

statistical society of australia incorporated

# newsletter

31 august 1990

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## ASC10/PSC2

The 10th Australian Statistical Conference/2nd Pacific Statistical Congress, held at the University of New South Wales from July 2nd to 6th, attracted in excess of 400 registrants. These registrants included conference invitees, students and one-day registrants. It was very encouraging to see many more students registered than is usual for these conferences; some of the students were assisted by grants from the Central Council of the Society. There was a large contingent of our New Zealand colleagues in attendance, many of whom also contributed papers.

The conference publication contained abstracts of 139 papers, of which more than 120 were contributed papers. This resulted in a very full programme, as the Programme Committee tried to adhere to a policy of thirty minutes for presentation of contributed papers. It was necessary to have three parallel sessions on most occasions when contributed papers were being presented.

The conference began with an opening address by Dr Bob Frater, Director of CSIRO's Institute of Information Science and Engineering. Bob gave an excellent overview of what the conference programme offered, and how the topics to be addressed fitted into the modern information-oriented world. Bob was followed by Professor Ron Brookmeyer of Johns Hopkins University, the Keynote Speaker in Medical Statistics, who reviewed the current state of statistical modelling of the AIDS epidemic and indicated some of the major problems still to be dealt with.

This report won't recite the conference programme in detail. Some highlights which were worthy of mention are briefly covered below.

- Professor George Box's Keynote Address in the quality session raised some very important questions, and provided some answers, about statistical process control and automatic process control. In particular, he indicated areas in which statistical analysis could add to what the engineers were attempting to do with automatic process control.
- Professor Brad Efron's Keynote Address, sponsored by Sun Microsystems Australia, looked at six questions raised by the bootstrap; Brad admitted that he had an answer to only one of these questions.
- The intricacies of the statistics of option pricing, and the wonders of the Black-Scholes theorem, were very ably and entertainingly explained by Professor Hans Föllmer of the Universität Bonn.
- The sessions on Election Night Forecasting, arranged by Hugh Morton, attracted a galaxy of international speakers and a large audience. The audience was even heard laughing uproariously during the paper by F. Smith of The Queen's University of Belfast.
- The session to mark the centenary of the birth of R.A. Fisher featured four speakers. Dr Oliver Mayo reminisced about Fisher's time in Adelaide, and spoke of the many major contributions Fisher made in genetics. He also revealed that he was still being supported by Fisher, as he was wearing Fisher's belt! Graham Wilkinson reviewed Fisher's work in inference, and spoke of why this work was still relevant. Terry Speed brought to our attention a "delightful essay" by Fisher in 1926 which gave an

*Editors: D.E.Shaw, CSIRO, DMS, PO Box 218, Lindfield, NSW 2070*

*E. Brinkley, Australian Bureau of Statistics, PO Box 10, Belconnen, ACT 2616.*

*R.I.Forrester, CSIRO, Biometrics Unit, INRE, GPO Box 1666, Canberra, ACT 2601.*

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excellent summary of Fisher's ideas on field experiments. Professor George Box completed the session by pointing out that Fisher's work on statistical data analysis and experimental design was a major contributor to the advancement of scientific knowledge. The modern field of quality improvement is providing another fruitful area for the application of methods developed by Fisher.

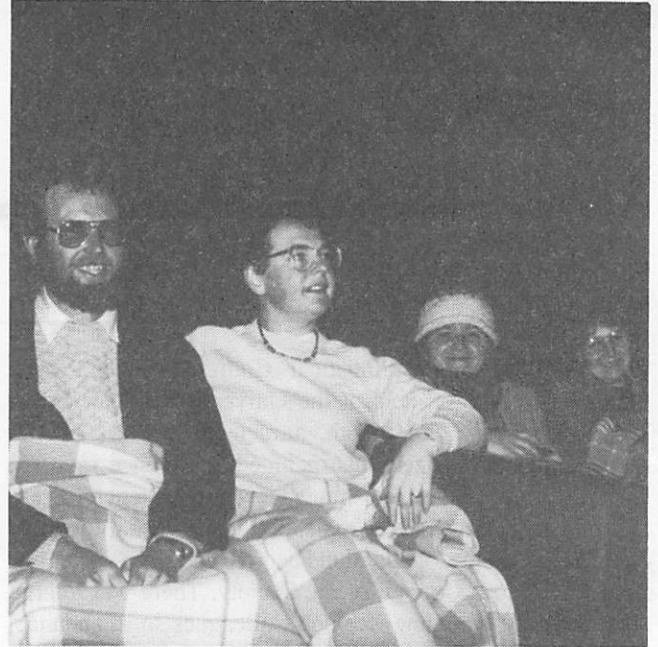
- Professor Adrian Smith of Imperial College, in his Keynote Address, showed that sampling and resampling techniques were powerful tools for inference and diagnostic checking in Bayesian (and likelihood) methodology. Part of his address went under the heading "Why should Brad Efron have all the fun?"
- Thanks to generous support from the Australian International Development and Assistance Bureau, two distinguished overseas speakers were arranged at short notice; they spoke at a special session on Thursday afternoon. Professor H. Nhu of The State University of Hanoi spoke on "Some problems in the theory of stability", and C. Liu of the State Statistical Bureau, Peoples' Republic of China, spoke on "1990 Population Census in China"

On the more social side of the conference, the excellent conference dinner was very well attended. The diners saw the Pitman Medal awarded to Peter Hall, and heard a wonderful after-dinner address by Professor Toby Lewis, who spoke on weighty constitutional matters.

Those who attended the conference were invited to complete a questionnaire about their comments on the 10th Australian Statistical Conference/2nd Pacific Statistical Congress. When collated, the questionnaires returned will provide guidance to organizers of future conferences, particularly the organizers of the next conference in Perth

in 1992. If you wish to register any comments about the recently-held conference, it is not too late to send them to Doug Shaw, DMS, CSIRO, P.O. Box 218, Lindfield NSW 2070.

The organizers of the 10th Australian Statistical Conference/2nd Pacific Statistical Congress would like to thank everyone who contributed to making the conference such a success. In particular, they would like to thank all those who attended, and all those who contributed papers.



This is not to show that conferences bring people together or to suggest that there is anything improper going on, but rather to show how cold it was at the College.

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## VALEDICTORY ADDRESS - Part II

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### A.T. James

Until the advent of the Department of Mathematical Physics in 1951, Adelaide offered no way on in Physics, except for a good experimentalist, which I was not.

