June 1993

Newsletter

Operational Research Society of New Zealand (Inc.)

New Members

A warm welcome to new members since the last newsletter.

Beca Carter Hollings & Ferner Ltd.		Auckland
Bruce Lamar	Senior Lecturer	Christchurch
Andrea Manley	Statistician	Invercargill
James Corner	Lecturer	Hamilton
Damien Mather	Engineering Consultant	Auckland
Yu Hayakawa	Lecturer	Wellington
Robert Gibberd	Student	Auckland
Guy Hodges	Resources Analyst	Rotorua
Peter Frizzel	Student	Palmerston North
Himangshu Paul	Senior Lecturer	Christchurch
Paul Keating	Managing Consultant	Auckland
Bill Barclay	Traffic Engineer	Lower Hutt
David Blake	Student	Auckland
John Paynter		Auckland
Chris Johnston	Student	Wellington
Andrew Toop		Christchurch

Your New Council (Elected December 1992)

Elected at the AGM were:

President	Grant Read	**Ex-Officio**	Bruce Lamar
Vice President	Jonathon Lermit		Les Fowlds
Secretary	Mark Pickup		Kerry Mayes
Treasurer	Mathew Hobbs		Jeff Meyer
Newsletter	Fred Baird		John Scott
APORS Rep.	Hugh Barr		
Circulation	Victoria Coad		
International	Hans Daellenbach		
Strategic Develop	Victoria Mabin		
Conference	David Ryan		
Student Affairs	Tapas Sarkar		

1992 ORSNZ Conference Report

The 1992 Conference, held at Canterbury University in August, was one of the most successful yet, with more papers (41) than any previous conference and more participants than any conference outside Wellington.

The quality of the papers was generally high, but for many the highlight was the student paper session which covered topics from optimising sheep grazing patterns for wool production to airline crew promotion planning. After much deliberation, the judging panel were unable to decide between two papers from Auckland University (see separate box) and decided these should share the first prize money of $700, generously donated by the Electricity Corporation of New Zealand (ECNZ). The student project prize of $300, also donated by ECNZ, was awarded to a team from Waikato University, for their work on production planning for a plastics firm. Many of the participants also enjoyed a special presentation on pallet and container packing algorithms and software, by Bill and Kathy Dowsland, of Swansea.

The keynote speaker was Professor Harvey Greenberg, of the University of Colorado at Denver. Harvey is renowned for his work on large scale models of the US energy sector but spoke mainly of his more recent work on "Intelligent Mathematical Programming Systems". According to Harvey, many consider the concept of an "intelligent math programming system" to be a contradiction in terms. (Others may consider all math programming systems to be as intelligent or even a good bit smarter than most of us!).

Harvey's consortium are bringing together researchers from several fields to move math programming beyond the GAMS/AMPL type of environment to the point where analysts have good quality automatic tools for formulating, debugging and interpreting Mathematical Programs. This includes integration into Management Information Systems in a way which may be transparent to the ultimate user.

Harvey demonstrated these concepts, using his software package ANALYSE, in a one-day workshop after the conference. Participants learned to trace through the constraint structure of a solved LP to determine why the solution was constrained to that value, and especially the role of each constraint in determining the marginal cost of expanding production. With such analysis and tools it is possible to automatically generate English language explanations for management, to determine what is causing the annoying infeasibilities that often crop up in large mathematical programs due to inconsistent data, for example. Our thanks to Harvey for his contribution to the conference, for the workshop, and for his visits to OR groups in Auckland and Wellington.

Thanks also to ECNZ and Ernst & Young Management Sciences, who sponsored Harvey's visit to New Zealand, and to the Management Department at Canterbury University who sponsored and organised the conference.

This year's conference will be held on August 23-24 at Auckland University.

Grant Reed

Student Prize Winners, ORSNZ Conference 1992

From the left: Dr Jonathan Lermit, Colin Ives, Paul Day, Ross James and Dr Grant Read. The prizes were presented by Grant as President of ORSNZ and Jonathan on behalf of the sponsor, ECNZ.

Paul Day graduated from Auckland in 1991 and is currently a PhD student, working on rostering problems for Air New Zealand. Paul's project involved constructing a 14 day cabin crew roster for Air New Zealand domestic flights that satisfied both rostering constraints and award regulations. The solution technique is based on generating lines of work over a sub-roster period and solving a set partitioning optimisation to determine an optimal feasible sub-roster. The two steps of generation and optimisation are repeated for each subsequent sub-roster period until a full legal and feasible roster is constructed for the 14 day period.

Colin Ives also graduated from Auckland in 1991. He is employed as an operations analyst by Coca Cola Bottlers NZ, coordinated production and product distribution throughout NZ. Colin's student project was concerned with promoting Air New Zealand personnel to fill vacancies in the staff structure, where crew are promoted after completing significant training. When introducing new aircraft, it is economically beneficial if the training courses are scheduled so that the required crew strengths are attained as close to the aircraft commissioning date as possible. Colin investigated the development of an LP to find the optimal promotional schedule.

The project by Ross James, Vicki Mendelssonn and Geoffrey Walsh from Waikato investigated the best machine scheduling system for a plastics manufacturer. A simulation model was used to compare the current multi-server queing policies with single server policies, which were found to be more efficient. However the benefits were outweighed by the implementation costs and a MRPII system that integrated production and accounting systems was recommended.

Newsletter Editorship

Your council is painfully aware that this Newsletter is only the second since we introduced the "new look" in July last year. In part this delay has been caused by circumstances beyond our control, and we have had to make arrangements with a new printer. Our thanks to IPL Publishing Limited for taking over this task.

Simon Carr

Jonathan Lermit has also decided to stand down as Newsletter Editor. As President I would like to thank Jonathan for all his work on the newsletter over the years, and particularly for upgrading it to its present standard. Jonathan will continue in his role on the Newsletter Committee and as a departmental editor.

The new editor, Simon Carr, has previously worked with Scicon in the UK and with Ernst & Young Management Sciences. He can be contacted at ECNZ, Wellington.

