, Covance), a clinical research associate (Denise Gow, Roche) and a data manager (Anne-Maree Pezzullo, Covance). Each had 15 minutes to present their challenges and to present some thought provoking ideas. Everyone then went to one of eight breakout groups to discuss their own challenges and anything that came out of the speakers' presentations. Each breakout group identified their top three challenges and over the course of the day all attendees were given three stickers to use as votes for any particular challenges. The top challenges revolved around better communication between

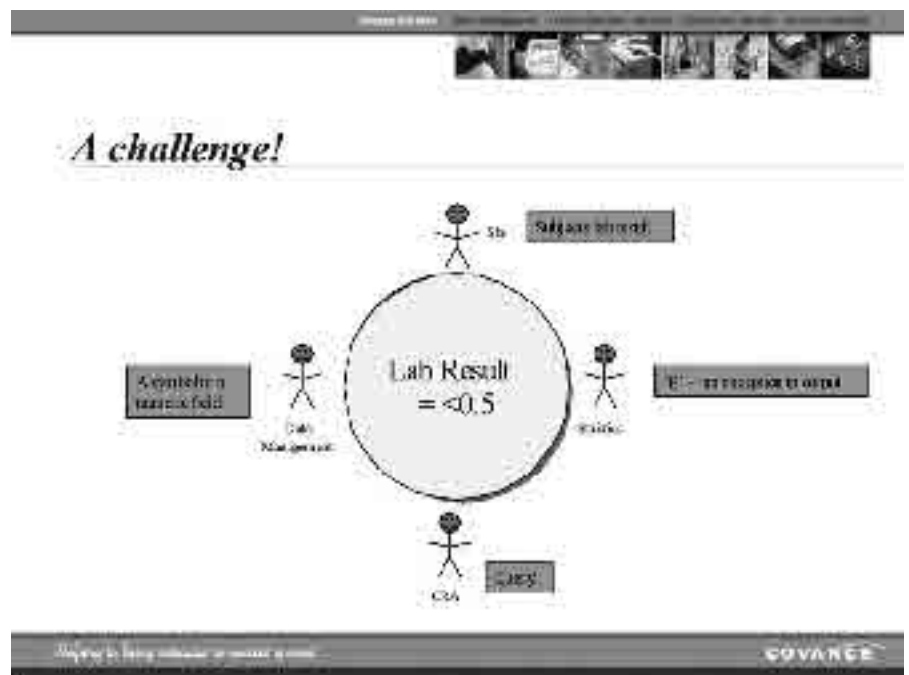


Figure 1: How the various functions involved in clinical trials can see a problem differently – each frustrated in their own right but possibly a common solution with better communication.

all the functions, particularly as these trials often continue over a long period of time.

The second session focussed on the role of safety data such as adverse events, medications, laboratory data and coding of adverse events and medications. There were three speakers followed by a panel discussion. John Simes (NHMRC Clinical Trials Centre) spoke on the role of data safety monitoring boards in monitoring safety and effectiveness of new therapies, in particular focussing on lessons from cancer and other clinical trials. He was followed by Jenny Baker from the Therapeutic Goods Administration focussing on what the regulatory authorities want to see in safety reports and Jill Thorn (Roche) who shared with us the differences between Meddra and CTC coding dictionaries focussing on when to use the different dictionaries and why.

The theme of the third session was measures and analysis. Here an

oncologist, Michael Boyer (Royal Prince Alfred Hosp) started the session by sharing with us how oncologists use clinical trial results when treating their patients. This was followed by William Reece (Eli Lilly) talking specifically on the design and analysis of phase II clinical trials in oncology and Philip McCloud (Roche) talking on the design and analysis of phase III clinical trials in oncology. Phase II trials usually have response rate type endpoints while phase III have the survival type of endpoints.

The final session of the day aimed at increasing understanding of the RECIST criteria and its current use. RECIST stands for the Response Evaluation Criteria in Solid Tumors and is the current standard used to assess the treatment response. The session started with a medic, Kate Jin (Roche) presenting the RECIST criteria. This was followed by Michael Boyer talking about how oncologists use RECIST and the challenges faced with comparing scans obtained under

new technology with those obtained under older technology. Finally, Terry Neeman (Covance) discussed situations where RECIST is not appropriate for measuring response. In particular, RECIST measures the response over all tumours which is reasonable when chemotherapy type treatments are used that affect the whole body. Now that there are newer biologics that treat only the targeted tumour then RECIST is no longer valid. After these talks the group again went to their breakout groups to discuss their personal experiences with RECIST.

Attendees were asked to complete a workshop evaluation form at the end of the day. Responses showed that 85%, 71%, 91% and 95% of attendees rated sessions 1 to 4 respectively as Excellent or Good indicating there is an interest and a need to be providing similar workshops where cross-functional sharing and learning can take place.

