statistical society of australia incorporated

SSAI newsletter

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Analysing Grouped Data Workshop

It was better than anyone imagined it could be. If it hadn't been for Ray Lindsay, statistician at ABARE, to ask the question, we would all be less wise than we are today. Ray said he'd like to know more about mixed models, and the mixed model workshop idea was born. It might have remained a mere idea had it not been for our six lively and enthusiastic speakers: Brian Cullis, Mark Clements, Daniel Elazar, Ken Rowe, Veronica Rodriguez and Ann Cowling. Terry Koen proved to be a very able moderator in the discussion/debate that followed. In a pastiche of topics using statistics covering agriculture, education, oncology, disability, diabetes and chocolate cake, it was a day to be remembered.

The first talk was given by Ann Cowling of the Statistical Consulting Unit (SCU), Graduate School, ANU. She emphasised that mixed models play a prominent part in repeated measurement studies. Three important classes of these studies are structural studies, longitudinal studies, and cross-over studies. Ann gave examples of each type of data and presented a mixed model for each. She then analysed them using REML estimation which is available in all the major statistical packages, and gave handouts showing the analysis done in S-Plus/R, Genstat, SPSS and SAS.

The second talk was given by Ken Rowe, a Research Director at the Australian Council for Educational Research (ACER). Ken began by defining performance indicators (PI's) as data indices of information by which the functional quality of an institution or system may be measured and evaluated. PI's serve various purposes, the most notable of which are monitoring, policy determination, target-setting, evaluating, and reforming.

Daniel Elazar, James Chipperfield, Terry Neeman and Brent Henderson

Ken focussed mainly on educational PI's. The two key purposes of these are to encourage system accountability in terms of efficient and effective utilization of resources, and to bring the delivery of educational services into public sector accounting in a way which ensures that such services represent 'value for money'. Types of educational PI's are many and varied and include access/participation rates, class sizes and teacher to student ratios, and longitudinal achievement indicators and measures of factors affecting students' progress rates. The sources from which educational PI data may be obtained are inherently multilevel and multifaceted and include students,

In this issue

Editorial 4
President's Corner 5
Competition 5
SSAI-sponsored Review 7
ISI 2005 12
Member Advantage 14
Conferences 15
Further Education 16
Branch Reports 17

Analysing Grouped Data Workshop

Veronica Rodriguez, Christine Donnelly and Ann Cowling

classes, schools, districts, regions or provinces, states or territories, and nations.

Ken stressed that the foundation of all responsible analysis and reporting of such PI data is the need to take into account their measurement, distributional and structural properties by: (1) fitting the response data to sound measurement models that meet the requirements of measurement, followed by (2) fitting multilevel explanatory models to the measured PI data. He noted that for student assessment and reporting, it is vital that such PI data be based on good measurement, consisting of well-constructed and qualitatively-described empirical scales; otherwise, we generate serious 'garbage-in/garbage-out' problems. In this context, Ken described the Rasch measurement model and warned of the dangers of aggregation bias. To illustrate, he presented some data from the 2000 OECD Programme for International Student Assessment (PISA). He used graphs to compare students' reading literacy achievement measures in several dozen countries, and to compare the performances of males and females based on a sample of 6200 15-year-old students drawn from 231 Australian schools in the 8 Australian States and territories. In conclusion, Ken answered the question "How should we analyse and report performance indicator data?" by asserting: "'Caress' the data and user beware!"

Veronica Rodriguez (ABARE) gave an interesting talk on analysing longitudinal data using state-space models. Veronica began by describing state-space models as a powerful tool for handling models that contain error correlation structure. Many statistical models for longitudinal normal data can be written in state-space form, and once that has been done it is an easy task to apply the Kalman filter so as to obtain the likelihood function. An advantage of this approach is that it makes unnecessary the inversion of large matrices and allows for observations which are not evenly spaced in time.

Veronica illustrated these ideas by applying them to longitudinal clinical data on 73 children that developed diabetes at some stage of their lives, the aim being to identify the factors that affected their growth. The factors she considered included gender, diabetes status of the mother, and the way in which diabetes was diagnosed. Veronica described two possible models for the data: one that took into account error correlation and one that did not. Ignoring the error correlation under-estimated the variance, and resulted in spurious significance of several factors. Another example involved livestock freight data from farm surveys conducted by ABARE on about 1400 Australian farms since 1989.

Daniel Elazar from the Australian Bureau of Statistics (ABS) described how the demand for small area data has grown rapidly in Australia over the last ten to fifteen years and how that has motivated the ABS to put research effort into identifying more reliable and defensible methods for producing quality small area estimates.

The Disability, Ageing and Care survey is a multi-stage clustered survey and amongst other things provides information on impairment types (e.g. physical, sensory, brain, intellectual). There is need to provide estimates of impairment type by the Statistical Sub-Division (SSD). Unfortunately not all small areas can be covered in the survey and the reliability of estimates for the rarer impairment types tends to be poor. These predictions can however be improved by adopting a model-based approach that uses auxiliary data, including unit level data such as age and sex and area level data such as the socio-economic index, remoteness index and the disability support pension.

Daniel described the models that they have applied thus far, contrasting approaches for individual impairment types with multivariate approaches which consider the disability impairment types simultaneously and can achieve additional efficiencies from their dependence. In particular, a Bernoulli generalized linear model that incorporates covariates at the small area level and at the person level and a multivariate Poisson model with small area level random effects were described. These models were estimated using hierarchical Bayesian methods (WinBUGS).

The quality of the small area predictions from these models were contrasted with a simple demographic synthetic model which adjusts the disability proportion as determined by age and sex at the broader Statistical Division level by the demographics at the SSD level. The comparisons were made using a number of diagnostic measures including the posterior variance. Models that incorporated person level information were generally found to perform better.

Daniel concluded by stressing the importance of good quality auxiliary data. He also outlined some of the future directions this work will probably take, including making the Bernoulli model truly multivariate and incorporating random effects and addressing the over-dispersion and zero-inflation of the multivariate Poisson model.

Mark Clements from the National Centre for Epidemiology and Population Health (NCEPH) discussed the task of estimating cancer maps from counts aggregated to local government areas LGAs.

The motivation was the registration of NSW cancer counts over the period from 1997 – 2001, with the primary focus throughout the talk being on cancer of the

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Analysing Grouped Data Workshop

Ray Lindsay and Gavin Melville

lung and bronchus in males. Several issues were identified that make the estimation of the cancer map more challenging. These include the fact that the local government areas are different in size (with small areas being more variable), variation greater than we would expect from standard Poisson counts (over-dispersion) and clustering effects due to spatial dependence.

A hierarchical Bayesian approach was taken. While declaring that he was not philosophically a Bayesian, Mark was quick to espouse its virtue, particularly through the flexibility and ease of use in WinBUGS.

The counts were assumed to be Poisson with a mean in each LGA equal to the expected number of counts (given population size) multiplied by the relative risk. Three different models were then discussed for the log relative risk: (i) global heterogeneity, (ii) clustered (through a conditional autoregressive model) and (iii) global heterogeneity and clustering. Mark described each model in turn, the relevant WinBUGS analysis and the ensuing cancer map. The third model with both heterogeneity and spatial clustering was found to be the best model according to the deviance information criterion.

Brian Cullis from New South Wales Department of Primary Industries in Wagga Wagga would have won the prize for the most intriguingly titled talk (if indeed we had a prize). His talk was in conjunction with Kathy Haskard and Ari Verbyla and concentrated on spatial prediction using the mixed model framework.

The talk began by briefly describing some of the heritage of mixed models and outlining some of its many forms in modern statistics. Brian then described the motivating problem as one of obtaining spatial predictions of soil salinity in large rice bays. Given soil salinity can have a major impact on rice production it is important to know where in the field growing rice is likely to be viable. Fairly exhaustive measurements of salinity throughout the field can however be obtained with electro-magnetic equipment and used as a basis for a salinity map.

In the past a geostatistical approach using 'Surfer' has been adopted for obtaining these spatial predictions. Brian discussed how such models fit naturally inside the mixed model framework and how that machinery may used to obtain predictions. The main focus of the talk was however on geometric anisotropy, which is a special case of anisotropy, and occurs when the spatial dependence changes with direction in an elliptical fashion. Brian described how we could actually embed geometric anisotropy in the Matern class of covariance functions and allow a more general covariance structure. The generalization stems from the two additional parameters that capture the rotation and stretching of the spatial process. Likelihoods can be maximized over all parameters using REML. Eight different models, 4 isotropic and 4 anisotropic, were compared for the rice data. Those models incorporating geometric anisotropy were found to offer a significant improvement.

Brian's finished with some concluding remarks that are relevant to anyone interested in spatial prediction:

(i) There is a need for geometric anisotropy, conjecturing that it is possibly the norm rather than the exception.

(ii) The Matern class is a rich and flexible class of covariance functions

(iii) Geostatistical models fit naturally in the mixed model framework, though there is still a need to improve the computational efficiency.

(iv) The choice of covariance function can significantly affect prediction

(v) The use of plug-in estimates of covariance parameters in the prediction phase appears to perform well. While more work is needed on this,it does seem to demonstrate that a fully Bayesian approach may not be required.

(vi) The standard practice of plotting empirical variograms and selecting the model can lead to severe model misspecification.

Borek Puza, Brent Henderson

Daniel Elazar, Ken Rowe, Brian Cullis, Mark Clements, Ann Cowling and Veronica Rodriguez

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Disclaimer

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Editorial

The last few months have produced some interesting traffic on ANZSTAT, the mailing list for Australian and New Zealand statisticians.

Conferences continue to feature on the postings and ISI in Sydney in April 2005 is clearly the next 'big thing'. The centre page of this newsletter is all about ISI and can be pulled out and posted on notice boards.

The Statistical Squirrel came out of hibernation to draw everyone's attention to the fact that the August 2004 issue of this newsletter contained no fewer than eight photos of our fearless President, Neville Bartlett, and that in the majority of them Neville was giving something to someone. A big thankyou to the Squirrel for highlighting this! The Statistical Society does not just take from its members, it also gives in a variety of ways.

A lecturer also enquired recently on ANZSTAT about list members' experiences of teaching statistics to students who were blind. One Society member, Penny Bennett, made a number of comments from her own experience, and she has expands on them here.

As a PhD student at the University of Adelaide, my research focus is to recommend optimal designs for comparative gene expression studies. In particular, I am exploring the notion of admissibility, introduced by my supervisors Dr Gary Glonek and Assoc Prof Patty Solomon, as an optimality criterion that maximizes the precision of biological effects of interest in the study.

Since starting my PhD last year, I have learnt a great deal about research and the challenges it presents. It is probably fair to say I have overcome a few additional challenges, finding alternative ways to carry out work as I am blind. In fact, my methods of working have changed over time as my sight has deteriorated. This is often the case for people who have retinitis pigmentosa, though everyone's sight and needs can vary.

The key resource for me is definitely my computer set up with speech screen reading software. It enables me to hear text at a fast pace, providing me access to documents, email and the vast amount of information on the internet. I use Windows and Unix and key strokes for everything rather than the mouse.