Grant Read, President ORSNZ

ORSNZ Annual General Meeting

By a vote of 107 to 1 in the postal ballot, the Society has approved a change to the constitution so that the financial year can terminate in June. This will allow the next AGM to be held at the August Conference in Auckland where elections will be held for next year's Council. An annual report and registration forms will be circulated before the Conference.

Mathematical Sciences Council

In March representatives from the NZ Mathematical Society (NZMS), the NZ Statistical Association (NZSA) and the NZ Association of Mathematics Teachers (NZAMT) met to consider their representation on the Interim Board of the Royal Society. The meeting was attended by Jonathan Lermit on behalf of ORSNZ. At the meeting it was agreed that a Mathematical Sciences Council of New Zealand would be formed, consisting of the presidents and representatives from the NZAMT, NZMS, NZSA and ORSNZ together with the representative of Mathematical Sciences from the Interim Board of the RSNZ.

APORS Presidency 1995-97

ORSNZ and the Australian OR Society (AORS) have both been asked by the Asia Pacific Operations Research Society (APORS) to prepare proposals to take on the APORS presidency from 1995-1997, and to host the APORS Conference in 1997. The Council is working on a proposal to be submitted to the APORS Council meeting at the IPORS Conference in June.

OR Models for the Electricity Corporation of New Zealand

by Grant Read — Energy Modelling Research Group, University of Canterbury New Zealand
John Culy — New Zealand Institute of Economic Research
Victoria Coad — Electricity Corporation of New Zealand

The OR Society of Japan has asked ORSNZ to submit an article on an OR application in New Zealand for a special issue of their journal. The following article, which attempts to summarise almost 20 years of work by a number of people in the electricity sector, was chosen out of three proposals made to Council. We hope it does not lose too much in Japanese translation.

Hydro power has played a major role in New Zealand's development, as a source of cheap energy for industrial and domestic uses, as a basis for export industries such as metal smelting and timber processing, and as a spur to regional development. Although thermal and geothermal plant have been gradually introduced since 1958, 75% of electricity production still comes from hydro, making the country critically dependent on hydro inflows, which vary by +/- 20%, and on the proper management of storage reservoirs, which can only store 16 weeks average inflows.

This dependence was graphically illustrated in 1992, when extremely low inflows forced a four-fold increase in electricity spot prices, a major appeal for voluntary savings, re-commissioning of mothballed plant, and closure of a major smelter, causing a noticeable drop in GDP. Thus it is not surprising that OR models have been extensively used to address the reservoir management problem, or that those models came under intense scrutiny during the crisis. This certainly enhanced public awareness of the importance of "OR models" although we might wish that this had happened under happier circumstances!

Mixed hydro-thermal systems are particularly difficult to manage, because one must deal with all the complexities of the hydro and thermal sub-systems, while accounting for hydrological risk over a 1-2 year horizon. The New Zealand problem is complicated by the fact that transfers between the two main islands are limited. OR models have been successful in reducing costs for many such systems. For systems with only one thermal station, a "newsagent" type heuristic can be used to determine a "guideline" such that, if storage falls below this level, the thermal station should be used to conserve storage.

This approach was used in New Zealand, before 1979 when STAGE was introduced, with simulation studies indicating a saving of 8% of the expected costs of fuel and "shortage", compared with the heuristic. That model used a "marginalistic" variant on Stochastic Dynamic Programming (SDP), using simulation to estimate the opportunity cost of using water as a "fuel", ie the "marginal water value", as a function of aggregate national storage level. More detailed LP and NLP models were developed but SDP gives a better model of the critical hydro risk. SPECTRA has now replaced STAGE, using a new "dual" variant of SDP to efficiently construct water value functions for both islands simultaneously. Although this model came under intense scrutiny after the 1992 hydro crisis, a Parliamentary Review Committee concluded that it had operated properly, while simulation suggests that it provides 5-10% savings over STAGE.

OR models have also been used extensively for expansion planning. Integer Programming was experimented with but simulation was preferred because it allowed a more realistic model of system operation. Since the PRISM model was introduced in 1984, it has become central to the Corporation's planning processes, and is also used extensively for pricing and strategic studies. SPECTRA, which is

effectively a shorter term version of PRISM, also plays a crucial role in pricing, since the water values it produces determine the way in which electricity prices respond to hydrological variations. The contributions of such applications are hard to quantify, but probably exceed those from optimisation at the operational level.

Over the last few years New Zealand has moved toward a more competitive electricity market, and this trend is expected to continue. This has important implications for the way in which OR is practised and for the models themselves. Current developments include :

- better methods for handling inflow correlation
- optimisation of spinning reserve requirements
- optimisation of reservoir management
- simulation of system behaviour, in a competitive environment where firms may have incentives to adjust releases in order to manipulate prices
- calculation of optimal prices for transmission and spinning reserve.

This last problem involves solving the dual of the "Optimal Power Flow" problem to determine the set of prices which is consistent with any given dispatch, and which can therefore be offered to independent generators without distorting the optimal dispatch. It is interesting to note that, although OR models were originally introduced to optimise primal problems such as reservoir management, those models have been increasingly used to study dual problems, such as pricing and valuation. This trend seems to be continuing as we move forward into a more competitive and decentralised decision-making environment, in which price signals, rather than direct managerial control, provide the primary incentives for efficiency. This also implies an increasing need to incorporate the behavioural insights of managerial economics into OR models, and to interpret such models in those terms.

Editor's Note

Article references have been omitted to save space, but can be obtained from Dr Read or the Editor.