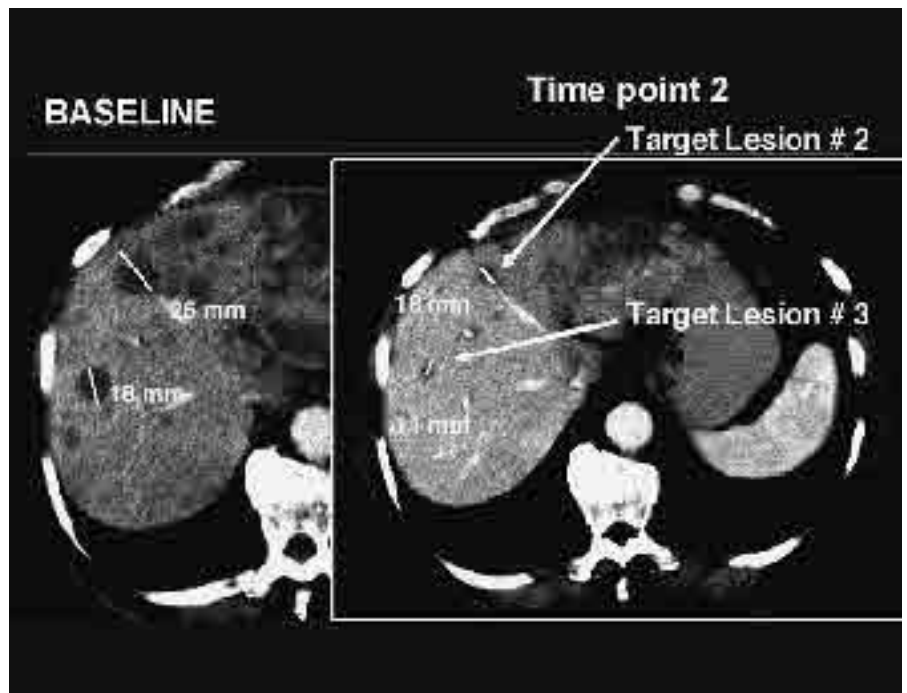


Figure 2: Example of measuring tumour response at two time points

Caro Badcock

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SENIOR CLINICAL OR MEDICAL STATISTICIAN for a cutting edge pharmaceutical company in Central London to design and provide statistical advice, analysis and related services to support and facilitate the achievement of assigned clinical development projects in line with the company's strategy and external medical / scientific standards. Applicants must have a relevant degree and solid statistical experience in CRO or pharmaceutical R&D including all phases and large studies and experience of international drug development in a multi-cultural environment. Ref: SSA 10635

EXPERT STATISTICAL METHODOLOGIST for top global pharmaceutical provider at their international headquarters in Switzerland. Working within clinical development, he/she will act as an expert consultant in statistical methodology (frequentist or bayesian) to ensure that effective state of the art methods are used in support of clinical projects. Candidates need a PhD in statistics, outstanding knowledge in applied statistics and experience in clinical / medical statistics and application in clinical trials. Also, basic knowledge of bayesian statistics, demonstrated extensive track record of statistical research and proven skills in developing and implementing novel methods and innovative strategies in drug development projects. Ref: SSA 11250

SENIOR CLINICAL STATISTICIAN for a global Pharma at its UK Research centre in West Sussex. Here she will join the ECD Biostatistics group as a senior member and provide specific project support working with other statisticians and giving guidance and expertise on the design, analysis and reporting of clinical trials. Candidates need a MSc or PhD in Statistics or Mathematics and extensive relevant experience in clinical trials. Good knowledge of clinical trials methodology, drug development process and health authority guidelines and regulations. Basic knowledge of pharmacological and physiological sciences and PK / PD and good knowledge of scientific computation and SAS / S-Plus is ideal. Ref: SSA 11236

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Three Doors with Borek Puza (Edition 8)

Welcome to the 8th edition of *Three Doors*. Last time I presented The Widget Puzzle and am now pleased to announce Terry Neeman as the latest winner of the Three Doors Prize, a cheque for \$60 as donated by SSAI. The solution to the puzzle is given below, followed by the next puzzle. Erratum: In the “Note” of Edition 7 (Number 116, page 5), after the sentence beginning “It can also be shown ...”, add “This is true both: (a) unconditionally; and (b) given that persons 2,...,k-1 all sit in their assigned seats.”

The Widget Puzzle

Yesterday, random samples of 20 widgets each from factories A and B contained 1 and 3 defective widgets, respectively. Today, you bought a box containing 8 and

2 widgets taken randomly yesterday from factories A and B, respectively. Upon testing all 10 widgets you find that exactly two are defective. Find the maximum likelihood estimate of the probability that both of these defective widgets came from factory A.

Solution to The Widget Puzzle

Let a and b be the defective rates for factories A and B. Also, let $D =$ “There are two defectives in the box” and $C =$ “All the defectives in the box came from factory A”. Then the probability that both of the defectives in the box came from factory A is

$$p = P(C|D) = P(CD)/P(D) = f(2,0)/\{f(2,0) + f(1,1) + f(0,2)\},$$

where $f(u,v)$ denotes the probability that a binomial random variable with parameters 8 and a takes on the value

u , and that an independent binomial random variable with parameters 2 and b takes on the value v . We see that p is a function of a and b , and so could also be written $p = h(a,b)$. Now, the maximum likelihood estimate (MLE) of (a,b) based on the two random samples of size 20 each is $(1/20, 3/20)$, and so the corresponding MLE of p works out as $h(1/20, 3/20) = 0.30143$.

However, this is not the ‘true’ MLE of p , because it does not take into account the two defectives in the box. Thus the true likelihood function is

$$L(a,b) = g(1,3)\{f(2,0) + f(1,1) + f(0,2)\},$$

where $g(s,t)$ denotes the probability that a binomial random variable with parameters 20 and a takes on the value s , and that an independent binomial random variable with parameters 20 and b takes on the value t . There are several ways in which $L(a,b)$ can be maximised (e.g. trial and error, or better still, the EM algorithm with the ‘latent’ data taken as the number of defectives in the box which came from factory A). We find that the true MLE of (a,b) equals $(0.08369, 0.16621)$. Hence the true MLE of p works out as $h(0.08369, 0.16621) = 0.41367$.

It is interesting that if the two defective rates are the same (i.e. $a = b$) then $p = h(a,a)$ works out uniquely as 0.62222, regardless of the value of a (due to a cancellation of all terms depending on a). This value of p is quite plausible because the difference between the proportions $1/20$ and $3/20$ is not statistically significant.

The Conception Puzzle

A couple decides to have children until they have a child with the same gender as their first child. How many children can they expect to have? Express your answer as a function of p , the probability with which each of their children turns out to be a boy. Assume that the couple can have an unlimited number of children, that the genders of their children are independent from birth to birth, and that p is constant over time.

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My experience at the ASC/NZSA conference

In July 2006, I attended the ASC/NZSA 2006 conference in Auckland, New Zealand. I was keen to attend the conference to hear talks by, and initiate contact with, statisticians working in my field. In particular, as a young statistician, the opportunity to meet with other younger statisticians whom could provide an avenue for support during my work was sought.

Overall, I found the conference very worthwhile. There were many symposia on statistics in the biology, environmental and ecology, my own area of expertise and I learnt a lot from these contributed sessions. In particular, I very much enjoyed talks by Mark Burgman, Steve Buckland and Rachel Fewster. I had heard Mark talk before, but he never fails to impress, and the presentations by Steve and Rachel were most interesting and relevant to me, as part of my own work involves state-space population modeling. Another outstanding talk was by Thomas Yee, on constrained ordination, and I also felt this had direct relevance to some of my own work.

