NEWSLETTER

December 1999

Operational Research Society of New Zealand (Inc.), PO Box 6544, Wellesley St. Auckland, New Zealand
http://www.esc.auckland.ac.nz/Organisations/ORSNZ/

EDITORIAL

I sit down to write a rather overdue editorial not knowing quite what sort of emphasis would be appropriate.

As I come towards the end of another busy year facing, before it is over, a busy pre-Christmas social schedule, the OR Society Conference, and a greater work-load than I would like, I reflect on how little time I have had, or spent, on reflecting and thinking. In moving from the university to the business-world I have been struck by the different level of discussion and debate, of thoughtful interaction over whatever may take people's fancy. There seems no time to indulge in the luxurious leisure of "thinking" that is still present and I hope will always continue in the ivory-towers. While I still find some time to mull over "ideas", especially if they relate to work, it is in the area of personal reflection and thoughtful interaction with myself that I find a busy schedule takes its greatest toll.

Recently I have developed a back problem which has left me in some discomfort. (Nothing to compare to the problems Hugh Barr is facing – and Hugh we wish you well!) After not too long I was seeking medical help and for many weeks now I have studiously performed a selection of contortions, stomach strengthening exercises, cold packs and shower tortures (alternating cold and hot water on my back), all aimed, so my osteopath says, at getting me right (and, after all, it is costing me enough!!). If he is to be believed I will be such a new man you will hardly recognise me. Compared with the effort I have expended, at least twice a day, on fixing up my physical disorder, my time spent thinking and reflecting has been rather sparse.

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Publication dates: March, June, September, December
Deadline for submissions: on the 15th of February, May, August, November (for following month's issue)
Send submissions as word attachments by email to Production Manager, Tricia.Lapham@vuw.ac.nz

A VERY MERRY CHRISTMAS AND SAFE HOLIDAYS TO ALL MEMBERS

As professionals, we speak of "values" and "ethics" and some parts of the OR discipline are straying into them as an academic pursuit. (I am often intrigued that what I hear of "business ethics" has not much to do with business and even less to do with ethics – but be that as it may.) It seems a pity to me that these have almost been turned into the fruit of some mechanical "strategy" process that we, as individuals or organisations, indulge in once in a while, in the endeavour of setting goals, objectives and vision statements - whereas they are properly the result of an on-going process of thoughtful introspection and reflection; born out of our souls; exposed to the scrutiny of others; fashioned against the practicalities of life; but never lost to pragmatism. Not something we dream up in a half-day seminar.

There is honesty about the endeavour of thoughtful introspection. I appreciate it when I see people and organisations with clearly defined values and notice their integrity and strength. On the other hand I fail to see it all too often, especially in the political rhetoric we have recently been exposed to in the run-up to the election. I write this in the hope that we can do better.

JOHN GEORGE, email: jgeorge@phb.co.nz

RESEARCH SCIENTIST - OPERATIONS RESEARCH

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$52K-$56K plus Superannuation (Exceptional candidates may be appointed at a higher level)

You will be a member of a highly successful team of nine operations research professionals working on challenging industrial applications of optimisation and simulation technology. The objective of the group is to improve the effective use of resources in Australian industry. This is achieved by developing models, algorithms and prototype software for decision support.

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You will have a PhD in operations research or applied mathematics, or equivalent research experience. You will have a strong background in optimisation, demonstrated problem-solving skills and experience in implementing algorithms in C/C++. Sound oral and written communication skills are essential.

Further information about the position is available from:
Dr Graham Mills, Ph. (08) 8303 8784 email: Graham.Mills@cmis.csiro.au

Copies of the job description and selection criteria are available from:
Yvonne Craig, Ph. (03) 9545 8009 email: Yvonne.Craig@cmis.csiro.au

Applications should quote reference number 99M50 and should include details of your skills, qualifications, work achievements and the names of two professional referees. Applications should also include your response to the selection criteria and should be sent to:

The Personnel Manager
CSIRO Mathematical and Information Sciences
Private Bag No. 10
South Clayton MDC 3169

by 12 January 2000.