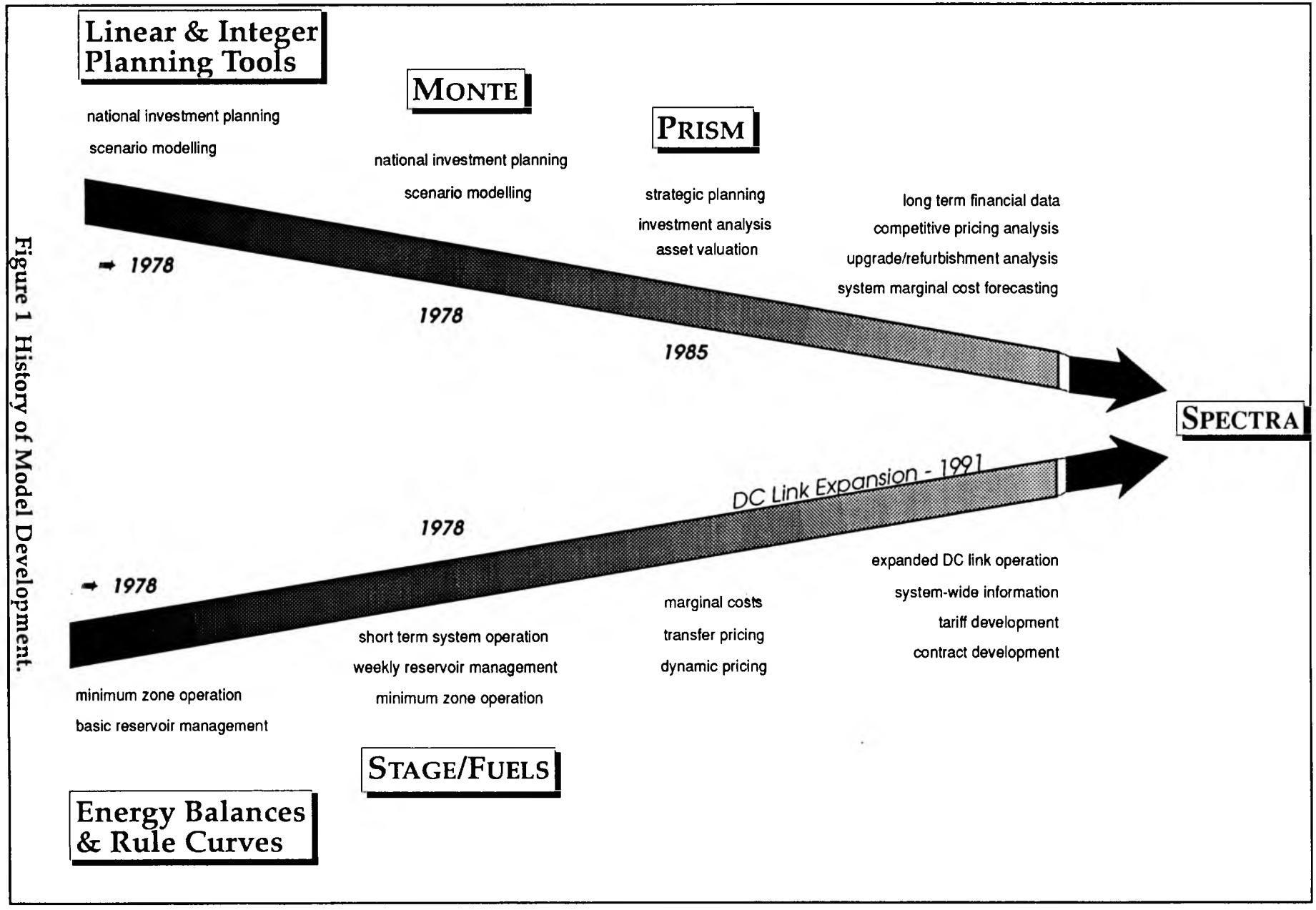


Figure 1 History of Model Development.

Department of Management Systems at Waikato University

by Les Foulds

Management Systems is a short title for a Department which covers three areas. We thought long and hard about an appropriate title and this is the result. The Department is involved in research and teaching in the areas of Management Science, Management Information Systems and Operations Management, and a title which bundled all of those together wouldn't fit on the letterhead.

The Department is one of six in the School of Management Studies and was established in 1990 as part of a devolution of the old, and rather large, Department of Management. As a relatively small department (9 staff) in a large school (approximately 75 staff) we have the advantage of autonomy at the risk of being somewhat more vulnerable. By and large, it has been a good move.

Back row from left: Jim Corner, Delwyn Clark, Les Foulds, Paul Cragg, Angele Cavaye, Suo Chun Tang (visitor)
Front row from left: Bindu Singh (secretary), Chuda Basnet, John Buchanan, John Scott. Absent: Pavel Berkha

Les Foulds is Professor and Chairperson of the Department, providing leadership and guidance. Les has interests in many areas including facilities layout, world class manufacturing, scheduling, applied graph theory and combinatorial optimisation.

Chuda Basnet joined the Department in 1991, after completing a PhD in Indusial Engineering at Oklahoma State University. With his industrial experience in production and aircraft maintenance, he is principally involved in Operations Management type teaching and research. His research interests are in manufacturing systems modelling.

Pavel Berka is undertaking a two year Post Doctoral Fellowship in World Class Manufacturing. Pavel

is from Czechoslovakia where he specialised in the economics and management of engineering production, notably quality management in the automobile industry. Pavel holds both a LLD and a PhD and has taught at both Brno Technology University and Nottingham Business School.

John Buchanan joined the Department in 1988, after three years with Price Waterhouse in Auckland. John completed his undergraduate and PhD study at the University of Canterbury. His teaching and research is mainly in the Management Science area, with specific interests in decision making with multiple criteria.

Angele Cavaye is a lecturer in Management Information Systems and is also working towards a PhD degree. Angele obtained both an MA and an MSc degree in the UK before coming to New Zealand in 1988. Her research interests include information system security, telecommunications and international competitiveness.

Delwyn Clark has had an association with Waikato longer than most of us, returning from a period overseas to complete a BMS degree part time. Delwyn is an assistant lecturer and is currently undertaking her PhD in the area of strategic modelling.

Jim Corner is lately from Arizona, where he completed a PhD in Operations Research at Arizona State University. Jim has held various management positions over a period of 10 years with US Steel in Wyoming. His research interests include multi-attribute decision making, decision analysis and decision support systems. If anyone has a good, used whitewater kayak for sale, please contact him.

Paul Cragg teaches Management Information Systems and Management Science. His PhD was on information technology and small firm performance. Paul, along with John Scott, is one of the longest serving members of our department. His research interests include information technology in small firms and user-built decision support systems.

