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## COMPETENCY BASED PROFESSIONAL ACCREDITATION

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Vice-President, Canberra Branch

The prolonged low-key debate on whether we should accredit statisticians has become a luxury we can no longer afford. It is no longer a question of whether to do it but of how to do it. Events outside our immediate control are threatening to overtake Statistics and the other professions in Australia. We still have the opportunity as a professional society to take control of our profession and thereby have a voice in determining the nature and role of the profession but if we prevaricate we risk finding ourselves under the control of others.

While we have been regarding professional accreditation as a matter for the Society, the Commonwealth Government has acted. As part of its labour market reform strategy the Commonwealth Government has adopted a process based on competency standards for professional accreditation which can be implemented with or without the agreement of the professions. There is clear evidence that without immediate initiatives from within the professions, the existing professional societies will become totally irrelevant.

The purpose of this article is to draw attention to the nature of and explain the background to the process adopted by the Commonwealth Government, what is meant by competency standards and to discuss ways in which the Society can seize the initiative rather than simply react once it is too late.

There are sound reasons for introducing professional accreditation quite apart from the pressure exerted by the Commonwealth Government. Indeed the Society is

currently considering adopting accreditation and in a wider context, so are the Royal Statistical Society (RSS) and the American Statistical Association (ASA). These arguments will not be discussed here, firstly because I believe that we do need to take control of our profession by adopting measures which include professional accreditation, the introduction of a formal code of ethics, etc., and secondly, because the actions of the Commonwealth Government make such discussion irrelevant. It is right and proper that we recognise our contextual circumstances because these preclude the adoption without adaptation of an overseas model for accreditation.

Most of the information contained in this article is derived from a meeting of the Federation of Australian Scientific and Technological Societies (FASTS) held at short notice in Canberra on 30 August. The revelations made at the meeting are so important for all professions that they deserve the widest possible dissemination and discussion. This article is intended to provoke urgent and wide discussion within the SSAI.

### Background

The first clear step in the development of the current situation was the release in the mid 1980s by the Commonwealth Government of the key policy document "Australia Reconstructed". This document set the basic agenda for many of the government's labour market reforms and expounded the philosophy of tripartism. Tripartism advocates a social contract model for decision making that requires decisions to be made on the basis of discussion and agreement between three groups, namely the government, employers and unions. The significance of tripartism is that it allows all other interest groups to be

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ignored. The philosophy is apparently well established in Sweden and Austria. There are of course important differences between these two countries, neither of which belongs to the European Economic Community (EEC), and Australia, but with our low industrial base, we are probably closer to Austria than Sweden. A critical difference is that, particularly in Sweden, other interest groups (such as the professions) seem to be better represented in the employer and union groups than they are here.

Labour market reform in Australia is being pursued through award restructuring. As part of award restructuring negotiations, the metal workers unions in 1987 demanded training to open career paths. The Commonwealth and State Governments decided to co-operate to maintain control of training. On the basis of a memorandum of understanding between the relevant Commonwealth and State Ministers, the National Training Board (NTB) was set up in 1990 as a public company. (It is alleged that this circumvented certain constitutional difficulties...) Its role is to "assist industry to develop and then endorse national competency standards for occupations and classifications in industry or enterprise awards or agreements."<sup>1</sup> This will be achieved by registering national Competency Standards Bodies (CSBs) for each occupation and/or industry to develop, monitor and maintain standards.

A second important thrust comes from the Commonwealth Government's multicultural agenda. The National Office for Overseas Skills Recognition (NOOSR) was formed in 1989 in the Department of Employment, Education and Training (DEET) to replace the Committee on Overseas Professional Qualifications (COPQ) which had been in the Department of Immigration. NOOSR was given responsibility to overcome barriers to the recognition of overseas qualifications. As an alternative to the classical approach (based on qualifications assessment and/or examinations) they want to move to competency based assessments which determine an applicant's real occupational competence.

The third thrust comes from the education and training agenda. It may be helpful in the sequel to keep in mind that the Commonwealth Government (sadly) seems to make little or no distinction between Education and Training, treating the two as essentially synonymous. Part of the education agenda involves a desire to remove what are seen as artificial barriers between institutions and to ensure that assessment is based on performance outcomes required by industry rather than "traditional time-based approaches" or focus on the knowledge that is thought to be required. This criticism is apparently based on glaring failures in apprenticeship training schemes; that it is of relevance to the professions is accepted without question. The Commonwealth Government recognises that the potential impact of the introduction of competency standards is enormous: "Competency standards, established in consultation and co-operation with industry, will be the benchmark for curriculum development, assessment, training delivery, accreditation and individual certification in the Australian vocational education and training system"<sup>2</sup>. We can only assume that the universities are yet to appreciate the wide applicability of this approach.

The NTB has set up an eight level structure for classifying occupations and industries, the last two of which apply to professions. The NTB is supposed to deal with professions involved in award restructuring and NOOSR with those not currently involved in award restructuring. Presumably, the professions NOOSR deals with are in a less complicated industrial relations situation. The development of the Competency Based Training (CBT) system is being overseen by the Vocational Education, Employment and Training Advisory Committee (VEETAC) while the National Credit Transfer Authority (NCTA) is working on using competency to remove barriers between institutions. VEETAC and NCTA seem to have little short term impact on the professions though clearly their agenda will have an enormous long term impact.

It is vitally important to realise that although there are many unanswered questions about the process and the players, the juggernaut has begun to roll and is proceeding at full pace. This means that many of the questions likely to be raised by our membership have not even been thought about, never mind answered, but it also means that not everything is set in concrete so the system may be adjusted to meet new situations and to this extent at least retains some flexibility. Our opportunity and responsibility is to take advantage of precisely this residual flexibility.

### What are competency standards?

In the first NTB Network, competency standards are defined in terms of their component parts. We are told that

"A competency standard comprises:

- a title, with perhaps a short description of its purpose
- elements of competency, describing things that a person is able to do in terms of output
- performance criteria - statements of the required level of performance in the workplace, which can be used by an assessor to judge performance
- the range of variables (if required), spelling out the range of contexts and conditions to which the performance criteria apply."<sup>3</sup>

It is clear that we need a deeper discussion of what is or is not meant by competency. The emphasis on relating competency to outcomes is fundamental to the notion of competency. Everyone involved with the process is at pains to make very clear that qualifications and experience (the traditional basis for professional accreditation) are not synonymous with competency. The clearest positive description of competency states:

"A competency comprises the specification of knowledge and skill, and the application of that knowledge and skill, within an occupation or industry level to the standard of performance required in employment. The concept of competency focuses on what is expected of an employee in the workplace rather than on the learning process; it embodies the ability to transfer and apply skills and knowledge to new situations and environments. This is a broad concept of competency in that all aspects of work

performance, and not only narrow task skills, are included."<sup>4</sup>

(Notice the effort made to stress that competency standards should not be too narrowly defined or task based.) However, we are also informed that:

"strategies and processes for training delivery, recognition of prior learning and assessment of individuals exist and are likely to lead to nationally consistent competency standards and outcomes."<sup>5</sup>

This seems to suggest that competency based assessment may ultimately be similar to the classical methods based on formal qualifications and experience. However, it is clear that this outcome cannot simply be assumed and will only arise after a careful appraisal of the classical methods from a competency perspective.

Exactly how competency is defined and assessed is supposedly up to each industry and occupation (within the tripartite framework) so it is impossible to give an abstract definition of exactly what constitutes a competency standard. The problems of overlapping but conflicting interests appear not to have been considered and it remains unclear exactly how the professions fit into the structure. The fact that most of NTB's work so far has been on the lower non-professional levels of their structure means that there is still time to influence outcomes at the higher levels.

There are many ambiguities in describing competency standards and how they will be assessed but there are none about the process of establishing them. Competency standards are to be set by CSBs which are registered by the NTB. Any organisation which can satisfy the NTB that it:

- "has expertise or access to expertise in competency standards development
- is identified and accepted as being representative of the industry or occupation
- has the clear support of the major parties within the industry"<sup>6</sup>

can become a CSB. The NTB is primarily concerned that principal interested parties are consulted and in particular that the tripartite structure is adhered to.

In view of the emphasis on outcomes rather than process in the competency rhetoric, it is ironic that the Commonwealth Government seems concerned only with process in its own workings. This "do as I say rather than as I do" approach means that issues such as who assesses the assessors and, possibly more acutely, who assesses the overseers are not being addressed at all.

The process of establishing a competency standard for a profession can be initiated by any organisation claiming to represent that profession applying to NOOSR for funding to draw up competency standards (i.e. to define competency) and set itself up as a CSB. Since NOOSR seems not to be in a position to assess the claims of competing organisations, the result may seriously damage a profession. This does not seem to concern NOOSR who are far more concerned that tripartism be adhered to. That is, that government, employers and unions be consulted.

