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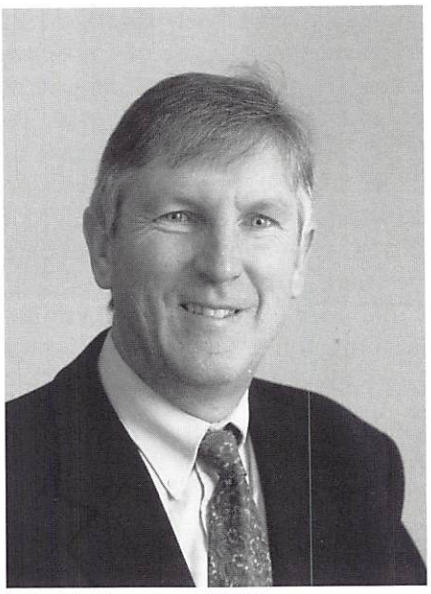
2001 Foreman Lecture – The Australian Population Census

The 2001 Foreman Lecture was presented by Mr Dennis Trewin, the Australian Statistician. Dennis paid tribute to Ken Foreman by remembering him as a great leader/coach and a person that used to spend a large amount of time mentoring young graduates. He pointed out that Ken Foreman was the first mathematical statistician at the Australian Bureau of Statistics. Ken introduced sample surveys, statistical quality control and seasonal adjustment among other things to the ABS.

Then Dennis guided us in a journey through time on the Australian census history. It all started in 1788 with musters at specified locations. The first census as we know it was in 1828 in New South Wales and since then until 1886 the colonies conducted their own censuses. In 1908 there was an agreement between the colonies to conduct a uniform Australian census, but differences in interpretation of definitions and presentation of results between the states and no coordinated authority to produce Australian results resulted in difficulties comparing across states. The first Australian census was in 1911 and it was supposed to be run every ten years, but in 1931 it was deferred to 1933 because of the depression and in 1941 it was



cancelled because of war. Since 1961 it has been run every five years and in 1977 this was mandated by law for electoral purposes. The next Australian population census will be held this year on 7 August.

Dennis showed us how the media for the census evolved through time going from paper publications in 1911 to Internet based community profiles in 2001. He also pointed out that the Australian population census, with 32,000 field staff, is one of the biggest operations in Australia. He mentioned some of the statistical techniques used in the population census like pilot testing, experimental design, and sample surveys among others and he showed why the census is a source of innovation.

The discussants for this lecture were Dr Ron Sandland from CSIRO and Dr Roger Jones from the Australian National University. Ron made further remarks about the census and an additional tribute to Ken Foreman. Roger talked about the census and the indigenous population. He pointed out that there were good innovations in the latest censuses but it is necessary to further improve the census in relation to the indigenous population.

Veronica Rodriguez

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Central Council

SSAI Central Council met on 5 July at the School of Business and Information, ANU. It was a busy day, given that the General Meetings of the SSAI and of ASPAI were then followed by their Annual General Meetings. A brief summary of those meetings follows.

In 2000 the Society had 703 ordinary members, 23 Honorary Life Members and 85 student / retired members making a total of 811. This number represents a further decline in membership over previous years. This trend has already resulted in much debate within Central Council regarding possible causes and what Council, together with the Branches, can do to stop this trend. A number of strategies have been discussed at other meetings, so at this meeting Council discussed a range of benefits that it hopes will be available to all members later in 2001. These benefits would be additional to the current list of benefits available to members (Journal, Newletter, reduced conference fees, professional accreditation, *etc.*).

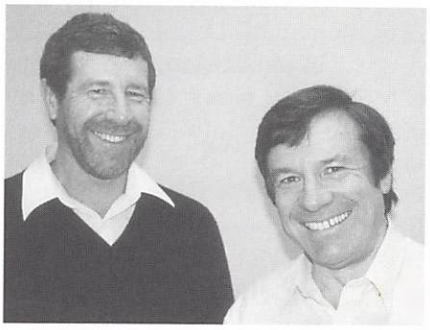
As of July 1, Chris Lloyd took over as the Managing Editor and co-Theory & Methods Editor of the *Australian and New Zealand Journal of Statistics*, the other Editor and Book Review Editor being Rob Hyndman. The SSAI takes this opportunity to express its gratitude to Simon Sheather and Murray Jorgensen for the time and energy they have devoted to the journal. Further, the Society wishes to thank retiring *Newsletter* editors Eden Brinkley, Bob Forrester and Doug Shaw, for their efforts in producing the *Newsletter*. Eden will remain in a transitional role for the time being.

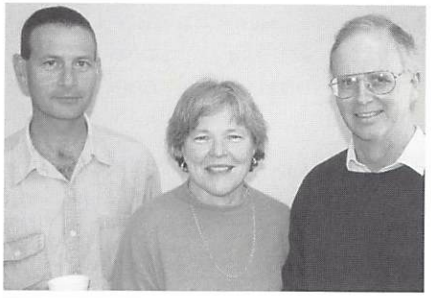
The accreditation process is now firmly established thanks to the tireless efforts of the Accreditation Committee and the society's Administrative Officer Mrs Lesley Sieper. Those members granted AStat or GStat status are listed from time to time in the *Newsletter*.

The SSAI web site continues to be upgraded and is now being visited by thousands of people many of whom are from the USA.

Reports were presented on progress with the next Australian Statistical Conference (July 2002 in Canberra) and the following one (July 2004 in Melbourne). The Society has also been invited to participate in some form when the International Statistical Institute holds a Session in Sydney in April 2005.

Finally the Council warmly thanks two people for their exceptional contributions to the SSAI: Eden Brinkley, who is stepping down after six years as Treasurer, and Ian James, who retired as President but continues as Web-master.





Top: Ian James hands the reigns to the incoming president Nick Fisher. Middle: Gary Glonek, Lesley Sieper and Tony Swain enjoying a coffee break during the Central Council Meeting. Bottom: Ken Brewer, Peter Hall and John Maindonald at the AGM.

Obituary – Richard Tweedie

It was with great sadness that we heard of Richard Tweedie's death on 7 June 2001 in Minneapolis at age 53. Richard had a heart attack whilst playing badminton.

Richard Lewis Tweedie was born in Leeton, Western New South Wales on 22 August 1947. He spent his childhood there and after matriculating from Leeton he went to the Australian National University graduating with a Masters Degree in Statistics in 1969. He was then awarded a scholarship by ANU which he used to complete a PhD at Cambridge on the topic of Markov Chains. He was awarded a Doctor of Science at the Australian National University in 1986 as a consequence of his considerable research achievements. There cannot be too many better qualified statisticians in Australia!

Richard's work career was equally impressive. It was also extremely varied, indicating his flexibility. After returning from Cambridge he spent two years as a Postdoctoral Fellow in the Institute of Advanced Studies at the Australian National University. In 1974, he was then lured to the revitalised CSIRO Division of Mathematics and Statistics under the leadership of Joe Gani. In 1978 he spent a year at the University of Western Australia before returning to Melbourne to head the Victorian Branch of the CSIRO Division.

Richard's next career move was in 1981 to head the fledgling Sydney based SIROMATH Pty Ltd, a company set up to carry out research and consulting for business and industry. SIROMATH grew rapidly and established branches in Melbourne, Darwin and Perth. He stayed there until 1987 before moving to the Gold Coast before becoming Foundation Dean and Foundation Professor of Information Sciences at Bond University.

In 1991, Richard accepted an offer to move to the United States to become professor and later Chair of the Department of Statistics at Colorado State University. He joined the University of Minnesota in 1999 where he became Professor of Biostatistics, the position he held at the time of his death.

What an incredibly varied and interesting career! Two countries, six cities and seven institutions.

Richard's statistical interests also varied considerably. I will list those on his web site but this is only a sub set of his actual interests – stochastics processes, biostatistics, meta-analysis, operations research, computing and engineering models, applied statistics (particularly in epidemiology/biological modelling) and statistics and the law. He published over 120 scientific papers, and his widely acclaimed book "Markov Chains and Stochastic Stability", co-authored with Sean Meyn, received the 1994 Operations Research Society of America award for the best research publication in Applied Probability.

Richard played an important role in professional associations over a number of years, particularly the Statistical Society. He had an active committee role at the Branch level in four different Branches. He and I were founding Editors of the Statistical Society's Newsletters where I got to know Richard very well as we first explored the intricacies of computer based publishing to produce the Newsletter. Richard was elected President in 1985-86. His significant contribution to the Statistical Society was recognised by his election to Honorary Life Membership in 1998.

His professional contribution did not finish there. Despite his very busy work life, Richard always thought it important to contribute to his profession. He also served as Editor of two important journals: Annals of Applied Probability and Statistical Science. He was also elected as a Fellow of the Institute of Mathematical Statistics in 1989 and a Fellow of the American Statistical Association in 1997.