When it comes to mathematics, the story is a little more complicated. I have no immediate access to accessible mathematical articles and texts. Equations are not speech friendly as they are represented as graphics such as in pdf documents. The speech friendly medium is for me to listen to the code in latex .tex files and use my brain to interpret mathematical equations. Once I have obtained the .tex of research material , there is no stopping me!

Finally, graphs are also an important tool. I have a machine that enables graphs to become tactile by touch, raising all lines, points, braille labels on axes etc. and I find it to be very effective.

I am looking forward to developing my range of skills further in the future, enabling me to work effectively and contribute to making advances in our field.

Penny is able to read the newsletter because of the pdf files that have recently started appearing on the Society website. But you don't have to be visually impaired to find this electronic format useful!

Website of the month

Following the editorial comments in this issue, the website of the month belongs to the mailing list ANZSTAT, which is http://www.maths.uq.edu.au/~mrb/anzstat/. Here you will find the instructions on how to join, post to and leave the list, and also a method for accessing previous postings to the list.

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President's Corner

Review of Statistics in Australian Universities

The SSAI review of Statistics in Australian Universities is now underway. Terms of reference have been agreed and are included elsewhere in the Newsletter along with an invitation to members to start preparing to make a submission if they wish. Our SSAI web-site is the best place to find the details, background information and the latest timetable. A funding application to the Department of Education Science and Training (DEST) has been successful so that we now have funding from DEST, ABS, CSIRO, APRA and Roche as well as a modest amount of our own funds.

The Minister for Science, Hon. Peter McGauran, has announced an audit of science skills and this audit is expected to take place during 2005. The ARC conducted a review of the mathematical sciences in 1995 and since that time there have been sufficient changes that there is interest in carrying out another review of the mathematical sciences. Should the ARC commission such a review, SSAI will be well placed to make a worthwhile contribution based on the review of statistics.

Why hold a review?

Everyone has a view on the state of statistics in Australia and conducting a fairly comprehensive review across many organisations is a way of determining, with some authority, where we are now, how we got to this point and what the consequences will be if changes are not made. Distilling the common threads from many points of view will provide a sound basis on which to formulate ways that we can move forward.

A typical review within an organisation has a body of authority (board or head) that can accept recommendations and proceed to implement them. The SSAI review is fundamentally different in that we have no authority whatever to 'enforce' any particular recommendation that falls outside of our normal activities. This means that we must be constructive and encourage others with authority and resources to cooperatively implement new approaches. There is absolutely no role for us to be critical of others in this process. It is an opportunity for people to present their own views on where we are and what needs to be done.

A number of people have expressed the view that they are tired of reviews along with the time and effort necessarily involved. If you have prepared material for another review it should be useful for this review with the only substantial difference being that this review has a fairly broad scope. Most of the information and ideas should be still be relevant. Let us not make this process any harder than it needs to be.

SSAI Office and Web-site

For some years, SSAI has rented some office space at Covance in Canberra in a rather cramped set of offices at the Ainslie shopping centre. Covance has moved to a more spacious and modern site much closer to the centre of Canberra and SSAI has moved with them. Our telephone number is the same but the postal address has changed.

Coincidentally, SSAI has renovated its web-site and moved to a commercial server. We have been using university web sites for quite some time and are very grateful for the assistance from ANU. Special thanks go to Michael Martin for all of his assistance over the last few years. It is time for us to stand on our own feet and not rely on the generous hospitality of others. One major advantage of the new configuration is that it provides us with greater flexibility of operation in that branches and sections can now directly maintain their own section of the SSAI site quite independently of everyone else while maintaining overall integration. This will no doubt facilitate last minute changes and announcements that will inevitably arise. Email addresses have changed along with the move so change your address book entries now.

Workshops

It is great to see so many workshops/courses happening around the country and the registrations are running at very encouraging levels. Our Executive Officer is providing assistance by looking after registrations, fee collection and the issuing of receipts. This service is not free of charge but it frees organizers from having to sort out GST matters and so on. Some have complained that we are charging too much for this service but it is substantially less than that charged by some universities who are becoming more commercially oriented when providing such facilities.

ISI 2005

One of the ways that SSAI is assisting the ISI 2005 conference is by providing people to review and classify abstracts. A group of people have agreed to assist with this and their help is greatly appreciated. SSAI members will be able to take advantage of substantial discounts when registering so check out the conference web-site for details (www.tourhosts.com.au/isi2005/).

ASC/NZSA 2006

Arrangements are well in hand to stage the 2006 conference in conjunction with the NZSA in Auckland. Sky City is an excellent venue in the heart of Auckland within easy walking distance of a wide range of accommodation and shopping. We have been most impressed with the facilities and the surrounding environment. David Scott heads up the organising committee and William Dunsmuir chairs the program committee. Feel free to approach either of these two people if you have any suggestions.

Neville Bartlett
Email: neville@nrbartlett.com.au

2005 Membership Subscriptions

Invoices for 2005 Membership subscriptions will be sent to members in the near future. Please look out for your invoice and consider taking advantage of the discount that applies for early-bird payments before 31 January 2005.

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AusCan Scholar Program

A scheme to promote scientific exchanges between outstanding Australian and Canadian statistical researchers.

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

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 interact with a number of researchers in that country.

Applications are sought from Australian statisticians who wish to be considered for the position of the inaugural AusCan Scholar to visit Canada in 2005. The visit will be of 4-8 weeks' duration, one week in each of a few cities, and extendable if made in conjunction with participation in a national conference. The primary objective is to move around the country to meet people.

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 and members of the Statistical Society of Australia.

The Scholar will be required to provide a 2-page report within one month of completing the visit outlining activities carried out, key contacts made and expected follow-up collaborative activities. The report will also be published on the SSAI and SSC websites and the Scholar may be requested to make a presentation at his/her Society's national conference.

Selection of the 2005 scholar will be made by a Committee chaired by the SSAI President and a representative of the Canadian Statistical Society. The costs of this program will be shared by SSAI and SSC. Funding is available to the Scholar to cover airfares, 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

by close of business, Friday 14 January 2005.

The Scholar for 2005 will be announced by the end of February 2005 and the visit must be completed by the end of 2005.

Professional Development

Forthcoming Professional Development opportunities brought to you by the NSW Branch of SSAI

1: A series of one-day workshops designed to provide members with skills in applying SAS is being planned. These workshops will be presented by SAS, are condensed versions of the corresponding SAS Institute courses and will be offered at very competitive prices.

- Mid to late February 2005
  - SAS Programming Fundamentals
  - Introduction to Statistics using SAS
- March 2005
  - Introduction to Data Mining using SAS

2: March 30 and 31 2005 – a two-day workshop "Meta-analysis for Drug Development" presented by Prof Stephen Senn during his visit to Australia to attend ISI. Stephen is Professor of Statistics at Glasgow University and highly regarded throughout the pharmaceutical and health industries. He has published over 190 articles and authored three books, viz *Cross-over Trials in Clinical Research, Statistical Issues in Drug Development and Dicing with Death*.

Contact: Caro Badcock – Caro.Badcock@covance.com

Preliminary notice

Post ISI Workshop on Panel Survey Methods Canberra, April 14th 2005

The ACT Branch of the Society, in conjunction with the ABS and the Department of Family and Community Services, is proposing to run a half day workshop on panel survey methods in Canberra, immediately after the ISI conference. The workshop takes advantage of the presence of members of the recently finalised EU funded DACSEIS project in Sydney who are interested in travelling to Canberra post conference.

It is projected to address methods issues arising with the design and conduct of panel surveys or in large scale survey design and estimation more generally, and would be attractive for members who may not be able to attend ISI itself. Format, timing and content of the workshop to be confirmed.

Contact Stephen Horn (02 6244 1485) or Frank Yu (02 6252 5000) for further details.

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Statistical Society of Australia Inc.

The State of Statistics in Australian Universities – an SSAI-sponsored Review

Preamble

The general situation that has prompted this Review is the increasing shortfall of graduates suitably educated in Statistics to meet the needs of employers in business, industry, government and academia in Australia[1]. This has become so critical an issue for large employers such as the Australian Bureau of Statistics (ABS), CSIRO and certain commercial enterprises that the matter was taken up with the Federal Minister for Education, Science and Technology. The Minister has requested that suitable initiatives be developed in order to address the problem.

The Statistical Society of Australia, Incorporated (SSAI) believes that the problem of assuring the future supply of statisticians, and of others with appropriate statistical skills, has to be tackled by addressing:

(a) school students, so as to instil an appreciation of the fascination and relevance of Statistics in all facets of life;

(b) university students, at both undergraduate and postgraduate levels, through stimulating and relevant study programs that equip students appropriately for careers in Statistics or for careers for which a reasonable level of statistical competence is essential;

(c) students at all educational levels, and other groups as well (e.g. careers advisors, parents, and people in Statistics-based professions), with an enhanced promotion of Statistics as a career choice.

Activities are in train to address (a) and (c). This review relates to (b), and focuses primarily on those students who are majoring in Statistics.

The purpose of this review is to provide a sound basis for discussions with those who can have significant influence on the future development of university education – and thus university Statistics education – in Australia, particularly

(i) the Minister, the Department of Education, Science and Training (DEST), and Vice-Chancellors, who are in a position to develop new educational models and structures, and review the direction of current funding, and

(ii) potential industry partners who can be a source of new funding.

While the SSAI recognises that many of the issues in Statistics education being proposed for review are significantly institution-specific, the review team is requested to address them, as far as possible, from an Australia-wide perspective.

There are many parties that have a strong vested interest in the matters covered by this review. Moreover, the review team's recommendations might require major long-term commitments by these and other parties. The SSAI believes, accordingly, that the review team must have the regard and respect of all the involved parties. The members of the review team have been selected for their impeccable credentials in terms of their professional standing, judgment, experience and independence of mind.

The review team is asked to come to a view on each of the following Terms of Reference. Note that the term 'employers' is used in its broadest sense and consists of universities, business, industry, education, research and government employers.

Terms of Reference

1. Context: employer needs.

(a) What are the present and emerging employer requirements for Statistics graduates?

(b) What are the university and employer views of the numbers and quality of graduates?

(c) What are the university and employer views of the important attributes for statistical graduates? What are the important fields that need coverage for employers and universities and what gaps are there in supply?

2. Context: undergraduate studies with a view to immediate employment as a statistician.

(a) Quantify changes in the number and quality of students choosing to major, do honours and do postgraduate courses in Statistics, and document reasons.

(b) What factors would encourage or discourage students from studying Statistics?

(c) Are current undergraduate Statistics programs equipping graduates to meet the present and emerging requirements of employers for Statistics graduates? Are there any significant issues that need to be addressed?

(d) What specific influences have led to the recognition of employer requirements in undergraduate Statistics programs, and how is this recognition being realised in these programs?

3. Context: undergraduate studies with a view to postgraduate studies in Statistics.

(a) Are current undergraduate Statistics programs preparing students well for postgraduate studies in Statistics, with a view to eventual careers

(i) in business, industry or government, in positions requiring the practical application of advanced statistical skills and knowledge?