## Practical Experiences with Competency Processes

There are four important examples to illustrate the actual working of the competency process.

1. The NTB asserts that our approach to competency standards has much in common with practices in Germany and the United Kingdom. NOOSR reports that competency standards form the basis for skills recognition between EEC countries and gives the explicit example of Architecture as a field in which their use has been successful.

Interestingly, Fred Smith, President of the Royal Statistical Society (RSS) recently wrote:

"Since 1948 the RSS has avoided involvement in issues related to the formal qualifications of statisticians, although it has contributed to wider questions about their education. With the move towards "professionalisation" in most disciplines and the pressure for European-wide recognition of qualifications, it is my view that the RSS can no longer afford to stand aside from issues relating to the professional status of statisticians."<sup>7</sup>

This statement and the supporting documentation indicates that the RSS is considering adopting the accreditation procedures (based on the classical assessment of qualifications and experience) of the Institute of Statisticians (IoS). The fact that there is no explicit discussion of competency issues means that we cannot expect to gain approval for this approach without further work which would have to gain tripartite approval.

2. Commonwealth Scientific and Industrial Research Organisation (CSIRO) scientists have had competency provisions built into their award. They have to negotiate their plans and aims for the year ahead and then assess their performance against these plans and aims at the end of the year. This does not fit into the NTB/NOOSR structure in any obvious way but it is nonetheless an example of an implementation of competency standards in Australia. The CSIRO experience seems to be that there are good aspects to this development but that competency is a confusing notion. This is exacerbated by the fact that, as in most Commonwealth Government rhetoric, the words used have non-standard meanings.

3. Professions with legal registration requirements are being required to set competency standards in the NTB/NOOSR structure. The South Australian State Registration Board is making the running for psychologists with government, employers and unions though which one I do not know. The Australian Psychological Society (APS) has a marginal role if any. The likely outcome is a CSB with lower standards than would be acceptable to APS controlled by the State Registration Board because the requirements for registration are substantially lower than those for joining APS.

This example must be of great concern to all professional societies. It certainly lends fuel to the claims of some professional organisations that the introduction of competency standards is actually an exercise in "deskilling" the professions. (This concern is fuelled further by the



activities of other state government organisations. For example, the NSW Department of Health has 6 levels for scientists. The only qualification mentioned for any of these is apparently the High School Certificate.)

4. The Advanced Skills Teachers program for recognising outstanding teachers provides another example of what could happen. By adherence to tripartism and excluding explicit subject area representation (such as from the mathematics teacher's association) from the development of this program there is no consideration of content skills and no reward for subject ability or knowledge of pedagogy.

### How other societies are reacting

There are a number of professional societies in Australia to which we can compare ourselves. The most appropriate is probably the Australian Computer Society (ACS). In response to pressures which are very similar to those which have been experienced by statisticians, ACS has established professional accreditation on the basis of approved courses (or exams), experience and annual evidence of keeping up with developments in the field. They have applied to NOOSR to initiate the process of becoming a CSB. It is unclear how much they will have to change their accreditation procedure at this time but they will certainly have to review their approach from the competency perspective.

The Australian Mathematical Society (AMS) are also beginning to consider moves towards the accreditation of mathematicians. Their situation is rather different from that of either SSAI or ACS but it is nonetheless interesting to note that they are also feeling the pressure to take control of their profession.

NOOSR states that architecture, dietetics, engineering, nursing, occupational therapy, optometry, physiotherapy, psychology (sic.), social work and welfare and veterinary science are all currently working on the development of competency standards with the view towards forming CSBs. Contact with one or more of these groups is likely to provide us with vital information about the processes involved and about how competency and competency assessment can be tackled.

For the moment, FASTS is trying to get more information about NTB/NOOSR and the competency standards process to forward to individual member societies. It seems likely that FASTS will operate at an advisory level but it will remain up to member societies separately and together to protect their own interests. The matter will be discussed further at the November Annual General Meeting.

### What should SSAI do?

I strongly believe that we need to take control of our profession before someone else does it for us. A vital step in this direction is to introduce professional accreditation. This is so important that I believe we no longer have the luxury of debating whether or not we should introduce accreditation but that, as a matter of urgency, we should decide on the form of accreditation to adopt. This means that the options are:

1. Set up professional accreditation along classical lines
2. Begin examining competency based accreditation

3. Approach NOOSR for funding to initiate the formal process.

These approaches are not mutually exclusive and several could be pursued simultaneously. However, we should not underestimate either the expense or the amount of work involved in pursuing any one of them.

In criticising the Commonwealth Government for the process they have instituted for the adoption of the competency based approach, we must recognise the value of the basic tenets of competency. When all is said and done, the competency based approach is fundamentally sound, has a number of attractive advantages over the classical approach and provides a positive direction in which SSAI should move.

I think we need to begin with the explicit recognition that the urgent need is to accredit applied statisticians (as Practising Statistics Professionals) rather than mathematical statisticians and/or probabilists, no matter how skilful in their areas such people may be. The purpose of accreditation is not to control who does research in statistics or who collects their own data and analyses it for their own benefit, but to control who claims to be a statistician, who interacts directly with the public as a statistician or who charges for the provision of statistical services. Its purpose is not to control the development of statistical science as a discipline in its own right but to control the interaction of statistics with other disciplines. It is not possible to prevent the public from consulting charlatans (though the labour market reform agenda may help achieve this end) but it is possible to distinguish between accredited statisticians and others and to seek recourse against say government decisions based on the analyses of unaccredited people which can be shown to be in error. We need to recognise that accreditation cannot make an analysis good, that we cannot guarantee the performance of members in any particular situation, but that we can identify and root out consistent failure.

I am broadly in favour of a competency based approach because it simplifies the problem of dealing with the diverse array of paper qualifications of people working in statistics and offers the possibility of dealing fairly with the applications sub-branches of statistics (biometry, medical statistics, econometrics etc.). It means that a psychologist or geographer who has made him/herself into a statistician would not be refused accreditation simply because they had not completed an honours degree in mathematical statistics but would be assessed on their ability to analyse appropriate data. This is not to say that all theoretical training is irrelevant but rather to suggest that we consider substantial changes of emphasis in assessing its value. A competency based approach also means that people who have qualifications but who have not kept up with developments in the field (for example by avoiding computing) cannot shelter behind their qualifications and expect to be accredited. We need to face the fact that a lack of computing skills could logically make some SSAI members unaccreditable. At the same time, we need explicit recognition that there is more to statistics than being able to produce computer output. We need to face the fact that there can be no grandfather clause for competency. These and many of the other issues which

arise can be tackled by allowing differential membership in the SSAI and possibly differential levels of accreditation.

In seeking to set competency standards, we would need to come to terms with divergent views within profession as to what constitutes a good analysis. We need to recognise different philosophical approaches. We need to reach broad agreement about acceptable ranges of approaches so that we do not provide too limited a set of guidelines. We need to define a necessary body of common knowledge and encourage advanced specialisation into particular areas. We need to accept that ultimately we are trying to assess knowledge, experience but above all judgement rather than specific techniques. These are difficult issues but they are not avoided by adopting the classical approach to assessment because they still have to be confronted when we consider accrediting particular courses.

Decisions on the future of our profession need to be made by those who value and appreciate applied statistics. We should recognise that all three options pose difficulties for SSAI by exposing a number of controversial issues which up to now we have preferred to avoid. The question is whether we should try to solve them or abrogate our professional responsibility to whoever is prepared to step forward and do so.

<sup>1</sup> NTB Network, June 1991, No 1, p1. <sup>2</sup> *ibid.*, p1. <sup>3</sup> *ibid.*, p3. <sup>4</sup> *ibid.*, p3. <sup>5</sup> *ibid.*, p4. <sup>6</sup> *ibid.*, p4. <sup>7</sup> The Royal Statistical Society News & Notes, October 1991, Vol 18, No 2, p1.

## UNIVERSITY OF HONG KONG

### Lecturers in Statistics

Due to an expansion of the university and rapid growth of the Statistics curriculum, additional Lecturers in Statistics are required. Applicants qualified in any branch of Statistics or Probability are welcome.

Annual salaries (superannuable) are on the scale: HK\$309,120 - 516,480 p.a. (11 points). Starting salary will depend on qualifications and experience. (US\$1 is fixed at HK\$7.0). At current rates, salaries tax will not exceed 15% of gross income. Children's education allowances, leave, and medical benefits are provided; housing or tenancy allowances are also provided in most cases at a charge of 7% of salary.

Further particulars and application forms may be obtained from the Secretary, Faculty of Social Sciences, University of Hong Kong, Hong Kong, fax (852) 517-0806, email STATIST@HKUCC.BITNET. Applicants who use computer mail should include their email address with the final application.