What sort of person was Richard? Before giving my own impressions. I would like to quote from some of the many tributes. His brother, Bruce Tweedie, refers to him "an as outstanding man and a brilliant and generous guide and mentor". His sister-in-law, Joanne Russell, refers to him "as a person of great intellect and energy" and "a man with a great sense of humour and quick wit". His daughter, Marianne, also refers to his great sense of humour - "He never showed emotions well, but he showed his love through making people laugh". His long time friend and professional colleague, William Dunsmuir, referred to him as an "outstanding collaborator" and "a brilliant consultant and communicator with a knack of explaining complicated statistical ideas to practical people". He also referred to his passion for his profession.

These tributes are very consistent with my own memories. I remember Richard's quiet but very sharp sense of humour. I remember his incredible patience, particularly in those early days of the Newsletter. (Our experiments with computer based publishing often resulted in the loss of hours of work. It could have also had something to do with the late hours we spent at Yarralumla trying to meet our deadlines.) I also remember his modesty. His intelligence was obvious but he never flaunted it. He had a close friendship with my son during those times; finding a soulmate, albeit considerably younger, who actually enjoyed solving mathematical problems. I also remember his cheerful disposition - he always greeted you with a smile and a friendly greeting. Finally, I remember his great courage. He suffered a very serious heart attack in his 30s whilst travelling in the US on business. This would have slowed most people down but not Richard. He continued his incredibly high workload, travelling the world to support his work and continuing his love for badminton. I feel privileged to have known Richard.

Richard leaves his long time friend and wife of 30 years, Catherine, and his daughter Marianne. They can feel justifiably proud of Richard. He certainly left the world a better place, particularly the statistical world.

Dennis Trewin

John Pollard Awarded Prestigious Silver Medal

John Pollard, Professor of Actuarial Studies at Macquarie University, has been awarded the Silver Medal by the Institute of Actuaries of Australia (IAAust). This award recognises a long record of outstanding actuarial work in the service of the profession, business, government and community, which has brought credit to the profession. The Silver Medal has only twice previously been awarded.

"There's no more deserving Australian actuary than John Pollard" said Tony Coleman, President of the IAAust, when presenting the award at the IAAust's recent biennial Convention at Sanctuary Cove on the Gold Coast. "The quality of John's academic and research papers, his leadership of the Macquarie University actuarial department and contribution to actuarial education nationally and internationally, make his contribution truly outstanding" Coleman said. Congratulations John!

Western Australia Branch

We are saddened to report the recent death of our colleague Dr A. (Tony) Grassia.

Tony died peacefully on the evening of 21 May. He was buried on 30 May following a mass in St Cecillia's Church, Floreat.

Tony had been a long-standing member of the Society and one of our most colourful characters. Since he arrived in Perth in 1976, he had been a very active member, attending most of the monthly meetings and for many years also the dinners afterwards. He always displayed an infectious enthusiasm for life and the people around him at these gatherings.

A fuller obituary is being prepared for publication in a later Newsletter.

Robin Milne

Branch Reports

NEW SOUTH WALES

Statistical Squirrel's

Not so-Western Western Theme

My dear readers. My long-suffering companions. My friends. I find that I must apologise greatly for any confusion you may have experienced whilst reading my last contribution. In their infinite wisdom the editors saw fit to censor some of my previous work. But that is of little import. What stands before us is a glorious future, bright, shiny and pretentious. Let us not look back, but forward, to better days and better ways.

A life of crime can flow from high times

It sounds like *Reefer Madness* all over again: one toke on that joint and you'll be off nicking your neighbour's car – or maybe even murdering them.

Federal government figures made public this month [June] indicate that every second person arrested in Australia could be under the influence of cannabis. The figures from the Australian Institute of Criminology are the result of a comprehensive program launched in January 1999 of testing prisoners arrested at police stations in East Perth, Sydney's Bankstown and Parramatta, and Queensland's Southport.

So wrote Helen Bain in The Australian on June 14. But you didn't need to read this in The Australian, all you needed to do was come to the NSW branch April meeting to hear Dr Toni Makkai speak on Crime and Justice Statistics for Policy Purposes and you would have heard most of it already (weren't we lucky?).

Dr Makkai, Deputy Director of Research and Head of the Illicit Drugs Monitoring Program at the Australian Institute of Criminology (AIC), made a trip only just shorter than her title to get to the April meeting. Coming from Canberra to Campbelltown via Sydney Airport, Toni addressed a huge crowd made up of many long lost colleagues from Wollongong.

Toni began her talk by outlining the role and purpose of the AIC. Based in Canberra, the AIC is a Commonwealth Statutory Authority funded by Federal money. To snarls from the academics in the audience, Toni said that Amanda Vanstone had been a good minister for the Institute as she knew how to get money out of the PM. The core activities of the Institute are covered by their Act, and they perform

policy relevant research and publish information in an accessible form ("Trends and Issues", 6 pages long so that the politicians can read it on the flight between Sydney and Canberra). Toni stressed the fact the Institute was not a statistical collection agency.

After outlining some current research areas, Toni discussed a current policy question. Namely, how much crime is directly attributable to illicit drugs? The magic, oft-quoted figure is 80%. The real question is can the criminal justice statistics back this figure up.

The data sources used to answer this question have many issues affecting them. Administrative data, collected by the courts, prisons and the police must be collated from the different jurisdictions. There is no national database recording offenders or arrests. Survey data does not cover victimless (property) crime and prison data records only the most serious offence. Additionally, variation in legislation and sentencing between the States can lead to different data being collected. To top it all off, the administrative data is collected to monitor performance rather than for research.

To overcome these issues the Drug Use Monitoring in Australia (DUMA) pilot project was established. This study monitors drug use amongst police detainees at the four police stations/watchhouses/lockups as described earlier. In the study, persons who have been detained by the police are asked some questions and asked to submit a urine sample. Astonishingly, the response rate is as high as 80%.

Toni discussed several issues regarding the establishment of the project and lamented the fact that the subjects were not drawn from a random sample of police stations (the police commissioners in each of these jurisdictions had volunteered to run the survey). The focus of the survey was on opiate use in adult males arrested for any offence, looking for the percent that tested positive. Unfortunately the urine tests do not tell the whole story. Nor do they answer the question of how much crime is attributable to the drug use. The question of using a control group had been raised whilst establishing the project. The solution to this was to perform tests in shopping centres!

The talk ended with a discussion of other issues for consideration. Whilst DUMA had provided an association between drug use and crime, causality could not be assessed. Furthermore, the difference between offences and offenders needed to be considered. A lively methodological debate followed, after which dinner was enjoyed prior to the rather long drive home from Campbelltown.

O Squirrel Where Art Thou?

(with thanks to the Soggy Bottomed Boys and the Coen Brothers, to the tune of 'I Am A Man of Constant Sorrow')

I am a squirrel of instant sorrow
Got no work to fill my days
I bid farewell to [unnamed comp'ny]
The place where I last earned a wage
(The place where he last earned a wage)

For six long years I had been working
No leisure here on earth I'd found
For in this world I'm bound toil
I have no job to go to now
(He has no job to go to now)

It's fare-thee-well my old employer
I never expect to see you again
For I'm goin' to ride this western railroad
I'll sing my blues upon this train
(He'll sing his blues upon this train)

You will not see me in sunny Sydney
For many weeks I'll be away
And you may learn to miss the squirrel
While I am weepin' in WA
(While he is weepin' in WA)

Maybe you will think I'm just a stranger
My face you ne'er will see no more
But there is promise that is given
I'll meet you on Hell's Stygian shores
(He'll meet you on Hell's Stygian shores)

Bayesian Modelling via Mixtures

So there you have it. A sudden, shock departure from my previous place of employment saw me spend a goodly amount of time in May in the land of my birth. Thus I was unable to attend Kerrie Mengersen's fine talk on Bayesian Modelling via Mixtures and I am unable to tell you anything about it. I pray that you will forgive me.

Random Spatial Tessellations and their Applications

Ahhhhhhh! If there's anything in this world that this squirrel loves, it's tessellations. A picture of well formed closed, convex cells of finite area always leaves this little furry one's heart racing. The sheer beauty, the unadulterated purity, the breathtaking spectularity are all too much for me. Fortunately Andrew Hayen, late of Sydney University, now at UNSW, covered much the same ground in his introduction as he did in his talk at the Postgraduate Awards Day last year. This allowed your fine, furry scribe time to regain his composure and concentrate on the talk.

Considering Poisson processes as a means of generating particle distributions, Andrew looked at a variety of methods of forming tessellations: Voronoi (the most important and intuitive), Delaunay triangulation (formed by joining the particles of a tessellation that share a Voronoi edge) and the Johnson-Mehl growth model (where particles are generated over time due to a stationary Poisson process and [non-convex] cells form around them). Now if you're the Benny Hill type (R.I.P. big fella), you might think the Johnson growth model quite amusing. But let me tell you, it was no laughing matter as tessellation after titillating tessellation marched across the screen. As luck would

have it, and before I scrambled away for a cold shower, Andrew moved on to some real life examples.