ORSNZ VISITING LECTURER: PROFESSOR RICHARD E BARLOW

Professor Richard Barlow has visited a few Australian universities before he came to New Zealand in October as a 1999 ORSNZ Visiting Lecturer. He gave talks at the University of Auckland, Massey University, Victoria University of Wellington and the University of Canterbury.

After finishing Ph.D. study in the Department of Statistics at Stanford, Professor Barlow joined the Institute of Defense Analysis, and then moved to General Telephone Laboratories. He joined the Department of Industrial Engineering and Operations Research of the University of California at Berkeley in 1963. He has been working there until July of this year. He now is a Professor Emeritus.

He has published a number of articles on reliability theory as well as a few books on the subject. He has been an associate editor of journals such as SIAM J. of Applied Mathematics, Technometrics, Annals of Statistics, Annals of Probability and Mathematics of Operations Research. His honours include the von Neumann Prize presented by TIMS-ORSA jointly to him and Professor Frank Proschan in 1991.

While in Wellingtron, he was interviewed by Dr. Yu Hayakawa, a former student of his.

YH: What made you decide to work in the field of reliability theory?

REB: I was working on a Ph.D. thesis at Stanford, and working with Frank Proschan in the summers at a quick reaction facility run by Sylvania (now General Telephone), and it was there that they had reliability problems. Frank and I started working with the engineers on their problems. Frank was interested in spare parts problems and I was interested in maintenance problems. We were both in statistics, but at the same time Frank had a considerable background working at Sylvania on the East Coast. So, he was interested in applications and I was also interested in applications, and at that time, the OR program at Stanford was in the Statistics Department. There was no separate Operations Research Department. So, we really worked on problems that would be called Operations Research problems today. Our theses were both connected with Samuel Karlin together with Herbert Scarf and Kenneth Arrow. They had a very important book that led to a lot of research in inventory theory. We were both students of Karlin. At the time, mathematical statisticians would not really touch problems involving reliability. It was too applied. And in some sense, statisticians are not that interested in them even today. But Sheldon Ross told me that when he was a graduate student about 9 years after I finished at Stanford, our book on reliability theory got him interested in probability because the book was about probability applications. There were not too many such books. Feller was the author of an important book on probability applications in our era. Feller was actually interested in applications although he was also a very good mathematician. It was an excellent book [i.e. An Introduction to Probability Theory and Its Applications, V. 1, 2nd ed., John Wiley & Sons].

YH: Could you mention some of your results that had a big impact on the field?

REB: The impact was mainly on statisticians who were interested in writing papers. One of the results was the convolution of IFR (increasing failure rate) distributions. The proof was fairly short, only a page, but it took a long time to get that proof. It is very nice but abstract and this led people such as Henry Block and Tom Savits to prove convolution results for IFRA (increasing failure rate on average) distributions. This was an open problem in our 1975 book (i.e., ``Statistical Theory of Reliability and Life Testing''). The impact really was on the research of people who were working in the defense industry. We were working at the height of the Cold War and as a result, there was no problem getting funding for reliability research. Our biggest fans, so to speak, were in Russia and Eastern Europe who were of course our cold war enemies. But they were the ones who were most interested in our papers. So we had an impact on the mathematicians at Moscow University, the group led by B. V. Gnedenko. There were also Belyayev and Solovyev. The three together had the first book in Russian which was also a research monograph at a high mathematical level. There were, of course, a lot of other papers and books, but they were written by engineers. Engineers tend to write about very specialised problems. They do not look at the big picture nor do they get very abstract. That is the nature of engineering. It is the difference between what we did and what the engineers were doing.

We looked at reliability problems in a more abstract way. Rather than analysing special series and parallel type systems, Birnbaum, Esary and Saunders came up with the coherent system idea. Frank, I and Albert Marshall did a lot of work in reliability that was published as technical reports at the Boeing Scientific Research Laboratories. Ronald Pyke and Z. W. Birnbaum, in the Mathematics Department of the University of Washington, were all consultants at this Laboratory. That is the period when a lot of this reliability research got going. We had applications that engineers actually referred to, such as minimum repair models.

YH: You recently published a book on engineering reliability. Would you comment on it?

REB: Of course, I recommend that everyone purchase this book. It seems as if it is very specialised because of the engineering examples. However the approach is statistical, I mean it is really about statistics. The text book illustrates the Bayesian methodology in statistics.