As my preliminary preparation for the PhD qualifying examination in mathematics at Princeton, Adelaide had three traditions. The first was the 19th century British mathematics brought to Adelaide in 1875 by its first Professor of Mathematics, Horace Lamb. Mr, later Professor Sanders, was still teaching it during the 1940s, much of it from Lamb's books, which had had world wide publication. In spite of their high quality at the time of their writing, they naturally grew to lack the subsequent European Continental and American developments, such as the adoption of the Englishman, Cayley's matrices and the use of group theory, abstract algebra and topology.

Lamb's successor, Bragg, was also very distinguished, but his attention turned to experimental physics. After Bragg left in 1908, mathematics at Adelaide fell under an engineer, Professor Chapman.

A major point of Sir William Mitchell's 1919 manifesto for the University of Adelaide was that Adelaide should again have a Professor of Mathematics. A brilliant Adelaide graduate, John Wilton, was appointed on Lamb's recommendation and this inaugurated the second tradition.

On his arrival in Adelaide, Wilton reformed the School Curricula and Public Examinations in mathematics and set them up to high standards along British lines. After 20 years, however, it had become something of a game played with artificial rules, for example, dealing with complicated trigonometric identities without the use of complex numbers and De Moivre's theorem.

Admittedly, to do otherwise would have involved a major problem of introducing mathematics that the majority of teachers were not trained to understand. I have heard that Professor Barnes had great difficulties along these lines in introducing the new maths in the 1950s and Professor Jordan with modern chemistry.

The tricky mathematics exams that Wilton had instituted for the PEB ultimately provoked complaints, and shortly

after his death in 1944, even from the Premier and Minister for Education, Sir Thomas Playford, who complained that the difficulties were holding up the entry of apprentices to industry.

Professor Sanders, who succeeded Wilton, had to confront one of the most powerful premiers South Australia has had. Professor Sanders didn't give in because the integrity of mathematics was at stake; namely, in contrast to Playford's demand for lower standards at the leaving examination were equally insistent demands from the engineers to add more advanced topics, such as complex numbers. To accept the demands from both sides would lead to a Mathematics I course that was mathematically unsound.

Sanders and Playford reached a resolution in which the standard of the two maths. exams at Leaving was lowered as a concession to Playford, but in return, an extra two hour Special Mathematics Exam was instituted as a prerequisite to University Mathematics I.

Sanders' ability to stand up to the Premier, was enhanced by the fact that the University of Adelaide still had independence; it was not completely dependent on the Government, but also had substantial revenue from fees and endowments.

One day a graduate student at Yale University, asked me if I knew a mathematician named Wilton? I replied, "Yes, he was a Professor of Mathematics at Adelaide, but why do you ask?" He said, "I have just been reading G.H. Hardy's obituary of him and it's a strange document. It sounds like God Almighty talking."

Hardy gives an expert review of Wilton's work with which he was evidently very familiar. The last judgement comes in the penultimate paragraph.

*"It will be plain from this summary that Wilton was a fine mathematician, with admirable taste and a natural inclination towards deep and difficult problems. He may have left nothing, strictly, of major importance, but his record is genuinely impressive. He might perhaps have made a bigger name if his taste had been less fine, and he had been content to work in fields which offer cheaper rewards."*

In private life, Professor Wilton was a highly cultured, sensitive man who delighted in music and reading Dante's "Divine Comedy" in Italian. Unlike Hardy and Kerr Grant who professed atheism, he was a Quaker and wrote a book entitled "Love, Hope and Faith" based on his SCM talks.

Being within the British Empire, Wilton naturally tended to follow the leading British mathematicians, in his case, at Cambridge, where he studied.

A quotation from G.H. Hardy's "A Mathematician's Apology" indicates the effects. Hardy states on page 150:

*"I have helped to train other mathematicians, but mathematicians of the same kind as myself, and their work has been, so far at any rate as I have helped them to it, as useless as my own."*

*"I may be judged to have created something worth creating. I have added something to knowledge and*

*helped others to add more ... and these somethings have a value."*

Hardy naturally leaves the assessment of the value to others. Hilbert, who could be ranked as a mathematician with Newton and Gauss, strongly endorsed the value of Hardy's mathematics.

Initially in his career, Wilton had published work on differential equations, continuation of which would have been of great benefit to engineers and scientists. His move into the pure mathematics of Hardy created a vacuum in a considerable area of mathematics of utility at Adelaide. Into this vacuum stepped Dr Hans Schwerdtfeger in 1940, a refugee from Nazi Germany, to establish the third tradition of mathematics at Adelaide.

Schwerdtfeger had studied at the leading mathematical school in the World, the Mathematische Institut at Göttingen. Most of its scholars, along with Schwerdtfeger, were driven out by the Nazis. Leading ones such as Von Neumann and Herman Weyl went to Princeton along with Einstein from Berlin.

Many people of integrity, like Schwerdtfeger and his wife, who spoke out against the evils of Nazism, chose an uncertain future in exile rather than submit themselves and their families to an evil regime. I once had an inkling of it when I showed him the book that Kerr Grant had set me to read for Honours Physics, "Theoretical Physics" by Joos. Schwerdtfeger jumped from the chair at his desk across to the side of the room at one bound, as if he'd seen a snake. "That Nazi," he exclaimed in a blazing anger.

I was fortunate to have Dr Schwerdtfeger for half of Mathematics I, but the feast came in third year when he taught a five term course entitled "Engineering Mathematics III" of which I attended the last four terms. This came about as follows:

The University of Adelaide instituted accelerated courses for engineers in 1942 to meet a wartime demand. I haven't had time to search out the documents, but the story was that increased failure rates produced a considerable retardation on the average, instead of acceleration, and a Council Minute of June 1944, well before the war was over, indicated the abolition of the scheme, presumably as a failure. Before the University of Adelaide copies Bond University, or takes up proposals from Mr Dawkins for acceleration of studies, I think the records of this wartime experience should be carefully studied.

Unfortunately, the University could not afford one more lectureship for third year and honours to allow Mr Szekeres to join Dr Schwerdtfeger concurrently. When Dr Schwerdtfeger left for Melbourne, Mr Szekeres, in his own inimitable way, continued the third tradition.

Students are like plants. When you transplant them, they take some time to establish their roots before they show much visible growth. But Princeton mathematics, being based in the same tradition, followed straight on from what Schwerdtfeger had taught me, except that instead of one lecturer, there were a dozen who could deliver lectures of that quality, with more to follow at the Institute of Advanced Study.

## CENTRAL COUNCIL REPORT

A meeting of Central Council of the Society was held at the recent 10th ASC in Sydney. Some of the decisions reached and matters discussed at the meeting are given below.

### New Members on the Central Council Executive.

Professor Tim Brown was elected as Vice President of the Society. Tim will take over as President next year when Dr Richard Jarrett's two year term comes to an end.

Dr Helen MacGillivray was elected as Secretary, to replace Dr John Field. Helen will take over this position later in the year.