In one of the symposia for environmental statistics, I also presented my own research on applying mark-recapture methodology to a critically endangered orchid to estimate demographic parameters. Most people do not think of applying such techniques to a plant, however detectability issues arise in many plant studies, eg. orchids, as they enter a

period of dormancy each year when they cannot be observed from above-ground. It was very valuable to obtain feedback from the audience and enter discussions with interested researchers after the symposium was finished.

Attending conferences is a good opportunity to be exposed to research outside of your own area. The Young Statisticians symposium was an eclectic mix of talks, and I was very impressed by the quality of the presentations, and the standard of research being conducted. One outstanding talk that I found completely fascinating was the "Effect of uncertainty in the number of contributors to DNA stains" by James Curran in the Statistics in the Public Sphere symposium. I have little knowledge of genetic analysis, and its associated problems and uses, and found this talk very captivating. Mostly for personal interest, I also attended a symposium on Statistics in Society.

The conference also had a strong social side. I met lots of people in attending dinners organized for the Young Statisticians (although our group at first couldn't find the restaurant!), and also for an Environment Statistics Network (thanks to Petra Kuhnert for organizing this).

I thank Data Analysis Australia for providing a Young Statisticians Grant that helped fund my trip.

Joanne Potts

Young Statisticians @ ASC 2006

This is a post conference report after attending the Australian Statistical Conference/New Zealand Statistical Association Conference 2006, 3 - 6 July 2006.

Data Analysis of Australia (DAA) contributed a Travel Scholarship of \$834 toward my expenses and for the 2006 membership of Statistical Society of Australia, for which I am extremely grateful. I am also grateful to Telstra, in particular my manager, who gave me study leave to attend the conference. Last but not least, I am grateful to the ASC/NZSA 2006 Organising Committee, who did such a brilliant job to ensure the success of the conference.

More importantly, I have achieved the aims of attending the conference i.e. gaining the benefits of attending a highly sought after international conference:

- (i) Obtaining a broader perspective on the latest developments in Statistical Methods and Analysis;
- (ii) Obtaining insights that will definitely help me to evaluate and improve my work and work-place contributions. Many sessions of the conference were directly relevant to my work, study, and interests.

Of particular interest to me were:

- The keynote addressed by Professor Ray Chambers on 'Models and Auxiliary in Survey Sampling'. He illustrated how modern based sampling theory allows auxiliary information to be efficiently used in survey-based inference by addressing the types of inference of concern to sampling statisticians and inference

for parameters of statistical models for surveyed populations.

- 'Stratified Multiple Response Analysis and Diagnostics' by Ivy Liu and Thomas Suesse. Paraphrasing the authors: Surveys often contain qualitative variables for which respondents may select any number of the outcome categories called "multiple responses." The talk illustrated the method of applying the generalized MH type estimators (Greenland, 1989) to estimate the conditional group effects among the outcome categories and followed the bootstrap method to estimate the variances and covariances for the estimators using two examples and proposed a diagnostics strategy to detect heterogeneity of the estimators across the strata. Such

Young Statisticians @ ASC 2006 cont.

methods can also be used for data with dependent observations across strata, and perform well even for highly sparse data.

This is very relevant to work at Telstra where we undertake behavioral analysis and customer profiling, to integrate market research data with internal data to develop segmentation insights, and to identify customer target groups to optimize offers/campaigns. We analyze large data sets from survey sampling with multiple responses for customer profiling and modeling purposes. Auxiliary information is often critical: "All the different data sources that provide information about the population from which the sample data were obtained, including information about how the sample was selected and how the non-

sampling error is distributed." And models of course play a major role!

- Various talks on topics in epidemic models, such as, 'Emerging Infections and the Effect of Random Times', which is related to my Honours' year research project at the University of Melbourne. Techniques for modeling and the statistical analysis of disease spreading in epidemics are closely related to those for studying the spread of rumours, in turn to those for modeling the spread of word-of-mouth and other advertising, and its effects on behavior such as churn.

- (iii) Establishing networks for future contact or collaboration with internationally renowned Statisticians.

In particular I am glad to have met Professor Peter Hall, one of Australia's most eminent statisticians and the managing director of DAA, Professor John Hentridge. It was really nice to see familiar faces whom I have met in previous conferences or summer schools. A benefit of having personal contact is being able to judge personality interactions, so important for communication. For example, Associate Professor Ai-Hua Xia made the exposition of some difficult topics so much more exciting by use of his humour. I feel more comfortable in approaching either of them, and others I met at the conference, should the need arise.

Sharon Lau

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SSAI Benefits for Members

The Statistical Society of Australia Inc is the national professional society for statisticians in Australia. As such, it is expected to provide direct and indirect benefits to its members. A functional central office is essential to the provision of these direct and indirect benefits.

Recently, the society has begun to separate, in its budgeting and financial reporting, activities which are considered 'operational' – collecting subscriptions, managing membership, printing and distributing the Newsletter, maintaining the website – from other activities that provide direct and indirect benefits to members. The financial aspects of the production of the Australian and New Zealand Journal of Statistics, a joint activity with the New Zealand Statistical Association, are treated quite separately from the Society's other activities.

Activities that the society sees as providing direct or indirect benefits to members include:

- Maintaining an accreditation program for individuals and for degree programs
- Supporting Section activities, particularly those of the Young Statisticians Section
- Supporting Australian Statistical Conferences
- Managing and supporting the response to the SSAI Review
- Managing and supporting Continuing Professional Development (minimal at present - should be more significant)
- Participating in the AusCan Scholar program
- Liaising with other statistical/mathematical groups, e.g. NZSA, AMS
- Being a member of appropriate mathematical/statistical/technological groups, e.g. AMSC, FASTS
- Being involved in Public Awareness and Image Promotion for the statistical profession.
- Providing opportunities for professional networking and information sharing through branch and section activities.

This list is not exhaustive, but a basis for discussion. It will always be somewhat fluid. Feedback and input are invited.

Kaye Basford and Doug Shaw

Membership Renewals for 2007 are now due!