YH: How are the concepts of reliability used in industry in the United States and in other countries?

REB: Failure rate functions, of course, are universally used. When we were writing our first monograph, the main application of statistics in reliability was the work of Epstein and Sobel. They introduced, or rather made popular, the exponentiality distribution. The reason it was so popular is because of the ease with which you can analyse data if you assume exponentially. They had published tables based on the exponential distribution that were in use in the industry to a large extent even to a greater extent than our work which was used later. But the IFR idea was something that a lot of people were interested in and using that concept you can get bounds on survival probabilities. Later we showed how you could use properties of IFR distributions in total time on test plots. A lot of people, especially in Scandinavian countries, have used these total time on test plots.

YH: Can you relate to us reliability success stories in real life?

REB: There was a question about reliability growth. The Air Force, in particular, had contracts with defense contractors, people who were developing systems for the Defense Department. And in the contract they would put an incentive in terms of reliability growth. If they could show that there was definitely reliability growth by demonstrating over time that the equipment was getting better, then the contractor would get a bonus. So, there was a time when the Air Force came to us, actually to Bill Jewell and myself. They were questioning this reliability growth in a certain context, and one of the reasons they were questioning it, I think, was because this incentive was costing the Air Force a great deal of money. So, we looked at this. Actually it was Bill Jewell who was able to show that the claimed "reliability growth" was really just an artefact of the data. This saved them lots and lots of money. So, in terms of money, that was a reliability success story.

I think frankly that the fault tree method is probably one of the most useful reliability methods. We did not develop the fault tree method as such but had a conference on the subject in 1974. This was the first time there was a conference on the subject of fault trees which brought together mathematicians and engineers. The subject was really developed by mechanical engineers. Fault trees had a big influence on the nuclear safety industry. There was a SIAM proceedings of this conference. It was coloured green for safety and the proceedings were still being bought 10 or 15 years after the conference.

I was also involved with consulting at the Lawrence Livermore Laboratory. Their problems were pretty sophisticated relative to most industry problems. I did a lot of work analysing accelerated life test data. I think one of the important things that came out of this was that although testing is usually done at high stress levels, very, very little - if any is done at low stress levels. But the whole idea is to predict reliability at low stress levels from data gleaned from experiments at high stress levels. When we first started looking at the data there was not much available. The engineers were all using exponential distributions to analyse the data. This was failure data about spherical pressure vessels. Spherical pressure vessels are used on the Space Shuttle. They are also used in very highly classified situations. Anyway, these pressure vessels were being tested as well as strands that were used to construct these special vessels. There were accelerated tests that went on for 7 years. We analysed the data at the end of a seven year period. As a result of this analysis, we could see for one thing that failure distributions were changing with stress levels. This meant that you should not use, for example, an exponential life distribution model with the usual power law as a function of stress level for the failure rate. The analysis that I did using computer facilities which were extremely good at that time at Lawrence Livermore Laboratory, analysed data over 7 years. In the case of very high stress, strands failed within an hour or so and in some cases within a year. At lower stress levels, failure did not occur for years in some cases. A result of the analysis was that the shape parameter of the Weibull life distribution changes with stress level. You cannot use an exponential life distribution where the failure rate changes with different stress levels. We analysed the data independent of the scale parameter using total time on test plots. Then we used posterior distributions based on a Weibull-type model. It becomes absolutely clear that the Weibull shape parameter changes with stress level. As the stress level goes down, mean life goes up and the Weibull shape parameter also goes up. That means that the failure rate is increasing more and more rapidly with age. I thought that was a success story.

YH: Are there any bad failures?

REB: There have certainly been very bad failures recently though I am not connected with those. I think it is due to the fact that engineers are skipping the necessary fault tree analysis and reliability analysis. There have been recent failures with satellites that were to be put into orbit. Recently there was a problem with a satellite that was supposed to orbit Mars. That was a human error situation. A major advantage of fault trees is that you can easily incorporate human error into the analysis. Originally fault trees were used by people who were only interested in safety. People who were interested in reliability were using block diagrams. When we were at Boeing, working at the Boeing Scientific Research Laboratory, the two groups did not talk to each other. We were on opposite sides of Duwamish river in Seattle. In retrospect, it turns out that people on the other side of the river from the Laboratory who were developing fault tree analysis were actually doing something more useful. I decided that after I got involved with nuclear power safety problems.