John Scott completed his doctoral thesis on transportation modelling. His work experience includes time as an OR analyst with National Airways Corporation (the old Air NZ) and as a Senior Consultant with the East Asiatic Company, a Danish shipping and trading company. John is interested in mathematical programming, transportation and experiential learning.

The Department is involved in both undergraduate and graduate teaching. We have a four year undergraduate BMS degree. From second year on, our courses effectively split into three streams; Management Science, Management Information Systems and Operations Management. Graduate courses in each area are also provided.

We also teach an introductory course at first year which has a student-centred learning focus. In the first year course all 400 students receive a large workbook with all course reading material and this is used as a basis for class discussion. There are few lectures. The Department has been moving to a more student centred style of teaching in a number of courses; for example the Information Systems Development course uses an ongoing case study and 2nd year Management Science is non-lecture based.

Les Foulds and John Scott are editors of APJOR and Paul Cragg is on the editorial board of the Journal of Strategic Information Systems. The Department has published regularly in international journals and has a thriving research report series.

Puzzle Corner

This issue's puzzle has been contributed by Dr James Corner, recently appointed as a Lecturer in Management Science at the University of Waikato.

The island of Modeller's Dread is inhabited by 200 mathematical programmers, all desperate to escape. Of the 200 inhabitants, 100 have blue eyes and 100 have brown eyes; however, the programmers do not know their own eye colour. In fact, people who can prove, by using their own logic, that they know their own eye colour to an obliging ferry owner will be transported away, 24 hours later, never to return. There is no reflecting material on Modeller's Dread and communication of any sort between inhabitants is punished by instant execution. However, any programmer may look into the eyes of any other programmer.

Now, there happens to be a 201st person on the island as well, whose eye colour is irrelevant. He is the Grand Poo-Bah who one day get up to speak in front of the 200 island inhabitants (he is exempt from the instant death rule!). He says, "I see someone whose eyes are blue!"

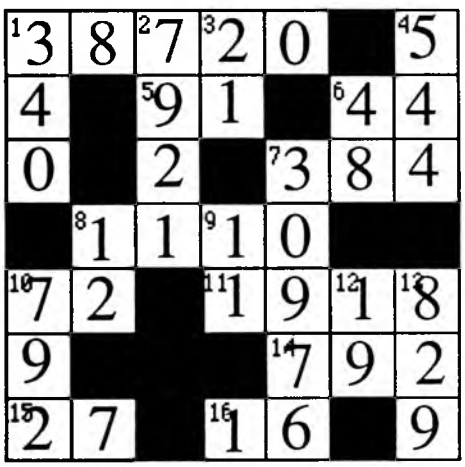
What happens?

The Glass Rod Problem

A glass rod is dropped on the floor and it breaks into 3 pieces. What is the probability that a triangle can be made from those 3 pieces?

In general, if it breaks into n pieces when dropped, what is the probability of being able to form a closed n sided figure from the n pieces?

The Solution to "DOG'S MEAD"



The prize of one year's free membership has been won by **Tristram Scott**, of Canterbury University. Correct solutions were also received from: Curt Hjorring, Paul Bieleski, Jenny and John George, P.J.Gargiulo, and Frank Stewart.

Forum Letter

ARTIFICIAL KNOWLEDGE?

"Artificial" (not genuine) may be broadly defined as some artifact, object, thing, idea resulting from human or machine effort, as distinguished from pre-existing nature or character.

An early student of operational research, I later related artificial intelligence problems to OR methodologies. I have always had somewhat of a distaste for the AI label including, as it does, at least the partial conceit of fabricated humanity. I do not have a reasonable substitute and I recognise the difficulties the founders of the field had in choosing a name for the complex research ideas and activities of a very small number of scientists.

But now we have correctly denoted "artificial neural network" structure in the artificial intelligence domain. It is clearly possible to construct computer representations of physiological neural networks. Indeed they can be designed, without any pretence of intelligence, to solve problem which humans might proudly consider their own. Thus artificial neural network are not only named correctly but, when programmed properly, offer all sorts of opportunities to be wonderfully clever. It is helpful to recognise that artificial neural networks probably leave us with a sense of potentiality in considering how we might approach the building of an artificial intelligence.

We can actually visualise or see a neural network, artificial or computerised: while we don't yet generally agree as to what intelligence is. Scientists are searchers for additions to knowledge. They use real intelligence to accomplish their goal. Query: does what is called artificial intelligence produce artificial knowledge? A look at this seemingly inconsequential question my offer some useful ideas as to future research in operational research, artificial neural networks, and artificial intelligence.

Mitchie and Rory state that, while the Second Law of Thermodynamics tells us that information cannot be created, nonetheless knowledge can be, and by computers at that. They declare that "...it has been demonstrated incontrovertibly that something new can come out of computers and that something is knowledge." The authors write, "knowledge is a special form in which information can be stored, retrieved, and understood by the human brain [and indeed] ...there is no...barrier to computers creating knowledge".

I assume in this Letter that it is "intelligence" that permits the creation of "knowledge". Of course, problem does not lie in the definition of knowledge as organised and stored information. That we can all easily agree on. Rather a key issue is "what are the effective procedures by which that 'particular or special form' of information appropriately designated as 'knowledge' are themselves achieved, either in the human brain or in its supposed computer counterpart?" In general, it seems reasonable to designate such procedure as "intelligent operations and to say that, if and when, we deal with the creation of knowledge by computers we shall be dealing with "artificial intelligence and hopefully not artificial stupidity. (Note that a program's designation, whatever the problems it may handle, does not tell us anything whatsoever about its "intelligence.) The degree to which there are self-programmed procedures and lack of human intervention in the process, beyond the construction of one or more algorithms, would seem to be a reasonable gauge of the "intelligence" inherent in the process.

But what about "artificial knowledge"? An artificial intelligence computer algorithm that delivered newly created knowledge might or might not vocalise something like "EUREKA", depending on whether it

could recognise knowledge, new or otherwise. But could there be some (any) element of artificiality in the knowledge? In other words, should one speak of artificial knowledge being created by an artificial intelligence computer algorithm?