You should have recently received your renewal notice for 2007.
If you haven't, please contact Liz Jermyn via email at admin@statsoc.org.au to check on your membership status.
Early bird discount for renewal expires on 1 February 2007.

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Branch Reports

CANBERRA

Special meeting on data mining and machine learning in Canberra

The monthly meeting of the Canberra Branch of the SSAI on 31 October 2006 featured two presentations on data mining and machine learning. The first speaker was Dr Graham Williams, Principal Data Miner at the Australian Taxation Office (ATO) and Adjunct Professor at the University of Canberra and the Australian National University; and the second speaker was Dr Mu Zhu of the University of Waterloo, Ontario, who is visiting Australia as the inaugural AusCan scholar. The AusCan Scholarship is a new program developed by the Statistical Society of Australia and the Statistical Society of Canada to foster young researchers and promote collaborative activities between the two societies.

Graham Williams

Graham began his talk - titled "Deploying Data Mining: Machine Learning and Statistical Modelling" - by presenting some statistics that provide an overview of the ATO's activities. For example, the ATO collected 230 billion dollars in tax for the financial year 2004-2005, of which 4.5 billion were received only after the implementation of certain 'compliance activities' such as audits. Another 2.4 billion dollars was identified and remains as debt, to be collected for that financial year. Also, E-Tax is becoming increasingly popular as a way for individuals to complete their tax returns, with 1.4 million E-Tax submissions received for 2004-2005. That number constitutes an increase of 25% over the previous financial year.

To deal with such masses of data the ATO employs several hundred people. About 60 of these are data analysts who are specifically concerned with risk and compliance issues, and these include a core team of 15 with PhDs in the national office in Canberra. A recent move was to introduce data mining as a national capability in 2004, with a view to providing a better framework for risk management. Most government departments are setting up areas of expertise in data mining, and the ATO currently leads the way with one of the largest data mining groups in Australia.

Data mining is a data-driven approach to understanding the world. It deploys

machine learning and traditional statistical modelling approaches (like linear regression) to build models from large data collections. The algorithms in the data mining toolkit include: decision trees (classification and regression trees), random forests (bagging), support vector machines, and boosting. For example, 'boosting' involves coming up with an ensemble of plausible models and making a decision based on a weighted average of them. In contrast, 'random forests' involves building many decision trees, allowing each one to 'vote' in relation to a set of plausible decisions, and choosing the decision which receives the largest number of votes.

Data mining is implemented in many different systems. In particular, the R programming language provides a rich set of tools for the professional data miner. However, many data analysts have not been keen to learn this sophisticated language, and this has led to the development of Rattle. This package provides a user-friendly interface between R and the analyst and has been used by ATO officers to quickly compare the performances of alternative models via specialised performance charts tuned for revenue authority analyses. More information on Rattle can be found at www.togaware.com.

SEPTEMBER

Meeting of young statisticians in Canberra

At the monthly meeting of the Canberra Branch of the SSAI on 26 September 2006, Dr Simon Blomberg of the Centre for Resource and Environmental Studies (CRES) at the Australian National University (ANU) and Ms Genevieve Hayes of the School of Finance and Applied Statistics (FAS) at ANU shared their experiences as young statisticians to a crowd of both young and old. The talks were followed by lively discussion and then a sumptuous pizza dinner, kindly sponsored by FAS.

Simon Blomberg

Whilst doing his Bachelor's degree at Monash University in Melbourne, Simon did not study much mathematics, but focused mainly on biology and physics. He got only a smattering of statistics in first year and none in the second. But he particularly enjoyed his third year statistics subjects, and it was at about this time that he started to become interested in data.

Simon did his Honours degree at Monash University and continued on to complete a PhD in Zoology at the University of Sydney. After that, Simon and his wife went to the University of Queensland where she did her own PhD. There he taught statistics to biology students using SAS, taught himself LISP, and gained an interest in computational statistics. Next, he spent two years at the University of Aberdeen - because his wife got a postdoc there - followed by roughly 12-month postings each at the University of Madison and the University of California (Riverside).

It was upon returning to Australia in 2002 that Simon became fully aware of the slim job prospects for someone with a PhD in ecology and lizards, and this led him to do a Master of Applied Statistics at the ANU in 2004. With that qualification he was soon able to win a research position at CRES working with Professor David Lindenmayer, Dr Ross Cunningham and others. One of Simon's ongoing projects at CRES is the South West Slopes Restoration Study. This involves examining the effects of revegetation on salinity and comparing wildlife in areas with differing levels of tree plantings and remnant vegetation. Inferences from the Study require several specialised statistical techniques, such as mark-recapture models and principal components analysis. Simon has learnt how to deal with problems such as correlated data and has become quite a wiz with the R programming language. He believes it important for data analysts to get involved in the field, because then they can see how the data are actually collected.

Genevieve Hayes

Genevieve - a GStat and FIAA (Fellow of the Institute of Actuaries Australia) - is currently in the second year of her PhD program in Actuarial Studies at the ANU. Originally, she decided to do Actuarial Studies because she was good at mathematics, it was more exciting than engineering, and it held the promise of financial rewards. However, at that time she did not have much idea what it was all about. After filling out most of her electives with statistics subjects, she graduated in 2003 with Bachelor of Actuarial Studies and Bachelor of Commerce degrees, majoring in Finance and Statistics. Then Genevieve worked for an actuarial consulting company in Sydney for about

one year. There she gained an appreciation for the practical problems encountered by actuaries and participated in a variety of research projects; for example she was involved in research into more effective ways of calculating insurance liabilities. She found the research work particularly enjoyable and this led her to return to full-time study back in Canberra.

Genevieve's PhD topic is on the use of stochastic techniques in life insurance reserving. Genevieve has been developing three stochastic submodels for life insurance reserving: a mortality model, a lapsation model and an economic model. Her most recent investigations have focussed on developing the mortality model. Life insurance mortality data often features many problems which are hard to deal with and consequently ignored, for example duplicate policies, overdispersion, heterogeneity and dependence. With a view to solving these problems, she has experimented with a number of probability models, including ones which feature the binomial and Poisson distributions. After detecting significant overdispersion, Genevieve tried fitting zero-inflated Poisson and negative binomial models and found the latter to be the more appropriate. Genevieve is now much happier at university than she was in private enterprise. She's not sure what she'll do after completing her PhD, but it will probably have a lot to do with statistics.