YH: How popular are OR courses amongst university students?

REB: Optimisation courses are popular. Engineering economics courses are in some sense even more popular but in another sense students are only taking it to fulfil a requirement. That is not reliability of course. Our graduate reliability course student class size has fluctuated a great deal in the last 3 or 4 years. Recently I have had more and more students from outside the department because I was emphasising this engineering reliability aspect. In addition to IEOR students I have had 2 or 3 from Mechanical Engineering, usually at least one from Civil Engineering and one from Nuclear Engineering. It was not a big class.

YH: Do you think there need to be changes in the OR curriculum in general?

REB: Yes. What is happening in our department at Berkeley is that there is more and more interest in industrial economic problems. So Ian Adler is giving a graduate course for the first time this semester in financial engineering. Sheldon Ross is interested in option pricing. These are all at the graduate level. They are still offering undergraduate Operations Research courses, but the number of faculty that have interests close to the Business School has been increasing. The Business School has more and more influence on the department. Our graduate students are taking courses there. So that is what is happening in our curriculum in Berkeley at least. The changes are towards Finance and Business.

YH: Would you comment on what steps should be taken about the future of OR?

REB: There is an ebb and flow of ideas in the university in our time. Likewise there is an ebb and flow of life in the natural world. It is called evolution. It has been remarked that evolution is more like a bush than a tree. The same thing occurs with intellectual disciplines within the university. Operations Research started as an interdisciplinary need in World War II and grew into a separate discipline. In some universities (take Stanford as an example) statistics broke off from mathematics and Operations Research broke off from Statistics. Now

Operations Research is no longer a separate department at Stanford. The thinking now is that Operations Research should go back to applications; to what I would call “substantive fields", i.e., those concerned with problems arising from the natural and commercial world. However, in time, these fields will adopt Operations Research techniques as a part of their curriculum. This has happened at Berkeley in other engineering departments. So where does this leave Operations Research?

I think Operations Research departments are “melting away”. Rigorous OR mathematical research is occurring in mathematics departments as they seek to be more applied. OR techniques are being adopted by “substantive fields" of research. I think the same thing is happening to statistics departments. In my view, different basic probability models need to be developed for “substantive fields" of research, i.e., the normal distribution model is like an “elephant gun" being used in an indiscriminate fashion for a multiplicity of problems whereas different problems always require their own special probability models. The calculus of probability, on the other hand, can and is being taught in mathematics departments regardless of the field of application.

Acknowledgments: Yu Hayakawa is grateful to Tapas Sarkar and Tony Vignaux for their assistance.

YU HAYAKAWA, Victoria University, email:Yu.Hayakawa@vuw.ac.nz

Cplex

WAIKATO NEWS

I recently attended the 50th Meeting of the European Working Group on Multicriteria Decision Analysis (MCDA) in France. This is a group of mostly European academics working on related problems in this area, and they have been meeting twice per year for the last 25 years. The meeting I attended commemorated Bernard Roy's (LAMSADE, University of Paris, Dauphine) contribution to the field. Of the 100 conference participants, only a handful of us were not from Europe, although we 'foreigners' were warmly received and treated well.

While this conference was interesting for me (despite half of the papers being presented in French), I could not help but reflect on how parochial and territorial this OR sub-field has become. By this I mean that I was struck by the regional differences in how we attack such fields of study. I will not go into the details of such differences within MCDM, but certainly, there are differences in the areas of problem structuring, assumptions regarding decision maker preferences, and modeling techniques. While differing approaches all are valid (in my mind), why is it that legions of researchers in a certain geographical area will latch on to a particular way to study a particular field? Why is there a 'French,' or 'European,' or 'American' school of study for MCDA? Is it that we tend to continue to study the approach (or approaches) that were offered to us in our doctoral programs, by researchers who themselves were taught using the same basic sets of techniques? Do we then tend to settle in local geographic areas, thus perpetuating these as interesting fields of study for the next wave of doctoral students?