Applications close 12 January 1992.

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## BRANCH REPORTS

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### Victoria

#### July Meeting

Carol Soloff & Aliida Hellenen from the Social Analysis and Consultancy Section of Australian Bureau of Statistics addressed the meeting. They discussed the conduct of the National Health Survey for which the field work was conducted between October 1989 and September 1990. The survey used a sample of 22,000 households throughout Australia with additional surveying being done in three States (including Victoria) where the State supplied extra funds. The multistage sampling procedure was described as was also the general design of the questionnaire. The survey contained four groups of questions: (i) socio - demographic (ii) current and past health status (iii) actions taken to maintain health/ combat deterioration in health (iv) health risk factors.

Data from the survey will be available shortly.

#### August Meeting

Dr Phillip McCloud outlined his experiences in coordinating the provision of Statistical consulting services by the Statistics Dept at Monash University. Promotion of the service has been by contact with local statistical experts within discipline areas, Yellow Pages, direct

mailing, seminars and word of mouth. The services provided have ranged from brief comments to full experimental design and data analysis. In 1990 the service earned nearly \$40,000, with 80% of the earnings going to the consultant doing the work. In dealing with clients it was important to make the client part of the analysis so they accepted the work. Follow-up is also important. A number of issues have arisen relating to production of papers from the work. Should the consultant seek to be a joint author of papers incorporating their analysis of data? Should the payment of a fee by the client exclude the possibility of joint authorship? Reduction of fee where joint authorship was involved could be seen as buying joint authorship.

#### September Meeting

The September meeting was the annual Belz lecture. It was given this year by Prof Don McNeil. He talked about the problem of producing graphical displays of data from several samples for comparative purposes. He took audience participation literally by getting us to assess relationships between data sets displayed graphically in a number of different ways, before explaining what it was all about! The type of graphical displays included box plots, dot plots, quantile plots, 'enhanced' quantile plots. Each graphic compared two normal samples where the p value

for the difference in mean ranged from .017 to .078. Subjects (without knowing the  $p$  values involved) were asked to say whether the two data sets had different means. An experiment was conducted with a group of Computer Science students. Fitting a logistic regression model to the responses suggested that ordinary quantile plots were inferior to the other three methods which did not differ significantly. There was no subject effect. There appeared to be little relation between the  $p$  value and the response. We wait with some trepidation to hear whether a group consisting mainly of trained Statisticians are better able to judge from graphical displays than relatively inexperienced students!

## Queensland

After the excitement and glamour of the Annual Statistical Society conference on the Gold Coast, it has been a return to normal in Queensland, except for experiencing the longest period without rain in recorded history. (Trials of prominent political figures are considered 'par for the course' post-Fitzgerald).

### Filtering non-stationary stochastic processes

Our first meeting since the last report was held on 7 August. The meeting was addressed by Nancy Spencer on filtering a class of non-stationary stochastic processes. In her talk Nancy summarised portions of her doctoral thesis. Congratulations to Nancy who has subsequently been awarded her PhD and is currently visiting Nottingham Polytechnic and Manchester to continue research into non-stationary time series.

### Reliability models in the mining industry

The talk for the September meeting of the Queensland branch was given by Dr Peter Taylor on reliability models in aspects of the mining industry. Peter has been visiting The University of Queensland, Department of Mathematics as the Ethel Raybould Visiting Fellow. Peter's talk was centred on work carried out with Hien Vu, as the basis of her Honours thesis at The University of Adelaide. The development of reliability models for the ore delivery system used at ALCOA's Pinjarra aluminium mine and refinery in Western Australia was discussed. In many of these models the equilibrium probabilities for the system throughput capacities are independent of the distribution of the breakdown and repair lifetimes. That is, the corresponding model possesses insensitivity properties. In other cases, the model is not insensitive, but insensitive upper bounds for the system downtime probabilities can be calculated from simple modifications. The discussion included the setting up and analysis of such models.

## South Australia

### Census 91

A topical General Meeting of the Branch was held on Wednesday 31 July 1991: Russell Rogers, the Deputy Commonwealth Statistician talked on Census 91.

The talk outlined the ways in which Census 91 differs from previous censuses conducted by the ABS. The impact of political, social and technological changes on the content, the conduct, the analysis and the eventual



## Centre For Clinical Epidemiology and Biostatistics and Department of Statistics The University of Newcastle

Applications are invited for enrolment in Masters and Postgraduate Diploma Courses in 1992.

## MEDICAL STATISTICS/ BIOSTATISTICS

The Centre for Clinical Epidemiology and Biostatistics involves the Department of Statistics which specialises in biostatistics, statistics for health service research and management, statistics for quality improvement and statistical computing. It contributes specialist teaching for and supervision of candidates enrolled in the programme.

The programme consists of coursework, data analysis projects and research.

Graduates in statistics, mathematics, economics and other relevant disciplines are invited to apply.

The courses are offered on a full-time and part-time basis or at the University of Newcastle by Distance Learning for those not resident in Newcastle. The Postgraduate Diploma usually involves one academic year of full-time study, or the part-time equivalent. The Masters degree requires all the subjects and projects for the Postgraduate Diploma followed by a research project usually taking one academic year of full-time work (or the part-time equivalent).

Scholarships and other forms of financial assistance may be available.

Closing date is 3 January 1992.

Further information and application forms can be obtained from the Course Controller, Dr Dianne O'Connell, Centre for Clinical Epidemiology and Biostatistics, David Maddison Clinical Sciences Buildings, Royal Newcastle Hospital, Newcastle, NSW 2300. Phone (049) 26 6147. Fax (049) 26 4307.

marketing of the information from Census 91 were explored.

### Swings and Gerrymanders

Alistair Fischer of the Department of Economics at the University of Adelaide addressed a General Meeting of the Branch on Tuesday 3 September 1991.

If swings in electorates were uniform, we could guard against gerrymanders, because we would be able to arrange for 50% of the seats to coincide with 50% of the two-party preferred vote. But swings are not uniform, so we cannot guarantee the absence of electoral malapportionment, either deliberate or accidental. The talk explored the implications of a non-uniform swing, quantified its effects and suggested how this information can be used by Electoral Boundaries Commissions to minimise the chance of this form of malapportionment. Examples of the Australian and South Australian Parliaments were used.

### The Statistician's Role in a Multidisciplinary Review Team

Glenys Bishop of Bond University was visiting the University of Adelaide and addressed the Branch on Tuesday 17 September 1991.

The Commonwealth and State governments have jointly funded several projects under the Home and Community Care programme. To gauge their success, each project must be reviewed by an independent agency. Glenys is a member of a team reviewing three of these projects in Queensland. In the talk she concentrated on one of the projects under review, describing how the review team was put together, some of the issues examined and the statistical analyses that were performed.

### A Cancer Mortality Atlas for Australia

Peter Baghurst of the CSIRO Division of Human Nutrition addressed the Branch on Wednesday 2 October 1991.

Maps of Australia with areas shaded according to the quintile of standardized mortality ratio (SMR) for cancers at various sites have been prepared from unit-record death data for the period 1969-1988. The areas mapped correspond to Statistical Divisions or Sub-Divisions which had stable boundaries over the twenty-year period for which data were available. Total person-years of experience within each area were estimated from data collected in 4 censuses, and SMRs were calculated by external standardization using a world standard population. A statistic to test for clustering of high and low values was devised from all the adjacencies, the null hypothesis distribution being obtained by computer simulation. Several maps show marked differences in the geographic distribution of SMRs for various sites. Some of this variation across regions may be due to ethnic differences, but the maps suggest the existence of important environmental influences for cancers at certain specific sites.

## Western Australia

### Modelling Criminal Careers

Associate Professor Ross Maller of UWA presented an interesting address to the July Branch meeting on the topic

of "criminal careers". Ross began by defining the "criminal career" of an individual to be the total time spent in prison by that person over his/her lifetime. As Ross explained, the definition carries with it a complication that criminal careers are only ever observable in censored form prior to the individual's death. Faced with this, Ross described how he had modelled selected aspects of the WA prisons database (eg using improper exponential distributions (with covariate-dependent parameters) for the times to an individual's  $j$ th recidivism). The level of detail entered into by Ross was sufficient to build up a realistic method for stochastic simulation of criminal careers. For the first time, this method has provided enough data (albeit simulated) to allow comparisons between the criminal career expectations of different population groups. It is also seen as useful in the prediction of prison populations and has succeeded in exploding previously held theories (eg that criminal career lengths are likely to be exponentially distributed).