Borek Puza

WESTERN AUSTRALIA

As a result of positive interaction between the mathematics teachers in Western Australia and the local WA Branch of the Statistics Society, an evening titled "An Invitation to Statistics: Various Young Statisticians from Western Australia" was advertised through the Mathematical Association of Western Australia in addition to the local membership of the WA Branch. The presentation was aimed at getting statisticians and mathematics teachers in a joint forum to publicise the work that young people in the profession of statistics do, for example by giving us a brief summary of where they are and what they do now and how they came to be at their current position in terms of past training in mathematics and statistics. The president of the WA Branch introduced each in turn the speakers *Carl Mackin*

(*Australian Bureau of Statistics*), *Andrew Van Burgel* (*WA Department of Agriculture and Food (Albany Office)*), *Anna Munday* (*Data Analysis Australia*), *Christopher Milne* (*Synergy Energy*), and *Vaike Vohma* (*Telethon Institute of Child Health Research*). The speakers each had 10 minutes to present their story, with the time limit dutifully enforced by Berwin Turlach.

Carl led the way with a talk titled "From B-Block to the Bureau", beginning with an extract of an ABS Census form filled out with questions appropriately answered by himself. His path was influenced by "Good Will Hunting" the attraction of solving mathematical puzzles and the lure of dollars in the Bureau. After discussing a variety of interesting facets of his job he concluded with some unusual statistics that the ABS collects: "How many apricots were grown on back yard trees in 1998?" and "How many books were held in public libraries in 1997?"

Andrew described his path to be "From Treasure to Poo", highlighting the fact that his first job was in the Department of Treasury and Finance but now in his current position he is involved in a major project on worm eggs in sheep poo. He showed that he had a gift for solving mathematical puzzles from early on in his career and described how his decision to move to Albany was influenced by family considerations. In particular his wife is from Albany and it is an ideal setting for his young family, thus teaching the next generation. He also is appreciative of the chance to travel to conferences.

Anna spoke on "Statistics- where has it taken me?". Anna also had a flair for maths at an early age and described how several maths competitions spurred her on in her mathematics studies. In the end she was not sure what she would study at university but enjoyed mathematics and economics and so enrolled in a BSc, eventually doing honours in statistics, whereupon she embarked on a path to the ABS for 2 years and eventually landed a job at DAA in Perth where she is now a Senior Consultant Statistician. She described some of the broad variety of work she is involved with and finally pointed out the opportunities she has had to travel.

Chris began by describing his circuitous path to statistics, having done study in psychology, theatre arts, media, and then mathematics and statistics, the latter for which he showed a flair. On graduating with Honours in Statistics he also took up a consulting job with DAA where he was principally involved with consultant work with Western Power. Eventually he severed his ties with DAA and began to work with Western Power, the branch for which he worked then evolved into Synergy. He described his role as "forecasting, forecasting and forecasting" but also made reference to the need to be able to communicate to superiors. In his job he makes extensive use of books and the internet for learning and again emphasized the delivery of the results is often more important than the results themselves.

Vaike titled her talk "Statistics in medical research". Starting with her high school mathematics and how she dutifully threw all her notes in the bin on completion she ventured into university studying a variety of subjects including psychology, human biology and anatomy, mathematics and statistics and chemistry, and then on to microbiology and physiology (but hated the lab work!). Having changed institutions she was reborn and was advised to do biomedical science and mathematics and statistics. In 2003 she completed her biomedical science degree and after a 2003 ANU Summer Scholarship embarked on medically related statistics. Doing honours at TICHR and Murdoch University on looking at significant predictors for asthma, hay fever and eczema led her to employment at TICHR in 2006. But she says working 9-5 is over rated and spilled the beans that she was enrolling in a PhD with the School of Population Health in collaboration with TICHR

The speakers along with the president formed a panel to answer questions from teachers and members. Questions included what did the speakers value most from their teachers and was there a teacher who greatly influenced them? There was particular interest in the cadetships offered by the ABS and starting salaries for mathematics and statistics graduates.

The president of the mathematics teachers association of Western Australia wrote that it was a terrific experience and is seeking further presentations at the Secondary Convention by these "wunderkinds".

Brenton Clarke

SOUTH AUSTRALIA

Career Opportunities in Statistics

The August meeting of the SA branch was a special event targeted at Young Statisticians and organised by the Young Statisticians representatives for SA. Five experienced Statisticians were invited to speak about their experiences working as a Statistician. In particular, they were asked to talk about what it was like when they started their career and what advice they have to give to people looking to start a career in Statistics. The speakers were Sandra Pattison (Acting General Manager, NCVER), Gary Glonek (Head of Statistics, Discipline of Statistics, Adelaide University), Mary Barnes (Statistician, Statistical Bioinformatics and Agribusiness team, CSIRO), Andreas Kiermeier (Senior Statistician, SARDI) and Amy Salter (Senior Lecturer and Deputy Director of DMAC, Discipline of Public Health, Adelaide University). A number of key themes were discussed by the speakers.

The decision to study Statistics: None of the speakers went to university to study Statistics or with the intention of becoming a statistician. Mary originally received a scholarship to study Metallurgy at the University of NSW but then studied Statistics to help her in her work with the Lysaghts Port Kembla (now BHP) Project Group. Andreas was not pleased when he was told that he had to study Statistics as part of his degree but went on to enjoy it and pursue a career in this area. Amy didn't know what Statistics was when someone suggested she take a course in it to help with her studies in Psychology. Gary loved Pure Mathematics but felt that there were better employment opportunities in Statistics. He is still able to use his mathematical skills to solve statistical problems and has come to enjoy working with data.

Starting out as a Statistician: Sandra reassured statistics students by telling them that she wasn't sure what she was doing when she first started working as a statistician and that it took her 6 months to feel confident in her role. Gary admitted that it took him years, rather than months, to feel confident in what he was doing.