The first example Andrew gave of where tessellations become useful in the real world is in the telecommunications industry. Consideration: telecommunications stations around nations may be Voronoi tessellations if stations service the locations that are in proximation. Questions that can be addressed using this methodology are the number of stations required in an area and the intensity of subscriber density. The mobile phone network is a good example.

Andrew then moved onto the area of facial recognition, and the question of how recognition can occur despite "different" circumstances (apart from the fact that mine is cute and furry). It has been postulated that if faces are represented as a unique point in multidimensional space, then the Voronoi cell associated with this point is stored in a person's "memory" and the cell represents the tolerance to different circumstances. Hence faces that are caricatured are still easily recognisable. Distinctive faces have few neighbours whilst common faces have lots of neighbours. Andrew made the point that the point representing the point that is the face moves within the Voronoi cell, but as long as the point representing the point does not stray into another cell, you will be yourself (if you get the point, which I don't, but all you have to remember is that my face is cute and furry).

Additional examples were given, regarding patterns of service areas of bus companies in the UK and the rediscovery (several times) of Voronoi polygons in ecology. Andrew ended the talk with a discussion on point pattern analysis and its use in crime distribution, an example of some research that drew unreasonable conclusions and that our esteemed speaker judged, quite rightly, as dodgy.

The evening concluded with a fine meal at an establishment genteel, a culinary extravaganza for those with guts of steel (i.e. we pigged out at an all you can eat).

The Lonely Planet

Coming at the end of an extraordinary three months, I feel that it is time to congratulate a fellow council member. Two of the last three council meetings were held at venues regarded as not-quite-the-norm – UWS in Campbelltown and UWS in Parramatta. Having also sent us trekking to the UWS campus at Penrith, Fred Osman (can you guess where he works?) has opened the society up to new and exciting places to visit and never want to return to. And so Fred, I have composed a verse to celebrate your bravery and vision. I hope you like it.

Different vistas, different skies
We'll see the world through different eyes
A plan exciting, bold and new
(We must admit it's cheaper too)
Move the meetings from the city
And the venues that are quite not-so-good.

We'll travel far, we'll travel wide
To meetings o'er the countryside
Lead on Fred, we'll follow you
Though others they may cry boo-hoo
Let them hide and stay away
It is their loss, that's all I'll say.

For new horizons are quite fun
This Squirrel loves them, ev'ry one
For these meetings, at new places
Are no longer same old faces
We get to meet a whole new crowd
And of that, you should be proud.

Till next time…

Statistical Squirrel

VICTORIA

The Annual General Meeting of the Victorian Branch was held on the 27th of March. The chairing of this meeting was the last official duty of outgoing President Neville Bartlett, prior to the two-year term of new President Neil Diamond commencing. As immediate Past-President, Neville now holds the office of Vice-President. Other members of the 2001 council elected at the meeting are: Bruce Fraser (Secretary), Geoff Laslett, Kym Butler, John Taffe and Geoff Robinson.

The meeting approved minor changes to the Branch constitution. The amendments were proposed in order that the Branch may become Incorporated in Victoria. Incorporation will bring the Branch under the appropriate incorporation act in Victoria and provide members with greater legal protection and security than is currently the case. The amended constitution, and the AGM minutes, are available at the new website for the Branch: http://matilda.vu.edu.au/~ntd/statsvic/index.html. The website also contains details of upcoming meetings and talks, reviews of past talks, contact details for council members, and a membership application form.

Since the AGM, the council has been considering ways to increase the membership of the Branch, and in particular the student membership. Council is currently considering incentives for student members, and looking at options for subsidising student membership fees.

Monthly meetings are currently being held at the Hawthorn campus of Swinburne University, usually on the 4th Tuesday of each month, with wine and cheese at 5:45 followed by a talk at 6:15. Several interesting talks have been given at the monthly Branch meetings so far this year. Reviews of the talks for February to June follow, along with a review of the annual Belz lecture delivered in October 2000 by Dr. Geoff Laslett.

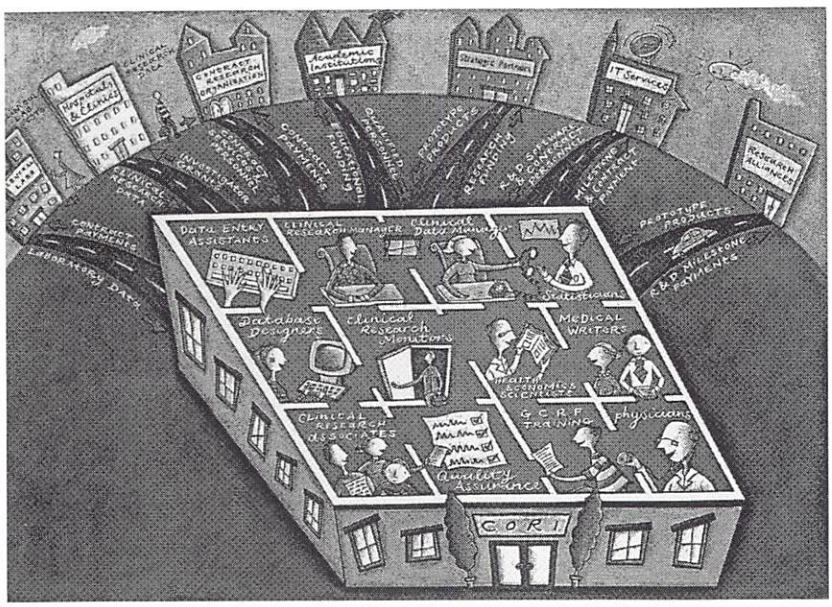
Lilly

Answers That Matter.

ELI LILLY AUSTRALIA CLINICAL OUTCOMES AND RESEARCH INSTITUTE

What is the Clinical Outcomes and Research Institute?

The Clinical Outcomes and Research Institute (CORI) is Eli Lilly's Regional Centre of Excellence for clinical research trial design, trial management, data management, data analysis and report writing for the Asia Pacific region.



The rooms within the centre (left) illustrate the key roles and functions of the Clinical Outcomes and Research Institute. The linkages with the laboratories, hospitals, contract research organisations, strategic research partners, research alliances and academia provide the essential network to fulfil the research goals of Eli Lilly's Clinical Outcomes and Research Institute.

Why Australia?

Eli Lilly has had a strong record of R&D investment in Australia over the past 10 years. Gaining entry into the Pharmaceutical Industry Investment Programme has increased Eli Lilly's commitment to Australian research to a target of $150 million over five years.

Why is the Clinical Outcomes and Research Institute good for Australia?

The establishment of the Clinical Outcomes and Research Institute increases the level and scope of research already carried out by Eli Lilly Australia. The Clinical Outcomes and Research Institute provides us with the impetus to develop strategic alliances with other Australian research institutions, to increase our involvement in preclinical and early stage research and development. It promotes Eli Lilly Australia as one of the Asia Pacific region's leaders in research and development and will help position Australia as a world leader in pharmaceutical research and development.

What is the research focus?

The centre is designed to help develop medicines for the treatment of cancers, cardiovascular diseases, endocrine diseases such as diabetes and osteoporosis, infectious diseases and neurological disorders such as depression and schizophrenia.

Lilly's commitment to statistics.

Eli Lilly's Clinical Outcomes and Research Institute is a strong supporter of the future of statistics in Australia demonstrated by our gold sponsorship of the SSAI Professional Accreditation Program and our input into the Biostatisics collaboration of Australian educational activities and workshops. The Clinical Outcomes and Research Institute currently employs statisticians with clinical trial design and analysis experience, and we expect further appointments will be required in the future to meet the growth demands.

Eli Lilly Australia Pty Limited ACN 000 233 992

The Jinmium Controversy

On Tuesday 31 October 2000, Geoff Laslett of CSIRO Mathematical and Information Sciences, delivered the Belz Lecture, in memory of Maurice Henry Belz (1897-1975), who headed the first autonomous department of statistics in Australia. Geoff has spent his career as a statistician in CSIRO, and mainly works on statistical problems in the Environmental and Earth Sciences. He was the president of the SSA Victoria Branch from 1997 to 1999, and is currently an associate editor of *Environmetrics* and the *Australian and New Zealand Journal of Statistics.*

In 1996 the Jinmium rock shelter in the Northern Territory hit world headlines. Three Australian researchers announced that humans had inhabited the site as long as 120,000 to 180,000 years ago. This claim directly challenged current scientific ideas about the origins and spread of modern man. According to the `Out of Africa' hypothesis, *homo sapiens* evolved in Southern Africa about 200,000 years ago, reached the Middle East about 100,000 years ago, and colonised Australia about 50,000 years ago. Jinmium is a tilted sandstone block featuring some distinctive engraved art, and the researchers' claim also implied that this was the oldest rock art in the world. The Lecture outlined the controversy, and the role of statistics in its resolution.