### Some Statistical and Mathematical Questions in Finance

In August, Dr Fima Klebaner of Melbourne University explained some of the basic ideas and recent advances in mathematical finance. To help the uninitiated, Fima began by providing Branch members with a brief history of options trading. This apparently began long ago in Holland, where options to buy or sell tulip bulbs were traded (prior to actually growing them). In Australia, options trading has experienced very rapid growth since 1976 (with little effect from the 1987 crash). Fima then went on to explain the principle of no "arbitrage" (no profit without risk) and the use of the Black-Scholes formula (1973) to determine a fair options price (assuming that stock's price variations followed a geometric Brownian motion). Fima's observations of actual pricing data in Australia indicate agreement with the Black-Scholes formula (a measure of its fairness? its popularity? or both?). Fima also touched on the relations between fair pricing and martingale theory, the question of estimating the "volatility" of a stock and some recent work from Stanford on "universal portfolios" (where the proportion of stocks in the companies in a portfolio is a iteratively rebalanced to maximise the benefits from their relative price fluctuations). It was certainly a lively, well-presented talk, but there are no signs as yet of rapid increased in Branch members' fortunes!

## Canberra

### The Effectiveness of Water Fluoridation: The Australian Story

In August, Sue Wilson of ANU spoke to the Society about her experiences as a member of the NHMR&C Working Group on fluoridation of community water supplies. The subject was of some interest to her Canberra audience, particularly since the ACT Government has been involved in an 'on-again, off-again' debate on the future of artificial water fluoridation in the Territory since September 1989 (when a temporary government 'coup' led to an equally temporary halt in the addition of fluoride to the Territory's water). Since then, the ACT Government has conducted a public inquiry into the fluoridation issue, leading to the

recent decision that the amount of fluoride being added to the ACT's water supply be halved to 0.5 parts per million.

At about the same time as this political brouhah got going, the NHMR&C set up its own Working Group on the issue, mainly in response to a submission from Drs Mark Diesendorf, P. Sutton and J. Colquhoun which raised doubts concerning the claimed efficacy of water fluoridation for preventing dental caries (tooth decay) in children. The analysis carried out by these authors was based on data collected by the School Dental Services in the various States and seemed to indicate little relationship between changes in the level of caries incidence and the presence of absence of fluoride in public water supplies. The Working Group was therefore set up to evaluate the same data used by Diesendorf *et al* (in order to see if their conclusions held up under independent assessment), to comment on the estimated magnitude of the beneficial effects of water fluoridation and whether it was still a desirable public health policy for Australia, and to identify whether there was a need for more systematic monitoring of the use of and exposure to fluoride by the Australian population.

Not surprisingly, one of Sue's main conclusions was that although evidence for the beneficial effects of fluoridation in Australia still outweighed (somewhat) evidence against fluoridation, much of the data that had been used in the fluoridation argument (including the School Dental Services data) were seriously deficient. In particular, there was an urgent need for more rigour (and better data) in studies of the effectiveness of water fluoridation. The last word on fluoridation has definitely not been written.

#### **The Australian Prisons Census: Estimating Remand Times**

Mark Collins of the Australian Defence Forces Academy was scheduled to speak to the Society in September, on the important social issue of the length of prison remand times for people appearing in Australian criminal courts. A person is on remand if they have been charged with a criminal offence and jailed, but have not yet been tried and convicted for the offence. They are (technically) innocent people in jail. A 'fair' legal system would ensure that remand times are kept to an absolute minimum. Unfortunately, Mark came down with one of the many flus and chills that stalk the Canberra winter, and so was not able to give his talk in person.

However, all was not lost, as the Society was lucky enough to get Mark's co-worker John Walker from the Australian Institute of Criminology to deliver most of Mark's paper. In an entertaining talk, peppered with anecdotes about the quality (or, to be more precise, the lack of quality) of the data available on criminal justice issues in Australia, John introduced members of the Society to the many largely statistical problems that arise when one attempts to measure the effectiveness and efficiency of the Australian criminal justice system. In particular, depending on the seriousness of the charge, the distribution of remand times in this system can be extremely long tailed, and does vary substantially between States.

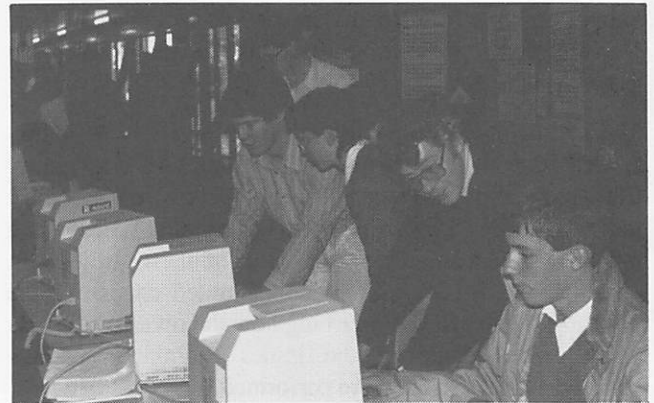
John also presented the meeting with two 'definitions' of statistics for an outsider looking at statistical data and

statistical analysis for the first time. They are reproduced below, and bear some thinking about in the current debate about statistics as a profession:

- "To understand statistics, we must study the activities of the agency which compiled them, for these are the purposes for which these statistics were compiled."
- "Thou shalt not lie — but are excused if complicated stats are used."

#### **Other Activities**

A member of the Branch has provided us with a pictorial follow-up to the report, published in the last Newsletter, on the Society's attendance at Careers Expo 91. The picture below shows the Society exhibit at the Expo, with Ray Lindsay introducing a young passer-by to a problem which requires him to try to match X-LISP-STAT in fitting a regression line 'by eye'. Nearby, on the other Mac's used in the display, a couple of enthusiastic 'punters' are trying to use the sampling program to guess the number of jellybeans in a bottle (they didn't win).



#### **Illawarra Statistical Group**

The Illawarra Statistical Group continues to provide a regular series of seminars for statisticians in the Wollongong region.

At the end of July, Dr Debbie Street (UNSW) spoke on the topic of "Is There Publication Bias?", in which she examined the implications of researchers publishing only the results of tests which yielded statistically significant findings. Our next speaker was a visiting American consultant, David Morganstein, of Westat Inc. David's talk covered a number of issues related to consulting and the introduction of statistical ideas to the layperson. Early in October, Lynn Morris (Roads & Traffic Authority of NSW) gave a talk entitled "A Day in the Life of an I.O.(P)". Amongst other things, we learnt that the collecting of information related to traffic flows is not for the faint-hearted. Lynn also described the use of a simulation package to model traffic flows. Our next guest will be Dr Shahab Ghahreman (U. of W'gong), while Professor David Griffiths will speak at the end-of-year meeting.

The ISG also sought to widen the public's knowledge of Statistics and its applications by providing a display at the University of Wollongong's annual Open Day.

Ken Russell



## Courses in S and S-PLUS Sydney

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*Every participant will be provided with a workstation, or PC DOS machine, if preferred.*

**Presenter:** Dr Bill Venables, Senior Lecturer in Department of Statistics, University of Adelaide. Dr Venables is a very experienced Lecturer and Statistical Consultant and has in recent years given courses on the S language both in Adelaide and in Bond University. His well known "Notes on S" have been successfully used in short courses in many countries, including Holland, Japan, the UK, the USA and Canada.

**Contact:** Sue Clancy, CSIRO Division of Mathematics & Statistics  
Phone: (02) 413 7549 Fax: (02) 416 9317

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The successful candidate will be involved in the teaching program, supervision of Honours and postgraduate students, research and, if appropriate, statistical consulting. Applicants should possess a Ph.D. (or equivalent) in statistics and provide evidence of teaching and research ability. Experience in statistical consulting would be useful but is not required.

The position is available for 4 years from 1 February 1992.

Further information about the position is available from Prof R G Jarrett, Head of the Department of Statistics, on (08)228 5418 or e-mail rjarrett@stats.adelaide.edu.au.

**INFORMATION** about the general conditions of appointment and the selection criteria may be obtained from the Director, Personnel Services at the University.

**SALARY** per annum Interim Salary Scale: Lecturer Level B: \$39,363 × 7 – \$47,150

**APPLICATIONS, IN DUPLICATE**, quoting reference number 9658 and giving full personal particulars (including whether candidates hold Australian permanent residency status), details of academic qualifications and names and addresses of three referees should reach the Director, Personnel Services at the University of Adelaide, GPO Box 498, Adelaide, South Australia, 5001, Telex UNIVAD AA 89141, Facsimile (08) 223 4820 not later than 6 December 1991.

The University reserves the right to make enquiries of any person regarding any candidate's suitability for appointment, not to make an appointment or to appoint by invitation.