Work-life balance: Both Amy and Andreas commented on the difficulties they had faced in finding a balance between work and life at times during their career. For Amy, this time was early in her career while trying to establish herself as a Lecturer and Researcher. For Andreas, the difficulty arose while trying to finish his PhD and work at the same time. However, the sacrifices they made at these times have contributed to their successful careers. Mary has enjoyed flexible work arrangements, choosing to work 4 days per week which allows her to spend more time with her children.

Advice for young Statisticians: Sandra mentioned that there are currently two graduate positions available at NCVER for people with qualifications in Economics, Mathematics or Statistics. She pointed out that only two of the six selection criteria relate to skills and knowledge in statistical analysis, while the other criteria relate to things like communication, time management and report writing skills. She said that teamwork is very important at NCVER and that they are looking for evidence that prospective employees have worked as part of a team, rather than having been in charge of one. Amy suggested that people interested in becoming an Academic should consider doing a Post Doc after completing their PhD to increase their list of publications. Andreas also commented on the importance of publications, pointing out that at times during his career, he was often acknowledged in papers for statistical work but was not included as an author. This situation has changed in his current position and he now appears as an author on many publications. Mary directed students to a number of useful websites, including available positions at CSIRO. Both Gary and Andreas encouraged students to learn as much as they can while they are at university because some people find it difficult to learn outside of this structured environment. Gary also pointed out that it is important to continue learning throughout your career, as Statistics is a changing field.

The talk attracted a fantastic turnout of around 50 people which exceeded expectation. Approximately half were undergraduate Statistics students, while the remainder were postgraduate Statistics students, early career Statisticians and

members of the Society. For many people attending the talk, this was their first time at a Statistical Society meeting and many students expressed interest in finding out about future events for Young Statisticians. After the talk, people were invited to stay for pizza and had the opportunity to talk to the speakers and gain advice specific to their circumstances.

Lisa Yelland

NEW SOUTH WALES

As promised in the previous newsletter, the latter part of 2006 saw a flurry of activity from the NSW Branch.

The AusCan Scholar, Dr Mu Zhu, kicked off his trip around Australia talking to the NSW Branch. October saw another busy month. The monthly meeting was moved from the usual Tuesday or Wednesday to a Thursday to coincide with my visiting the University of New England to judge the NSW Schools Statistics Poster Competition. This competition was conducted in conjunction with the University of Southern Queensland National Schools Statistics Poster Competition 2006 and the Australian Bureau of Statistics Census at Schools. It was a pleasure for me, wearing my President's hat to act as a judge. While the organisers were not swamped with posters in this, the first year in NSW there was a unanimous decision as to the 2006 winner and extreme optimism that the competition will increase momentum in 2007.

With my visit to UNE it was decided to hold the October monthly meeting via video conference. There were two speakers. The first, Greg Falzon, a PhD candidate from UNE spoke on his research into cancer diagnosis using extra-cellular matrix proteins. Greg's PhD is jointly with physics and statistics which allows him to undertake the experiments required for assessing the structural change in collagen samples and then build the statistical models to generate the diagnosis. I think we all need to watch this space for this young man – he appears to be well on the way to changing the way in which breast cancer is diagnosed! Greg's talk was followed by Matt Wand, Head of the School of Mathematics and Statistics at UNSW. Matt talked about the feature significance of multivariate densities and

introduced SiZer type technology to help us in assessing the statistical significance of such features. Matt's aim, given this was the first time the Branch had met via video conference and that he was speaking second was to have some exciting dynamic graphics. It was unfortunate that although the intention was good the video conferencing equipment at UNSW did not transmit the image in real time to UNE – it came as snapshots so we didn't get to see how easy it was to identify modes and ridges in 3d. Apart from this hiccup, the evening was a success for those who attended either venue. In particular, for those at UNE they were excited at contributing to a Branch meeting. It is planned that in 2007 at least two meetings will be held via video conference with an invitation to any other sites in the state welcome to join.

The other event happening in October was the Challenges of Clinical Trials in Oncology Workshop. This event is described elsewhere in the newsletter.

The final event of the year is the Jim Douglas Post Graduate Awards Day followed by our annual dinner, being held on November 29 at the Macquarie Graduate School of Management.

Caro Badcock

QUEENSLAND

August Meeting

On 1st August Bruce Western spoke at the University of Queensland on 'Discrimination in Low-Wage Labor Markets: An Employment Audit for New York City'

This paper which reported on joint work with Devah Pager and Bart Bonikowski, reported on a field experiment designed to measure racial discrimination in employment in New York City. Typically, discrimination is studied with regression methods in which wage differences between black and white workers are estimated, adjusting for the effects of covariates. In the current study, teams of matched testers were sent to apply for jobs and observe the response of employers. Because testers are matched by design, estimates of discrimination are likely to be less biased than with regression analysis. Results indicate a strong preference among New York

employers for white and Latino workers over blacks. Assigning white testers a resume with evidence of a criminal record eliminates their advantage among employers.

Bruce Western is professor of sociology at Princeton University. He has research interests in the fields of labor market stratification, political sociology, and statistical methods. His research in statistics has examined the application of Bayesian methods to problems in comparative sociology and stratification research.

September Meeting

At the 12th September meeting Don Stevens from Oregon State University presented a talk entitled 'Statistics and the Art of Non-representation'

The Clean Water Act has been in place in the US since the early 1970's. One of the requirements of the CWA is that States provide Congress with a biennial report on the status of all surface waters. The most recent report, some 35 years after the CWA was enacted, contains a disclaimer "This report does not describe the health of all waters of the United States because states have not yet achieved comprehensive assessment". This is a distressing state of affairs, particularly since the scientific and statistical methodology to achieve comprehensive assessment has been available for many years.

He examined some of the reasons that States have been slow to adopt statistical sampling methodology for assessment of surface water condition. Some of the reasons are economic, some are lack of understanding, and some he stated are rooted in the psychology of human cognition: the human species is very poor at integrating data with prior conceptions. He discussed some of the characteristics of human cognition that have been identified, explored their implications in environmental monitoring, and commented on their significance to practicing statisticians in other application fields.