Let us step back for a moment and agree on some characteristics of artificial intelligence. Let us say that artificial intelligence is a process, or set of algorithms which, when provided with information, produces, with some strictures on human intervention, other interesting information, or even what we might term knowledge, of some interest, utility, or value. But suppose the artificial intelligence process that provides us with this information is spuriously "intelligent" that is, the "knowledge" the process provides is also artificial. So, we now compare information generated by an AI device with answers provided by an operational research program: the former may be artificial knowledge stemming from no resident intelligence, the latter clearly incorrect in whole or in part.

An important task of today's operational research leaders is fostering the development of operational knowledge producing methodologies through an effective combination of operational research with the ideas that are now arising in artificial intelligence.

Professor David Bendel Hertz,
IFORS President 1977-1979

Local and International Events

29th ORSNZ Conference

Conference Centre, University of Auckland 23-24 August 1993

The ORSNZ conference this year will be held in Auckland at the same time as the ORSNZ AGM.

Contact: Professor David Ryan
Department of Engineering Science
University of Auckland, Private Bag 92019
ph (9) 373-7999 Ext 8398 fax (9) 373-7428
E-mail d.ryan@auckland.ac.nz

TIMS/ORSA '94 Joint National Meeting

Boston, U.S.A 24-27 April 1994

OR/MS Without Boundaries

Contact: TIMS Business Office
290 Westminster Street
Providence, RI 02903 USA
ph (401) 274-2525
fax: (401) 274-3819

or: ORSA Business Office
1314 Guilford Avenue
Baltimore, MD 21202
U.S.A

TIMS XXXII

Anchorage, Alaska 12-15 June 1994

Natural Resources, Economic Development, and the Environment: The Role of Management Science

Contact: TIMS XXXII - Anchorage
The Institute of Management Sciences
290 Westminster Street
Providence, RI 02903 USA
ph (401) 274-2525 fax: (401) 274-3819

Local and International Events

IFORS 93 - 13th Triennial Conference on Operations Research

Lisbon, Portugal 12-16 July 1993

Contact: IFORS 93
Faculdade de Economia
Universidade Nova de Lisboa
Travessa Estev_o Pinto
1000 LISBOA, PORTUGAL
fax: (351) (1) 387 1105

APORS '94

Fukuoka, Japan 26-29 July 1994

Development in Diversity and Harmony

Contact: Operations Research Society of Japan
Gakkai Centre Bldg, 4-16, Yayoi 2-chrome
Bunkyo-ku,Tokyo 113 Japan

15th International Symposium on Mathematical Programming

Ann Arbour, Michigan, USA 15-19 August 1994

Contact: 541 Thompson St, Room 112
University of Michigan
AnnArbour, MI 48109-1360, USA
ph (1) (313) 764-5305 fax: (1) (313) 764-2990
E-mail xvismp@um.cc.umich.edu

WHAT IS OPERATIONAL RESEARCH?

Operational Research is the scientific approach to solving management problems. Using observation, data and analysis, the OR practitioner builds up quantitative relationships, called models. Models that take an overall system view help management make informed decisions.

The Secretary
Operational Research Society of New Zealand
P.O. Box 904
WELLINGTON

Please enrol me as a member of the Operational Research Society of New Zealand, at the membership grade indicated below. I enclose the appropriate fees*.

I agree to be governed by the constitution of the ORSNZ, and to remain liable for subscriptions until I notify the Secretary in writing of my intent to withdraw from the Society.

Signature :_____ Date :____ /_____/_____

Individual members in
Auckland, Wellington, Christchurch and overseas..... $35.00
Individual members in other areas..... $31.50
Student members [1]..... $15.00
Corporate members..... $100.00
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Occupation : _____
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* Current fees for 1993
[1] Student certification : _____
(Signature of Instructor and Institution)

[2] Corporate sponsors may specify up to 4 additional addresses.

TIMS XXXII
Anchorage Alaska
June 12-15, 1994

Natural Resources, Economic Development, and the Environment: The Role of Management Science

The '94 TIMS Anchorage meeting theme is *Natural Resources, Economic Development, and the Environment: The Role of Management Science*. Alaska, like its neighbors, Russia and Canada, has abundant natural resources such as oil and gas, coal, minerals, fish, timber, etc. The natural environment is also a resource which is affected by economic and resource development. MS researchers and practitioners have opportunities to share ideas and work in resolving this conflict. Paper topics are not limited to this theme. Since Alaska is part of the Pacific Rim where major trade and transportation will continue and expand throughout the next century, papers on this topic as well as traditional MS topics are also encouraged.

Publications

The organizing committee anticipates publication of selected papers on the conference theme. Possible publications include a special issue of a TIMS journal(s) or an edited volume. Papers to be considered for publication are due May 16, 1994, for the beginning of the refereeing process.

Program Participation

We invite you to participate in any of the following special program activities:

- Putting together a panel discussion
- Conducting a workshop or tutorial
- Demonstrating software
- Other activities.

Please respond by June 1, 1993, to the Special Programs Chair, Dr. George Geistauts.

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Tours and Plant Visits

Visits are planned to several plants during and immediately following the meeting. Pre- and post-meeting group tours will also be organized. Possibilities are listed at the bottom of the submission form. To help us plan, please indicate which interest you.

DEADLINE FOR ABSTRACTS – OCTOBER 4, 1993

Track Sessions — Please indicate the track session that best fits your submission.