*The University of Adelaide is an equal opportunity employer.*

## STATISTICAL EDUCATION IN SCHOOLS

The purpose of this article is to draw members' attention to recent developments in the area of statistical education in schools and, in particular, to summarize the relevant parts of the National Statement on Mathematics for Australian Schools (subsequently referred to as the Statement) which was recently published by the Curriculum Corporation on behalf of the Australian Education Council. The Statement is intended "...to provide a framework around which systems and schools may build their mathematics curriculum" and includes recommendations as to what and how mathematics should be taught in Australian schools.

Recommendations for the content of most areas of the mathematics curriculum do not amount to major changes from current practice, but for the area of probability and statistics noticeable increases in content are recommended at both primary and secondary levels. These recommendations are in keeping with world-wide moves to increase the amount of probability and statistics taught in schools. In the US this year the National Science Foundation has awarded the American Statistical Association two grants, in excess of US\$1 million each, one for the development of a teacher and administrator Quantitative Literacy workshop model for the elementary mathematics curriculum and one for the development of a data-driven curriculum strand for high school mathematics. As commented on in AMSTAT News (July, 1991) "...These projects reflect the national concern that American education is falling behind in teaching the quantitative skills students need to prepare them for productive lives in the 21st century."

The amount of probability and statistics currently taught in Australian schools varies considerably, ranging from virtually nothing in some states to quite substantial amounts (at least in theory) in others. In Victoria (the state I know most about), there is provision for probability and statistics to be taught at most levels and some material on these topics is included in most of the commonly used textbooks. However, prior to years 11 and 12, schools are reasonably autonomous with respect to what they teach and many have chosen to omit these topics. In future things are likely to be quite different. Recent changes to the years 11 and 12 curriculum in Victoria have resulted in a noticeable increase in the amount of probability and statistics being taught at these levels, especially statistics which was almost totally absent from previous courses, and this is already starting to have a flow on effect down into earlier year levels. Given that all states and territories contributed to the development of and have endorsed the general thrust of the Statement and given that they are currently supporting the development of materials for the teaching of probability and statistics at both primary and secondary levels, there is every reason to believe that the recommendations of the Statement will be acted upon and that there will in future be more probability and statistics taught, at all levels, in schools throughout Australia.

I am aware that there are some people in the statistical community who question the wisdom of including substantial amounts of probability and statistics in the

school curriculum. Most of the concerns I have heard can be classified under one of the following three headings.

- Introduction of this material will displace some of the more traditional, more rigorous mathematics which is more important at school level.
- The concepts are too difficult to be taught at school level.
- Many, if not most, teachers are incapable of successfully teaching the material.

I do not wish to enter into a detailed debate as to the merits of the recommendations here, but would encourage those who feel concern to make an effort to find out exactly what is being proposed, if they have not already done so, and be prepared to become actively involved with the changes. I offer a few personal comments here in the hope that they may reduce the fears of some people.

- Some time is currently spent on the teaching of probability and statistics in schools. Much of it is wasted, however, in that much of the material presented is inappropriate and boring; if time is to be spent on this material it is preferable that it be spent wisely.
- The amount of probability and statistics being proposed, especially in the compulsory years, is not so substantial that it need displace essential mathematics and indeed there are many places where the teaching of probability and statistics can be directly linked to the teaching of other concepts to the mutual benefit of both. For example, work on probability and fractions, and work on scatterplots and coordinate geometry.
- Some of the material mentioned in the Statement, in particular some of the material on statistical inference, goes beyond what I consider to be appropriate at present, but it may well be appropriate for some senior students, in future, who have been exposed to statistical concepts throughout their earlier schooling. It is not envisaged that all of the recommendations in the Statement be acted upon immediately.
- There is an urgent need to provide teachers with professional development in the area of probability and statistics and to develop suitable teaching materials. Work is being done in these areas but a lot more remains to be done. In Victoria a substantial statistics course for teachers (3 hours/week for 26 weeks) is being developed, with funding from the Victorian Education Foundation and the Victorian ministry of Education, and will be presented up to 10 times at various locations in both 1992 and 1993.

What follows are a number of abstracts from the Statement. The first few abstracts refer to the purpose and structure of the Statement while the remainder give some of the detail which relates to probability and statistics, or 'Chance and Data' as it is referred to in the Statement.

## The purpose of the Statement

"The purpose of the Statement is to provide a framework around which systems and schools may build their mathematics curriculum. It identifies important components of a mathematics education for the majority of students. It is descriptive rather than prescriptive. It does not provide a syllabus or curriculum and, indeed, its structure makes it inappropriate for direct use in that way."

"Precisely how it will be used, and by whom, will depend upon the particular distribution of responsibilities for curriculum development within each State and Territory."

"....its major audience is curriculum developers at the system, regional and school level."

"The present document is intended to represent one phase in an on-going process of collaboration between States, Territories and the Commonwealth. As such, the document itself is to be subject to periodic revision."

## Structure of the Statement

The Statement is presented in two parts. Part I deals with general issues such as what is mathematics, the goals of school mathematics, the teaching and learning of mathematics, and assessment. Part II describes "...mathematical understandings, skills, knowledge and processes which should typically be made available to students." These are described under headings, referred to as strands, each of which has a number of major subheadings, as follows:

### Attitudes and appreciations

Attitudes  
Appreciations

### Mathematical inquiry

Mathematical expression  
Order and arrangement  
Justification  
Problem-solving strategies

### Choosing and using mathematics

Applying mathematics  
Mathematical modelling

### Space

Shape and structure  
Transformation and symmetry  
Location and arrangement

### Number

Number and numeration  
Computation and estimation

### Measurement

Measurement and estimation  
Indirect measurement  
Approximation, change and the calculus

### Chance and Data

Chance  
Data handling  
Statistical inference

### Algebra

Expressing generalisations

## Functions

## Equations

The material for each strand is presented under four bands A, B, C and D, which correspond, loosely, to difference school levels;

band A — lower primary years,

band B — upper primary years,

band C — lower secondary years,

band D — upper secondary years (years 11 and 12, the post-compulsory years).

Bands A to C are meant to "...contain all of the experiences considered necessary for the typical citizen".

The approach taken to band D is somewhat different since there is no need for students to stay on at school after (typically) year 10, and those that do are not required to take any mathematics, though most do.

## Scope statements and activities

Within each band in each strand there is a series of scope statements which are intended to "...provide a framework around which States or schools may build their mathematics curriculum". Following each scope statement there is a list of activities which are intended to provide clarification and support, but are not intended to be either comprehensive or restrictive. What follows is a listing of the scope statements for each band of the Chance and Data strand together with one of the associated activities. Between 3 and 12 activities are given for each scope statement and while it did not seem appropriate to reproduce all of them here, the scope statements are difficult to interpret without reference to at least some of the activities.

For each strand there is a general statement as to its purpose and scope, as well as individual overviews for each band within the strand. These sections provide some reasons for the choice of material included in the scope statements and some suggestions as to how the material might be presented in the classroom.

The scope statements, which are labelled A1, A2, ... are prefaced by a statement of the form:

"Experiences with chance (say) should be provided which enable students to:"

### Chance and Data

#### Band A [lower primary years]

#### Chance

A1 use, with clarity, everyday language associated with chance events

Possible activity (one of three presented):

- Clarify and use common expressions such as 'being lucky', 'that's not fair', 'always', 'it might happen', 'tomorrow it will probably rain'.

A2 describe possible outcomes for familiar random events and one-stage experiments

- Identify all outcomes arising from one-stage chance experiments, such as tossing a coin, rolling a die,

using a spinner, or selecting a marble from a container.

**A3** place outcomes for familiar events and one-stage experiments in order from those least likely to those most likely to happen

- Select from containers with different numbers of each of two colours of Smarties according to how likely it is that a particular event will occur (e.g. from which container am I more likely to pick out a red than a blue?).

#### Data Handling

**A4** frame questions about themselves, families and friends, and collect, sort and organise information to answer these questions

- Devise rules to sort and classify objects and use the rules consistently (e.g. classify the things in their pencil cases).

**A5** represent and interpret information to answer questions about themselves, friends and families

- Represent collected continuous data using paper strips (e.g. a strip of paper as long as the distance around the head) in order to make comparisons (who has the biggest head?).

#### Band B [upper primary years]

##### Chance

**B1** make statements about how likely are everyday experiences which involve some elements of chance and understand the terms 'chance' and 'probability' in common usage

- Make simple predictive statements about everyday events (e.g. in Perth, it is more likely to rain in July than in December) and understand and use appropriate words such as possible/impossible, likely/unlikely, certain/uncertain, biased/fair, a chance/no chance.

**B2** for random events, systematically list possible outcomes, deduce the order of probability of outcomes and test predictions experimentally

- Systematically list all the ways an event can occur (e.g. list all the ways of scoring a sum of seven when throwing two dice).