I do not confess to have answers to such questions, but it does seem that we as researchers tend to get stuck in a methodological rut when it comes to advocating interesting or even valid directions for research. I know I do with my own research in MCDA, and I wonder if this is true for most OR researchers. Therefore, as a result of my attending this conference, I have made a silent vow to break out of my mold, encourage my doctoral students to look beyond my personal horizons, and see what else the various regional academic communities around the world have to offer. Perhaps I'll be pleasantly surprised.

JIM CORNER, Waikato University, email:j.corner@waikato.ac.nz

ORSNZ99

The 34th Annual Operations Research Conference of New Zealand is still on – **Waikato University, Friday 10th and Saturday 11th December.** We have a genuinely international flavour for the conference with almost 30% of the papers to be presented by overseas speakers. As I've said earlier, we have a good and varied programme, including a panel discussion on the Saturday.

We hope you will be able to come to the conference. Full details can be obtained from the Conference Website: www.mngt.waikato.ac.nz/orsnz99.

JOHN BUCHANAN, Department of Management Systems and ORSNZ99 Conference Chairman

ANNALS OF OPERATIONS RESEARCH

OPERATIONS RESEARCH AND CONSTRAINT PROGRAMMING IN THE ASIA PACIFIC REGION

CALL FOR PAPERS

Within the framework of the Annals of Operations Research there is to be a special issue on Operations Research and Constraint Programming in the Asia Pacific region which is expected to appear early in 2001.

The principal aim of the issue is to provide a summary snapshot of research in and application of Operations Research (OR) and/or Constraint Programming (CP) in the Asia Pacific region.

New extended submission date January 15, 2000. Further details email: paul.lochert@sci.monash.edu.au

NEWS FROM AUCKLAND

OR/MS continues to thrive at the University of Auckland. New OR/MS problems continually emerge from the business community to provide thesis topics for students and sustenance for staff. Rostering and scheduling applications continue to be a major driver of successful optimisation projects, with applications moving from Air New Zealand to Sky City Casino, St John's Ambulances, and NZ Police call centres. Dave Ryan's international reputation in this area has taken him out of New Zealand on what must be a record number of overseas excursions this year.

It is with considerable regret that we say farewell to Shane Henderson, who has returned to the University of Michigan. Shane was with the department for two years, and in that time he was not only a key contributor in all facets of the Department of Engineering Science, but also played a major role in running the affairs of ORSNZ in Andrew Mason's absence. He has done a superlative job as acting treasurer, and passed the reins to Phil Neame until the election of a new treasurer. Shane continues to collaborate with Andrew Mason (on ambulance scheduling) and Andy Philpott (helping Team New Zealand to retain the America's Cup). We wish him well in what promises to be an illustrious career, and hope to see him back in Auckland before too long.

Next year sees a return to near-full strength for the Department of Engineering Science, with the return of Andrew Mason from his travels, and the arrival of Golbon Zakeri to a full-time lecturing position. Golbon has spent the last two years in the US, with a sojourn at Argonne National Laboratories, followed by a period of teaching and research at Milwaukee University.

In the Department of Management Science and Information Systems, the departures of staff to colder climes (Diane Bischak for Calgary in July and Jay Sankaran for Canterbury in December) have generated new positions which (along with a Chair in Operations Management) are currently in the process of being filled. In research developments, David Robb is leading a recently formed team on Enterprise Systems and Supply Chain Management. If other researchers are interested in affiliating with this group please e-mail him d.robb@auckland.ac.nz.

ANDY PHILPOTT, University of Auckland, email:a.philpott@auckland.ac.nz

ORSNZ VISITING LECTURER AWARD

The Council of The Operational Research Society is calling for applications for the 2000 ORSNZ Visiting Lecturer Award. The award of $500 is intended to assist the travel within New Zealand of internationally recognised OR/MS academics and practitioners who are visiting this country. In special circumstances the Fund might be used to support a visit from Australia. The award is intended to encourage the interaction of the visitor with all of the regional branches of the Society, and it will be expected that the visitor give lectures at each of these branches. The Council makes up to two of these awards each year.

To apply for such a grant, the host of the visitor in New Zealand should apply in writing to:

Dr Andy Philpott
President, ORSNZ
Department of Engineering Science
University of Auckland
Private Bag 92019
AUCKLAND

enclosing a curriculum vitae for the visitor, and a proposed itinerary. Applications close at the end of January and at the end of June, for visits occurring in the next twelve months.