Accounting, Auditing & Tax
Daniel E. O'Leary, Univ. of Southern California
AHP
Ernest Forman, George Washington Univ.
AI/Expert Systems
Michael Goul, Arizona State Univ., Gary Koehler, Univ. of Florida
Combinatorial Optimization
Celso Carneiro Ribeiro, Catholic Univ. of Rio de Janeiro, Brazil
Computer Science and MS
Erik Rolland, Univ. of California-Riverside, Ramesh Subramanian, Univ. of Alaska Anchorage
Data Envelopment Analysis
Lawrence Seiford, Univ. of Massachusetts
Economics and Finance
Greg Goering, Univ. of Alaska Fairbanks, Peter Nijkamp, Free Univ., The Netherlands
Education and MS
Engineering and Technology Management
Richard Deckro, Portland State Univ.
Entrepreneurship/Innovation
Ray Gehani, Rochester Inst. of Technology
Ethics and MS
Forecasting
Askar Choudhury, Univ. of Alaska Anchorage
Fuzzy Sets
Christer Carlsson, Abo Akademi Univ., Finland
Group Decision & Negotiation
Gregory Kersten, Carleton Univ.
Healthcare and MS
Yasar Ozcan, Virginia Commonwealth Univ.
Location and Routing
Erhan Erkut, Univ. of Alberta, Canada
Logistics
Ed Gillenwater, Univ. of Mississippi
Manufacturing Systems & Production
Marketing
Gary Erickson, Univ. of Washington
Mathematical Programming
Sam Thiru, Univ. of Alaska Anchorage
MCDM
Pekka Korhonen & Jyrki Wallenius, Helsinki School of Economics, Finland
Military Applications in MS
So-Young Sohn, Naval Postgraduate School
MIS
Hasan Pirkul, Ohio State Univ.
MS in Environmental Engineering
Hugh Ellis, Johns Hopkins Univ.
MS in Environmental Management
MS in Fisheries
MS in Forestry
Larry Davis, Univ. of California, Berkeley
MS in Natural Resources Development
Dimitri Hatziginatiou, Univ. of Alaska Fairbanks
MS in Oil Industry
J. David Fuller, Univ. of Waterloo, Canada
MS in Tourism
MS in Wildlife Management
Optimization /Neural Networks
Asim Roy, Arizona State Univ.
Organization & Strategy
Jim Collins, Univ. of Alaska Fairbanks
Organization Theory/ Management
Project Management
Public Programs & Processes
R&D
Re-engineering Process
M. Lynne Markus, Claremont Graduate School
Simulation
Diane Bischak, Univ. of Alaska Fairbanks
Statistics and Applied Probability
Hong Chen, Univ. of British Columbia, Canada
TQM
Transportation

CONTRIBUTED PAPERS SUBMISSION FORM

Deadline for Abstracts: October 4, 1993

Authors who wish to present a paper should complete and mail 3 typed copies of this form (in English), along with a check for $100 (US$) payable to TIMS, no later than October 4, 1993. The abstract fee will be deducted from the registration fee for authors whose papers are accepted. Handwritten abstracts will be returned to the authors.

Mail to:

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The Institute of Management Sciences
290 Westminster Street
Providence, RI 02903 USA
(401) 274-2525 FAX (401) 274-3189

- Include $100 submission fee payable to TIMS. No refunds.
- Submit three typed copies of this submission form.
- List the speaker as the principal author.
- Must be received by October 4, 1993.

PAPER TITLE _____

ABSTRACT *(50 words non-technical)* _____

_____

_____

_____

_____

SUGGESTED TRACK/S _____

☐ **Check here if you plan to submit a paper to be considered for publication.**

1 Principal _____
Affiliation _____
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4 Author _____
Affiliation _____
Address _____
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Phone _____
☐ Member of TIMS ☐ Non-Member

If needed, would you chair the session in which this paper is presented? ☐ Yes ☐ No

☐ Check enclosed $ _____ ☐ Please charge my credit card: ☐ MasterCard ☐ VISA (only)

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PLANT VISITS AND GROUP TOURS — Help us plan

If you would like to join your colleagues on a plant visit or group tour, please check which options would be of interest to you.

PLANT VISITS *(some possibilities)*

☐ Prudhoe Bay Oil Field Operations (North Slope)
☐ Automated Package Handling Facility (Anchorage)
☐ Trans-Alaska Pipeline Terminal (Valdez)

GROUP TOURS

☐ Portage Glacier
☐ Prince William Sound
☐ Alyeska Resort/Girdwood
☐ Denali National Park
☐ Fly-In Fishing
☐ Soviet Far East

DEADLINE FOR ABSTRACTS – OCTOBER 4, 1993

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FIRST ANNOUNCEMENT AND CALL FOR PAPERS
APORS'94

The Third Conference of The Association
of
Asian-Pacific Operational Research Societies within IFORS

July 26–29, 1994, Fukuoka Recent Hotel, Fukuoka, Japan

THEME
Development in Diversity and Harmony

Organized by
ORSJ (The Operations Research Society of Japan) for APORS
Sponsored by
IFORS (The International Federation of Operational Research Societies)
Co-Sponsored by
EURO (The Association of European Operational Research Societies within IFORS)
ALIO (Asociacion Latino-Ibero-Americana de Investigacion Operativa)
NORAM (The Association of North American Operations Research Societies within IFORS)
and by several related academic societies of Japan

INVITATION

Dear Colleagues:

The Association of Asian-Pacific Operational Research Societies (APORS) was founded in 1985 to promote the development of operations research and its applications in all nations of the world especially from the Asian–Pacific region.

Both the First Conference held in Seoul hosted by KORS and the Second Conference held in Beijing hosted by ORSC were magnificent and successful, thanks to the devoted works of the host societies. We, ORSJ, feel ourselves responsible for taking over the thus established tradition at the Third on one hand, but, on the other, we consider it also important to make a trial of a conference of the style easier for any other APORS member society to take over.

Moreover, we have been a little concerned about the fact that Seoul and Beijing are located around the north-east corner of the APORS region. We wish that the conference place would be as near the center of gravity of the APORS region as possible. With such relevant factors in mind, we chose Fukuoka for the conference place, one of the ten biggest cities in Japan and, among them, located closest to the center of gravity of the APORS region.

The theme of this conference, Development in Diversity and Harmony, is a key factor for the future of our society and we, OR/MS scientists and engineers, are requested to keep this in our mind.