Dr Laslett first described the dating technique used at Jinmium. Every quartz grain possesses an internal clock or timer driven by natural ionising radiation. It is based on defects (trapping sites) in the crystal structure: the number of trapping sites occupied by electrons is a measure of the age of the crystal. The clock can be reset to zero by exposing the grain to sufficient heat or light, which causes the electrons to escape the traps and emit light. This enables the clock to be read in the laboratory: the grain is heated, and the amount of emitted light (the emission signal) is measured and converted into an age. For technical reasons, several thousand grains are usually dated together in practice. The Jinmium researchers dug a pit next to the wall of the shelter, and dated several samples from the pit faces. They argued that the clocks had been reset to zero by strong sunlight when the quartz grains were lying on the surface just prior to burial, so that the sample ages were burial times. A sample of grains immediately above a cluster of Aboriginal stone tools yielded an age of 116,000 years, and thus provided a minimum time for human occupation of the site.

These astonishing dates have provoked a flurry of further work at the site and a number of counter-claims. First, Bert Roberts of La Trobe University and Nigel Spooner of the Australian National University suggested, on scrutiny of an emission signal published by the Jinmium researchers, that the quartz grain clocks had not been reset to zero by sunlight. They decomposed the signal into components, and revised the burial age downwards by a factor of ten or more! Second, Michael Bird of the Australian National University carbon-dated charcoal grains in the deposit, and achieved ages of less than 10,000 years. Third, Bert Roberts read the quartz grain clocks by exposing the grains to light rather than heat, and achieved young ages for the site. Finally, Alan Watchman of James Cook University dated the rock art directly. He drilled out some grime that had accumulated in indentations in the artwork, and dated the carbon grains in it. His measurements ranged from 1500 to 11,000 years.

The accumulated new evidence suggests that the art and artefacts are young (probably less than 10,000 years old). However, the new dates were still not perfectly consistent. Bert Roberts realised that a satisfactory explanation of the dating problems at the site required more insight into the site's history, and that this could be provided by dating single grains separately. In principle this has always been possible, but Dr Roberts, in a world first, managed to overcome the considerable technical obstacles involved. Dr Laslett's role was to model the emission signals from single grains, to fit calibration curves and to estimate single grain ages and their standard errors correctly. It was discovered that the single grain ages in a sample varied enormously, from 1000 years to over 30,000 years in one case. Most grains, though, yielded ages of less than 10,000 years.

This study indicated that Jinmium is a complex site. Each quartz grain in a sample has its own history: some apparently old grains have probably been eroded off the face of the shelter and buried without sufficient exposure to sunlight to reset their clocks, and some apparently young grains have infiltrated into lower, older strata through burrowing animals, anthropogenic action and natural geomorphological processes. It is not valid to assign a single age to a sample in such a case. However, most grains are young, suggesting that humans have occupied Jinmium relatively recently, and the `Out of Africa' hypothesis is not invalidated. Despite the evidence, the original researchers have not publicly conceded.

Interestingly and coincidently, this geology and statistics related lecture was given in the Old Geology 1 Lecture Theatre at the University of Melbourne. Around 50 people attended the lecture, and enjoyed a pleasant Belz Dinner at the Union House afterward.

Dr. Jisheng Cui

The representation and analysis of geographical disease data

The February meeting was addressed by Dr. John Bithell of Oxford University. Dr. Bithell

presented an interesting talk on the methods used to study geographic patterns in the occurrence of specific diseases or health conditions, and the problems that face analysts working in this area.

Most of the interest is in relatively rare health conditions, which means that analysts have to contend with very small sample sizes of observed occurrences. Dr. Bithell used instances of childhood leukemia as an example throughout his talk. What is the best way to estimate a geographic risk function using small sample sizes? Dr. Bithell explained that kernel density estimation was often used. For example, if we have a sample of n observed occurrences of a health condition at coordinates (X_i, Y_i), then a geographic risk function can be estimated by:

$$\varphi(x,y) = 1/n \, \Sigma \, 1/h_i^2 \, k\{ [(x- X_i)^2 + (y- Y_i)^2] / h_i^2\},$$

where k is a distribution function, eg a 2-D normal distribution, and h_i is the "bandwidth". h_i is chosen to be larger in low density areas.

A relative risk function is then given by dividing the risk function by the population density function, $\pi(x,y)$.

3-D graphical methods can then be used to display the expected number of cases over an area, and smoothing used to reduce large peaks and troughs.

This method is relatively simple – it only takes into account the distance from observed cases, and not features of the terrain that may contribute to risk (eg power lines). However, given the small sample size constraint, this method may well give the best workable estimate of risk. Nonetheless, Dr. Bithell outlined more sophisticated modelling methods, such as Areal modelling, where log risk can be modelled as a linear function of explanatory variables, or through an "elevation of risk" method, where alternate distance measures are used (eg proximity to a point source, such as a power line). Hypothesis testing can then be used (with a null hypothesis of uniform risk) to test the suitability of various models.

Bruce Fraser

Statistical Moderation in the Victorian Certificate of Education

Following the Annual General Meeting of the Victorian Branch of the Statistical Society in March, Professor Tim Brown of the Department of Mathematics and Statistics of the University of Melbourne gave a very interesting talk entitled "Statistical Moderation in the Victorian Certificate of Education".

Tim's recent work in this area followed the review into the VCE carried out by the Victorian Government in 1997 and the subsequent changes to the VCE assessment by the Victorian Board of Studies. The key change was the replacement of Common Assessment Tasks (CATS) by coursework assessment. Since this school assessment counts for at least 50 per cent of the final assessment in many subjects it is important that these assessments are comparable and fair to all students. In 2000 statistical moderation procedures were used by the board to help achieve these requirements.

Tim described some of the key features of the moderation system used in 2000. First, a moderation group for each study at each school is established. Secondly an external score for each student is determined based on their examination score and the GAT (General Achievement Test) scores. The weightings are based on a regression of the internal score on the examination(s) and components of the GAT as long as inclusion of the GAT scores leads to sensible regression coefficients and an improvement in the reliability of the predictions of the internal score. The final step is to use the external scores of the moderated group to adjust the school coursework assessments. The moderated score has a quadratic relationship with the coursework score standardized to give the same mean and spread across the state. The quadratic relationship varies from school to school and is determined so that the maximum moderated score in a school is equal to the maximum external score for that school, the mean moderated score is equal to the mean external score and if possible the minimum moderated score equals the minimum external score. The moderated score does not change the rank order of students, as determined by their school assessment.

Tim shared with the audience some of the rationale for the approach adopted and aspects of dealing with outliers and unusual cases. Tim used MINITAB to develop and demonstrate the methodology. In the end, however, when the SAS programs that were to be written by an external consultant were not delivered on time, the Macros Tim wrote were used to do the processing. Despite the fact that the data set was very large, involving 40 000 students in 550 schools and between 80 to 90 subjects, MINITAB proved very flexible and was able to handle the job.

Finally, Tim outlined some changes that will be implemented in 2001. After a lively question time further discussion was held at a local restaurant.

Neil Diamond

Some Meaty Statistics

On May Day 2001 Ray Watson, Associate Professor in the Department of Mathematics and Statistics at the University of Melbourne, celebrated the onset of the colder months with a meaty presentation to the Victorian Branch. He told the story of the development of a meat quality predictor, a tale involving `data

fudging, conflicts, profit-motivation, a lot of data, politics, statistics and meat-science'. There was a lot of statistics, some lies but, according to Ray, `no damned lies'. During the course of the project, part of Ray's time was apparently spent in educating meat scientists on basic statistical principles: things like looking for trends, ignoring transient fluctuations and discarding inexplicable outliers, which, ever the teacher, he proceeded to re-educate us about.

In the 1970s sales of beef started to decline, a trend confirmed in the 1980s. Concerned, the meat industry responded by surveying consumers. It appeared that the main culprit was `meat of variable quality'. This led to the birth of Meat Standards Australia (MSA), an organisation with the avowed aim of guaranteeing the tenderness of beef purchased by the consumer. Of course, this meant that a valid method of measuring beef quality had to be developed.

The MSA spent large sums of money assessing various options for measuring quality: subjective measurement by professionals was not very reliable, and not valid, because it did not relate to consumer preferences; laboratory measurements, such as stress tests on meat, were reliable but of questionable relevance to the consumer; expert sensory panels had moderate reliability and validity; and consumer data were very unreliable, but they were valid, by definition.

The MSA provisionally settled on expert sensory panels, and conducted a large experiment comparing expert panel responses with those of consumers. The correlations between one expert panellist and another, and between the expert panel as a whole and the consumer panel, were excellent, so the MSA decided to pursue expert panel assessment of meat quality. One of the MSA project leaders was suspicious, however, and approached Ray for an independent opinion. Ray carried out some simulations and demonstrated that the correlations were too good: the quality measures, such as tenderness, liking of taste and liking of texture, could be regarded as discretised transformed Gaussian variables, and the underlying Gaussian variables would require pairwise correlations mostly in excess of 0.98 to explain the high correlations between panellists. The MSA agreed that the expert panel data had been fudged, abandoned the taste-testing panel plans, and opted for quality assessment based entirely on consumer preference data. This was a brave move, because such data are notoriously variable. And Ray, after this initial involvement, was asked to get involved further by assisting in the task of analysing the data and making it all work!