OPERATIONS RESEARCH STUDENT PROJECTS IN ENGINEERING SCIENCE 1999

The following operations research projects were carried out by students in the final year of their BE in Engineering Science at the University of Auckland. For further information contact the project supervisor (shown in parentheses below the student's name).

Carly Allbon (Ryan)	Flight schedule optimisation
Kalman Bekesi (Philpott)	Short-course yacht routing under uncertainty
Ruth Brown (Philpott/Henderson)	Meat processing at the Richmond Takapau sheep plant
Bert Chen (Henderson)	Call centre demand at police communications centres
Basilisa Choi (Henderson)	Modelling travel times for St John's Ambulances
Michael Crestanello (Ryan)	Staff scheduling and rostering at the casino
Justin Fernandez (Smith)	Analysis of variability in marinade pickup in Tegel products
Catherine Hicks (Philpott)	Optimising paper machine felt change schedules
Parvati Patel (Henderson)	Pump allocation at the New Zealand Refining Company
Philippa Lamb (Smith/Henderson)	Real-time staffing allocation at Tegel Foods
Nicolas Roberts (Philpott)	Single period optimisation of electrical generator offers
Richard Warburton (Smith)	Modelling pyramid and multi-level marketing schemes
Guy Wingfield (Ryan)	Proposal for location based billing for mobile phones
Jackel Wong (Smith)	Analysis of quality control methods at Tegel Foods

FUNDED MASTERS PROJECT IN OPERATIONS RESEARCH

OFFER CONSTRUCTION FOR A HYDRO-ELECTRIC RESERVOIR

Closing date for applications: January 25, 2000

Funding: $12,000 per annum for 18 months

Time frame: March 1, 2000 – June 30, 2001

Description

Every day large hydro-electric generation companies offer electricity to the wholesale electricity market. The amount that is offered and its asking price determines whether the generator will be dispatched i.e. asked to generate this amount of power and inject it into the transmission network. The generator is paid for its dispatch at each node of the transmission system an amount equal to the marginal price of power at this node. This is determined by the market clearing price taking into account all the offers of power throughout New Zealand. Generators also receive compensatory payments from the market according to their long-term contract positions.

We are seeking a student to conduct a Masters research project at the University of Auckland to investigate improvements to the modelling of price-making behaviour in packages for medium-term planning of hydro-electricity generation. The project is supported by a grant from Mighty River Power Ltd. The first stage of the project will look at price-making optimisation in a stochastic dynamic programming framework. The second stage of the project will look at medium-term planning in more depth. For more details see http://www.esc.auckland.ac.nz/People/Staff/Philpott/hydro.html

How to apply

Interested students with a good first degree majoring in Operations Research should send or email a copy of a recent curriculum vitae including the name of one person who could act as an academic referee to:

Associate Professor Andy Philpott
Department of Engineering Science
University of Auckland
Private Bag 92019
Auckland, New Zealand
Email: a.philpott@auckland.ac.nz

before January 25, 2000.

ANZIAM 2000

Australian and New Zealand Industrial and Applied Mathematics Society

The 36th Annual Applied Mathematics Conference and Annual Meeting will be held at the Copthorne Resort in Waitangi on the shores of the Bay of Islands, New Zealand from the evening of Tuesday 8 February to lunchtime on the following Saturday 12 February 2000. The annual conference of ANZIAM is an established gathering of applied mathematicians, scientists and engineers with wide-ranging interests. It provides an interactive forum for presentation of results and discussions by students, academics and other researchers on applied and industrial problems derived in many scientific fields and amenable to quantitative description and solution. The invited speakers are - **Professor Jerzy Filar**, University of South Australia: **Dr Derek Goring**, National Institute of Water and Atmospheric Research, New Zealand: **Professor Peter Jackson**, Auckland University: **Professor Nancy Kopell**, Boston University: **Dr Margaret Wright**, Bell Laboratories, Lucent Technologies. Further information and registration forms are available from the web http://www.esc.auckland.ac.nz/organisations/anziam2000 or email anziam2000@auckland.ac.nz

FUNDED MASTERS PROJECT IN OPERATIONS RESEARCH

LONG RANGE PLANNING OF FORESTRY ESTATES

Closing date for applications: January 25, 2000

Funding: $10,000 per annum for 18 months

Time frame: March 1, 2000 – June 30, 2001

Description

The planning of forestry estates requires very long time horizons. A stand of trees reaches its greatest value at about 25 years after propagation. This means that there is considerable uncertainty surrounding the market conditions which will prevail when a forest stand is harvested. This must be taken into account in previous propagation and harvesting decisions.