CONFERENCE CHAIRMAN
KONDO Jiro (President of the Science Council of Japan, Former president of ORSJ)

ORGANIZING COMMITTEE

Chairman:	HASEGAWA Toshiharu	(ORSJ; Kyoto University, Former vice-president of ORSJ)
Members:	FUSHIMI Masanori	(ORSJ; University of Tokyo)
	IRI Masao	(ORSJ; University of Tokyo)
	IWAMOTO Seiichi	(ORSJ; Kyushu University)
	KODAMA Masanori	(ORSJ; Kyushu University)
	KOSHIZUKA Takeshi	(ORSJ; University of Tsukuba)
	KURITA Osamu	(ORSJ; Keio University)
	MATSUYAMA Hisayoshi	(ORSJ; Kyushu University)
	TAKAHASHI Yutaka	(ORSJ; Kyoto University)
	TAKAMORI Hiroshi	(ORSJ; Aoyama Gakuin University)
	TOKINAGA Shozo	(ORSJ; Kyushu University)
	UMEZAWA Yutaka	(ORSJ; University of Tokyo)
	WAKAYAMA Kunihiro	(ORSJ; Hosei University)
	YANAI Hiroshi	(ORSJ; Keio University)

INTERNATIONAL PROGRAM COMMITTEE

Chairman:	IRI Masao	(ORSJ; University of Tokyo, President of ORSJ, President of APORS)
Advisors:	HSU Guang-Hui	(ORSC; The Institute of Applied Mathematics of Academia Sinica, President of ORSC, Former president of APORS, Vice-president of IFORS)
	RHA Woong-Bae	(KORS; Former president of APORS, Former vice-president of IFORS)
Members:	CHEW Kim-Lin	(ORSS; National University of Singapore, Vice-president of APORS, Editor of APJOR)
	FOULDS Leslie R.	(ORSNZ: University of Waikato, Editor of APJOR)
	JAISWAL N K	(ORSI: Institute for Systems Studies and Analyses)
	KANG Suk Ho	(KORS: Seoul National University)
	KUMAR Santosh	(ASOR: Royal Melbourne Institute of Technology)
	LING Teresa	(ORSHK: City Polytechnic of Hong Kong)
	PA Ismail	(MSORSM: University Utara Malaysia)

The conference will include plenary and parallel sessions for invited and contributed papers as well as tutorials. The topics of the sessions will cover Theory and Applications of OR/MS, such as those listed below.
The working language is English.

OR in Management & Manufacturing

- Inventory Management
- OR in Business Management
- Corporate Planning
- Banking/Finance
- Marketing
- Manpower Planning
- Investment Analysis
- AHP
- DEA
- Computer-Integrated Manufacturing/Flexible Manufacturing Systems
- Production Planning and Control
- Scheduling

OR in Public Sectors

- Energy/Natural Resource/Environment
- Transportation
- Education
- Health Care
- Economic Planning
- Logistics
- Regional Planning

Applied Probability and Statistics

- Decision Analysis
- Design of Experiments
- Regression Analysis
- Queueing Theory
- Reliability
- Quality Control
- Stochastic Processes
- Time Series Analysis
- Forecasting
- Sampling Method

Mathematical Programming and Optimization

- Linear and Nonlinear Programming
- Combinatorial Optimization
- Dynamic Programming
- Graph Theory
- Stochastic Programming
- Multi-Criteria Optimization

Use of Computers for OR

- AI and Expert systems
- Neuro-Computing
- Decision Support System/Strategic Information Systems
- Simulation/Simulated Annealing/Genetic Algorithms
- Software Engineering

There will be also a number of specially organised sessions on current topics of OR/MS.

PROCEEDINGS

The Proceedings will be published after the conference. All plenary papers and selected contributed papers will be included. All papers of the proceedings will be refereed.

ABSTRACT

Individuals interested in presenting papers should submit three type-written copies of the abstract containing:

-- Title of the paper
-- Name(s), affiliation(s), address(es), e-mail address(es) and telephone, fax and telex numbers of the author(s)
-- An abstract typewritten in the format shown on the back of this form
-- Up to 5 key words to explain the paper
-- Equipment(s) needed for the presentation

Abstracts of all papers to be presented will be available at the conference.

SCHEDULE

Submission of abstract:	Not later than December 17, 1993.
Notification of acceptance of paper:	To be sent after February 1, 1994.
Submission of camera-ready manuscripts:	Not later than March 31, 1994.
Conference program:	To be sent after June 1, 1994.

CORRESPONDENCE

All correspondence should be addressed to:
Operations Research Society of Japan.
Gakkai-Center Bldg. 4-16, Yayoi 2-chome, Bunkyo-ku,
Tokyo 113, Japan.

SOCIAL ACTIVITIES AND CONFERENCE TOURS

Some activities and tours will be announced later.

Please return this card at your earliest convenience to

APORS'94
Operations Research Society of Japan.
Gakkai-Center Bldg. 4-16, Yayoi 2-chome, Bunkyo-ku.
Tokyo 113, Japan.

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Affiliation:
Address:
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* Please send me the registration and hotel reservation forms when available.
* I intend to submit a paper whose tentative title is:

Title of the paper

Name:
Affiliation:
⋮
Name:
Affiliation:

Abstract

(Single spaced. Less than 200 words.)

Key words of less than five.

Equipments needed for the presentation. (Some may not be available.)

All correspondence should be addressed to
Name:
Address:
Telephone number:
Fax number:

ORSNZ 1993 REGISTRATION

Name & Title: _____

Address: _____

_____

_____

Wording for Name Tag:

Name: _____

Affiliation: _____

Conference & Banquet Fees:

The conference fee includes breakfasts, lunches, and (excepting the student fee) the banquet. Registration & the banquet are free of charge for students presenting papers. *Students must complete the student declaration overleaf.*

Regular.....	☐	$180	including banquet
Student.....	☐	$ 70	excluding banquet
Late fee.....	☐	$ 20	payable after 1 August
Banquet tickets*..	☐	$ __	(__ guests at $60 each)

Total: ..... $ _____

*Guests and students not presenting papers are welcome to purchase tickets for the banquet. Please note that places are limited to 130 persons.

Accommodation at O'Rorke:

Full payment for accommodation at the O'Rorke student hostel *must be received by 1 July.*

Arrive ___/8/93 and depart ___/8/93,
__ nights at $47.31 per night ..... $ _____

Wine Trail:

__ persons at $32.31 each ..... $ _____

Payment

Payment may be made by cheque (made out to 'ORSNZ') or by credit card. All prices are in $NZ & include GST.