(ii) as statistical researchers in business, industry or government?

(iii) as academics?

(b) What specific influences have led to the recognition, within undergraduate Statistics programs, of career requirements in the three career

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directions mentioned, and how is this recognition being realised in these programs?

4. Context: structural and funding changes to improve the supply of Statistics graduates to the employment market.

(a) What changes, if any, to

(i) the structure of current undergraduate Statistics programs, and

(ii) the financial resourcing of these programs should be considered that would attract more students to studying Statistics with a view to making it a career?

Proposals for such changes should refer specifically to the range of current and prospective Statistics-based careers in business, industry and government as well as enhancements of the educational skills and qualifications that may be required of those providing the undergraduate Statistics teaching.

(b) How essential to the proposed structural changes to current undergraduate Statistics programs is increased funding? Indicate the extent to which these could be achieved with current funding, and what would require a funding increase of (i) 10% (ii) 50%.

5. Context: postgraduate studies in Statistics.

(a) Are current postgraduate Statistics programs preparing students well for careers

(i) in business, industry or government, for positions requiring the practical application of advanced statistical skills and knowledge?

(ii) as statistical researchers in business, industry or government?

(iii) as academics?

(b) What specific influences have led to the recognition, within postgraduate Statistics programs, of career requirements in the three career directions mentioned, and how is this recognition being realised in these programs?

6. Context: structural and funding changes to improve the supply of graduates with advanced Statistics qualifications (masters and doctorate) to the employment market.

(a) What changes, if any, to

(i) the structure of current postgraduate Statistics programs, and

(ii) the financial resourcing of these programs should be considered that would attract more students to studying Statistics with a view to making it a career?

Proposals for such changes should refer specifically to

- the range of current and prospective Statistics-based careers in business, industry, government, and academia for which an advanced Statistics qualification is indispensable.
- how to capitalise on the current high standing of Australian research in Statistics.
- enhancements of the educational skills and qualifications that may be required of those providing the postgraduate Statistics teaching.

(b) How essential to the proposed structural changes to current undergraduate Statistics programs is increased funding? Indicate the extent to which these could be achieved with current funding, and what would require a funding increase of (i) 10% (ii) 50%.

7. Context: possibility of additional funding via specific structural changes.

What are the prospects of attracting additional funding for Statistics education in Australian universities by implementing the following structural changes:

(a) increased collaboration among Statistics departments across universities?

(b) improved collaboration with Statistics-using disciplines at the same university?

(c) closer relationships with industry?

(d) introducing specialised degrees (e.g. a Bachelor of Statistical Science)?

8. Context: other relevant issues.

In the course of its work, the review team may identify other issues that it feels are germane to the purpose of the review, yet not explicitly covered in the preceding Terms of Reference. The team is invited to provide comment on such issues.

Append to the report those areas of application of Statistics in government, business and industry (*e.g.* official Statistics, pharmaceutical, …) that came under scrutiny during the course of enquiries by the review team.

9. Setting priorities for recommendations.

Recommend the most important ways forward, towards addressing the shortfall of graduates suitably educated in Statistics for meeting the needs of employers in business, industry, government and academia in Australia.

10. Reporting arrangements.

This Review will be conducted under the auspices of the Statistical Society of Australia and the Review team is to report to the SSAI Executive.

[1] It is recognised that many students taking Statistics courses in Australian universities actually intend to pursue careers overseas, generally with employers in their home countries. This Review is concerned exclusively with the needs of Australian employers.

Season's Greetings to members of SSAI and their families

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The State of Statistics in Australian Universities

INVITATION

SSAI is holding a review of Statistics in Australia and invites submissions from any interested person(s) or organisation(s). In this issue you will find background information, the Terms of Reference, the review team, a draft timetable, how to make a submission, consultation arrangements and a proposed itinerary.

Please feel free to discuss the review with anyone who you think may be interested or would have constructive suggestions. The review is open to anyone who wishes to make a submission that falls within the ambit of the Terms of Reference. Confidentiality is assured for part or all of a submission if that is requested by its author(s).

The recently revised SSAI web site (http://www.statsoc.org.au/review) will be the best place to go for background information and up-to-date details of itineraries etc.

I encourage you to consider making a submission as an individual or participating with a group in developing a submission.

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Professor Ian James
Murdoch University

Professor Smith is a leading British academic statistician, who held Chairs in Statistics at Nottingham and Imperial College before taking up his current appointment as Principal of Queen Mary. He is the author of the recent report *Making Mathematics Count*, an enquiry into Post-14 Mathematics Education in Great Britain, commissioned by the UK Government.

Professor Vere-Jones is a leading New Zealand academic and consultant. He has been one of the most prominent international figures in Statistics education for many years, and has been active in the International Association for Statistical Education since its earliest days. He has been involved in many academic reviews.

Professor Ian James is a leading Australian academic with research interests in statistical methodology, medical Statistics and biostatistics. He is a Past-President of the SSAI, and a past editor of the *Australian Journal of Statistics*, and was awarded Honorary Life Membership of the SSAI in recognition of his academic and professional contributions to advancing the discipline of Statistics.

Draft Timetable

Call for submissions:
5th November 2004

Deadline for submissions*:
14th January 2005

Visit by Review Team:
14th – 25th February 2005

Draft report sent to SSAI:
15th April 2005

SSAI response sent to Review Team:
17th June 2005

Final report sent to SSAI:
29th July 2005

* Please endeavour to make your submission by 14th January 2005 so that it can be sent to the Review Team ***before*** they visit.

SSAI's Canberra office has moved – The new postal address is: PO Box 111, Braddon ACT 2612
The telephone remains the same (02) 6249 8266 – Our new Fax (02) 6249 6558

How to make a submission

You are invited to make a submission in relation to the Terms of Reference. Please send your submission by email to review@statsoc.org.au or to admin@statsoc.org.au with a message line that reads "Submission to SSAI Review of Statistics". If you wish your submission not to appear in the Appendix to the report, please mark the submission itself "Confidential" on the front page.

Consultation Arrangements

Invitations to respond to the **Terms of Reference** will be issued in a variety of ways, including

- Announcement in *SSAI Newsletter*
- Publication on the SSAI Web site (http://www.statsoc.org.au/review)
- Announcement posted on anzstat list-server
- Direct mail to major employers
- Direct mail to university groups.

Major employers and senior academics will have the opportunity to talk to the Review Team. Ideally, this will be through face-to-face discussion but realistically it will not be possible for the team to visit all locations. SSAI State Branches will most likely make local arrangements for visits by the Review Team (including arranging a venue to work and scheduling interviews). It is hoped that the Review Team will be able to visit all six SSAI Branches.

An executive officer will be appointed to assist with the conduct of the review.

A steering group has been appointed to oversee the conduct of the review and this group will work closely with the Review team by resolving issues regarding the Terms of Reference and other matters that arise. This group is chaired by Tim Brown and the other members are William Dunsmuir, Jan Thomas (AMSI and AustMS), Adrian Baddeley, Eric Sowey, Murray Cameron, Leonie Doyle/Jennifer Forest (DEST) and Neville Bartlett.

Provisional itinerary

The Review team will visit Canberra, Sydney, Brisbane, Melbourne, Adelaide and Perth.
The visit is constrained by Professor Smith's teaching commitments and the following schedule is proposed:

Date	Location
Sunday 13th February	Canberra (preliminary discussions)
Monday 14th February	Canberra
Tuesday 15th February	Canberra, fly to Sydney late afternoon
Wednesday 16th February	Sydney
Thursday 17th February	Sydney, fly to Brisbane late afternoon
Friday 18th February	Brisbane
Saturday 19th February	Free/fly to Melbourne
Sunday 20th February	Free
Monday 21st February	Melbourne
Tuesday 22nd February	Melbourne, fly to Adelaide in evening
Wednesday 23rd February	Adelaide
Thursday 24th February	Adelaide, fly to Perth during afternoon
Friday 25th February	Perth

Notes:

- The general *modus operandi* envisaged for each day is that the Review Team will hold discussions with people according to a schedule developed by the review executive officer in conjunction with the relevant SSAI Branch.
- It is expected that discussions would be held in small groups, if possible, given the likely pressure on time.

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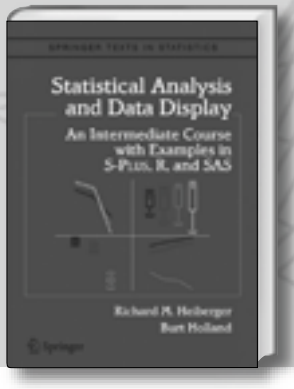
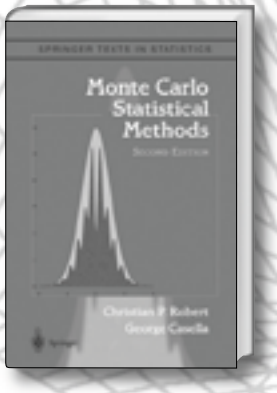
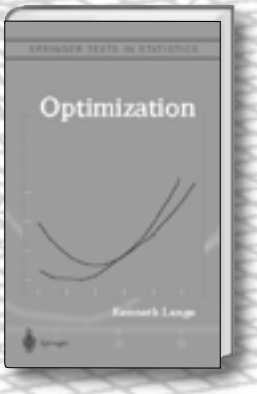
Springer for ***Statistics***







R. M. Heiberger, B. Holland

Statistical Analysis and Data Display

An Intermediate Course with examples in S-PLUS, R, and SAS

This contemporary presentation of statistical methods features extensive use of graphical displays for exploring data and for displaying the analysis. The authors demonstrate how to construct and interpret graphs, discuss principles of graphical design, and show how accompanying traditional tabular results are used to confirm the visual impressions derived directly from the graphs. Many of the graphical formats are novel and appear here for the first time in print.
The authors provide and discuss S-Plus, R, and SAS executable functions and macros for all new graphical display formats. All graphs and tabular output in the book were constructed using these programs. Complete transcripts for all examples and figures are provided for readers to use as models for their own analyses.

2004. XXIV, 760 p. Hardcover **€ 79.95**; sFr 135.50; £ 61.50
ISBN 0-387-40270-5

C. P. Robert, G. Casella

Monte Carlo Statistical Methods

Monte Carlo Statistical Methods is a very popular book published in 1999 with new advances covered in the second edition. This new edition has been revised towards a coherent and flowing coverage of simulation techniques, with incorporation of the most recent developments in the field. In particular, the introductory coverage of random variable generation has been totally revised, with many concepts being unified through a fundamental theorem of simulation.

2nd ed. 2004. XXX, 645 p. 132 illus. Hardcover **€ 89.95**; sFr 152.50; £ 69.00 ISBN 0-387-21239-6

R. Y. Rubinstein, D. P. Kroese

The Cross Entropy Method

A Unified Approach to Combinatorial Optimization, Monte-Carlo Simulation and Machine Learning

This book provides a comprehensive and accessible introduction to the cross-entropy (CE) method.
It based on an advanced undergraduate course on the CE method, given at the Israel Institute of Technology (Technion) for the last three years.
The book is aimed at a broad audience of engineers, computer scientists, mathematicians, statisticians and in general anyone, theorist or practitioner, who is interested in fast simulation, including rare-event probability estimation, efficient combinatorial and continuous multi-extremal optimization, and machine learning algorithms.