### Pitman Medal

Central Council unanimously endorsed the recommendation of the Committee for Honorary Life Members and Pitman Medal that a Pitman Medal be awarded to Professor Peter Hall. The Medal was presented to Peter at the Conference dinner later in the week.

### Sections

Dr John Field was elected to take over the Chair of the Industrial Statistics Section from Dr Brenton Dansie.

Dr Ken Russell has indicated that he would like to stand down as Chairman of the Statistics in Education Section. However Central Council has been unable to find anyone who is keen to take on this responsibility. Anyone who is interested is urged to contact either Richard Jarrett or John Field. Council also decided with regret to allow the Statistics in the Earth Sciences Section to lapse following its inability to find a successor to Dr Nick Fisher as Chairman.

### Use of the Society's funds.

Council is keen to see some of the accumulated funds of the Society put to good use, and spent some time discussing various ideas for this. See the article by Richard Jarrett elsewhere in this Newsletter, and let your Branch Secretary know if you have any good ideas.

### Tasmanian Statistical Group.

Another article in this Newsletter describes the formation of a statistical group in Tasmania. Council discussed how it might support the initiative, and has suggested to the group that it set itself up along the lines of the Illawarra Statistical Group, as reported in the last Newsletter.

### Future Australian Statistical Conferences.

The next ASC will be held in Perth in 1992, and planning for this event is well under way. The Victorian Branch agreed to investigate holding the 12th ASC in Melbourne in 1994.



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For more information about these positions please contact Ray Lindsay on (06) 246 9713. If calling from interstate our toll free number is 008 026120. Selection documentation is available from the Recruitment Section (06) 246 9640. Applications addressing the selection criteria should be sent two weeks after publication of this newsletter to:

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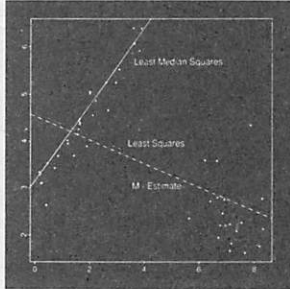
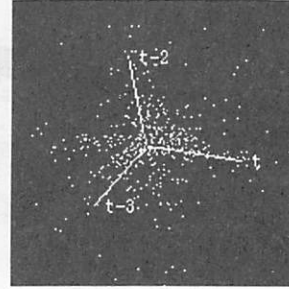
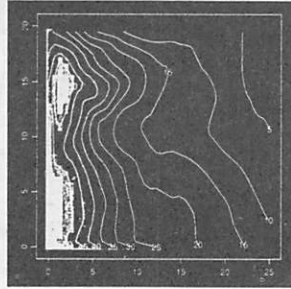
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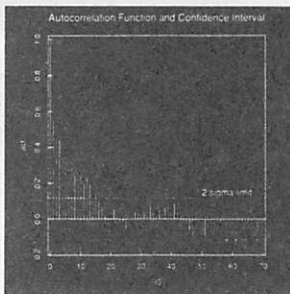
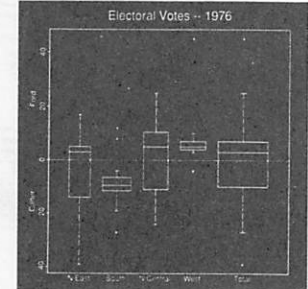
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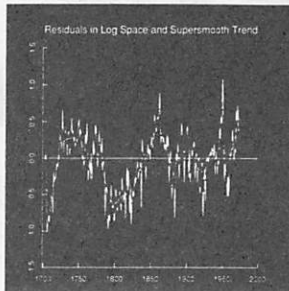
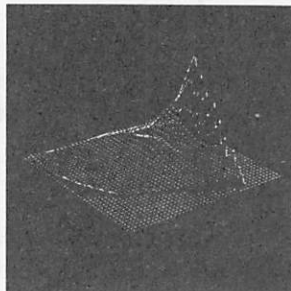
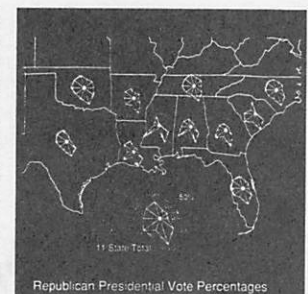
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## BRANCH REPORTS

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### New South Wales

#### Sampling of Mineral Ores

The May meeting of the Branch heard Ian Saunders (Bond University) speak on Sampling of Mineral Ores.

Although sampling theory is notoriously the "poor relation" in statistical teaching, neglected in favour of the more mathematically exciting analytic theory, there is considerable value in applications of sampling.

The value is clear when sampling relates to quality estimation for minerals. Millions of dollars may be lost by inaccuracies in estimates of ore quality. Further, the problems encountered in designing sampling schemes are far from trivial.

The fundamental problem is the existence of an overall "trend" in the characteristics of the ore: samples of material that originated close together in the ground tend to be more similar than samples taken far apart. This trend must be accommodated in the modelling of the accuracy of the sample estimates.

A typical physical set-up for sampling mineral ore was described, with the special difficulties involved.

Ian introduced the "variogram" method of allowing for long-term variability which has recently become popular. He provided uses of the variogram and showed its value in comparing and designing sampling schemes. He demonstrated its use in comparing systematic, stratified and restricted stratified sampling schemes. He also showed how to obtain estimators of sampling error, and discussed the minimal assumptions which underlie the variogram model.

The applications show that sampling is valuable and doing it right is challenging.

#### New Members

The Branch welcomes the following new members:

Ian Hoffman, Dr Marek Musiela, Peter Wright, Dr Magdalena Mok, Hugh Jones, Margaret Swincer, Anthony Mobbs, Dr Ivor Francis, Paul Spence, George Lin, Anne Russell.

### Victoria

#### Assessing Rater Agreement

At the May meeting Dr Nicola Crichton, visiting the Department of Mathematics at Monash University, spoke on Assessing Rater Agreement. She gave an extremely comprehensive review of an area that is traditionally little known to statisticians but very well known to psychologists and other social scientists. The talk focussed on a study published in the *British Medical Journal* which compared the rating of 100 cervical biopsies by five different observers, using five or six categories from "normal" to "cancer". Nicola discussed in detail the widely used Kappa statistic first proposed by

Cohen in 1960 and since modified and extended in various ways. This statistic is attractive to the lay user since it gives an overall measure of the degree of agreement between raters, in the form of a single number between -1 and 1, but several serious problems in its interpretation were pointed out. Nicola went on to describe a number of model-based approaches to the problem of assessing rater agreement, concluding that these should be preferred, since they enable the particular features of individual data sets to be brought out. On the other hand, large amounts of data are required to distinguish reliably between different competing models: this is an under-recognised fact of life in relation to many statistical techniques. Conclusions in relation to the biopsy data were not very reassuring to women undergoing these investigations. Agreement between the five pathologists was only "fair" (overall Kappa 0.38), although careful data analysis revealed that three of the five were in substantial agreement while the two others were doing their own thing to a rather worrying degree.