**B3** make and interpret empirically based predictions about simple situations

- Investigate situations which are difficult or impossible to analyse theoretically but experimentally simple (e.g. a drawing pin falling point up) and begin to develop the notion of the relative frequency of different outcomes for chance events.

##### Data Handling

**B4** systematically collect, organise and record data to answer questions posed by themselves and others

- Design data collection sheets and use them to record and organise data (e.g. record the number and type of cars owned by students' families).

**B5** represent, interpret and report on data in order to answer questions posed by themselves and others

- Make short statements about data (e.g. more than half the class walked to school each day this week).

**B6** understand what samples are, select appropriate samples from specified groups and draw informal inferences from the data collected

- Discuss and decide how to select a simple random sample (e.g. by drawing names out of a hat, or by giving each child a number).

#### Band C [lower secondary years]

##### Chance

**C1** understand and explain social uses of chance processes

- Investigate uses of probability in insurance and games of chance, and discuss related social issues.

**C2** construct sample spaces to analyse and explain possible outcomes of simple experiments and calculate probabilities by analysis of equally likely events

- Determine the probability of simple events by reasoning about equally likely outcomes (e.g. upon drawing one card from a full pack the probability of getting a heart is one-quarter because...).

**C3** estimate probabilities using the long-run relative frequency (that is, empirical probabilities)

- Recognise that repetitions of the same experiment may produce different results.

**C4** model situations and devise and carry out simulations

- Represent one chance event by another chance activity (e.g. use a spinner divided into seven sections to model the number of babies being born on any day of the week) and use simulations to estimate probabilities, means, medians, etc.

##### Data Handling

**C5** access, evaluate and interpret information presented in different forms from a variety of sources

- Extract information from a variety of graphs, charts and tables presented in the media and government publications (e.g. Australian Bureau of Statistics Census Data, Year Book Australia).

**C6** systematically collect, organise and record data for practical purposes

- Design simple questionnaires and undertake trials to test whether the questions serve the intended purpose, and investigate the effects of different wordings of questions on responses.

**C7** summarise and interpret data using visual representations and measures of location and spread

- Represent univariate data in standard graphical forms (e.g. line plots, histograms, stem-and-leaf plots and box plots), choosing forms, scales and axes which are appropriate for the context.

**C8** understand the impact of statistics on daily life

- Investigate the use of the word 'average' in a range of social contexts (e.g. consider the impressions given by 'the average student ...' and 'the student with average results in mathematics ...') and the use of



different 'averages' to serve different purposes and sometimes to mislead.

#### Statistical Inference

- C9 understand what samples are and recognise the importance of random samples and sample size
- Distinguish between a population and a sample and consider the circumstances under which a sample may or may not be appropriate or necessary.
- C10 draw inferences and construct and evaluate arguments based on sample data
- Develop inferences from data that may be in tables, computer databases, or scatter plots.

#### Band D [upper secondary years; post-compulsory years]

##### Chance

- D1 use experimental and theoretical approaches to investigate situations involving chance and to determine the likelihood of particular outcomes
- Investigate the behaviour of experimentally determined probability as the amount of data increases (e.g. plot the proportion of heads obtained against the number of tosses of a coin).
- D2 generate, use, interpret and investigate properties of probability models
- Examine various probability models (normal, binomial, geometric, Poisson etc.) and properties such as mean, quantiles, and variance of each.
- D3 use simulation to model uncertain events
- Carry out simulation based on a probability model (e.g. estimate a value for  $\pi$  using Buffon's needle method, birthday or queuing problems).

#### Data Handling

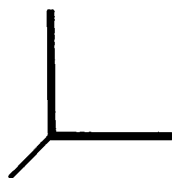
- D4 plan, manage and appraise data collection and presentation
- Evaluate reports and media articles where information has been collected, summarised and interpreted (e.g. phone-in polls, popular scientific magazines, news items on sport, politics, economy).
- D5 undertake exploratory data analysis
- Summarise and interpret data, using appropriate measures of location, spread and correlation.

#### Statistical Inference

- D6 examine various sampling methods and the relationship between samples and populations
- Investigate the role of random sampling in quality control (e.g. control charts, acceptance sampling).
- D7 determine and use estimates of population parameters and confidence intervals
- Use class data to develop an intuitive notion of confidence intervals (e.g. students calculate sample means and standard errors, and examine the proportion of students whose confidence intervals actually contain the population mean).

It is not possible to do full justice to a document of over 200 pages in a summary such as this and readers who are interested in finding out more about the Statement can obtain a copy from the Curriculum Corporation, St Nicholas Place, 141 Rathdowne St, Carlton, VIC, 3053 (Tel. (03)639 0699 Fax. (03)639 1616) for a cost of \$10.95 (+ \$5 postage).

Ken Sharpe



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## SPECIAL INTEREST SECTION

### Medical Statistics

Consideration is being given to a workshop preceding the 1992 Statistical Conference in Perth. One idea that is being floated concerns "the use of statistical analyses and arguments for resolving issues of causation in the law, government policy and public health". Recent examples include determination of the number of deaths caused by drug use, a possible link between power lines and cancer, and the health effects of passive smoking.

At this early stage it would be useful to know of this topic is of general interest to members of the Society. I would

also be interested in any other suggested topics for a workshop, either in Perth or at any other time or place. My address is on the back page; phone (03) 344 6991, fax (03) 344 7014.

A satellite meeting on Biostatistics is to be held in Newcastle from Monday 30 November to Wednesday 2 December 1992. Details are contained in the Australasian Conferences section of this issue.

John Hopper

## NEWS ABOUT MEMBERS

Dr Nick Fisher, Program Manager, Applied and Industrial Statistics, Division of Mathematics and Statistics, CSIRO was elected a Fellow of the American Statistical Association for significant contributions to the analysis of spherical statistics, for excellence in the application of statistics in geology and mining, and for service to the profession.

Dr Sue Wilson, Senior Fellow, at the Australian National University was also elected a Fellow of the American Statistical Association for outstanding applications of statistics to important problems in the biological, social

and medical sciences, and for leadership in promoting statistical science.

Professor Joe Gani received an honorary D.Sc. from the University of Wollongong on 10th October. The citation was delivered by Professor S.A. Morris, Dean of the Faculty of Informatics.

Joe Gani is known to most members of the Society. He has made his mark in the statistical world in many ways, and it is with great pleasure that we congratulate him on his admission to the degree of Doctor of Science, honoris causa, at The University of Wollongong on 10 October 1991.

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## MISCELLANEOUS

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### Young Statisticians Workshop

The Canberra and New South Wales branches held a professional development workshop for young statisticians in Wollongong at the beginning of October. It was organised by Alan Welsh and Simon Sheather, a veteran of similar workshops held by the Victorian branch.

Twelve young statisticians from Canberra, nearly all public servants, and nine from New South Wales, mainly students, met to talk about their work in an informal setting, and to hear talks by invited speakers.

The young statisticians found it worthwhile and the Newcastle contingent offered to organise a similar event in the Hunter Valley next year.

Jeff Wood, (246 5703)

### FASTS

At its 29 August Board Meeting in Canberra FASTS President Professor Tony Wicken reported on the government's "juggernaut" of the National Training Board, the National Office of Overseas Skills Recognition and the "Finn" report which recommends the establishment of a skills transfer agency. These agencies could takeover professional accreditation. If the government loses the next election the Coalition will deregulate the labour market. This will cause a major vacuum in the

development and maintenance of professional accreditation.

Either way FASTS and its Member Societies must get organised.

### Statistical Society of Australia Honours Scholarships

Each scholarship will be awarded annually by the Branch Council (or committee nominated by the Branch Council) of the state or territory in which the scholarship is to be held. A Branch Council (or nominated committee) may choose not to make an award in any year if it is judged that there is no applicant of sufficient merit. The scholarship shall be open to graduates who are qualified to undertake an honours degree in Statistics or in Mathematics with major concentration in Statistics. The scholarship shall be awarded primarily on the basis of academic merit, but a Branch Council (or its nominated committee) may take account of the potential of applicants to become successful members of the Statistical profession. Award of the scholarship is subject to full time enrolment in an honours course in the state or territory in which the award is made. The value of the scholarship may vary from \$500 to \$1000, depending on the Branch. For further information, contact the secretary of your Branch.

Helen MacGillivray

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## AUSTRALASIAN CONFERENCES

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### CONFERENCE SUMMARY

**ACSPRI 92** - 2-14 February 1992, University of New South Wales, Sydney. (Full details this Newsletter.)

**Workshop on Approximate Conditional Inference**, 30 June - 3 July 1992, ANU, Canberra. (Full details this issue.)

Information: Dr Andrew Wood, CMA, ANU, GPO Box 4, Canberra ACT 2601, tel. (06) 249 0705, fax (06) 249 5549, email woamath@durra.anu.edu.au.