2004. Approx. 320 p. Hardcover **€ 89.95**; sFr 152.50; £ 69.00 ISBN 0-387-21240-X

K. Lange

Optimization

This introduction to optimization attempts to strike a balance between presentation of mathematical theory and development of numerical algorithms. The content of courses on optimization theory varies tremendously. This book views linear programming as a special case of nonlinear programming. The real bridge between linear and nonlinear programming is convexity. The theoretical side and applications of convexity in the design of algorithms for problems with either a large number of parameters or linear restraints are addressed in this book.

2004. XIII, 252 p. Hardcover **€ 79.95**; sFr 135.50; £ 61.50
ISBN 0-387-20332-X

Edited by P. D. Boeck, M. Wilson

Explanatory Item Response Models

A Generalized Linear and Nonlinear Approach

This edited volume gives a new and integrated introduction to item response models (predominantly used in measurement applications in psychology, education, and other social science areas) from the viewpoint of the statistical theory of generalized linear and nonlinear mixed models. The new framework allows the domain of item response models to be co-ordinated and broadened to emphasize their explanatory uses beyond their standard descriptive uses.
The basic explanatory principle is that item responses can be modeled as a function of predictors of various kinds. For all major examples, computer commands from the SAS package are provided that can be used to estimate the results for each model. In addition, sample commands are provided for other major computer packages.

2004. XXII, 382 p. 50 illus. Hardcover **€ 69.95**; sFr 123.50; £ 54.00 ISBN 0-387-40275-6

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ISI 2005
Sydney, Australia
5-12 April 2005
Discounted Registration for SSAI members

Registration is now open for the 55th Session of the International Statistical Institute (ISI), which will be held in Sydney, Australia 5-12 April 2005.

In recognition of the contribution the SSAI is making to the 2005 ISI Session, the ISI National Organising Committee is pleased to announce that members of the Statistical Society of Australia (SSAI) can register at the ISI member rate of $650 (before 31 January 2005) or $730 (after 31 January 2005).

This is a great opportunity for SSAI Members to attend an ISI Session on home soil and take advantage of this cost effective and enjoyable way to stay in touch with the latest statistical developments.

If you are intending to participate, it is highly recommended that you register now to take advantage of the early bird registration fee. To register please visit the Session website www.tourhosts.com.au/isi2005 and complete the online form. Even if you are undecided as to whether to attend or not you should register your interest to ensure you are kept informed about the Session developments.

Scientific Program

The Scientific Program for the ISI Session will feature leading keynote speakers from around the world and more than 100 scientific Sessions.

Key note speakers will include: Robert M May, FRS, Oxford University, Clive Granger, Nobel Laureate and Glenn Stevens, the Deputy Governor of the Australian Reserve Bank.

A number of interesting papers have already been submitted to the website. The website will be open for the submission of Contributed Papers until 6th December 2004.

Geoff Lee, Local Program Committee Chair and Head of ABS's Methodology Division said ''… the Invited Program was shaping up really well". "The opportunity to attend a Session of the ISI in Australia is a once in a lifetime opportunity, and I hope all SSAI members will take advantage of it" he said. "I'm looking forward to seeing a strong contingent of Australians presenting papers and attending ISI in April next year."

Members of the SSAI will be assisting the ISI 2005 Local Program Committee to review the papers for the Session to ensure the Session is a success.

The Scientific Program will be supplemented with tutorials and short courses. Special theme days will cater for those with interests in finance and statistics, environmental statistics and genomics.

Details on the Scientific Program, including the list of Invited and Contributed Paper Meetings, are listed on the 2005 ISI website at www.tourhosts.com.au/isi2005.

Key Dates

Before 6 December 2004 – Deadline for Authors of invited and contributed papers to submit the final manuscripts. Registration deadline for all authors, organisers and discussants

Before 31 January 2005 – Early Registration fee cut off

After 31 January 2005 – Late Registration fee applies

4 March 2005 – Speakers to email their presentations to the Conference Managers.

4 April 2005 – Registration for the Session commences

5 April 2005 – Session opens

12 April 2005 – Session closes

For paper submission and Scientific Program schedules see the website www.tourhosts.com.au/isi2005 for more details.

Satellite Meetings

A number of satellite meetings will be held before or after the 2005 ISI Session. A list of the satellite meetings are listed below

31 March – 2 April 2005: Issues for Official Statistics for Small Countries (especially island nations) Noumea, New Caledonia (www.stat.fi/iaos/future_activities.html)

29 March – 1 April 2005: 14th International Workshop on Matrices and Statistics, Auckland, New Zealand (http://iwms2005.massey.ac.nz)

4- 5 April 2005: Statistics Education and the Communication of Statistics, Sydney, Australia (http://www.stat.auckland.ac.nz/~iase/conferences.php?show=iase2005)

13 - 16 April 2005: Fourth International Symposium on Business and Industry Finance, Near Cairns, Queensland, Australia (www.action-m.com/isbis4)

14 – 15 April 2005: Measuring Small Populations, Wellington, New Zealand, (www.stats.govt.nz/ISIsatellitemeeting)

General Schedule

	Morning	Early Afternoon	Late Afternoon	Evening
Monday 4 April	Short Courses	Registration Short Courses	Registration Short Courses	
Tuesday 5 April	Registration	Registration	Opening Ceremony	Welcome Reception
	Short Courses	Short Courses	Short Courses	
Wednesday 6 April	Scientific Meetings	Scientific Meetings	Scientific Meetings	Optional Social Event
Thursday 7 April	Scientific Meetings	Scientific Meetings	Presidents IPM Meeting	Australiana Night
Friday 8 April	Scientific Meetings	Scientific Meetings	Scientific Meetings	Optional Social Event
Saturday 9 April	Scientific Meetings	Excursions	Excursions	Optional Social Event
Sunday 10 April	Excursions	Excursions	Excursions	Optional Social Event
Monday 11 April	Scientific Meetings	Scientific Meetings	ISI General Assembly	Farewell Party (optional)
Tuesday 12 April	Scientific Meetings	Scientific Meetings	Scientific Meetings	

Social Program

The Social Program will be a highlight of the Session and has been designed to provide participants with an opportunity to relax and maximise networking opportunities.

The following events are included in the registration fee for delegates and accompanying persons:

Tuesday 5 April 2005 Opening Ceremony "Centenary Celebration – from Dreamtime to the Future

Tuesday 5 April 2005 Welcome Reception "Faces of Australia"

Thursday 7 April 2005 Australiana Evening – "The Way of Life Down Under"

The following **optional events*** will be offered to delegates and accompanying persons.

Wednesday 6 April 2005 Discover the Historic Pubs of the Rocks

Friday 8 or Saturday 9 April 2005 A night at the Sydney Opera House

Sunday 10 April 2005 Australian Wildlife by Night

Monday 11 April 2005 Farewell Party "A Floating Affair"

* Optional events are not included in the registration fee.

See the website www.tourhosts.com.au/isi2005 or Bulletin II for more details.

NEWS FLASH
See the ISI 2005 website for the latest Session information.
www.tourhosts.com.au/isi2005

Register TODAY!!

If you are interested in participating in the 2005 ISI Session please complete the online registration form at www.tourhosts.com.au/isi2005 or return the Registration Form in Bulletin II to the Conference Managers. Even if you are undecided about attending you should register your interest to ensure you are kept informed about the Session developments.

Contact Details

ISI 2005 Conference Managers
GPO Box 128
SYDNEY NSW 2001
Telephone: +61 02 9248 0800
Fax: +61 2 9248 0800
Email: isi2005@tourhosts.com.au
Website: www.tourhosts.com.au/isi2005

Have you seen Information Bulletin II? Information Bulletin II provides the latest details on the arrangements for the 2005 ISI Session and the final registration form. A copy is available on the ISI Website www.tourhosts.com.au/isi2005. If you would prefer a hard copy email isi2005@tourhosts.com.au and a copy will be sent to you.

Left to right: Felicity Kent, Conference Manager, Tour Hosts, Pippa McCreery, Tour Hosts and Geoff Lee, Methodology Division ABS and Chair of the 2005 ISI Local Program Committee at a recent Organising Committee Meeting which was held at ABS House, Canberra.

DISCOUNTED HEALTH COVER PREMIUMS FOR SSAI MEMBERS

Protecting your health is a necessary part of life regardless of your age. An active lifestyle, a salary increase or changing family circumstances are just some of the reasons why you may suddenly need to evaluate your health insurance needs.

As an SSAI member, you receive up to 5% off private health cover premiums with one of Australia's largest private health funds, the Hospital Contribution Fund of Australia (HCF). Other HCF benefits include:

- Immediate cover with the waiver of the normal two and six month waiting periods*
- 100% accommodation for obstetrics services (i.e. pregnancy and birth related services) in all HCF participating private hospitals (nightly excess may apply)
- All hospital products with 100% ambulance cover Australia wide
- All excess waived for day surgery with no overnight stay and for accidents**
- Family policies that covers dependent children up to 22 years of age

Call SSAI Member Advantage on 1300 853 352 to discuss your health insurance options or visit our website www.member-advantage.com/ssai for further details.

*Hospital and Extras cover must be taken. Does not cover pre-existing conditions, obstetrics, orthodontics and some other services. A 12 month waiting period applies to these for both Hospital and Extras services irrespective of any waiver. 2 year waiting period applies to hearing aids. Some conditions apply. **HCF will waiver the excess for all same day procedures; or for hospital treatments which are the result of an accident and given within 12 months of the accident.