#### Some Statistical Aspects of Molecular Approaches to Human Polygenic Disease

Professor Terry Speed from UC Berkeley spoke to the June branch meeting arranged in conjunction with the Epidemiology group. Terry began by explaining that "Polygenic" really meant "Complex" - in other words, no single gene is responsible for the incidence or heritability of the disease. The example that he discussed in detail was the identification of a phenotype for human lipoprotein subclass patterns and its effect on heart disease and other conditions. We were introduced to the terminology and methodology of lipoprotein classes and their study in blood plasma, which is the focus of the Lipoprotein Program Project of the Molecular Medicine Group at the Lawrence Berkeley Laboratory. Nondenaturing Polyacrylamide Gradient Gel Electrophoresis and Densitometry were demystified, and we learned how protein particle diameters determine the A/B phenotype. At some level A is good and B is bad, but there are problems in applying this concept to the construction of a full genetic model. Various approaches and problems were discussed, but Terry emphasized that it is not a good idea to rely solely on statistics or on number crunching through some pedigree analysis package - one must keep basic biochemistry and clinical research going along at the same time. For the statistician there are current research issues, such as the exact calculation of likelihoods, the proper handling of ascertainment, better ways of discriminating between alternate models, as well as diagnostics, robustness studies and so on. Terry ended by outlining an ambitious program of future work in refining the definition of the phenotype, re-examining the mode of inheritance, doing a detailed linkage analysis - all while keeping in touch with other project developments!

#### Encounters in Statistical Inference

At the July meeting, Professor Evan Williams spoke about some of his Encounters in Statistical Inference.

He began his talk by stating a major principle of one of the leading influences in his statistical career, Professor E.J.G. Pitman: "there should be minimal contribution of the mathematical model or other assumptions in making inferences". He illustrated this with some brief examples; one of the special characteristics of the normal distribution is that, from amongst all distributions with a given fixed variance, it contains the minimal information about a location parameter, and is, broadly speaking, in keeping with Pitman's minimal assumptions criterion.

The remainder of his talk was centred on a discussion of the usefulness and general kinds of ancillary statistics. Ancillarity - a term first coined by Sir R.A. Fisher in the 1920's and a principle Evan describes as "the obverse of Sufficiency" - is one of Evan's ongoing research interests.

## Queensland

### Rabid foxes in Great Britain

In April 1990, one of the series of statistics seminars being conducted by the Department of Mathematics at The University of Queensland was held in conjunction with the Queensland branch of the Statistical Society of Australia. Dr Frank Ball, from the University of Nottingham, discussed the subject of modelling the spread of rabies amongst foxes, particularly in Great Britain. Three quite different mathematical models for the spread of rabies amongst foxes were presented. Coupled simulations of one of the models were used to estimate the efficacy of control policies that reduce the fox population within a region surrounding the initial case. Frank extended that model to illustrate that killing foxes does not necessarily reduce the spread of rabies.

### Statisticians at Work

During May the Queensland branch held a meeting to provide information for secondary school mathematics teachers and careers advisers on the variety and extent of careers available for statisticians. The afternoon gathering took the form of a number of short talks by statisticians working in a variety of areas. Because of the diverse nature of statistical work and its applications, the statistical profession does not have a highly visible nor readily identifiable profile. It was felt that this meeting helped rectify these problems for the 30 or so members of the secondary school community who attended.

### More Bootstrap Confidence Intervals

Sun Microsystems and the Queensland branch of the Statistical Society jointly supported a public lecture by Professor Bradley Efron on "Better approximate confidence intervals in exponential families" at Bond University on 27th June. Brad presented a simple algorithm, developed with Tom DiCiccio, which generates accurate confidence intervals for any one parameter of a multi-parameter exponential family. The algorithm effectively approximates the bootstrap ("BCa") interval, with about 1% of the computation.

## South Australia

In May and June the Branch was addressed by two of our most distinguished members, Alan James, recently retired

as the Professor of Statistics at the University of Adelaide, and Graham Wilkinson, recently retired from CSIRO Division of Mathematics and Statistics. These two talks were videotaped to provide a record of our most senior statisticians.

On 15 May 1990, the Branch was addressed by Alan James (Honorary Visiting Research Fellow, Department of Statistics, University of Adelaide).

### The Use of REML and t-REML in Modelling Mitochondrial Power

Normal REML has been used to estimate heteroscedasticity and variance component matrices. Outliers in heteroscedastic data can be accommodated by extending REML to a specification using a t-distribution on low degrees of freedom. The methods are used in fitting a nonlinear model of the response of flux and potential of mitochondrial power to variation of 3 determining variables, and then estimating the variance component matrix of the regression coefficients between successive experiments.

On 19 June 1990, the Branch was addressed by Graham Wilkinson (Honorary Research Fellow, CSIRO Division of Mathematics and Statistics).

### R.A. Fisher's Contributions to the Foundations of Statistical Inference

Though Fisher's ideas have permeated most aspects of Statistics, his most profound contributions have been to the logical foundations of the subject. Even as an undergraduate at Cambridge he had formulated the idea of estimation via maximum likelihood (1912) and by 1925 had shown not only that m.l. estimators are in general asymptotically efficient, but are distinguished in the class of all efficient estimators by having the highest what C.R. Rao later termed second order efficiency. However his primary interest was in developing exact theory for small samples, and here his concepts of Sufficient and Ancillary statistics and of Statistical Information were vital components of a unified theory of inference which culminated in the concept of a fiducial distribution for unknown parameters (1930). This last concept gave rise to considerable controversy, and Fisher himself was not able in his lifetime to resolve all the logical difficulties.

The paper presented gave an historical outline of Fisher's development of his inferential concepts and theory, with some reference to the controversies that arose.

## Tasmania

Led by Terry Koen and Kevin Anderson a small statistical group has re-emerged in Hobart after a number of years hibernation.

Kevin Anderson gave the first presentation in February on "Reflections on a year as the inaugural research statistician for the ABS". He spoke about his efforts at propagandising for a more visually based in-house statistical culture, and his efforts to get subject matter staff in Central Office to be more "exploratory" with their data. He thinks that he was the first to mention boxplots in the ABS, and this without any trace of embarrassment at



abandoning his least-squares origins. As for robust regression, that is another story entirely!