A giant data collection exercise was undertaken that eventually involved consumer tasting of over 300,000 pieces of meat from animals for which detailed covariate information had been obtained. The meat was prepared according to a strict protocol, and the design was balanced for consumer type, order of presentation and other major factors. Taste-testing experts recommended that consumers record 13 response variables on each piece of meat (dryness, ease-of-first-bite, ease-of-chew, and so on), but this was felt to be too complicated and would lead to unreliable responses from panellists. This was simplified to four scales: tenderness, flavour, juiciness and overall liking. This last drew sharp criticism from sensory experts, who complained that it was not a true food attribute. However, the four scale scheme prevailed. The consumer also gave each piece of meat a star rating: roughly, 2=bad, 3=good, 4=better, 5=best. Ray carried out various analyses, and after adjustments to make the index both simple and politically acceptable (without sacrificing discriminatory power), he produced the meat quality index 0.4*tenderness + 0.3*overall liking + 0.2*flavour + 0.1*juiciness. Finally, he recommended that 10 consumers taste each piece of meat, and the overall quality index should be the trimmed mean of the 10 individual indices. The index seemed to work well, exhibiting trends with covariates that made good sense to meat scientists, so the MSA accepted Ray's ideas.

Meat quality could now be measured, so the next step was to predict it. Meat scientists attempted to construct an informal regression tree predictor (with variables such as days.aged>5, pH<5.9, rib.fat>3 and so on), but it proved unsatisfactory. Ray was called back in. He developed a meat quality predictor based on variables available in the processing plant. These variables included animal effects and the way the meat was treated: the cut of meat, the way it was cooked, the time of ageing, and so on. The resulting prediction methodology has been honoured by receiving the International Meat Science Millennium Prize. It is widely used by independent meat graders, and in some outlets has changed the way meat is cut and sold. However, the large supermarket chains are still reluctant to adopt it.

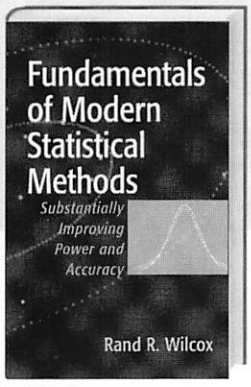
Ray's reputation as a clear and entertaining speaker drew a large audience, who were clearly fascinated by this real and atypical application of statistics. After the meeting, several attendees repaired to a nearby restaurant for dinner. Ray, with all eyes upon him, chose the prime beef, cooked rare. The verdict? The coffee was excellent.

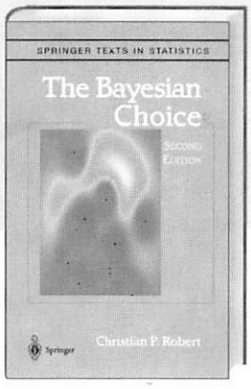
Geoff Laslett

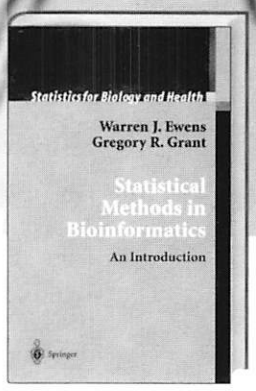
Confidence Intervals for R^2 and effect sizes in a one-way ANOVA weighted for unequal variances.

At the 22 May meeting of the Victorian Branch of the Statistical

Springer for Statistics







R.R. Wilcox

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2001. XIII, 258 pp. Hardcover **DM 119,90**; £ 44,-; FF 484,-; sFr 103,50; Lit. 141.680 ISBN 0-387-95157-1

C.P. Robert

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This graduate-level textbook presents an introduction to Bayesian statistics and decision theory. Its scope covers both the basic ideas of statistical theory and some modern and advanced topics of Bayesian statistics.
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2nd ed. 2001. XXIII, 604 pp. 23 figs. (Springer Texts in Statistics) Hardcover **DM 179,90**; £ 66,50; FF 726,-; sFr 155,-; Lit. 212.590 ISBN 0-387-95231-4

C.P. Robert, G. Casella

Monte Carlo Statistical Methods

A self-contained logical development of the subject, intended for a second year graduate course. No familiarity with Monte Carlo techniques or with Markov chain theory is assumed.

1st ed. 1999. Corr. 2nd printing 2000. XXI, 507 pp. 65 figs. (Springer Texts in Statistics) Hardcover **DM 169,90**; £ 62,50; FF 685,-; sFr 146,50; Lit. 200.780 ISBN 0-387-98707-X

W.J. Ewens, G.R. Grant

Statistical Methods in Bioinformatics: An Introduction

There is now a necessity for a text that introduces probability and statistics in the bioinformatics context. This book also describes some of the main statistical applications in the field, including BLAST, gene finding, and evolutionary inference, much of which has not yet been summarized in an introductory textbook format.
Only a basic understanding of biological concepts is assumed, and all concepts are explained when used or can be understood from the context.

2001. XIX, 476 pp. 30 figs. (Statistics for Biology and Health) Hardcover **DM 167,90**; £ 62,-; FF 677,-; sFr 144,50; Lit. 198.410 ISBN 0-387-95229-2

G. McPherson

Applying and Interpreting Statistics

A Comprehensive Guide

This book describes the basis, application, and interpretation of statistics, and presents a wide range of univariate and multivariate statistical methodology. It retains the unique feature of being written from the users'perspective; it connects statistical models and methods to investigative questions and background information, and connects statistical results with interpretations in plain English. In keeping with this approach, methods are grouped by usage rather than by commonality of statistical methodology.

2nd ed. 2001. XXVIII, 640 pp. 64 figs., with online files. (Springer Texts in Statistics) Hardcover **DM 159,90**; £ 59,-; FF 645,-; sFr 138,-; Lit. 188.950 ISBN 0-387-95110-5

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Society, Assoc. Prof. Bob Staudte, from the School of Mathematical Sciences, La Trobe University, gave a very interesting talk entitled "Robust Confidence intervals for R^2 and effect sizes in a one-way ANOVA weighted for unequal variances".

The research summarised in the talk arose from a consultancy project relating to case-mix funding in hospitals where regular changes to classification schemes of diagnostic related groups are made and the Government Department concerned wants a simple measure that it can use to determine whether the changes have been effective. The response, length of stay in hospital, varies from group to group, is highly skewed and contains numerous outliers. A weighted Co-efficient of Determination was proposed which turns out to be a simple monotonic function of the "effect size" which generalises the non-centrality parameter in the classical one-way ANOVA.

One of the key points in the development of the statistic is that groups should be weighted according to the ability to estimate group means. An extension of the initial research was then described where the effect size, of much interest to psychologists and others, defined by $(\mu 2 - \mu 1)/\sigma$ could be generalised to cover cases where the underlying populations have unequal variances. A simple and natural answer was found as a special case of the earlier work. In addition, confidence intervals for the effect sizes could be obtained using a linear function of a central $\chi 2$ distribution which simulations show gave remarkably accurate results even for small sample sizes. In concluding his talk, Bob showed how the methods developed could be made robust and indicated that interesting extensions to higher way layouts were possible and were the subject of current research.

Neil Diamond

Disease incidence assessment based on serial prevalence data

by Associate Professor Ian Marschner
NHMRC Clinical Trials Centre,
University of Sydney

19th June 2001

At the 19th of June meeting Associate Professor Ian Marschner, from the NHMRC Clinical Trials Centre at the University of Sydney, presented a talk on the development of methodology for estimating time-specific first incidence rates of permanent disease (or more often antibodies to a disease). The type of data he considers is large multiple cross sectional samples of the prevalence of the disease over time, without any individual linkage records. He assumes that the disease is permanent in the sense that individuals do not recover from the disease. An example of the type of data is annual prevalence rates of antibodies to a disease of all those patients who are tested for those antibodies, in say a government testing programme.

The methodology accounts for the possibility that diseased and not diseased persons may have different chances of being in the sample, provided that at each time that there is an external estimate of the relative inclusion rate, of those with compared to those without the disease. Relative inclusion rates can be affected by factors such as death, since in some cases (eg HIV) a diseased person is more likely to die than a not diseased person.

Associate Professor Marschner provides an elegant way of analysing such data through the use of generalised linear models embedded in an EM interactive procedure. He illustrated the methodology with 2 real examples, namely

1. data on the prevalence of HIV antibodies in pregnant women in Kinshasa, Zaire
2. data on the prevalence of toxoplasmosis (which is an important zoonosis ie disease acquired by humans from animals) antibodies in South Yorkshire from 1969 to 1980.

Kym Butler

QUEENSLAND

Rapporteurs are Peter Baker, Charis Burridge and Tony Swain.

Applications of Graphical Markov Models

Professor Nanny Wermuth, University of Mainz, Germany and President of the International Biometric Society, was the speaker at the March meeting of the Branch. A Max-Planck research prize in 1993, received jointly with David Cox, Oxford University, helped her to intensify research on graphical Markov models, with special emphasis on applications in the Social and Life Sciences. She summarised some of this work in her talk.