NEW MEMBER BENEFIT! Europcar joins SSAI Member Advantage

Member Advantage is delighted to announce a new car rental service for SSAI members. Europcar replaces the previous arrangement with Hertz and will deliver real savings to members on car rental.
New benefits include:

- Corporate rates in Australia and NZ
- Best rate of the day for US and Europe rentals
- Full range of new and current model vehicles including Passenger, Commercial, 4WD and Prestige
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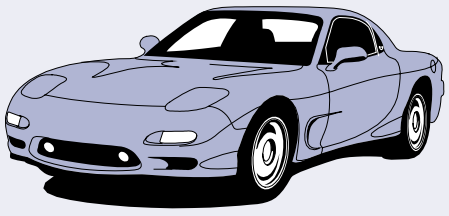

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Australasian Conferences

Bioinformatics Summer Symposium: Genome to Phenome Modelling
6 – 10 December 2004. ANU, Canberra.
http://www.maths.anu.edu.au/events/BioInfoSummer04/
Thredbo Statistical Meeting
6 – 11 February 2005. Thredbo Village, NSW. Australasian Region of the International Biometric Society and Australasian GenStat Users Association Inc.
http://www.maths.anu.edu.au/thredbo2005/
Statistics Education and the Communication of Statistics. IASE Satellite meeting
4 – 5 April 2005. Sydney. Email: bphillips@swin.edu.au
http://www.stat.auckland.ac.nz/~iase/conferences.php?show=iase2005.
55th Session of the International Statistical Institute
5 – 12 April 2005. Sydney Convention and Exhibition Centre.
http://www.tourhosts.com.au/isi2005/ Email: isi2005@tourhosts.com.au
Fourth International Conference on Statistics in Business and Industry (ISBIS-4)
13 – 16 April 2005. Cairns. ISBIS-4 is a satellite meeting to the ISI Session in Sydney.
http://www.action-m.com/isbis4

Overseas Conferences

International Sri Lankan Statistical Conference: "Visions of Futuristic Statistical Methodologies"
28 – 30 December 2004 — Kandy, Sri Lanka.
http://www.st.rmit.edu.au/~desilva/conference/slstat.htm

Issues for Official Statistics for small countries (especially island nations) IAOS Satellite meeting
31 March – 2 April 2005. Noumea, New Caledonia. www.tourhosts.com.au/isi2005
Complex Sampling, Retrospective Sampling and Missing Data (to mark the retirement of Alastair Scott). IASS Satellite meeting.
13 – 14 April 2005. Maritime Museum, Auckland.
http://www.stat.auckland.ac.nz/iass55/ Email: c.wild@auckland.ac.nz

Measuring Small and Indigenous Populations IAOS Satellite meeting
14 – 15 April 2005. Te Papa Tongarewa/Museum, Wellington
http://www.stats.govt.nz/ISIsatellitemeeting Email: ISIsatellite@stats.govt.nz

Competition

This month's competition is inspired by the following Christmas cheer from the Australian Bureau of Statistics.

- 31 Australians have died since 1996 by watering their Christmas tree while the fairy lights were plugged in.
- 319 Australians have died in the last 3 years by eating Christmas decorations they believed were chocolate.
- 3 hospitals reported 4 broken arms last year after cracker pulling incidents.
- 3101 Australians since 1997 have had to have broken parts of plastic toys pulled out of the soles of their feet.
- 318 Australians had serious burns in 1998 trying on a new jumper with a lit cigarette in their mouth.
- A massive 543 Australians were admitted to casualty in the last two years after opening bottles of beer with their teeth or eye socket.
- 35 Australians were injured last year in accidents involving out of control scalextric cars.
- 33 Australians die each year testing if a 9V battery works on their tongue.
- 3142 Australians were injured in 1998 by not removing all the pins from new shirts.
- 358 Australians are injured each year by using sharp knives instead of screwdrivers.

and finally

- 38 Australians cracked their skull in 1997 after falling asleep (passing out) while throwing up into the toilet.

The competition consists simply of adding to this list. If you know any statistics that reflect the approaching silly season, please forward them to the Editors by 10 January 2005. Merry Christmas and a happy New Year!

Society Secretaries

Central Council
President: Mr N. Bartlett
Secretary: Dr D. Shaw
Email: doug.shaw@csiro.au

New South Wales
President: Mr Alun Pope
Secretary: Dr Neville Weber
Email: neville@maths.usyd.edu.au

Canberra
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Further contact details for Society Secretaries and Section Chairs can be obtained by contacting the Society on (02) 6249 8266

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Looking for a job?

For a listing of current statistical vacancies in Australia and New Zealand visit:

http://www.statsci.org/jobs

Over 35 positions already listed in July 2004.

Do you have a position to advertise on the website?

Email a job description to mritchie@wehi.edu.au. Listing is free!

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Further Education

SHORT COURSES IN RESEARCH METHODS

2005 ACSPRI Summer Program

Australian National University, 18-29 January 2005

The Australian Consortium for Social and Political Research Inc. was formed in 1976 as a national organisation of member institutions to enhance the use of machine-readable data. In support of its objectives, ACSPRI offers courses in social research methods and research technologies designed to serve a wide variety of needs for training and professional development within the academic, public and private sectors.

ACSPRI (5-day) Courses

Week 1: 18-22 January 2005 (Tues-Sat)	**Week 2: 25-29 January 2005 (Tues-Sat)**
Introduction to Qualitative Research	Data Analysis in *SPSS*
Introduction to Statistics	Data Analysis in *SAS*
Introduction to *NVivo*: computer-assisted qualitative data analysis	Qualitative Group and Participatory Techniques for Research and Evaluation
Fundamentals of Multiple Regression	Qualitative Data Analysis
Factor Analysis	Applied Multiple Regression Analysis (*lap-top based course*)
Time Series Modelling	Forecasting
Introduction to Structural Equation Modelling (*AMOS*)	Data Analysis using *Stata*
Introduction to Structural Equation Modelling (*LISREL*)	Applied Structural Equation Modelling
Measurement in the Pyschosocial Sciences	Practical Multilevel Analysis with *MLwiN* and *LISREL*

ACSPRI Programs have earned a high reputation for presenting a practical and applied approach to research methods and data analysis, promoting hands-on learing opportunities, and using highly skilled and experienced instructors.

Course Fees (GST inclusive:)

ACSPRI Member: $1200* (early-bird fee: $1100) Non-member: $1650 (early-bird fee: $1550)

*Full-time postgraduate students studying at ACSPRI member institutions may be eligible for a substantial early-bird discount (all early-bird course fees must be paid in full on or by closing date of **10 December 2004**). See the ACSPRI website link for further details on the Summer Program 2005 and course fees structure, at http://acspri.anu.edu/courses/summer .

Further information, Course Application Forms and On-Line Bookings

ACSPRI – Tel: **02 6125 2200** Fax: **02 6125 4722** Website: **http://acspri.anu.edu.au** Email: **acspri.anu.edu.au**

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WESTERN AUSTRALIA

March Meeting

Associate Professor Matthew Knuiman from the School of Population Health, University of Western Australia delivered the March 2004 seminar at the WA Branch of the SSAI. His talk was titled 'Biostatistical Methods in Practice: Examples from the Busselton Health Study' and he acknowledged his coworkers Mark Divitini and Helen Bartholemew. Matthew began with a brief overview of the Busselton Health Study; Busselton is a coastal area that is situated south of Bunbury in the South West of Western Australia. The study began in 1966 with 5 founding investigators one of whom was Dr. Kevin Cullen who was a resident GP in the Busselton area. The Cullen children are well known both for their exploits in medicine and wine making. Currently Dr. Digby Cullen is one of the eleven board members of the BHS in 2004. Matthew Knuiman is the current Chair of the Research Committee of the BHS.

The survey itself involved a questionnaire on demography, lifestyle, general health history, gynaecological variables (women), plus taking physical measurements and some blood sample analyses. Importantly sera in six cross-sectional surveys of adults 1966-1981 (approximately 3,000 people per survey were taken and stored (approx minus 20C) and a 1992 survey of family asthma involving sera for 230 families were kept. A 1994-95 followup study involved collection of DNA material for about 4,500 people.

Matthew discussed various aspects of the statistical analysis and why it is important and in fact efficacious to investigate such things as risk factors for cardiovascular diseases using the available survey information. He talked about estimation using Cox regression and sampling risk sets. He noted using 'risk subsets', when collecting risk factor data are expensive (or time consuming), will save lots of money (or time). Recently discovered or initially unmeasured risk factors were measured in 2001 from frozen sera. This led to issues to do with validity of serological measures such as 'are they still reliable after 20 years of storage'.

In a separate line of study followed a discussion of familial correlations and modeling using an application of Fisher software. Measures of lung function such as FEV1=forced expiratory volume in 1 second (exhaled volume in 1st second)=measure of breathing capacity and FVC=forced vital capacity=(total exhaled volume) give the ratio FEV1/FVC as a measure of airway narrowing. Gender, age, height and smoking are known to be key determinants of lung function. A total of 2,617 husband-wife pairs attended at least one survey together since 1969. Conclusions included that a substantial proportion of adult lung function is genetically determined (heritability 40%, SD 300-350ml). Also there appeared to be little or no sharing of genetic factors between lung function and asthma (genetically distinct?).

Brenton Clarke

April Meeting

Statistical Genetics in the Land of Opportunity

The results of a survey of Australian statisticians would probably not portray this country as the land of opportunity. Rather, there would likely be comments on the number of leading Australian statisticians who have taken up positions overseas and perhaps some references to unfilled chairs of statistics at our universities. It was therefore refreshing to attend the April meeting of the WA Branch, at which Professor Lyle Palmer (Foundation Professor of Genetic Epidemiology at the University of Western Australia) suggested that for statisticians working in genetic epidemiology, Australia may be just the place to be.

Professor Palmer's talk was entitled "Gene Discovery in Complex Human Diseases: From Positional Cloning to Populations". He began by describing how advances in technology over recent years have led to a rapid increase in the speed with which genetic samples can be analyzed in the laboratory, but that our knowledge about genetic epidemiology (as measured by publications in the field) is increasing at a far slower rate. In particular, the early optimism that the genomics revolution would result in a swift cure for just about every disease has proved unwarranted. A major problem is that for complex diseases, such as cancer and asthma, multiple genes may combine to give a modest (though nonetheless important) effect. Very large population-based data sets are required to detect such effects, a fact that has recently led to international efforts to establish large databases incorporating genetic information. For instance, Biobank is a new UK database for which 500,000 individuals in the age range 45-64 years have been recruited.

Professor Palmer opined that in terms of the availability of large datasets for use in genetic epidemiology, Western Australia has much to offer. The advantages enjoyed by WA include excellent existing data resources (such as the Bussleton Health survey, which was the subject of the March talk to the WA Branch), and strong pre-clinical and public health university departments. Furthermore, linkage of multiple medical databases is already well underway in WA, which when completed will provide an outstanding information source. It follows that there is the considerable potential for world class genetic epidemiology in Western Australia, with consequent opportunities for statisticians and bioinformatics researchers. These opportunities range from the application of existing techniques to the development of new statistical methodology.

The audience thanked Professor Palmer for his talk in the traditional manner, after which 16 of them (a virtually unprecedented number) joined the speaker at a local Vietnamese restaurant.

Martin Hazelton

May Meeting

In the May meeting of the SSAIWA Mark Palmer, an experienced applied statistician of more than 32 years at CSIRO in Western Australia, spoke on "A Bayesian statistical model for end member analysis of sediment geochemistry, incorporating spacial dependencies". What do frog noises, sands at different locations on a beach, remote sensing, geology, air pollution studies, and acoustics have in common? These illustrations included examples of the sound plus visual illustration of signals from a frog habitat which contained more than one kind of frog, and jars of different types of sand from different ends of a beach, e.g. one containing ilmenite, which is black in colour, another containing creamy sand formed from limestone/calcium carbonate/shells and a third a mixture of the two components, were examples that motivated the "end member" problem.

The basic model is that the observed data are a linear combination of the "pure" sources, i.e. $y = AP$ where A here corresponds to the matrix of endmember values, each column corresponding to a "pure" source, and p are the proportions of each end member in the sample (unknown in this case).