Don Stevens is currently Senior Research Professor and Director of The Program on Design and Models for Aquatic Resource Surveys (DAMARS) at Oregon State University, Corvallis, Oregon, USA. DAMARS is funded

by the US Environmental Protection Agency (USEPA) to develop survey design and analysis methodology for assessing the condition of aquatic resources, including lakes, rivers, streams, estuaries, wetlands, and the associated biotic communities. Current areas of DAMARS research include graphical and Bayesian belief network models of multi-scale relationships in ecological studies, hierarchical Bayes models for spatially-explicit prediction of Coho salmon abundance, spatial covariance models to impute missing survey data, spatially balanced probability sampling, use of ancillary data in spatially-balanced sampling design and analysis, and the relationship between spatial sampling designs optimized according to model-based criteria or design-based criteria. He is also a consultant on monitoring design issues for the National Parks Service's Great Lakes Monitoring Network, the San Francisco Estuary Regional Monitoring Program, the Warm Springs Indian tribe, and the Wild Salmon Center.



Don Stevens Director of The Program on Design and Models for Aquatic Resource Surveys (DAMARS) at Oregon State University at the September dinner.

His previous positions include Senior Research Scientist, Battelle Pacific Northwest Laboratories; Associate Professor and Area Coordinator for Mathematics and Computer Science, Eastern Oregon State University, and General Supervisor and Principal Environmental Statistician for Dynamac Corporation, an on-site contractor at the USEPA Laboratory in Corvallis. In these roles, he has worked on projects on nuclear reactor safety and health effects

of low-level radiation, and managed projects on spatial sampling, development of indicators of forest health, ecoregion development, aquatic monitoring, and development of condition indicators for lakes and streams.

October Meeting

At the 3rd October meeting held at Queensland University of Technology Professor Mu Zhu, Department of Statistics and Actuarial Science University of Waterloo, Canada gave a talk on 'LAGO: Efficient RBFnets for Rare Target Detection'.

He discussed a general class of statistical problems where the underlying objective is to detect items belonging to a rare class from a very large database. He introduced an efficient computational algorithm called LAGO. In theory, he showed that LAGO can be justified as an adaptive-bandwidth kernel density estimate of the rare class density that is then adjusted locally by a factor which approximates the background class density to the first order. He also argued that LAGO is a highly efficient way to construct a radial basis function network (RBFnet) for the rare target detection problem.

Professor Zhu's current research interests include rare target detection, data mining, multivariate analysis, pattern recognition (classification and clustering), dimension reduction and variable selection.

November Meeting held on 31st October

Christine Hackett, Senior Statistician, BioSS, Dundee, Scotland spoke on "Linkage analysis in a mixed population of blackcurrant".

Christine studied mathematics at Churchill College, Cambridge and then took the diploma in mathematical statistics there before moving to Bangor (North Wales) to do a PhD modelling plankton distribution. She has worked as a statistical researcher and consultant for BioSS since 1988, based at the Scottish Crop Research Institute in Dundee. Her main research interest has been in statistical methods for linkage analysis and QTL mapping in plant species. Work includes inbreeding species such as barley, outbreeding species (such as raspberry, blackcurrant and diploid

potato) and autotetraploid species, such as potato.

The estimation of a linkage map of molecular markers is a prerequisite of studies to locate genes affecting important quantitative traits. The estimation is straightforward if markers can be scored on a population derived from a cross between two inbred parents, but this is not possible in many species, especially bushy or tree species. The talk focused on the analysis of a mapping population in one such species, blackcurrant, and used some exploratory statistics and simple genetic models to uncover some interesting features of the population.

Miranda Mortlock

VICTORIA

Nonparametric methods in ecological research

The speaker at the April meeting of the Victorian Branch was Professor Richard Huggins from the Department of Mathematics and Statistics, University of Melbourne. The meeting was held in the AMSI (Australian Mathematical Sciences Institute) seminar room in Carlton, as part of the Branch's new policy of rotating meetings between Melbourne's major locations. Richard used three interesting data sets to describe the use of nonparametric methods in ecology.



Richard Huggins
Photo: Brian Phillips

Using data collected on mountain pygmy possums during a mark-recapture experiment, a parametric model was used to estimate the population size and the effect of the animal's size on

capture probability. This resulted in misspecification which was shown to have a serious effect on estimators of the population size even though the average probability of being observed at least once is quite high. Using nonparametric models the estimated capture probabilities and the probabilities of being observed could be explained.

In a second example the speaker discussed data relating to the capture of the bird species, *Prinia flaviventris* (yellow-bellied prinia) at the Mai Po Nature Reserve in Hong Kong. A number of different models were discussed that tried to describe the relationship between the wing length of the captured birds and their capture probabilities. When fitting parametric models to the data, a number of problems were encountered such as capture probabilities that were too small in the left tail of the distribution, capture probabilities that decrease too rapidly as wing length increases and the population size being overestimated or underestimated. Nonparametric models provided some improvement.

A third example relating to the monthly numbers of suicides in Hong Kong from 1981 to 2002 was examined to relate the suicide rate to the unemployment rate and the divorce rate. The summary of these models was that Hong Kong's social structure is changing away from the traditional Chinese family structure.

The speaker left us with a number of points to think about when modelling data.

- Nonparametric methods have a long history in regression modelling.
- Semiparametric models are well known in regression and generalized linear models. There are important applications in environmental modelling.
- You need to uncover unknown structure.
- We don't need to parametrically model background effects when using nonparametric models.

Debra Partington

Using statistics to help map genes in mice

The May meeting of the Victorian Statistical Society was held at the Caulfield campus of Monash University. The speaker was Dr Melanie Bahlo from

the Bioinformatics Division at the Walter and Eliza Hall Institute of Medical Research.

Melanie graduated from Monash University with a PhD in population genetics in 1989. This was followed by a two-year postdoctoral stint at the same institution working on migration models with her PhD supervisor, Professor Bob Griffiths. She then moved to the Hall Institute to work with Professor Terry Speed in statistical genetics. She now uses statistical methods to analyse DNA data from both humans and mice in an effort to identify novel genetic variants. Her special interests include the localisation of human genes causing diseases such as epilepsy, deafness and muscular neuropathies and multiple sclerosis, and the analysis of data from ENU (N-ethyl-N-nitrosourea, a powerful mutagen) experiments in mice. The latter research was the topic of her seminar.