Nanny outlined how Graphical Markov models extend the path analyses of Sewall Wright, defined for linear systems of single responses, to systems with joint or single responses generated with sequences of conditional distributions for categorical and quantitative features. She then described how Graphical Markov models help visualise important statistical concepts and also to summarise the fitting of sequences of conditional distributions to categorical and quantitative data.

Some Practical Issues in the Design and Analysis of Computer Experiments

In the first of two May meetings, Tony Sahama, Lecturer in Information Systems, QUT, addressed the meeting on some statistical aspects of computer experiments.

First of all, Tony provided a practical demonstration that even lecturers in Information Technology can experience difficulties with hi-tech presentations. After the

problem was identified, and the missing computer replaced, we received an enthusiastic exposition of computer experimentation.

Deterministic computer simulations of physical experiments are now common techniques in science and engineering. Real experiments may often be too time consuming or expensive to conduct and might even be impossible. Indeed, a deterministic computer model for the process may be so complex that one cannot easily predict the output given the inputs. In this situation, one option is to conduct a computer experiment consisting of a number of runs of the computer code with different input choices. The responses are then approximated by a simple stochastic model. For example, a general linear model with correlated errors may be suitable. Tony described the application of Latin Hypercube experimental designs for choosing the settings of input variables for running such an experiment.

The efficiency of this approach was demonstrated for a case study of the ASET-B computer model, relating available safe egress time in fires to characteristics of the fire and of the surroundings.

2001 Session of the ISI

Our second May meeting was addressed by Dr Young-Dae Yoon, Commissioner, National Statistical Office, Korea. He also chairs the National Organising Committee for the 53rd Session of the International Statistical Institute, which is to be held in Seoul, 22-29 August.

Dr Yoon gave a very polished presentation on their plans for the conference and its associated activities. This made for a very interesting talk, covering both the professional program and a travelogue of the city and beyond. The organisers expect the session to attract about 1440 delegates, including about 70 from Australia and New Zealand. With invited talks covering 84 topics it is well placed to do so.

He suggested the ISI session is a kind of statistical Olympics, where many cutting edge issues on statistics are discussed and many statisticians from all over the world are gathered. He also stressed the Seoul session would be a good opportunity to prepare for the 2005 session in Sydney!

Our thanks to the staff at ABS for arranging the meeting and opportunities before and after it to get together with the visitors.

Joint meeting with QLD Statistical Liaison Officers

On 11 July 2001, the regular Branch meeting was held in conjunction with the Queensland Government Statistical Liaison Officers Meeting. Talks covered Census 2001, CensusAtSchool (UK and QLD) and the Royal Statistical Society Education Program.

Lynn Collins, Statistical Coordinator, Office of the Government Statistician began the proceedings by outlining the Queensland Government's role in supplementing the ABS activity for Census 2001. Adopting the slogan *Every Queenslander Counts*, the Queensland Government will undertake local advertising to target under-represented groups such as aborigines and Torres Strait islanders, rural and remote residents and youths. An estimated 45% of people in these groups are not counted in the Census and it is hoped that, by advertising in local print and electronic media, this rate can be substantially reduced.

Vivienne Johnson, from the Australian Bureau of Statistics, then gave an overview of the media campaign to be conducted by ABS in the lead up to the census on 7 August. She also reiterated the need to tailor the campaign to Queensland and to target media in rural areas.

Professor Neville Davies (Royal Statistical Society, Centre for Statistical Education) provided a lively presentation on "How to Communicate Statistics". Apart from opening and closing with a Beatle's song, Neville also entertained us with quotes like "Statistics is the science of doing anything...." and "Statistics provides value adding to data". On the serious side, Neville described the RSS Centre for Statistical Education endeavors on the Office of National Statistics (ONS) web site project, providing training for non-statistical and statistical professionals and finally the CensusAtSchools project as a tool for statistical education in schools.

The Communicating Statistics Module is part of the ONS web site project. This is a web-based resource to assist in communicating statistics to a varied audience who probably know very little about the subject and may even be hostile to it. It makes extensive use of the world wide web and encourages its audience to actively participate by undertaking specified tasks, as well as providing links to statistical resources on the web. Interestingly, Neville was of the opinion that some computer-based-learning software is often just e-delivery rather than e-learning and that sometimes the delivery is a distraction. However, as if to partially disprove his point, Neville showed some impressive but preliminary Java applets for interactive graphics to teach ideas about regression.

The Office of the Government Statistician and SSA QLD both plan to put the Communicating Statistics Module web pages on their sites.

Following his first talk, Neville showed a short video of the South African CensusAtSchools project. It was clear that South Africa's leaders believe that education is their biggest weapon against poverty. Their immediate aim is to increase the level of economic and statistical literacy. If the drive and enthusiasm

seen in the video is any indication, they are well on their way to success.

Lynn Collins and Louise Christenson, of the Office of the Government Statistician, then gave more detail about the recent CensusAtSchools in Queensland. Schools were invited to participate in this program on a voluntary basis, with the proviso that all children in a given class filled in their questionnaire. This programme was designed to stimulate awareness of, and interest in, the forthcoming national census. The form was presented to children in grades 5 to 10. While some questions were similar to those asked at the full census, there other questions of more relevance to children: for example, to name their favourite sports team and what pet(s) they had. They also measured their height and foot size.

Doreen Connor described the UK version of CensusAtSchools, on which the Queensland programme was based. An experienced teacher, Doreen now works with Neville Davies at the RSS Statistical Education Centre in Nottingham (UK). Over 400,000 pupils participated in this exercise in the UK several months before the April 2000 census. Doreen showed examples of media coverage of CensusAtSchools in the UK, which raised the profile of this initiative nationally. This census yielded some surprising information, such as the very wide-spread support for Manchester United soccer team. Also, 60 percent of 11–16 year olds have their own mobile phone.

Neville Davies then returned to the lectern to speak about the three-stage formal statistics syllabus run by the RSS. The third level, the graduate diploma, is equivalent to an honours degree. After a further 5 years of experience, taking significant responsibility for their work, graduate statisticians can apply for chartered status. Neville went on to describe recent visit to Malawi by himself, Peter Holmes and Bradley Payne. The aim is to set up an in-service training programme for staff in government statistical offices. A course management strategy document has been written up, and local staff have been given training in teaching the RSS Ordinary Certificate. The South African government is now interested in training 50,000 employees, in the belief that statistical literacy is a necessary precursor to the desired goal of economic literacy.

Congratulations to the staff at the Office of the Government Statistician who did a wonderful job in providing such an interesting array of speakers and a good venue.

Revamped SSA QLD Web Page

The Branch's web page has moved to http://www.maths.qut.edu.au/ssaqld/.

Notices of upcoming talks will be posted as soon as they become available. Also, where possible, details of past talks and related information, such as related web links and downloadable versions of presentations will be made available. In addition, the site now contains a downloadable membership application form and other SSA QLD information.

SOUTH AUSTRALIA

Graphical Models and Longitudinal Studies

South Australia has had the privilege of a visit of the eminent statistician, Sir David Cox, FRS, Nuffield College and Department of Statistics, Oxford. He presented a talk to the local Branch in February whilst visiting Associate Professor Patty Solomon of the University of Adelaide. Not surprisingly he drew a record attendance.

Examples of longitudinal and observational studies in the social-medical area were used throughout the talk. In particular two studies were highlighted, (i) what determines the wellbeing of diabetic patients? (ii) what was the effect of cancelling free milk in "Old" South Wales? Here the long-term relationship between maternal features and child development were followed.

Some of the concepts involved in analysing such studies were discussed from first principles. Such studies were very multi-dimensional with the classification of the variables open ended. Which variables are classified as response or explanatory and which need to be treated on an equal footing? A range of measurements was made on the cases in the diabetic study: six quantitative variables and two binary variables. The primary response variable was glucose concentration, explanatory variables of duration of illness, length of schooling and gender. Other intermediate variables included knowledge of the disease and the use of psychological measurements of the types of attribution. For example, is it the patient's responsibility or the doctor's or just fate?

Of interest was how Sir David represented the relationship of the variables with three different types of graphs; these have directed and undirected edges, showing which variable is conditioned on what. Properties of these graphs are based on separation theorem, factorisation theorem, parametric based and graph based factorisation of likelihood, Markov equivalence of different structures, derivation of graphs after marginalisation and conditioning. The variables are sorted into boxes, edges (or straight lines) are connected between the variables. This technique is a recursive regression graph providing a useful summary after analysis. This graphical presentation was also used to demonstrate the relationship of the maternal characteristics in the height of their children up to the age of five. The graphs show where the height in

year 5 is influenced by the height in year 3 and also by maternal height whereas height at birth and year 1 is more strongly influenced by maternal features.

So What's the Problem?

Ian Saunders of the Adelaide branch of CMIS, CSIRO, gave the traditional address by the outgoing President at the AGM on data being used in organisations. Questions posed by Ian were: What is the problem? Who cares? What do we know? What is the problem? What to do?