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In most vertebrates that have what humans term "colour vision", there appears to be three classes of cones based on their absorption spectra. We compute the total response by summing up the product of the "incoming light intensity" and the "frequency response" at each frequency. Or, we could write this in terms of the sums of the response of each of the three cones, i.e. an end member model. It was noted that artificial sensors in remote sensing, which generalize this model, also detect light outside wavelengths observed by humans. The basic statistical model becomes $y = Ap + \varepsilon$, where ε denotes associated variability. Analyses involved using the EM algorithm and likelihood were discussed and noted that they do not necessarily work well.

However, commonly we do have "some" information about the actual endmembers themselves; e.g., catchment soils, prior sampling, so it was suggested to take a Bayesian approach using MCMC to estimate the parameters. Mark, along with coworker Grant Douglas, further developed a spatial model for the compositions, not the actual measurements from an approach of Wikle et al (2001) and applied this to sediments in the North Pine Dam in South Eastern Queensland. The application also has also been translated to Moreton Bay, Lake Wivenhoe Dam, Fitzroy River, and Somerset Dam.

Wikle, C.K., Millif, R.F., Nychka, D. and Berliner, L.M. (2001) Spatio-temporal hierarchical Bayesian modelling: tropical ocean surface winds. *Journal of the American Statistical Association*, 96, 382-397

Brenton Clarke

SOUTH AUSTRALIA

Overdispersion: Compounds, Mixtures and Random Effects

During the July meeting, speaker John Hinde from the Department of Mathematics at The National University of Ireland, Galway, discussed some of the issues relating to overdispersion. This is a common problem when standard generalized linear models are applied and is characterised by greater variability in the data than is predicted by the mean-variance relationship indicated by the chosen model. A number of causes of overdispersion were considered, including correlation between individual responses, cluster sampling and the use of aggregate level data, rather than original count data. Consequences of overdispersion, such as underestimation of standard errors and selection of overly complex models, were also discussed.

The focus of the talk was overdispersion in the context of modelling count data and a number of examples were used to illustrate key ideas, which could also be extended to modelling counted proportions. Compounding through random sums of random variables was described using data on worldwide airline fatalities between 1976 and 1985, where the number of deaths is compounded with aircraft size. Random effects and the impact of different distributional assumptions were discussed in detail. An unknown mixing distribution can be used for random effects and non-parametric maximum likelihood estimation can then be used to estimate the distribution function. The talk concluded with a lively discussion about underdispersion and how the theory and techniques discussed could be applied in this situation.

Lisa Yelland

NEW SOUTH WALES

Haemopoietic stem cell transplant data collection, reporting and analysis in NSW

The July meeting of the NSW branch of the SSAI was held at the University of Sydney on Tuesday 27 July 2004. Our invited speaker Mr Ian Nivison-Smith from the Australasian Bone Marrow Transplant Recipient Registry gave us an insight into his background research in bone marrow transplants. Bone marrow transplants are life-saving procedures, which have been carried out in Australia since the late 1970's to cure patients with leukaemia and other life-threatening diseases. Ian described how patients can be infused with blood-forming stem cells from a compatible family member or unrelated volunteer (allogeneic), or from their own marrow harvested at a time when it is disease-free (autologous).

During the talk Ian pointed out that bone marrow is the site for haemopoietic or blood-forming stem cells. Haemopoietic stem cells produce red blood cells, white blood cells and cells involved with the immune system. Ian went further to talk about the diseases of the blood and marrow. Other main topics that Ian covered during his presentation included:

- What is a stem cell transplant?
- Adverse event and complications post transplant.
- Wonder drugs.

Ian's presentation pointed out that data on transplant activity in Australia & New Zealand is recorded and analysed by the Australasian Bone Marrow Transplant Recipient Registry (ABMTRR) sited at St Vincent's Hospital Sydney. Ian mentioned that more than 40 hospitals in the two countries communicate summary data on activity and outcome to the Registry. Ian emphasised that the ABMTRR is an important national resource and has recently received significant funding from the NSW government. Ian outlined that data is collected by data collectors, data managers, clinical trials coordinators and transplant coordinators. The sources include medical records, pathology records, BMT scientist calculations, minutes from meetings, clinical notes and letters to and from referring doctors.

The presentation continued to describe the set-up and administration of the ABMTRR, focusing on the strong currents of co-operation that have been developed with transplant centres, and the resulting high response rate. Ian concluded by thanking all the participating centres and supporters and summarised the following main important points:

- Allogeneic and autologous stem cell transplants offer a cure for life-threatening diseases of the marrow and immune system.
- The ABMTRR provides a multi-user data resource for transplant centres in NSW and across Australia and New Zealand.
- Comprehensive data collection enables regular and responsible reporting and quality retrospective research.

Dr Frederick Osman

Adaptive Sampling for Bayesian Variable Selection

The August meeting of the NSW Branch of the SSAI was held in the pleasant surroundings of the Australian Bureau of Statistics which is located in the heart of Sydney's central business district. The evening's presentation was given by Dr. David Nott, currently senior lecturer at the University of New South Wales. David completed his Ph.D. at the University of Queensland and his research interests include Bayesian inference and computation, and the analysis of gene expression data.

David's presentation focused on adaptive Markov chain Monte Carlo (MCMC) schemes in the setting of Bayesian variable selection in Gaussian

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linear regression models. One of the major current research goals in Bayesian statistics is the development of sampling schemes that are both highly efficient in terms of the degree of computation per usable simulated realisation, and fully automated, in that the sampling scheme adapts itself to both the model and data specified by the user, without the need for manual intervention in sampler specifications. From this perspective, Davids presentation represents the leading edge of research in this field.

David described the main ideas behind Bayesian inference, variable selection and MCMC sampling schemes, and explained why the latter could be inefficient in the variable selection setting. He then outlined a modification to the standard Metropolis-Hastings scheme that permits an adaption in the specifications of the sampler during run-time, based on the past history of the generated Markov chain, and gave conditions for the validity of such schemes. David developed a conditional prior as a proposal distribution that performs very well when the high posterior probability models containing relatively few or most of the predictors under consideration, and then used adaptive simulation ideas to generate a proposal that is both fast to simulate from and where computational effort is focused on variables where there is some doubt about their inclusion in a good model.

The proposal is based upon a best linear predictor and approximates the Gibbs sampler (and therefore the full conditional distribution), although it is computationally superior. The advantage of adopting a best linear predictor proposal is that it may be useful quite generally in many settings where coefficients may not be analytically integrated out. David then compared the developed method with a number of existing approaches to this problem via simulation studies and through an example of non-parametric regression.

Overall this was a very interesting and informative presentation, and the evening and conversation continued with a pleasant meal at a nearby Greek restaurant.

Scott Sisson

Revealing the riddle of REML

The September meeting of the NSW Branch was held at Sydney University and we were lucky enough to have Mick O'Neil, Associate Professor in Biometry at Sydney University, enlighten us all on the topic of Restricted Maximum Likelihood (REML). His talk was loosely based around a third year course he teaches at Sydney University and was an excellent mix of theory along with real world applications in agriculture.

Mick began by explaining the difference between standard Maximum Likelihood (ML) and REML methods. The purpose of these methods is parameter estimation, and they are beginning to supplant least squares as the standard technique. The core of both techniques is the likelihood function, which is the joint probability function of the observed sample i.e. it can be used to evaluate the probability of the observed sample conditional on a specific distribution. Both methods estimate parameters by selecting values that maximise the likelihood.

The difference is whether the likelihood is maximized by allowing all parameters to vary, or one at a time. ML maximizes the likelihood by optimizing all parameters simultaneously. REML on the other hand maximizes the likelihood for each parameter individually. The upshot of all this is that REML produces unbiased variance estimates, while ML does not.

The real advantage of REML is that it's an accurate estimator for unbalanced designs, while least squares isn't. This has meant that Linear Mixed Models, which can make use of REML, have become the tool of choice for many agricultural researchers at the expense of ANOVA models, that traditionally use least squares methods. The software package Mick uses to calculate his REML estimates is GenStat, which focuses on the use of REML. Although developed for agricultural researchers he assures us it can just as easily be used by others! GenStat can fit quite complex models using REML including those that include spatial covariance.

Another aspect of Micks' talk I found enlightening was his use of EXCEL. Now although there is some… resistance to all things Microsoft I found Mick's use of EXCEL to calculate REML estimates particularly interesting. Like it or loathe it the capacity to solve complex estimation problems using the ubiquitous EXCEL is quite useful. Mick showed us how to do this for REML by first using inbuilt EXCEL probability distribution functions to calculate the likelihood. Then an "add-in" called Solver was used to maximize the likelihood by changing the parameters of interest.

Chris Howden

QUEENSLAND

February Meeting

Adjunct Professor Malcolm Faddy addressed the February meeting. His talk was titled "Modelling and Analysis of Discrete Data". Professor Faddy graduated B.Sc. with honours in Mathematics 1967, and D.Phil. in Mathematical Statistics 1971; lecturer, University of Birmingham, UK, 1970-1987; Senior Lecturer, University of Otago, NZ, 1987-1991; Senior Lecturer then Reader, University of Queensland 1991-1998; Professor, University of Canterbury, NZ, 1998-2000; Professor, University of Birmingham, UK, 2001-2003; retired 2003, and currently part-time Adjunct Professor, Queensland University of Technology 2003-2006.

Malcolm discussed models based on the standard binomial and Poisson discrete distributions. Distributions admitting over- and under-dispersion relative to these standard distributions were constructed, using ideas such as zero-inflation, mixed distributions, random effects, and generalized Poisson processes. The resulting distributions were illustrated with reference to a number of data-sets from the literature, where re-analyses highlighted some deficiencies in the original analyses.

March Meeting and AGM

Before the talk, voting for Branch Council positions was completed. The following people were elected to Council at the Annual General Meeting of the Branch held on Tuesday, 2 March, 2004.

PRESIDENT: Dr Bronwyn Harch (Bronwyn.Harch@csiro.au)

SECRETARY: Prof. Kerrie Mengersen (k.mengersen@qut.edu.au)

TREASURER: Dr Charis Burridge (Charis.Burridge@csiro.au)

COUNCILLORS:

Dr Peter Baker (Peter.Baker@csiro.au) Branch Website

Mr Daniel Burrell (daniel.burrell@geneticsolutions.com.au) Young Statisticians

Dr Ross Darnell (r.darnell@uq.edu.au) Newsletter Correspondent

Dr Melissa Dobbie (melissa.dobbie@csiro.au)

Mr Brendan Farthing (Brendan.Farthing@epa.qld.gov.au)

Dr Tony Sahama (t.sahama@qut.edu.au)

Dr Nancy Spencer (Nancy.Spencer@treasury.qld.gov.au)

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Dr Tony Swain (Tony.Swain@dpi.qld.gov.au) Past President

Michael Livingston with Dr Nancy Spencer from the Office of Economic and Statistical Research (OESR) spoke to the meeting on the subject "A micro-simulation model of the Queensland juvenile justice system".

Michael Livingston has worked in the Crime Statistics Unit of Queensland's Office of Economic and Statistical Research for three years. During this time he has worked on a wide array of quantitative crime research areas including offending trajectories, crime dispersion and models of the criminal justice system. He is currently seconded onto the Juvenile Justice Modelling project.