**11th Australian Statistical Conference**, 6-13, July 1992, University of Western Australia, Perth, WA. (Full details Newsletter 53 and 54.)

Chairman of Programme Committee, Prof. Ian James, Mathematics, Murdoch University, Murdoch WA 6150, tel. (09) 332 2480, fax (09) 310 1711, email james@prodigal.murdoch.edu.au.

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#### AUSTRALIAN MATHEMATICAL SCIENCES COUNCIL

##### National Symposium on Mathematics

*Adding to Australia's Future*

Academy of Science, Canberra

20-30 November 1991

The Australian Mathematical Sciences Council, of which the Statistical Society is a founding member, represents over 5,000 mathematics teachers, academics, professionals and researchers. The Council has organised the National Symposium in order to enhance public, government and professional awareness of the role and importance of mathematics.

The Symposium will present a series of snapshots of some of the areas in which mathematical ideas and techniques are important to contemporary Australia and to its place in the international community. It will also explore some of the important educational issues that involve mathematics, such as teacher preparation, industry restructuring and parental expectations.

The Symposium is to be opened by Dr David Kemp, MHR, Shadow Minister of Education and chaired by the President of the Council, Professor Garth Gaudry of Flinders University.

The list of prominent speakers includes Professor Niels Becker, La Trobe University, AIDS Research; Dr Jack Gray, Manager, Quantitative Research, AMP Society; Mr Tom Pettigrew, Ford Motor Company, quality control; Assoc. Prof. Clem Annice, Research Centre in Mathematics Education, University of Canberra; Ms Wendy Morris, President, Australian Council of State School Organisations; Professor B.D.O. Anderson FAA FRS, Department of Systems Engineering, Australian National University; Mr Alan Swinstead AM, Engineering Employers' Association; Ms Cassandra Parkinson, National Board of Education and Training; Senator David MacGibbon, Senator for Queensland; Assoc. Prof. Jason Middleton, UNSW; Ms Pam Allen, Shadow Minister for the Environment, NSW; Dr Eileen Doyle, Division Manager, Integrated Steel, BHP Newcastle.

Invitations to the Symposium are being offered to selected members of the Society by the President and Branches.

#### *Editorial Comment:*

*This Newsletter will appear after this meeting has been held, but we felt its importance warranted the inclusion of this notice in the Newsletter. Attendance at the Symposium was by invitation only.*

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#### ACSPRI SUMMER PROGRAM IN SOCIAL RESEARCH METHODS AND RESEARCH TECHNOLOGY, 2 - 14 February, UNSW, Sydney.

Since 1984, ACSPRI has been running an annual summer program in social research methods. The Program aims to serve a wide variety of needs for training within academia, the public sector and industry. Courses range from those suitable for lecturers wanting to introduce research methods into their programs to those dealing with state-of-the-art techniques for experienced researchers.

This year's Summer Program will take place from 2 - 14 February 1992 at the University of New South Wales, Sydney.

The Program comprises two sets of week-long courses which run from Monday to Friday, 9.00 am to 5.30 pm. This means that participants can only enrol in one course for each week.

For a booklet containing descriptions of courses and application details contact Social Science Data Archives, ANU, GPO Box 4, Canberra ACT 2601; tel. (06) 249 4400/2200.

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#### WORKSHOP ON APPROXIMATE CONDITIONAL INFERENCE, 30 June - 3 July 1992, ANU, Canberra

The Centre for Mathematics and its Applications at the Australian National University will hold a workshop on the theory and application of approximate conditional inference from Tuesday 30 June to Friday 3 July 1992.

#### Invited Speakers:

Sir David Cox, University of Oxford, UK

Professor O.E. Barndorff-Nielsen, Aarhus University, Denmark

Dr C.J. Lloyd, La Trobe University, Australia

For further information contact Dr Andrew Wood, Centre for Mathematics and its Applications, Australian National University, GPO Box 4, Canberra ACT 2601; tel. (06) 249 0705; fax (06) 249 5549; email woamath@durra.anu.edu.au.

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#### PANEL SESSION ON STATISTICAL CONSULTING, July 1992, Perth

A panel session on Training for Statistical Consultants is being arranged for the 11th Australian Statistical Conference in Perth in July, 1992.

The training of statistical consultants is an important topic, and it is hoped that this panel session will be timely and useful. Most past discussions on training have focussed on the technical knowledge of statistics, and on the interpersonal skills, which a consultant

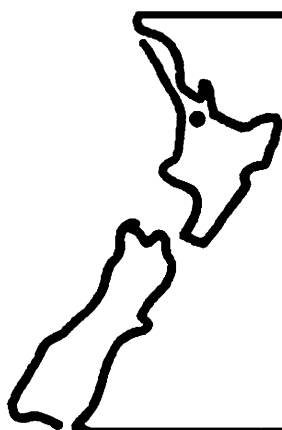


should have. While these will be featured, it is anticipated that the panel session will go further, and will explore other skills which a statistical consultant should have if s/he is to be successful. Amongst these are the ability to schedule competing activities, to determine the appropriate fees to charge, and to know how to advertise his or her services. Ethical considerations, ways of gaining appropriate recognition for the work done, and the division of work between a statistician and a "professional" client are also potential subjects.

It is intended that the panel session will have about six speakers, from various areas of application. Each will talk for not more than

10 minutes, and then the session will be opened to general discussion and questions from the audience. It is hoped that, at the very least, a summary of what is said will appear in a later issue of the SSA Newsletter.

Ken Russell is organising this Panel Session. He would be delighted to receive suggestions of topics or issues to be included in the Session, or the names of people who might be approached to speak. He can be contacted c/o Dept of Mathematics, University of Wollongong, P.O. Box 1144, Wollongong, NSW 2500 Australia (e-mail: kgr@uow.edu.au). Early replies would be appreciated.



## 1992 (XVI<sup>th</sup>) International Biometric Conference

Hamilton, New Zealand 7-11 December 1992

IBC92 Secretary  
Ruakura Agricultural Centre  
Private Bag 3080  
Hamilton, New Zealand

Phone 64 (7) 856 2839  
Fax 64 (7) 838 5012  
E-mail (internet) [ibc@ruakura.maf.govt.nz](mailto:ibc@ruakura.maf.govt.nz)

The Australasian region of the Biometric Society invites you to the sixteenth International Biometric Conference (IBC92) at the University of Waikato in Hamilton, New Zealand, from 7 to 11 December, 1992. This is only the second time an IBC has been held in Australasia; the first was in Sydney in 1967. Come and make it a conference to remember, visit friends and colleagues and experience some of New Zealand's unique attractions and adventure opportunities.

### Invited Programme

Professor Jean-Jacques Clautriaux (Belgium) chairs the invited papers programme committee. The invited sessions and the chairpersons, who each arrange for two invited speakers, are:

Extensions of generalized linear models — A.J. Dobson (Australia)

The AIDS epidemic: past, present, future — L. Billard (USA)

Bayesian monitoring of clinical trials — D.O. Dixon (USA)

Biometry in human genetics and plant genetics — E.A. Thompson (USA)

Design and analysis of large scale field experiments — R. Kempton (UK)

Statistics in ecology and environmental science — I. Yoshimura (Japan)

Interface of geographic information systems and statistical analysis tools — P.J. Diggle (UK)

Use of computers to design experiments — D. Rasch (Germany)

Consulting and collaboration — P. Dagnelie (Belgium)

Statistical needs for developing countries — N. Goodchild (Australia)

### Contributed Papers: Call for Abstracts

If you wish to present a contributed paper (oral or poster) please send an abstract, on the form published in the November 1991 Biometric Bulletin and in the March 1992 issue of this Newsletter, to the IBC92 secretary by 1 July 1992. Professor J.A. (Nye) John (New Zealand) chairs the contributed papers programme committee. The invited papers and abstracts of the contributed papers are pre-published as the conference Proceedings.

### Satellite Conferences to IBC92

A number of satellite conferences and workshops have been planned to coincide with IBC92. Preliminary information is published in this issue.

### More Information

The March 1992 Newsletter will contain registration and abstract submission forms. If you would like these before then or more information on the programme, pre- and post-conference tours around New Zealand, the mid-conference tour day and the accompanying persons programme see the November 1991 Biometric Bulletin or contact the IBC92 Secretary.

Further information available from Dr Harold Henderson, IBC '92 Secretary, Ruakura Agricultural Centre, Private Bag 3080, Hamilton, New Zealand; phone 64-7-8562839, fax 64-7-8385012; 6-mail (internet) [ibc@ruakura.maf.govt.nz](mailto:ibc@ruakura.maf.govt.nz).

### SATELLITE CONFERENCES TO IBC92

A number of satellite conferences and workshops (listed here) have been planned to coincide with IBC92.