The second presentation in March was by Howard Reeves, Principal Education Officer in charge of mathematics education for the state. He spoke on "Statistics Education in Tasmanian Colleges and High Schools". Amongst other things he gave an impassioned defence of new directions in the Tasmanian Education Department to replace norm referenced assessment with criterion based assessment.

The third presentation in June was by Glen McPherson who spoke on "Using Statistics: the Computer Revolution". Glen presented a view (which he has developed in a new book, *Statistics in Scientific Investigation: its Basis, Application and Interpretation* (Springer-Verlag)) that the basic functions of statistics are few in number and are independent of particular experimental designs and particular methodologies.

## Western Australia

### Modelling Health Effects using Surrogate Variables for Exposure to a Pollutant

On March 13, Dan Schafer, a visitor from Oregon State University, used some recent data on nitrogen dioxide levels and health scores to demonstrate a method of modelling the effects of personal exposure to a pollutant. The data set in question contained ordinal respiratory ailment scores (persistent wheeze, occasional wheeze and no wheeze) for 231 children, along with kitchen and bedroom NO<sub>2</sub> concentration measures from their homes. Using regression equations based on other studies, individual exposure scores were able to be predicted from the measured NO<sub>2</sub> concentrations (the "surrogates"). The question addressed was how these predicted scores should best be used to estimate the relationship between personal exposure and respiratory wheeze. After explaining the likelihood theory behind this question, Dan gave a very interesting exposition of the results he was led to.

## Canberra

### Deprivation, Education and the Allocation of Resources

Ian Diamond, University of Southampton, addressed the Branch at the April 24 meeting. One important aim of education policy is to alleviate the effects of deprivation by providing additional resources for individuals and schools that suffer from it. The actual amounts allocated must depend on the extent of deprivation and on the functional relationship between achievement, deprivation and resource allocation. A reliable measure of deprivation is therefore needed, both to estimate the functional relationship and to allocate resources in accordance with policy aims.

Deprivation is usually defined in relation to community norms. Social consensus may be achieved either directly or by defining a "basket of necessities" or a "basket of desirable activities", and estimating an individual's or a school's ability to purchase such a basket. In practice it is very difficult to achieve a consensus. A more generally

accepted class of measures is the census-based deprivation index.

To construct such an index we need to define a level of aggregation, a set of census variables and a method of combining them. The aggregation level chosen is usually the smallest attainable. The census variables used are usually limited to those which can clearly be seen to be relevant. The favoured methods of combination are principal component and factor analysis on the one hand, and cluster analysis on the other. The efficient use of principal component and factor analysis requires a multi-level model; typically some or all of the coefficients are specified to be random variables. Examples were given of indexes successfully constructed in the UK.

### The Economics Statistics Strategy

Mr Michael Colledge, visiting the Australian Bureau of Statistics (ABS) from Statistics Canada, addressed the Branch at the May 29 meeting. Michael discussed the formulation and implementation of the Economics Statistics Strategy (ESS). The ESS involves substantial reorganization and change to the ABS's output of Economic Statistics. Michael discussed the various components of the ESS, focussing on the problems for which the expertise of the mathematical and survey statisticians is most needed. These problems included the choice of the most appropriate sampling unit, measuring coverage of the survey frame, record linkage, automated coding, confidentiality preservation and quality assurance.

### Careers Expo Preview

Instead of the usual guest speaker, for the June 26 meeting, the display the Branch prepared for the 1990 Canberra Careers Expo was set up for members to view and comment on. The display centred on several micro computers onto which various data sets and statistical analysis software had been loaded. The aim of using the micros was to give students the opportunity to interactively analyse the data sets, and hopefully gain an appreciation of the work of the statistician.

To complement the micros a range of posters and promotional material was displayed. As a further attraction to students, some of our more enterprising members had even managed to transfer the new Branch logo on to wind-cheaters.

### A Model-Based Approach to Estimating Market Shares

Tim Holt, University of Southampton, addressed the Branch at the July 18 meeting. The topic of the discussion arose out of a consultancy where car manufacturers' market shares of "company cars" were the main focus of attention. The sample was large enough to estimate the shares of large manufacturers with sufficient accuracy, but not those of small manufacturers. The use of auxiliary information was known not to produce much improvement in this situation, so a synthetic estimation approach was found to be necessary.

In synthetic estimation, information is transferred from domains (sub-populations) where large samples are available for accurate estimation, to small domains where

they are not. This implicitly assumes that the population structure can be approximated by a mathematical model and that some of the model parameters can be estimated over several domains simultaneously. Further, on the assumption that the model describes the population accurately, the manner in which the sample was obtained becomes irrelevant and in consequence selection probabilities can be ignored.

The specific model assumption made in this case was that given the "fleet size" (the number of cars bought by a single corporate purchaser), the probability of purchasing from a given manufacturer was constant from purchaser to purchaser. These probabilities were therefore estimated ignoring the differential probabilities of selection. (These depended essentially on numbers of employees.) The

selection probabilities were, however, still used when estimating the numbers of purchasing companies with different fleet sizes.

Using synthetic estimation reduced most variances by a factor of 2.5 or 3, sometimes more. (The variance estimator used took full account of the selection probabilities.) The price paid for this decrease in variance was the introduction of an unknown bias. Comparisons were made between the original estimates and several variants of the synthetic estimates. With the exception of a single manufacturer's market share, the synthetic estimates did not differ significantly from the original ones. This suggested that in most instances the use of synthetic estimation was worthwhile.

## SPECIAL INTEREST SECTIONS

### Statistical Education

A session on Education in Statistics was held at the Statistical Conference in Sydney in July. It was chaired by Pamela Shaw, and featured four speakers: Ken Russell (speaking on "Some Techniques for Explaining Non-Trivial Statistical Concepts to Non-Statisticians"), Kevin Anderson ("Exploratory Data Analysis in Workforce Training in Statistics"), David Saville ("Teaching Statistics Using the Natural Geometry of Fisher" - joint paper with G.R. Wood), and Ken Sharpe ("Statistical Education in Schools"). The speakers considered quite different aspects of Statistical Education, and showed how wide are the challenges facing us if we are to educate people about our discipline.

There was a pleasingly large audience at the session (perhaps it helped that it was held on the first day of the Conference?), and this encourages me to hope that such sessions may become a regular feature of Australian Conferences.

I felt that the general standard of presentation of papers at the Conference was a little higher than at previous gatherings. Congratulations to the organisers for sending out some suggestions to speakers. But there were still a lot of unreadable transparencies (it is foolish to expect people to be able to read a copy of ordinary typescript from an overhead projector), and talks which could not fit into the allotted time. We have a long way to go before every talk can be judged as "acceptable".