Michael has bachelor degrees in Mathematics and Information Technology from the Queensland University of Technology and is currently undertaking an Honours degree in Criminology at Griffith University.

Nancy Spencer has 20 years experience working with statistics and surveys in the social, allied health and transport areas for industry and universities prior to joining OESR in 2000. Nancy holds a PhD in time series and statistical modelling and is currently responsible for the statistics and research areas of OESR. Within OESR she has initiated the use of statistical models and spatial analysis techniques for crime and social statistics. Nancy has an interest in designing evaluation frameworks and in issues relating to Indigenous Queenslanders.

Both speakers spoke about a simulation model of the Queensland juvenile justice system devised by the Griffith University and the Office of Economic and Statistical Research. The model has been developed to accurately but parsimoniously simulate the flow of offenders through the system and the systemic responses to different offenders. Of particular importance to the model development was the accurate representation of the court decision and of reoffending behaviour.

Incorporated in the model is the facility to include targeted intervention programs of three broad types: crime prevention (including situational, developmental and community), diversion and criminal justice program. This functionality can be used to simulate the impact of proposed crime reduction programs and numerous scenarios have already been tested using the model. The presentation involved a brief description of the model and its development and the presentation of a number of simulated scenarios and their outcomes.

April Meeting

Dr Antonio Reverter, CSIRO Livestock Industries addressed the April meeting on bioinformatics. The title of his talk was "Design and analysis of cDNA microarray experiments at CSIRO Livestock Industries".

Toni Reverter received a Veterinary Science degree in 1989 from the University of Barcelona, Catalonia, Spain, and with concentration in Animal Production. Upon graduation, Toni was awarded a joint USDA - Spanish Department of Agriculture scholarship to continue postgraduate studies in the US. In 1990, Toni enrolled Colorado State University on a double major (Statistics and Animal Science). In 1994 he received a MS in Statistics under Dr. Franklin Graybill working on linear models and components of variance. The same year he received a PhD in Quantitative Genetics under Dr. Bruce Golden working on genetic evaluation and parameter estimation. In 1995, Toni joined the Animal Genetics and Breeding Unit (AGBU) at the University of New England in Armidale, NSW. While at the AGBU, he worked mostly in the computational intricacies of large-scale genetic evaluation systems. Since 2002, Toni has been with the Bioinformatics Group of CSIRO Livestock Industries and his duties focused on the design and analysis of gene expression microarray experiments.

The objective of his talk was to present an overview of the quantitative issues in cDNA microarray design and data analysis currently being considered at CSIRO Livestock Industries. Toni considered examples relevant to the beef, sheep, pork and poultry industries. A brief summary of analysis possibilities was given along with discussion of the statistical challenges facing the retrieval of useful information that is encapsulated in

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Dr. Sarjinder Singh is an Assistant Professor at St. Cloud State University, St. Cloud, MN, U.S.A.. He has published over 80 research papers. He introduced ideas of higher order calibration, hybridizing imputation and calibration, bias filtration, hidden gangs, several new randomized response models, median estimation using two-phase sampling, and exact traditional linear regression estimator using calibration.

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the simultaneous expression of thousands of genes. Emphasis was given to the optimal use of resource constraints when developing an experimental design. Finally, the application of mixed-model equations to the gene expression intensity readings and the way in which a linear combination of resulting BLUP solutions for the gene by variety random interaction effects via model-based clustering was briefly presented.

May Meeting

Kathy Ruggerio, CSIRO MIS, Canberra presented a seminar on "Experimental Design for Microarrays".

Kathy did her undergraduate degree (BSc with Honours) at La Trobe University in Melbourne. After that, she worked as a biometrician for Agriculture Victoria before heading across the pond to the University of Waikato to pursue a PhD program, in the area of experimental design, under the supervision of Prof Nye John. Kathy's PhD thesis was on alpha_n-designs which is a family of resolvable incomplete block designs suitable for both single and multi-factor experiments. She held a position at Massey University, Auckland Campus, lecturing in statistics and where she initiated a research program in the design of cDNA microarray experiments. It is this interest that brought her to Canberra where she now works in the area of bioinformatics.

In her talk, Kathy explained two-dye cDNA microarray experiments which involve carrying out deliberate interventions to nature. An investigator will want to infer cause and effect; that is, that observed changes in gene response are a direct consequence of the intervention. The challenge is to design experiments which, in a resource efficient manner, allow cause and effect to be elucidated. The experimental design paradigm enables this objective to be satisfied. It leads to a set of experimental plans for both single- and multi-factor experiments. These were catalogued for those situations where most of the cost is related to the number of arrays that are used in the experiment.

June Meeting

The speaker for our June meeting was Dr Steven Duffull, School of Pharmacy, University of Queensland. The title of his talk was "Experimental design in pharmacometrics".

Steve Duffull is a senior lecturer in the School of Pharmacy, University of Queensland. He obtained his undergraduate pharmacy qualifications in New Zealand in 1985. He then worked predominantly in the Department of Clinical Pharmacology at Christchurch Hospital. During this time he completed a Masters Degree in Clinical Pharmacy and a PhD in Clinical Pharmacokinetics. Dr Duffull then moved to Manchester (UK) and worked as a post-doctoral research fellow in the School of Pharmacy at the University of Manchester (UK). In 2000, he took up a position in the School of Pharmacy, University of Queensland (Australia). Dr Duffull is actively involved in research in the area of pharmacometrics, particularly optimisation, simulation and estimation procedures using frequentist and Bayesian methods. Current teaching interests includes research methods and clinical pharmacokinetics. Current research interests include

(i) design of experiments, clinical trial design, population PKPD (PFIM) study design;

(ii) the use of Bayesian methods for PKPD analysis;

(iii) the influence of obesity on the pharmacokinetics of drugs.

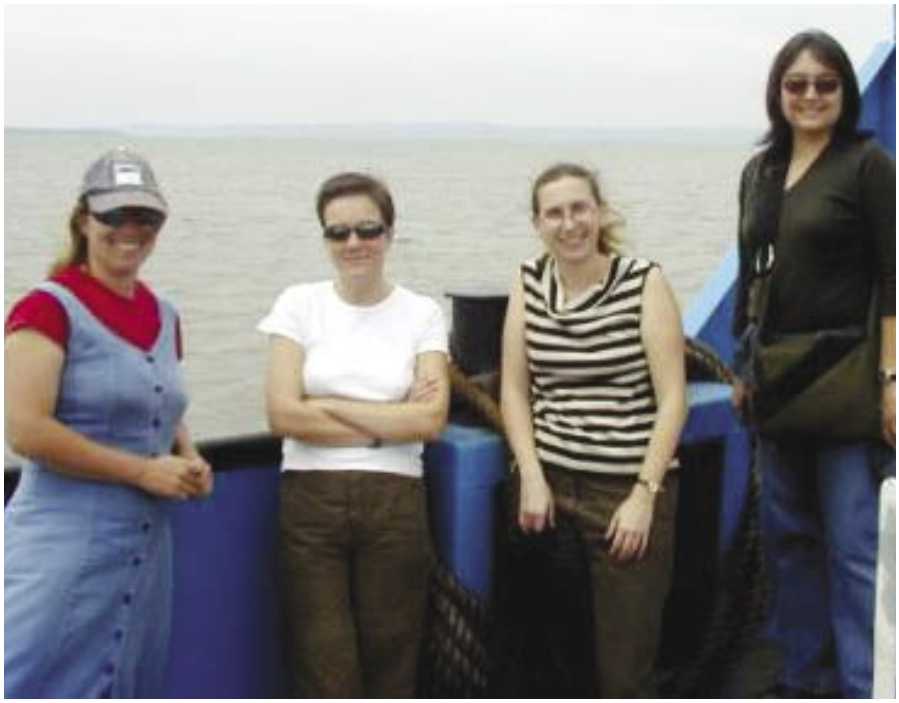
In his talk, Stephen focussed on the recent application of the theory of design of experiments in the area of clinical drug development and clinical use of drugs. The time course of response of a group of patients to a drug is complex in both a statistical and pharmacological perspective. Underlying models are generally non-linear and involve both fixed and random effects components. Designing studies to optimize information gained is a challenging area in clinical studies, often due to clinical constraints that are required to ensure that routine care of patients is not adversely affected. A real-time example was discussed that involved optimization of a design over multiple competing non-linear models with repeated measures and multiple response types.

July Meeting

Our July meeting was addressed by Professor David Balding, Imperial College, London.

Educated at Chevalier College Bowral, Kiama High School, Newcastle (Aust) and Oxford (UK), his undergraduate and graduate degrees were both in mathematics. David learned some statistical theory by "teaching it to bright undergraduates at Oxford". Since leaving Oxford in 1989 his interests have turned increasingly to the application of statistical ideas in biology, particularly in molecular evolution, population genetics, DNA profile evidence and genetic epidemiology. David now forms part of a biostatistics group within the Faculty of Medicine at Imperial College.

David's talk discussed joint work with Wenyang Zhang, Institute of Mathematics and Statistics, University



Find out in the next newsletter what these statistical sightseers were up to.

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of Kent, and Mark Beaumont, Animal & Microbial Sciences, University of Reading. This work investigates methods that have been evolving recently within the population genetics literature for approximating low-dimensional marginal posterior distributions under complex models involving large numbers of nuisance parameters. Although MCMC is sometimes feasible, there are typically problems with poor mixing, and model comparison is usually unachieveable. The alternative being proposed is based on simulation of parameters and datasets, from the prior and model respectively, followed by local regression to model the posterior density in terms of appropriate data summary statistics. Several levels of approximation are involved, but the reward is the ability to handle complex models and to perform model comparison via approximate Bayes factors.

August Meeting

Following her recent SSAI Award presented in Cairns, Assoc Prof Helen MacGillivray, School of Mathematical Sciences, QUT presented a talk on "Statistics Curriculum".

Helen MacGillivray's teaching and curriculum design experience of 25 years extends across all areas of statistical sciences and their applications, across all levels of subjects, all class sizes and most disciplines, particularly engineering. During the last decade her work in teaching and learning has received support through seven national or university grants. She has written and presented papers and workshops particularly on statistical learning through parallel projects; resources for teachers; mathematical transition, support and extension issues; and statistical learning in other disciplines. She is increasingly involved in mathematics and statistics education with the Queensland Board of Senior Secondary School Studies, the Queensland Schools Curriculum Council, and now with the Queensland Studies Authority, and other areas of Education Queensland. She has founded and directs a variety of successful extension and enrichment programs in mathematics and statistics for high school students. She is currently director of QUT's Maths Access Centre.

Helen has been President of the Statistical Society of Australia and the Australian Mathematical Sciences Council, Board member of the Federation of Australian Scientific and Technological Sciences, chair of an international forum on statistical literacy, and an organiser for the International Conference on Teaching Statistics, Australian Statistical and Statistical Education Conferences, and the Australasian Engineering Education Conference. Recently she has worked as a consultant with the Royal Statistical Society Centre in Statistical Education and the UK Learning and Teaching Support Network for Mathematics, Statistics and OR.