30 November - 2 December 1992

A satellite meeting on Biostatistics is to be held in Newcastle from Monday 30 November to Wednesday 2 December 1992. This precedes the International Biometrics Conference in New Zealand, and will be a joint venture of the Medical Statistics Section, the Australian NHMRC Twin Registry, and the Centre for Clinical Epidemiology and Biostatistics at the University of Newcastle, who will be the hosts. For further information please contact Professor Annette Dobson, Department of Statistics, University of Newcastle, NSW 2308, telephone (049) 21 5544, fax (049) 68 4742.

2 - 4 December, 1992

Molecular Evolution Workshop, prior to IBC92, Forest Research Institute, Rotorua, New Zealand.

Information: Dr Bruce Weir, North Carolina State University, Raleigh NC 27695-8203, USA. Email: nbsweir@ncsumvs.bitnet

2 - 4 December 1992

Workshop on Practical Applications of the Bootstrap, prior to IBC92, Australian National University, Canberra, Australia.

Information: Dr. Kim-Anh Do, Statistical Sciences Division, CMA, Australian National University, Canberra, ACT 2601, Australia; Telephone: 61 (6) 249 0564 or 61 (6) 258 1708; Fax 61 (6) 249 5549; Email: dokstat@durra.anu.edu.au

3 - 4 December 1992

Analysis of repeated measurements data: an overview, prior to IBC92, University of Waikato, Hamilton, New Zealand. Information: Dr David Fletcher, Department of Mathematics & Statistics, University of Otago, Box 56, Dunedin, New Zealand; Telephone: 64 (3) 479 7890; Fax: 64 (3) 479 8427; Email: dfletcher@otago.ac.nz

6 December 1992

Dynamic graphical analysis of statistical models: short course, prior to IBC92, University of Waikato, Hamilton, New Zealand.

Information: IBC92 Secretary, Ruakura Agricultural Centre, Private Bag 3080, Hamilton, New Zealand; Telephone: 64 (7) 856 2839; Fax: 64 (7) 838 5012; E-mail: ibc@ruakura.maf.govt.nz

14 - 16 December 1992

Methods for correlated data: current research, after IBC92, in Queenstown, New Zealand.

Information: Dr Katrina Sharples, Department of Preventive and Social Medicine, University of Otago Medical School, Box 913, Dunedin, New Zealand. Telephone: 64 (3) 479 7221; Fax: 64 (3) 479 0529; Email: katrina@otago.ac.nz

14 - 15 December 1992

Genstat Conference, after IBC92 in New Zealand. Information: Roger Payne (Payne@resa.afrc.ac.uk), Jeff Wood (jeff@biomact.biom.csiro.au) or John Maindonald (sramjhm@amv.dsr.govt.nz).

## HOT OFF THE PLANE FROM THE U.S.A.!

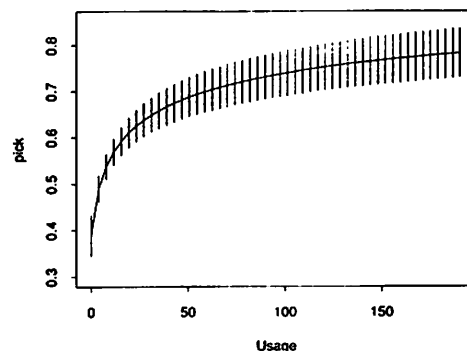
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## OVERSEAS CONFERENCES

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**3rd Pacific Area Statistical Conference**, 11-13 December 1991, Tokyo, Japan.

Information: Prof. Takesi Hayakawa, Department of Economics, Hitotsubashi University, 2-1 Naka Kunitachi, Tokyo 186, Japan; phone (81) 0425-72-1101 extn. 415, fax (81) 0425-77-2298.

**International Conference on Random Mappings, Partitions, and Permutations**, 3-6 January 1992, Los Angeles, CA, USA.

Information: Simon Tavaré, Department of Mathematics, University of Southern California, Los Angeles, CA 90089-1113, USA.

**International Symposium on Multivariate Analysis and Its Applications**, 16-18 March 1992, Hong Kong.

Information: ISMAA, Dept. of Mathematics, Hong Kong Baptist College, 224 Waterloo Road, Kowloon, Hong Kong.

**Census Bureau's 1992 Annual Research Conference (ARC 1992)**, 22-25 March 1992, Holiday Inn Crowne Plaza, Arlington, Virginia. ARC 1992 will comprise a mix of topics such as modeling social and economic phenomena, methods for establishment surveys, modeling and measuring nonsampling errors, emerging data processing technologies, longitudinal data weighting issues, planning for national CAPI and CATI surveys, research issues for 2000 census planning, and more.

**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 IVB@UK.AC.SHEF.PA

**Seventh International Conference on Multivariate Analysis (Part 1)**, 6-9 May 1992, University Park, PA, USA.

Information: C.R. Rao, phone (814) 865-3194, fax (814) 863-7114, e-mail crr1@psuvm.psu.edu.

**46th Annual Quality Congress**, 18-20 May 1992, Nashville, TN, USA.

Information: Shirley A. Feger, ASQC, 611 E. Wisconsin Ave., Milwaukee, WI 53203, USA.

**International Workshop on Bayesian Robustness**, 18-21 May 1992, Milano, Italy.

Information: CNR IAMI, via Ampere 56, I-20131 Milano, Italy.

**First US/Japan Conference on the Frontiers of Statistical Modelling: An Informational Approach**, 24-29 May 1992, Knoxville, TN, USA.

Information: Judy Snow, Conference Coordinator, Department of Statistics, 331 Stokely Management Centre, The University of Tennessee-Knoxville, Knoxville, TN 37996-0532, USA.

**Fifth International Symposium on Statistical Decision Theory and Related Topics**, 14-20 June 1992, West Lafayette, USA.

Information: Shanti S. Gupta, Dept. of Statistics, Purdue University, West Lafayette, IN 47907, USA.

**International Conference on Computers and Learning, ICCAL'92**, 17-20 June 1992, Nova Scotia, Canada.

Information: Dr Ivan Tomek, Jodrey School of Computer Science, Acadia University, Wolfville, Nova Scotia, Canada, B0P 1X0.

**The 5th International meeting on Statistical Climatology (SIMSC)**, 22-26 June 1992, Toronto, Canada. Held jointly with the 12th Conference on Probability and Statistics in Atmospheric Science.

Information: Francis W. Zwiers, Numerical Modelling Division, Canadian Climate Centre, 4905 Dufferin Street, Downsview, Ontario, Canada M3H 5T4, phone 1-416-739-4415, fax 1-416-739-4521, e-mail acrmfz@cid.acs.doe.ca.

**International Conference on Social Science Methodology**, 22-26 June 1992, University of Trento, Italy, organized by the Research committee on Logic and Methodology of the International Sociological Association. Papers are invited in fundamentals of social science methodology, research design, data collection methods and data analysis techniques.

Information: H.M.A. Schadee/J. van Puffellen, Dipartimento di Politica Sociale, Via Verdi, 26, 38100 Trento, Italy, phone 39 461 8813313, fax 39 461 881499 or 881348, email CONF92 at ITNCISTI or SCHADEE at ITNCISTI.

**Vth International Meeting of Statistics in the Basque Country**, 3-7 August 1992, San Sebastian, Spain.

Information: J.P. Vilapana, IMSIBA-4, The Secretariat, PO Box 32, E-48940 LEJONA/LEIOA (Biscay), Spain.

**1992 Joint Statistical Meetings**, 10-13 August 1992, Boston, MA, USA.

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

**7th International Congress on Mathematical Education (ICME-7)**, 17-23 August 1992, Quebec City, Canada.

Information: Congres ICME-7 Congress, Université Laval, Quebec, QC, Canada G1K 7P4.

**10th Symposium on Computational Statistics (COMPSTAT)**, 24-28 August, Neuchatel, Switzerland.

Information: COMPSTAT Secretariat, Groupe de Statistique, Université de Neuchatel, Pierre-a-Mazel 7, CH-2000 Neuchatel, Switzerland.

**Royal Statistical Society Full Conference**, 9-11 September 1992, Sheffield, United Kingdom.

Information: Prof. P.J. Diggle, Mathematics Department, Lancaster University, Lancaster LA1 4YF, UK.

**Seventh International Conference on Multivariate Analysis (Part 2)**, 21-23 September 1992, Barcelona, Spain.

Information: C.M. Cuadras, phone 34-3-3308851, fax 34-3-4110969, e-mail d3escca0@eb0ub011.earn.

**Seventh International Conference on Multivariate Analysis (Part 3)**, 16-22 December 1992, New Delhi, India.

Information: S.K. Mitra, phone 91-11-664741, telex 31-73274 ISI IN, e-mail isid!mitra%vikram@shakti.ernet.in.

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