We need a new Chairperson of the Section on Statistical Education. I simply do not have the time to do a proper job, and - in any case - it is time for a fresh hand at the wheel. For further information, or to offer yourself (or to suggest someone else to approach), please contact me or Richard Jarrett. Our addresses are on the back page.

Ken Russell

### Medical Statistics

#### Report on Workshop on Statistical Modelling of AIDS and other Epidemics

The current epidemic of HIV infection has already reaped a terrible cost in terms of person-years of life lost. The scientific effort to combat and cope with the diseases and consequent suffering produced by the HIV virus requires a multi-disciplinary approach. Statisticians can and must be involved, and in doing so will draw attention to the contribution statistics can make towards critical social issues.

Over the weekend of June 30 and July 1, 1990, a workshop preceding the Tenth Australian Statistical Conference in Sydney addressed the role of statistics in the AIDS epidemic. Fifty participants attended, including representatives from government health departments and life insurance companies; medical and statistical epidemiologists, statisticians and probabilists (both applied and theoretical); AIDS physicians and specialists. This is not a mutually exclusive list, as a number of participants can be classified into several groups.

The workshop concluded by moving a motion relating to the need for uniform data collection throughout the country, forwarded onto the Central Council of the Statistical Society of Australia for ratification and dissemination.

A clear message of the workshop was that contributions cannot be made in isolation. Knowledge on many different aspects of the disease, social behaviour and public and governmental attitudes are required to be able to identify the critical questions and the available data sources. Professor Ron Brookmeyer, guest speaker from the Departments of Statistics and Epidemiology at Johns Hopkins University, made explicit mention of the "need to put together the epidemiologic puzzle". His involvement in the design and conduct of a number of cohort and other studies of the epidemiology of AIDS and HIV infection has placed him in a strong position. This involvement is an essential requirement for making a meaningful

contribution. Ron serves on a Committee of the National Academy of Science, helping to produce official prediction figures for the U.S.A.

Dr Valerie Isham, from University College London led the more theoretical work on modelling, and it is important to note that her work is not being done in isolation. She was a founding member of the "Cox Committee", which has since become the "Day Committee". These committees consists of statisticians, epidemiologists and other AIDS specialists, and have performed analyses related to the prediction and back-projection of the epidemic in the U.K.

Drs Patty Solomon and Sue Wilson have applied the methodology to data from the National Centre in HIV Epidemiology and Clinical Research in Sydney on the Australian experience. This work is available through the National Centre for Epidemiology and Public Health at the A.N.U.

Prior to the workshop a press release promised that:

"in the face of the AIDS epidemic, statisticians are being called upon to help fight this infectious disease by providing answers to important questions such as:

- how many people have been diagnosed as having AIDS?
- how many new cases of AIDS will occur in the future?
- how long do persons with AIDS survive?
- how many people are currently infected with HIV?
- what proportion of people with HIV infection will go on to develop AIDS, and
- how long will this take?

- are drugs like AZT lengthening survival, and if so by how much?"

In answering these questions a number of key issues became apparent, some of which were:

- AIDS is a syndrome defined by presentation of one or more of a number of diseases or conditions, and this definition has undergone changes;
- reliable answers require the uniform standard collection of basic information;
- short term predictions of new cases can be given with relative accuracy due to the "smoothing" of AIDS incidence resulting from the long latency period, however long term predictions are far less reliable;
- about 50% of persons infected with HIV will develop AIDS within 10 years of infection, but what happens after 10 years is not known. It is now not assumed that a non-zero proportion will never develop AIDS;
- analyses of survival times and of latency periods are influenced strongly by changes in treatment modes, especially related to the increased use of AZT;
- long term effects on time to AIDS and on total survival time due to treatment of HIV infected persons without AIDS are unknown, and this influences back-projection methods.

Encouraging evidence is emerging that the rate of HIV infection in Australia may have slowed in the mid 1980s. The unfortunate message is, however, that even if HIV infection has ceased in Australia, only a small percentage of the total number of expected AIDS cases have so far occurred.

## SEEING Through Statistics: An introductory text with *MINITAB* problems

Robert G. Staudte, PhD, - La Trobe University, Victoria, Australia

An introductory text organised to progressively involve and motivate students and lead them (in section three) to applications of standard statistical methods for one and two samples, Chi square tests and linear regression - culminating with a detailed appendix on probability theory.

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#### Part I Descriptive Statistics

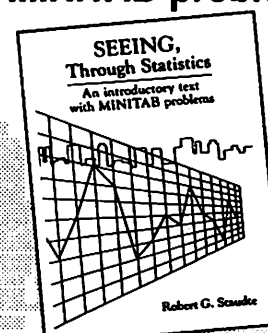
1. Uses and abuses of statistical data
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3. Contingency tables and conditional distributions
4. The correlation coefficient
5. Least squares fitting and linear regression

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6. Standard errors in scientific experiments
7. P0-Value of data relative to hypothesis

8. T-Tests and the law of averages
  9. Opinion Polls
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  - B. Tables
  - C. Glossary of notation
  - D. Solutions to selected problems
  - E. Index

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## MISCELLANEA

### Message from the President

At the recent meeting of the Central Council of the Society (held during the conference in Sydney), we agreed that the Society should play a more pro-active role in the discipline of Statistics, and I was asked to seek views from members about what the Society could do. At this stage, we are simply seeking your ideas (preferably with some idea of cost). Once we have seen and evaluated the ideas, we will consider what resources could be put into this.

Ideas which have already come forward are: (i) prizes or scholarships for students in Statistics, or prizes for the best student talk at the Conference; (ii) funding and co-ordination of overseas visitors to Australia; (iii) employment of a part-time publicity officer whose role might be to attract funds from industry and to prepare new careers brochures; (iv) employment of a part-time research assistant to prepare resource material in the area of Statistical Education; (v) compilation of resource material at the tertiary level, such as information about "Statistics in Engineering" courses.

Please send any ideas to me c/o Statistical Consulting Centre, University of Melbourne, Parkville, 3052. Even better, send by e-mail to richardj@mugga.mu.oz.

Richard Jarrett

### Writing to the Treasurer

Correspondence for the Treasurer of the Society is still going to the ANU, even though I took over from Daryl Daley as Treasurer more than eighteen months ago.

If you want to write to the Treasurer, and you do not care who he is, so long as he deals with your letter, please write to:

The Treasurer  
Statistical Society of Australia Limited  
GPO Box 573  
CANBERRA ACT 2601

Your mail should then be dealt with, even if I am away from Canberra, or have been replaced as Treasurer.

If you want to contact me personally on Society business you can still write to me at the same address. However, if the matter is particularly urgent, telephone, fax or email me at CSIRO.