Helen's talk provided a brief overview of national and international developments affecting statistics curriculum in the past decade. In aiming to identify immediate and future needs in statistical education, Helen also illustrated the pivotal roles required of statistical education research, development and applications in the statistical sciences. References to the recent International Association of Statistical Education's Roundtable on Statistics Curriculum, and the International Conference on Mathematics Education, indicated how Australia is, and can be, at the forefront of international thinking in aspects of statistical education.

September Meeting

A joint talk by Dr Robert Murison and Brett Carson on the topic of "Parallel Computing for Data Analysis" was well received at our September meeting.

Bob is a lecturer in statistics and Brett is a PhD student in computer science from the School of Mathematics, Statistics and Computer Science at UNE. Although from down south, both hold Qld passports.

In their talk Bob and Brett raised the problem of how the coincidence of large data sets and computer-intensive methods can sometimes challenge even heavy-duty desktops. They showed how cluster computing is a low cost solution for tasks which can be divided into separable work units. Much statistical computing is serial but there is still scope for parallel computing of certain tasks that will reduce computing time.

Their talk provided an overview of hardware and software for a 'Beowulf' cluster and then discussed data analyses where parallelising has dramatically reduced computing time (from days to hours). The examples were:-

1. estimating breeding values from a herd of 2.5*10^6 animals with 4 traits, O(10^7) equations.
2. parallel R
3. image analysis.

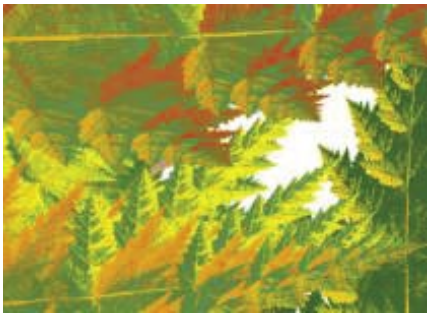
CANBERRA

Presentation on superfractals by Professor Michael Barnsley

At the monthly meeting of the Canberra Branch of the SSAI on 31 August 2004, Professor Michael Barnsley of the Mathematical Sciences Institute, Australian National University, gave a very stimulating and entertaining talk titled "Explorations of a New Geometry using a Stochastic Process". Michael began by thanking his collaborator and host Professor John Hutchinson, Professor Peter Hall for his help with computing, Cambridge University Press which has agreed to publish his book "Superfractals", and last but not least his wife Louisa and daughter Rose.

The focus of Michael's talk was some new semigroups of transformations which act upon sets, measures and pictures. One of his research aims is to discover invariance properties of the attractors of these semigroups, with a view to extending Felix Klein's vision of geometry as a group acting upon a space to include semigroups and colour. To probe the semigroups he has developed the Chaos Game algorithm, a type of Markov process. The results of applying this algorithm are spectacular and suggestive of a new model for real world images, new applications and a new geometry.

Michael presented many beautiful examples of his new geometry to a rapt audience. One of the themes was a fractal top featuring a fern-shaped figure. The following is one of these, together with a close-up whose details are revealed by a process called colour-stealing.



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In addition to still colour figures, Michael presented several motion picture clips, together with music. One of these was a moving version of the above close-up, with the colours 'stolen' from, and patterns changing in tandem with, accompanying clips from recent popular movies. Several snap-shots from these clips are shown on this page.

Michael concluded by discussing the potential relevance of his research on fractals to the movie and computer game industries. He cited the example of *Pixar* which started off as a computer company and now makes and sells films, and noted the importance of good graphics to the financial success of computer games.

Borek Puza

VICTORIA

Two of Victoria's most prominent local identities have been lured away. Richard Huggins, part of the backbone, heart and soul, lifeblood and core intelligence (he also tells excellent fishing stories) of the Department of Statistical Science at La Trobe University, has taken up a Chair in the Centre for Mathematics and its Applications at ANU. It is a two-year position, starting from the beginning of August. His colleague, Bob Staudte, has taken leave without pay from La Trobe so that he can assume a one-year Visiting Senior Full Professorship at Juan Carlos III University (in Madrid) with Professor Daniel Pena. He will be teaching one subject each semester and hopes to enjoy the change of scene and have more time for research. However (and this is almost impossible to believe) a delay in the Spanish Labour Ministry with his work permit means that Bob will be taking up his position a few weeks later than expected. The Victorian Branch wishes both well in their new ventures. Paul Kabaila is the new Head of Department at La Trobe.

Members may be unaware of the passing of Chris Wallace, Emeritus Professor of Computer Science at Monash University, in August. In one of his obituaries, Chris was described as the greatest and most influential thinker in Computer Science in Australia. His many innovations included one in statistics, minimum message length estimation (MML). At the time he conceived the idea Chris was working entirely outside the statistical profession. Despite this, or perhaps because of it, he was able to invent this new method of statistical inference. David Dowe, a long-term Victorian Branch member and ceaseless advocate of MML, introduced local statisticians to the basic principle at a Branch meeting in August 1995. Since that time members whose interest was sparked have engaged in vigorous and lengthy debate about its merits. Vale Chris Wallace, a true thinker outside the square.

Geoff Laslett

Scoring procedures for online reputation systems

Keith Ord, from the McDonough School of Business, Georgetown University, Washington D.C., presented a very interesting talk at the July meeting of the Victorian branch. He discussed the importance of reputation scores for decision-making in blind economic transactions, where the consumer or purchaser has little opportunity to gain knowledge about the provider. A number of Internet sites such as Amazon and eBay provide scoring systems for their products to validate their product quality. Some sites have gone further and have implemented basic structures to give the consumer a sense of the reputation of the individuals (the raters) who provide the information from which the scores are derived. Since consumers seek feedback to guide decisions, there is a need to know how reliable the sources of information rating products are. Experimental studies show that consumers value feedback as a source of information.

He gave some examples of the current scoring system including Amazon which uses an average product rating out of 1-5 stars and eBay which uses ratings +1, 0, -1 which are then aggregated. According to other research, the current system has flaws since the current summary measures, such as the use of a single general reputation score, do not accurately reflect reputation.

Keith and his fellow researchers have adopted a systematic approach to develop and update scoring systems for both products and raters using the multinomial-Dirichlet distribution. They have considered starting values, which have to be selected both to avoid undue

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barriers to entry and to provide reasonable assessments even when information is limited. They extended these procedures to allow the value of relevant information to decay over time, the weighting of evaluations to differ across raters and to allow regular updating of weights across raters. Although the focus is on Internet applications, the methods are generally applicable to any rating system. This new rating system was demonstrated using data on the Canon S50 digital camera, which illustrates the effects of different parameter settings upon the performance of the indices.

Ann Mahara

Keith Ord
Photo: Brian Phillips

Measuring student ability

The speaker at the August meeting was Philip Holmes-Smith, Director of School Research Evaluation and Measurement Services (SREAMS). Philip described how he uses Item Response Theory (IRT) to measure student ability. The IRT was developed to summarise the relationship between the ability of students taking a test and the difficulty of each item on that test. Using the assumption that a test item is a hard item if only the brightest students answer it correctly and that bright students are those students who can answer even the hardest items correctly, IRT represents a generalized iterative procedure that can be used to simultaneously estimate both the difficulty of items on a test and the ability of those taking the test. Ability estimates of individuals are based on their raw test scores, while item difficulties are estimated by summing the number of correct responses across all participants. The raw scores are then converted into logit units using a series of probabilistic equations, with the items located along the measurement continuum according to their difficulty, while persons are positioned according to their levels of ability. Philip gave an overview of the theory and demonstrated its use in measuring student ability. He also introduced an extension of the theory, the partial credit model to measuring attitudes.

Philip described some of the different types of items used in tests such as the Year 7 AIM Maths Test, including multiple choice and items that require calculations. He explained the notion of the Item Difficulty and how each item has it own Characteristic Curve (ICC), a graphical representation of the relationship between difficulty of the item and the ability of the participants. Philip noted that the ICC has the form of a normal ogive, describing three aspects of the item: discrimination, difficulty and degree of guessing. Discrimination reflects the ability of the items to differentiate between the respondents with different levels of ability, and is represented by the slope of the item at the point of inflection, with more discriminating items having a steeper slope. Item difficulty is represented by the point on the ability continuum where it becomes more likely than not for the student to answer the item correctly. The degree of guessing reflects the probability of someone with zero ability getting the item correct and is represented by the intercept.

Philip also described different types of IRT models, including a three parameter model, where discrimination, difficulty, and guessing parameters are estimated; two-parameter models that estimate discrimination and difficulty of the items; and one-parameter models (Rasch) where only the difficulty of each item is estimated. Philip also demonstrated how the IRT models can be used to estimate student ability with items of known difficulty.

The second part of Philip's presentation was concerned with the use of IRT models to construct a Maths ability test, using Year 5 as an example. Philip explained that the standard procedure would involve dividing the pool of test items to construct two parallel Year 3 Trial test forms, three Year 5 Trial test forms, and two Year 7 Trial test forms, with some items being common for two or more different test forms within a year level, and other items being common for two or more test forms across year levels. Trial test forms are then administered to students, using a sample large enough to ensure that every item is attempted by at least 300 students.

Philip explained that the majority of items (about 75%) are selected for test inclusion because they are appropriate to the age/grade level of the students taking the test. The remaining items are selected at levels above and below this to cater for students working above or below their age/grade level. The appropriateness of the item for a given year level is determined using curriculum guidelines, the "Item Difficulty" of each item as estimated using IRT, and the percentage of students answering each item correctly.

Philip also noted that an additional way of judging the appropriateness of an item is to compare its item characteristic curve, as predicted by the model, with the item characteristic curve observed in the raw data. Items where this difference is small are considered to have a good fit whereas items that have higher or lower discrimination than expected by the model are considered to have a poor fit. However, Philip pointed out that items with more discriminating power than predicted by the model still tend to be acceptable for the test construction because they discriminate well between children with different ability levels. Philip also noted that statistical fit of the item is assessed using the Infit Mean Square statistic, which reflects the degree of divergence between the observed and the expected pattern of responses, with the acceptable range of Infit Mean Square between .70 and 1.30. He also explained that there is a close relationship between the Mean Square statistic and item discrimination. Formally, the Index of Discrimination describes how much better high achievers perform on an item than low achievers.

Philip Holmes-Smith
Photo: Brian Phillips

Philip concluded his presentation with a demonstration of item analysis and a brief overview of how the IRT models can be applied to the analysis of attitude scales.

Lucy Busija

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APOLOGY: The Newsletter Editors apologise to the Australian Bureau of Statistics for incorrectly associating the ABS with the 'causes of death' data in the November competition. This set of figures is a hoax that regularly does the rounds at Christmas time, and bears no relation to information collected and published by the ABS. The ABS has asked that all figures attributed to their organisation that are published by SSA be checked with the ABS first, which can be done through their Director of Media and Public Relations. The ABS enjoys a strong and productive working relationship with the SSA and the Editors are keen to maintain this relationship by exercising due care with any ABS material that appears in the Newsletter in the future.