Statisticians have known for a long time and management studies have confirmed that managers generally don't make as effective use of data and information as they could. This is well known, so why aren't things improving? Managers and statisticians can be poles apart, due to differences in education, approach to theory, practical outlook versus abstract and approach to decision. Rational decisions are better than the 'gut-feel' decisions made by less data aware managers.

Studies support the use of TQM and particular quantitative methods. A research study using managers from organisations involved in the Australian Business Excellence Awards suggests the link of successful measurement systems to organisational performance. The measurement culture and system and information quality are strongly related. Structural equation models were used to explain correlation structure through linear structures and the relationship between observed and latent variables.

Recommendations from this work include: leadership to develop a measurement culture where there is confidence in the performance measures, people involved in measurement development, the right things are measured and reliably. Training in quantitative methods might also have a place. Statisticians make an impact especially to: provide the evidence of the link of measurement to performance, emphasis on fundamentals, identify the right measures, ensure proper data collection, extract information from data and make results accessible and understandable. The talk generated a lively discussion on the future of statistics amongst other issues, and whether the profession is getting involved where it should and recognised as it ought.

Almost Nonparametric Inference for Mixture Models

Another eminent visitor, Professor Tom Hettmansperger, of the Department of Statistics, Penn State had to sing for his supper at the April meeting. He described a case where the participants were asked to move an arrow placed at an angle, up to the vertical position. The angular error is measured with participants exhibiting vertical independence or dependence when trying to do this task.

The first case presented had a vector of m observations on each of n subjects resulting in a mixture of binomials. The average is used at the cut point but a lot of information is lost under this arrangement.

Three examples from cognitive psychology were presented (1) Rod and frame task - the number of times where the absolute error is less than 5°, results in two groups (field dependent and independent). Here the field independent group is probably a mixture of binomials and the same for the dependent group but the whole group are a mixture of the mixtures. (2) One observation per subject where it is possible to estimate the centre of the first component. (3) Test control versus treatment.

Given a vector of observations on each subject, there are ways to estimate proportions in a mixture without making parametric assumptions about the underlying component distributions. These methods are more robust and efficient especially if only one cut point is used to define the binomial. This also works for more than two components.

Changes in Physical Function: Results from The Australian Longitudinal Study of Ageing (ALSA)

Lynne Giles of Auckland University of Technology but formerly of Flinders University had only touched down in May before she presented a comprehensive talk on a large longitudinal study on ageing. Adelaide is a prime location to conduct a study of older persons. ALSA began in 1992 with the sixth wave of data collection recently completed. The study's design and objectives provide crucial information on social, behavioural, biomedical, economic, environmental and age related changes in health and well being of older persons. Data collection included face-to-face and phone interviews, clinical assessment and self-complete questionnaires.

Assessing changes in mobility was an important component of the study, with questions on this subject included in the first four waves. An index of mobility was generated and was the variable of choice for all participants 70 years or older. The analyses included transition models with logit models initially applied to determine order and allowed the inclusion of mobility status up to three previous waves. A base model found age (OR= 1.09), gender female (1.29) and mobility of two previous waves (OR=4.45 and 5.26) to be important. Time independent covariates such as demographics, psychological, sensory and lifestyle factors were also included.

Lynne elaborated on the valuable experience gained from one of few epidemiological studies in Australia, especially design and analytical issues that might not be foreseen. The sample design

consisted over stratified design with some over sampling. Couples were included which caused a cluster effect but certain groups like migrants and people of unsound mind were probably under represented. The study imposed a huge burden on the respondents coupled with the self-selection process of the subsequent waves might have resulted in a higher than usual higher of healthy individuals.

The talk prompted a great deal of interest as the characteristics of the ageing population overlap many disciplines and will probably feature in more statistical work of the future. Despite her very early start in Auckland, Lynne kept pace with the lively dinner crowd.

Margaret Swincer

Analysis of a case-control study with differential measurement error

The South Australian Branch President, Gary Glonek from the Department of Applied Mathematics at Adelaide University addressed the June meeting on the analysis of the effects of speeding on serious car accidents. Adelaide University's Road Accident Research Unit (RARU) had conducted the case-control study.

The cases were 151 day time crashes on metropolitan roads where alcohol was not a contributing factor, cars had right of way and were travelling at free speed. The speed of the vehicle was estimated from tyre tracks at the scene. Four control vehicles per crash were matched to the cases on the basis of location, direction of travel, day of week, time of day and light and weather conditions. Their speeds were recorded by radar and the boys and girls in blue verified the drivers were also free of alcohol! Sampling obviously not so random in this case.

Gary showed that logistic regression could be applied to this data but not without problems. Large errors accompany measure-ments of speed for crash vehicles but this error may be negligible in the controls. He described how estimates based on ordinary logistic regression could be biased in the presence of differential measure-ment error with attenuation in the regression coefficients being an often-cited consequence. As replication was not available in this study, the measurement error variance could not be estimated. Instead Gary demonstrated the significant effect measurement error could have on the log odds ratio using a simulation study. Gary found that the risk of serious accident doubled for each 5km over 60km/hr and this was true even when allowing for measurement error with different standard deviations.

However Gary also pointed out that at very high speed, such as 15km over the 60km/hr metropolitan speed limit the model might not be supported due to the lack of information (or serious crashes!) at this speed included in the study.

Michelle Lorimer

WESTERN AUSTRALIA

Estimating Roadside Vegetation Condition

Ross Taplin
Mathematics and Statistics
Murdoch University
10 July 2001, University of Western Australia

What do you look at when you are driving along the road? Life would probably be more interesting (though perhaps much shorter) if you spent your time inspecting the roadside vegetation rather than watching the traffic ahead. Certainly roadside vegetation is of interest to Main Roads Western Australia (MRWA), a body which is responsible for the state of the land bordering major roads in the West. MRWA is working towards a process for obtaining accurate estimates of the condition of this vegetation. This is important for the evaluation of the potential for erosion and deterioration of the natural environment, and also for monitoring the performance of contractors who tend the roadside vegetation.

Ross Taplin described his involvement in the development of methods for estimating the condition of roadside vegetation as a consultant to MRWA. The data for this estimation problem come from a number of raters who assess videos and photographs of countless stretches of roadside verge (and somehow remain awake throughout the process). These data presented Ross with some interesting challenges, including the almost inevitable outlier. (Viz: "Bill, who is an experienced rater, was off sick, so we plucked Fred out of the tea-room. Turns out that Fred doesn't know much about roadside vegetation...")

Despite the difficulties Ross was able to offer some sound statistical advice to the client. While the problem of estimating the condition of roadside vegetation is not yet fully solved, Main Roads WA is now making progress towards a procedure incorporating some of Ross's suggestions. Whether or not this results in more pleasant touring in the South-West remains to be seen. It certainly did result in an entertaining talk and lively discussion.

Martin Hazelton

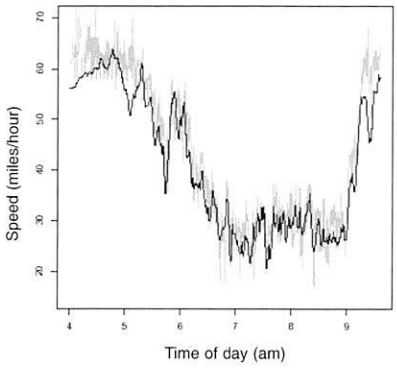
Speed Estimation from Automatic Vehicle Detectors

Everyone is an expert about traffic. This was indicated by the length of the discussion that followed Martin Hazelton's talk at our June meeting. Eventually a halt had to be called by some hungry members of the audience.

Martin described the operation of induction loop vehicle detectors which are used to collect aggregated data over 20 second periods on numbers of vehicles passing over the inductor and the total time during the interval for

which the loop has detected the presence of vehicles (occupancy time). This information can be used to estimate vehicle speeds in each interval through Martin's fundamental equation for each vehicle, y=l/s where y is occupancy time, l is effective vehicle length and s is vehicle speed. Although vehicle lengths are not recorded by the induction loop there are large exogenous data sets containing random samples of vehicle lengths for specific road types. Martin proposed an MCMC algorithm to fit a Bayesian model to this sort of data. The model incorporated a random walk model for car speed to ensure that speeds change smoothly over time. A Metropolis-Hastings acceptance-rejection procedure was used for sampling.

In the final section of the talk we were shown the results of fitting the model (shown in black) to data collected on a weekday morning between 4 am and 9.40 am from Interstate 5 in Seattle. Speed trap data (shown in grey) was also available which could be used for verification of results. The model was generally a very good fit but gave lower estimates of speed than the speedtrap data early in the morning and late in the morning. It was on this point that the audience was able to help (?) the speaker with their expert (?) knowledge of what types of vehicles are on the road at the time they are travelling to work. A copy of the slides Martin used for his talk are available for downloading from www.maths.uwa.edu.au/~martin/speedtalk.pdf



CANBERRA

Trawling the Depths of Government Data: Statistical Issues at ABARE

At the May meeting, the Canberra branch enjoyed talks given by Dr Ray Lindsay and Dr Terry Neeman, both from the Australian Bureau of Agriculture and Resource Economics – better known as ABARE.