Melanie Bablo
Photo: Brian Phillips

Much of the human genome remains a mystery. The function of many of the genes that were identified when the human genome was sequenced remains unknown. Inbred laboratory animals such as the zebrafish, mouse, fly or rat are very useful for the identification of genes influencing traits of interest, such as deafness and blood disorders, because they have reduced genetic background variation.

The talk focussed on the statistical methods used for the localization of induced mutations in laboratory mice. Methods such as genetic mapping with hidden Markov models, the Expectation-Maximisation (EM) algorithm and

graphical methods were discussed in the context of data arising from such mutants. Three examples of mouse mutants were presented, each with its own set of analysis challenges. Two mutants affected haematological traits such as platelet distribution whilst the third example was a novel mouse deafness mutant. Statistical analysis has helped both with the localisation of the mutant gene and the interpretation of the biological effects of the mutant.

The meeting closed with dinner at a nearby Malaysian restaurant.

John Tukey's one degree of freedom for non-additivity

The speaker at the August meeting of the Victorian Branch was Professor Stephan Morgenthaler from the École Polytechnique Fédérale de Lausanne. At the time he was visiting the Department of Mathematics and Statistics at the University of Melbourne while he was on sabbatical leave. The meeting was held in the AMSI (Australian Mathematical Sciences Institute) seminar room in Carlton.



Professor Stephan Morgenthaler
Photo: Brian Phillips

In 1949 John Tukey published, in the journal *Biometrics*, a now-famous paper entitled *One degree of freedom for non-additivity*. This is sometimes referred to by its acronym: ODOFFNA. The paper outlines a method of extracting an interaction term from the residuals of an additive fit to a data table. This simple method has proven to be highly effective in many applications.

In the abstract of his talk, Professor Morgenthaler provided the following background to his presentation:

Being a PhD student of John's, I was aware of his strong interest in the analysis of two-way tables and of his habit of revisiting topics he had worked on previously. But I was still a bit surprised when in preparation of a sabbatical spent with John Tukey at Princeton University in 1994, he proposed that we collaborate on ODOFFNA and generalizations of it.

The talk consisted of a brief outline of their joint work. The speaker began by explaining the ODOFFNA model, and neatly linking it to finding a power transformation for additivity in a two-way table. He described the *two-way plot*, Tukey's elegant graphical representation of the ODOFFNA model. The speaker then focussed on a natural generalisation, a type of 'rows regression' model in which each row of data is (apart from residual errors) its own linear transformation of a latent column effect. He outlined some of this model's properties, both good and bad. Finally, the speaker presented us with a suite of possible further generalisations of increasing complexity.

Professor Morgenthaler worked hard to convince the audience of the efficacy of the ODOFFNA model and its generalisations, by applying them to several real data sets in which the inclusion of interactive terms improved the fit enormously. However, the speaker undermined his argument somewhat when he confessed that a 'microarray data set' was simulated random noise. He was gently poking fun at bioinformaticians who find apparent structure in patient by gene data matrices. Such structure is sometimes spurious, but it is also often validated in independent experiments. So, in making this criticism, was the speaker allowing himself a degree of freedom too many?

Geoff Laslett

Building policy models for the Amazon rain forest

The 2003 Nobel Laureate in Economics, Professor Sir Clive Granger, was the special invited speaker at the meeting held on September 12 at Monash University's Caulfield Campus. This event was jointly organized by the Department of Econometrics and Business Statistics at Monash University and the Victorian Branch of the Statistical Society of

Australia. The presentation was attended by an enthusiastic audience of nearly a hundred people.

The topic of the presentation was building policy models for the Amazon rain forest. Professor Granger first noted that the Amazon rain forest is the largest in the world and is of considerable importance to global warming issues and of economic importance to Brazil; however, it is being deforested at a rapid rate. Direct causes of deforestation are logging and illegal settlers and farmers.

The amount of money involved in deforestation is quite large indeed. According to *New York Times* (October 16, 2005), the value of timber exports from Brazil is approximately \$1 billion per year. Thus, dealing with deforestation is not an easy task. Nearly 40% of wood cut in the Amazon is shipped overseas; the figure was 14% in 1999. Brazil's main markets are: Europe (40%), USA (33%),

and China (14%). Although the Brazilian government requires permits for cutting down trees, more than half of the timber exports are illegal.

Professor Granger discussed the sheer loss resulting from deforestation. Based on past data, Professor Granger and co-authors have estimated that more than 50% of the newly-cleared land in the Amazon forest becomes fallow within 5 years, a huge waste of the Amazon forest.

Professor Granger also discussed the relationship between deforestation and settlers. Part of the reason for the increase in settlers appears to be increased access to roads. In the Brazilian Amazon, nearly 75% of the deforestation has occurred with 50 km of paved roads. He pointed out that Alexander Pfaff and co-authors observed a direct relationship between new roads and increased deforestation (see <http://www.columbia.edu/~ap196/>).

Professor Granger also discussed how to build an econometric model linking important variables measuring the forest with socio-economic, physical, and policy variables using a panel data set of mixed quality. The problem of how to effectively introduce policy variables was given particular consideration. Results from an initial study were presented, but he emphasized that recent considerations suggest that a different model is required.



Professor Sir Clive Granger
Nobel Laureate

Professor Granger's presentation was well received by the audience and they also appreciated the fact that a person of his calibre has added his support to this important issue.

The Amazon study discussed in this presentation has been published. The reference is:

Lykke Anderson, Clive W. J. Granger, Eustáquio Reis, Diana Weinhold and Sven Wunder (2002). *The dynamics of deforestation and economic growth in the Brazilian Amazon*. Cambridge University Press: Cambridge.

Mervyn Silvapulle

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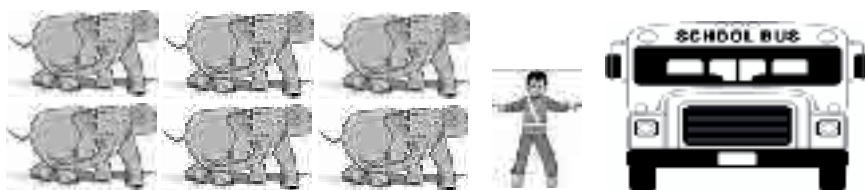
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