We are seeking a student to conduct a Masters research project at the University of Auckland to investigate techniques for extending the time horizons of stochastic programming forestry planning models. One way to overcome the short time horizon of existing models is to make the stages unequal in length, so that the later stages consist of, say, ten-year time periods. A drawback with this approach if adopted naively, is that decisions over a ten-year period might adapt to the price scenario in a way that anticipates the price eight or nine years in the future, thus giving biased results. This can be overcome to some extent by specifying a decision rule for this period which is contingent only on observations of price made thus far. For example one might require that the vector x representing harvest decisions in a number of age classes be a linear function of the current observed prices p of these age classes, so

$x = Ap,$

where the coefficients of A are different for each stage (but do not change with time in each stage) and have to be determined by the optimization. More complicated forms of decision rule might also be modelled. For example, it seems reasonable to allow harvest decisions to depend on current forest reserves as well as observed prices.

One of the key determinants of value in the forestry planning problem is the price scenario. Forecasts of price are difficult to construct with any confidence, especially for long time horizons. The need for an accurate forecast is alleviated to some extent by constructing a branching scenario tree, and a much more robust strategy is obtained. This strategy is still driven by the input data, and different policies will result depending on the choice of probabilities, discount rates, and levels of risk aversion. Part of this project will be devoted to the development of a stochastic model of these price scenarios.

How to apply

Interested students with a good first degree majoring in Operations Research, should send or email a copy of a recent curriculum vitae including the name of one person who could act as an academic referee to:

Associate Professor Andy Philpott
Department of Engineering Science
University of Auckland
Private Bag 92019
Auckland, New Zealand
Or Email: a.philpott@auckland.ac.nz

before January 25, 2000.

MEETINGS CALENDAR FOR 1999 AND BEYOND

26th International Conference on Computers and Industrial Engineering, 8 – 10 December 1999, Melbourne, Australia
Contact: Paul Lochert, Monash University, PO Box 197, Caulfield East, Vic 3145, Australia
Tel: 61 3 9903 2647 Facsimile: 61 3 9903 2227 e mail: p.lochert@sci.monash.edu.au

34th Annual Conference of the Operational Research Society of New Zealand. 10-11th December 1999, Waikato University, Hamilton, New Zealand
Closing dates for abstracts is 16 August 1999 and full paper submissions 27 October 1999.
Contact: John Scott, email:jls@waikato.ac.nz or email:orsnz99@waikato.ac.nz

36th Annual Applied Mathematics Conference and Annual Meeting, 8 – 12 February 2000, Copthorne Resort, Waitangi, Bay of Islands, New Zealand
Further information and registration forms from
http://www.esc.auckland.ac.nz/Organisations/anziam2000 or email anziam2000@auckland.ac.nz

Western Decision Sciences Institute 29th Annual General Meeting, 18-22 April, 2000, Ritz Carlton Hotel, Kapalua, Island of Maui, Hawaii
Contact: Miles Nicholls, email:mnicholls@swin.edu.au or website:http://misnt.calpoly.edu/wdsi

INFORMS-KORMS International Conference, 18-21 June 2000, Seoul, Korea.
Contact: Professor Sang Hyung Ahn, email:shahn@snu.ac.kr

Fifth Conference of the Asian-Pacific Operations Research Societies within IFORS(APORS' 2000), 5 – 7 July, 2000, Singapore. Details on http:www.comp.nus.edu.sg/~phuakh/apors
Contact Programme chair, Pual KH Phua, email:phuakh@comp.nus.edu.sg

Matrix Analytic Methods Conference, 12-14 July 2000, Leuven, Belgium.
Contact: Peter Taylor, email:ptaylor@maths.adelaide.edu.au or Malcolm Faddy, email: M.Faddy@math.canterbury.ac.nz

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