Jeff Wood

### Denis Thatcher Society

A new special-interest group has been formed in Washington D.C. To be nominated, a potential Society member must be the husband of a more prominent woman, preferably one in the public eye. If a Society member becomes prominent in his own right, however, he becomes ineligible for membership. The group takes its name from the cheerfully obscure husband of England's Prime Minister.

Co-founder Bernard Norwood, husband of Janet Norwood who is Commissioner of the U.S. Bureau of Labor Statistics, reported "Members bask in the achievements of their wives and enjoy the aura of recognition that their wives have rightfully achieved".

There are no initiation fees or annual dues, and no calls for contributions. The occasional lunch is held, always at clubs at which Thatcher Society members' wives have charge accounts. The motto of the society is "Yes, Dear".

[Source *Amstat News* (Newsletter of the American Statistical Association) April 1990]

### SPRUCE

As we enter the 1990's we are becoming ever more conscious of problems of protecting and conserving the environment. For many years statisticians have worked in a variety of fields to do with ecological issues, with the safeguarding and garnering of resources and with the supply of energy in its various forms in a safe and reliable mode.

The areas of study include: water resources; coal and oil; nuclear plant; industrial effluent; the food chain; meteorology; pollution and risk generally; traffic and transport planning; ecological factors; epidemiological effects; air pollution; and fisheries and oceanography.

There is much that the statisticians and probabilists have to offer in these important fields, from data analysis through probability modelling to statistical methodology. A co-ordinated effort is being made under the title SPRUCE to bring together work and workers in these fields to the benefit of all. SPRUCE initiatives will include conferences, general publication and research projects.

A first major conference will be held in Lisbon, Portugal, from 7 to 10 April 1992, jointly organised by the Universities of Lisbon and of Sheffield, UK. A number of prominent workers in the field have already agreed to take part in this Conference.

**SPRUCE: Statistics in Public Resources and Utilities, and Care of the Environment.**

*Conference President:* Professor Vic Barnett, Department of Probability and Statistics, The University, Sheffield S3 7RH U.K. Phone (44) 742 768555, ext. 4297; Fax (44) 742 739826; E-mail STIVB@UK.AC.SHEF.PA

*Local Organiser:* Professor K.F. Turkman, Departamento de Estatística, Faculdade de Ciências, Bloco C2, 1700 Lisboa, PORTUGAL. Phone (351) 1 678307, ext. 10; Fax (351) 1 678308; E-mail SCEIOC20@PTEARN

### Fasts News

#### PM's Science Council Meeting

Professor Tony Wicken, FASTS President attended the PM's Science Council. The morning session covered the co-operative research centres, and the afternoon science

and mathematics in schools. Without the guidelines not a lot could be said about the centres.

Whilst there were some initiatives foreshadowed in education, they mostly involved the States. The scope for a national initiative involving parents, industry and the professional societies was not explored.

#### **FASTS' Renews Friendship with the Coalition**

The new structures put in place by Dr Hewson will enable greater cohesion to be developed in their policies, and far more feed-in by groups like FASTS. Their time-frame is 18 months to "produce relevant, far-sighted policies".

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### **NEWS ABOUT MEMBERS**

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We wish every success to **Dr Helen MacGillivray**, immediate past President of the Queensland branch, who has just taken up her new appointment as Senior Lecturer in the School of Mathematics, Queensland University of Technology.

**Dr Andy Wood** has just arrived in Canberra from University of Western Australia, Perth, in August to pursue his research with the Statistics Research Section of the ANU.

**Dr Jim Booth** is similarly joining the Section in September from Gainesville, Florida.

Congratulations to **Dr Kim-Anh Do**, recently joining the ANU from Stanford, via Queensland, who married Dr Brad Broome during July.

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### **VISITORS**

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**Professor J. Cohen**; Rockefeller University; 5 - 19 September 1990; Melbourne University, Statistics Department; **Dr Fima C. Klebaner**.

**Professor R.J. Beran**; University of California, Berkeley; 10 September - 19 October 1990; ANU, Statistics Research Section; **Professor Peter Hall**.

THE UNIVERSITY  OF NEWCASTLE

NEW SOUTH WALES

## **LECTURER IN BIostatISTICS (3 YEAR FIXED TERM) CENTRE FOR CLINICAL EPIDEMIOLOGY AND BIostatISTICS**

(Position No. R146/90)

The University invites applications from suitably qualified men and women for the position of Lecturer in Biostatistics. The position is with the Centre for Clinical Epidemiology and Biostatistics at the University and the primary Faculty appointment will be in the Faculty of Medicine although a cross-appointment in the Department of Statistics is envisaged. The post is for a fixed-term of three years.

Applicants should have experience in teaching medical statistics to both postgraduate and undergraduate students. Experience in teaching students from Developing countries would be an advantage.

Applicants should have research experience in Biostatistics and in particular of collaborative work with medical scientists, preferably epidemiologists.

The position is designed to provide statistical input to postgraduate Diploma and Masters courses in Clinical Epidemiology and in Medical Statistics, to provide statistical consultation to others, mainly in the Faculty of Medicine, to take part in collaborative epidemiological research and to undertake a limited amount of undergraduate teaching in the Faculty of Medicine and the Department of Statistics.

Further information can be obtained from Professor R. Heller and Professor A. Dobson, telephone (049) 26 6142 or Fax (049) 26 4307.

Commencing salary will be within the range of \$33,163-\$43,096 per annum depending upon qualifications and experience.

Applications close 14 September, 1990.

#### **GENERAL INFORMATION**

Conditions of employment, including method of application and other particulars may be obtained from the Staff Office, University of Newcastle, N.S.W. 2308, Australia. Applications in duplicate should be addressed to this Unit.

*Equality of employment opportunity is University policy.*

*The University encourages a smoke-free workplace.*

NJA

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## AUSTRALASIAN CONFERENCES

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### CONFERENCE SUMMARY

**A Day with S.T.U. Hunter, Newcastle, 5 September 1990.**  
The Secretary, Department of Statistics, University of Newcastle, NSW 2308, (049) 68 5611. (Full details this Newsletter.)

**Conference on Regional Modelling and Regional Planning, Newcastle, 20-21 September 1990.** Dr Moira Gordon (049) 685-559. (Full details Newsletter 50).

**Combined Statcomp/Biological Statistics Meeting, 1 - 5 July 1991, Coolangatta, Queensland.**

Prof. Tony Pettit, School of Mathematics, QUT, GPO Box 2434, BRISBANE QLD 4001, Telephone (07) 223 2309, Fax (07) 229 1510, email zsmapettitt @ qut.edu.au. (Full details Newsletter 51.)