Ray gave a very innovating talk on visualising electricity supply data. Chris Short from ABARE showed Ray some very large datasets for electricity supply. The vast quantities of raw data were causing disk space problems, which was Chris' immediate concern. Files containing the price and quantity data for 150 generators are released just after 4am each day, and contain about 5 to 15 Mb of data, so six months worth of data was 2Gb. The data are in public domain on the web site of the National Electricity Market Management Company, NEMMCO.

Generators make multiple bids during the day, changing the price quantity combinations in the remainder of the day. Each 'bid' is a set of 48 half-hourly bids covering the 24 hour period starting at 4:30am. Each generator can determine the price bands at which it will offer electricity, which remain fixed for that day but can change across days. In each half-hour period the generator specifies how much electricity it is willing to supply in each of the price bands. During the course of the day, the generator submission modified bids which changes the amount of electricity it will supply at each price band. So the time of the bid is also available.

The key to the disk storage problem was that the data naturally splits into two parts, a price band dataset that is relatively small and a quantity dataset that is large. When thinking on how to display this mountain of data, Ray remembered the displays which are commonly referred to as Coxcomb diagrams, used by Florence Nightingale to demonstrate that the rate of mortality from non-battle causes in the Crimean War was much greater than those from battle causes.

The solution that Ray came upon draws loosely on the Coxcomb idea. The time element suggests the circular display and the multiple bids suggest an animated display, the radius represents the price bands and colour represents the quantity. Each half-hour supply curve occupies 7.5 degrees of the circle. The displays have been implemented in the Annotate facility in SAS/GRAPH. The output is an animation that shows, for a single generator, how the price-quantity changes during the day.

Terry gave an interesting talk about estimating standard error for small proportions. She spoke about the difficulties faced when estimating these errors in the ABARE farm survey context. Every year, ABARE runs an extensive survey covering many aspects of farm performance and farm management. The survey is stratified by region/industry/size design and model-based estimation methodology is used. An important feature is that every sampled farm is assigned a weight, which can be thought of as the number of farms that farm represents. The sum of the weights equals the total target population.

Estimates of average and relative standard errors are calculated using a computer program developed in-house, MeanRSE. The estimation of the relative standard error in this program relies on the assumption that the estimated mean is approximately normal distributed but this assumption is not tenable when estimating small proportions or when all answers are the same. It is known that under simple random sampling, exact confidence intervals for small proportions can be calculated. Terry showed that the estimated exact confidence intervals depend upon the survey design and

since ABARE's farm surveys have complex designs, there is a lot more work to be done to adapt this methodology to ABARE's surveys. Terry mentioned two references she is looking at:

Gross, Shulamith T. and Frankel, Martin R. *Confidence Limits for Small Proportions in Complex Samples, 1991*; and Korn, Edward and Graubard, Barry. *Confidence Intervals for Proportions with Small Expected Number of Positive Counts Estimated from Survey Data, 1998.*

PhD. Students' Talk-Fest

In early May, the Canberra Branch enjoyed talks given by three PhD students from the Australian National University.

David Hirst talked about some statistical problems in testing the modality of regression curves. He showed that methods used to test modality for density functions could also be used to test modality for regression functions. He particularly focused on the regression bandwidth test. He showed how to test the null hypothesis that a regression function has at most k modes by finding the smallest bandwidth - the critical bandwidth - where a kernel estimator of the regression function has k modes. He proved the conservatism of this test by showing an example where the function had a mode but the hypothesis that it did not have one was accepted. He also mentioned that the accuracy of the test could be improved by using the asymptotic properties of the critical bandwidth.

Christian Rau followed with a talk on object classification using functional data analysis. He presented work he has done in conjunction with his supervisor Prof. Peter Hall and Dr Don Poskitt. The problem was to classify ships based on low resolution radar images. The methodology they used was to decompose the covariance of signal/images retaining only a few principal components that accounted for most of the variability and yield a stable class estimate. Christian talked about the benefits of combining principal components and functional data analysis and he also commented about the availability of simple and flexible algorithms.

Andrew Rieck's talk focused on the construction of one-sided nonparametric prediction intervals. The coverage error was shown to be asymptotically improved when order statistics were used to estimate the end point of the prediction interval as opposed to a specific studentized approach. Prediction intervals which are constructed via interpolation of three order statistics - as opposed to using two or one order statistics - where shown to have decreased coverage error. The talk concluded with a simulation study comparing the small sample properties of various prediction intervals including some which were derived from a form of calibration.

Veronica Rodriguez

CONFERENCE SUMMARY

Australasian Biometrics and NZSA Joint Conference 2001

10-13 December 2001, Park Royal Hotel, Christchurch, New Zealand

Web site:
http://nzsa.rsnz.govt.nz/Conference/home.htm

16th Australian Statistical Conference

8-11 July 2002, National Convention Centre, Canberra.

The themes will be Bioinformatics, Surveys, Design of experiments and trials, medical statistics, financial statistics. A tribute to Richard Tweedie will also be given.

Information:
www.statsoc.org.au/asc16
Enquiries asc16@con-sol.com

Eighth Summer Workshop, New Zealand Mathematics Research Institute

6 – 11 January 2002, Masonic Hotel, Napier, New Zealand

The workshop is co-sponsored by the ISI's Committee on Probability and Statistics in the Physical Sciences.

Information:
E-mail napier@stat.auckland.ac.nz, or visit webpage
http://www.stat.auckland.ac.nz/napier2002/

Eighth International Conference on Statistics, Combinatorics and Related Areas

19-21 December, 2001
University of Wollongong,
Wollongong, NSW 2522, Australia

The School of Mathematics and Applied Statistics at the University of Wollongong, and the Forum for Interdisciplinary Mathematics, are proud to co-organize a three-day International Conference on Statistics, Combinatorics and Related Areas on the 25th anniversary of the Forum.

Plenary sessions, over twenty technical symposia, and contributed talks are being planned. Invited speakers include: Chris Heyde, Joe Gani, Clive Granger, Bryan Manly and Terry Speed.

Symposia Topics

- Cointegration
- Computer Security
- Data Mining
- Ecological and/or Environmental Statistics
- Estimating Function and Quasi-likelihood
- Experimental Design
- Generalized Linear Models
- Goodness of Fit
- Image Analysis
- Industrial Data Analysis
- Multivariate Statistics
- Nonparametric Testing
- Ranked Set Sampling
- Sample Surveys
- Statistics in Finance
- Time Series

At this stage, a program of the conference is being organised by the members of the International Organising Committee (IOC). The Web site contains information about members comprising the IOC. For those wishing to contribute to a particular session, please contact the person organising that session. Those wishing to contribute outside the areas are also welcome to send their abstract. Suggestions for further topics and proposals to organise a session should be sent to the conveners or a member of the IOC. The International Association of Statistical Computing has endorsed this conference.

Postgraduate students will be encouraged to attend this conference and present their work. A selection panel will judge the presentations and make recommendation for awards.

Information about registration, submitting abstracts, symposia organisers and the venue is available on the conference website. The conference website http://www.uow.edu.au/informatics/maths/statconference will be updated regularly.

For further details, please contact: Satya Mishra, Department of Mathematics and Statistics, University of South Alabama, Mobile, Alabama 36688-0002, USA, tel: +1 (334) 461-1642, fax: +1(334)-460-7969, email: mishra@mathstat.usouthal.edu or Chandra Gulati, School of Mathematics and Applied Statistics, University of Wollongong, Wollongong, NSW 2522, Australia; tel: (02) 42213836, fax: (02) 42214845, email: cmg@uow.edu.au.

Overseas Conferences

ProbaStat 2002, Fourth International Conference on Mathematical Statistics

4-8 February 2002, Smolenice, Slovakia

Information: C/- ProbaStat 2002, Mathematical Institute of the SAS, Stefanikova 49, SK-81473 Bratislava, Slovak Republic; Fax (+4217) 5239-7316; e-mail: probastat@savba.sk

The Sixth International Conference on Teaching Statistics, ICOTS-6

7-12 July 2002, Durban, South Africa.

Theme: 'Developing a statistically literate society'

Organised by the International Association for Statistical Education (IASE) and the South African Statistical Association (SASA).

Option of full refereeing of papers

Proposals invited for contributed papers and posters.

Information: Brian Phillips, E-mail bphillips@swin.edu.au or see website htto://www.beeri.org.il/icots6/

22nd International Symposium on Forecasting

23-26 June 2002, Department of Statistics, Trinity College, Dublin, Ireland.

Information: www.isf2002.org

7th Valencia International Meeting on Bayesian Statistics

2-6 June 2002, Canary Islands, Spain.

Information and updates at conference web site, http://www.uv.es/valencia7, and its US mirror site, http://www.stat.duke.edu/valencia7

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