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**A Day with S.T.U. Hunter, 5 September 1990, Hunter Technology Centre, Rankin Drive, Shortland, Newcastle (adjacent to the University), 8.30 am - 5.00 pm.**

Professor Hunter has kindly agreed to include this workshop for statisticians in his Australian lecture tour. This is a unique opportunity to learn from one of the world's leading teachers of statistical methods. Co-author with George Box and Bill Hunter of the classic text 'Statistics for Experimenters', Professor Hunter is in high demand as a lecturer and consultant in applied statistics and quality improvement techniques.

The Workshop will take the form of a relaxed, informal discussion of current statistical issues. Topics to be highlighted during the day will include the graphical analysis of factorial experiments, Taguchi methods and the interface between statistical process control and automatic process control. In addition participants are asked to bring along their own problems for discussion.

**Cost: \$50 per person (includes lunch, morning and afternoon teas).** Discounted accommodation is available at the Ambassador Hotel, Cnr King & Steel Streets, Newcastle, Telephone (049) 263777.

For further information contact The Secretary, Department of Statistics, University of Newcastle, NSW 2308. Telephone enquiries: (049) 68 5611.

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THE UNIVERSITY

OF NEWCASTLE

NEW SOUTH WALES

### SENIOR LECTURER/ LECTURER DEPARTMENT OF STATISTICS

(Position No. A186/90)

The University invites applications from suitably qualified men and women for appointment to the above position.

Applicants should have a proven research record and an interest in developing Statistics at graduate and undergraduate levels. The successful candidate will be expected to be involved in statistical consulting within and outside the University.

Applicants should have a special interest in at least one of the following areas:

industrial statistics and statistical aspects of quality management; biostatistics; use of statistics in health service management; mathematical statistics and computational aspects of statistics.

Salary will be at one of the following levels, \$43,984 per annum to \$51,015 per annum for a Senior Lecturer or \$33,163 per annum to \$43,096 per annum for a Lecturer. The level of appointment and commencing salary will depend on the qualifications and experience of the successful applicant.

Further information can be obtained from Professor Annette J. Dobson, telephone (049) 68 0401 Extension 598.

Applications close 11th September, 1990.

#### GENERAL INFORMATION

Conditions of Employment, including method of application and other particulars may be obtained from the Staff Office, the University of Newcastle, N.S.W. 2308. Applications (in duplicate) should be addressed to this Unit.

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## OVERSEAS CONFERENCES

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**11th Meeting of International Society for Clinical Biostatistics**, 18-21 September 1990, Nimes, France.

Information: Conference Secretariat, Department de l'information Medicale, Hôpital Caremeau, Avenue de Pr Debre, 30 000 Nimes, France.

**2nd International Conference on Environmetrics**, 27-30 September 1990, Como, Italy.

Information: A.H.El Shaarawi, National Water Research Inst., PO Box 5050, Burlington, ON, Canada L7R 4A6, Canada.

**34th Annual Fall Technical Conference**, 18-19 October 1990, Richmond, VA, USA.

Information: Rick Lewis (ASQC-SD), Union Carbide Corp., 3200 Kanawha Turnpike, S. Charleston, WV 25303, USA.

**International Conference on Measurement Errors in Surveys**, 11-14 November 1990, Tucson, AZ, USA.

Paper submission information from Paul Biemer, Department of Experimental Statistics, Box 30003, Dept. 3130, New Mexico State University, Las Cruces, NM 88003-0003, USA; Phone(505) 646-2937. Registration information from Lee L. Decker, ASA, 1429 Duke Street, Alexandria, VA 22314-3402, USA; Phone (703) 684-1221, Fax (703) 684-2037.

**3rd International Workshop on Artificial Intelligence and Statistics**, 2-5 January 1991, Fort Lauderdale, FL USA.

Information: William DuMouchel, BBN Software Products Corp., 10 Faucett Street, Cambridge, MA 02238, USA.

**ASA Winter Conference - theme 'Statistics and the Environment'**, 3-5 January 1991, New Orleans, LA, USA.

Information: ASA, 1429 Duke Street, Alexandria, VA 22314-3402, USA.

**Census Bureau's 1991 Annual Research Conference (ARC 1991)**, 17-20 March 1991, Arlington, Virginia, USA

Information: Maxine Anderson-Brown, Conference Coordinator, Bureau of the Census, United States Department of Commerce, Washington, DC 20233, USA.

**4th Valencia International Meeting on Bayesian Statistics**, 15-20 April 1991, Peniscola, Spain.

Information: Professor J.M. Bernardo, Palacio de la Generalidad, Caballeros 2, E-46001 - Valencia, Spain.

**Bernoulli Society 20th Conference on Stochastic Processes and their Applications**, 10-14 June 1991, Nahariya, Israel.

Information: R. Adler, Industrial Engineering and Management, Technion, Haifa 32000, Israel.

**1991 Joint Statistical Meetings**, 19-22 August 1991, Atlanta, GA, USA.

Information: ASA, 1429 Duke Street, Alexandria, VA 22314-3402, USA.

**International Conference on Industrial and Applied Mathematics (SIAM)**, 8-12 July 1991, Washington, DC, USA.

Information: SIAM, 3600 University City Science Center, Philadelphia, PA 19104-2688, USA.

**IMSIBAC-4**, 4th International Meeting of Statistics in the Basque Country, 4-7 September 1991, Bilbao, SPAIN.

Information: J.P. Vilaplana, P.O Box 32, 48940 LEJONA/LEIOA, SPAIN.

**International Statistical Institute, 48th Biennial Session**; 9-17 September 1991, Cairo, Egypt.

Information: ISI Permanent Office, 428 Prinses Beatrixlaan, PO Box 950, 2270AZ, Voorburg, The Netherlands.

**Statistics in Public Resources and Utilities, and in Care of the Environment (SPRUCE)**, 7-10 April 1992, Lisbon, Portugal.

Information: V. Barnett, Dept. Probability & Statistics, The University, Sheffield, S3 7RH, UK; Phone (44) 742 768555, ext. 4297; Fax(44) 742 739826; e-mail STIVB@UK.AC.SHEF.PA

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Faculty of Medicine Epidemiology Unit  
151 Barry Street, Carlton, Vic 3053.

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NSW Dept. of Agriculture & Fisheries  
c/o Agricultural Research Institute  
PMB Wagga Wagga, NSW 2650

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Wollongong, NSW 2500

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CANBERRA, ACT 2601.

Advertising will be carried in the Newsletter on any matters which the Editors feel are of interest to the members of the Society. In particular, advertisements of statistical vacancies, statistical literature and calculators will be welcome. For details of advertising rates etc. contact either the Editors or Dr J.T. Wood at the same address.

Members are requested to notify their local branch secretaries (see this page of the Newsletter) of change of address, in order that Newsletters and Journals can continue to be despatched to them.