Total Payment Enclosed: ..... $ _____

Credit Card Payments (Mastercard/Visa only)

Card Number: _____

Expires: _____ Signature: _____

Tax Invoice (all fees include GST)
Operational Research Society of New Zealand (Inc),
GST No.: 55-449-481. Issued 21/5/1993.

contd...

ORSNZ 1993 REGISTRATION

Name & Title: _____

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Wording for Name Tag:

Name: _____

Affiliation: _____

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PROGRAMMME:

August 25, 1993

8.45 am	Registration: (School of Engineering Foyer)
9.00 am	Lecture: Introduction to linear programming. Principles and syntax of GAMS. Examples of GAMS files and solutions. Interpreting solutions.
10.00 am	Morning Tea
10.30 am	Workshop: (Computer lab) Solving simple linear programs in GAMS. Participants will be expected to type in some example linear programming problems as GAMS input files and solve them on a PC.
12.30 am	Lunch
1.30 pm	Lecture: Introduction to nonlinear programming and integer programming. Examples of nonlinear programming problems. Solving nonlinear programs on a computer.
2.30pm	Workshop: (Computer lab) Continuation of morning session as well as solving simple nonlinear programs using GAMS/MINOS. Participants will be expected to type in some formulations of nonlinear programming problems as GAMS input files and solve them on a PC.
3.30 pm	Afternoon Tea
4.00 pm	Workshop: (Computer lab) Continuation of previous session as well as solving simple integer programs using GAMS/ZOOM. Participants will be expected to type in some formulations of integer programming problems as GAMS input files and solve them on a PC.
5.00 pm	Workshop concludes

WORKSHOP LECTURER:

Dr A.B. Philpott - Senior Lecturer, Department of Engineering Science, University of Auckland.

VENUE: School of Engineering
20 Symonds Street
University of Auckland

FEE: $297
(Includes teas, lunch, course notes and GST)

TO ENROL: Fill out the attached form and mail with fee to the address indicated. We will also accept preliminary reservation of places on the course by phone or fax. A Tax Invoice can be issued should you so require. As the course will have strictly limited numbers early enrolment is advisable.

ENQUIRIES: Professional Courses
Centre for Continuing Education
University of Auckland
Private Bag 92019
Auckland

Ph: 09 373 7599 ext 7050, ext 7619
Fax: 09 373 7419

ORSNZ 29th Annual Conference

Introduction

The 29th Annual Conference of the Operational Research Society of New Zealand (ORSNZ) will be held in the Conference Centre at the University of Auckland on the 23rd and 24th of August 1993. The conference brings together operational research workers from many groups, ranging from those involved in research to practitioners in local industry.

Keynote Speakers

There will be two keynote speakers visiting from Australia: Professor Bruce Murtagh from the Business School at Macquarie University and Associate Professor John Holt from the University of Queensland.

Venue

All sessions will be held at the Auckland University Conference Centre in the Architecture Building, 22 Symonds St, and in the adjacent School of Engineering.

Recreational Programme

An tour of the local vineyards, costing $32.31, is organised for Sunday 22nd August. The bus leaves from outside the Conference Centre, 22 Symonds St, at 12:45pm and returns around 5pm. Registration opens at 5:30pm with an informal reception in the Conference Centre. (Registration is also possible on Monday morning.) The conference banquet is being held at Langtons, Mt. Eden Domain, on Monday 23 August; drinks start at 7:00pm.

Conference Enquiries

Enquiries should be directed to:

Professor David M. Ryan,
Dept. of Engineering Science,
University of Auckland,
Private Bag 92019, Auckland, New Zealand
Tel.: (64)-9-373-7599 ext. 8398, fax: (64)-9-373-7468
Email: d.ryan@auckland.ac.nz

Travel Grants

There will be some travel grants-in-aid made available to all students attending the conference from centres other than Auckland. The size of the travel grants is yet to be determined, but will be proportional to travelling distance. If you wish to be considered for a grant, please complete the student declaration on the registration form and return this by 1 July 1993. Note that grants will be paid at the Conference.

Accommodation

Grafton Oaks Motor Inn (ph. 09-3090167, fax 377-5962) is 10 minutes walk from the University, and offers a special winter rate of $90/night for a single, twin or double room. A special rate has also been negotiated with the Hyatt (5 minutes walk from the University); telephone their Reservations Department on 09-3661234.

Opposite Grafton Oaks Motor Inn, the Huia Residence student hostel has single rooms for $30 and twins for $37; contact the Backpackers Travel Line on 09-8460096. (4 bed shared rooms at $16 per night can also be booked.)

Single rooms in the newer O'Rorke student hostel at 16 Mount St, off Symonds St, are available at $47.31 per night. Bookings for O'Rorke may be made on the registration form, with full payment required by 1 July 1993.

Discount Flights

Air New Zealand is offering a 30% discount off the standard class airfare for travel from 21–26 August 1993. Please quote code 'Dom 1942/3' at the time of booking. Note that a larger discount may be available if early bookings are made.

Conference Cost

The conference will cost:

$ 180 regular, including the banquet, and
$ 70 student, excluding the banquet.

A late fee of $20 will apply to all registrations received after 1 August 1993. No registration fee or banquet charge is payable by students presenting papers. Additional banquet tickets may be purchased at $60 each. Please note that all prices given in this programme include GST.

Important Dates

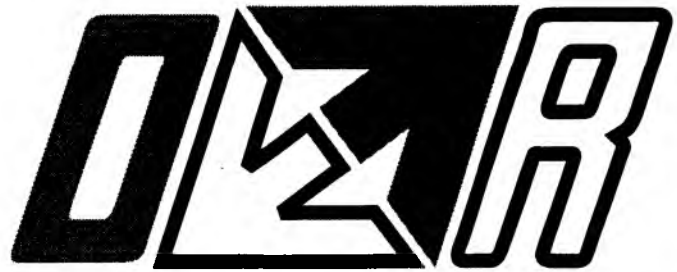
Papers due to Conference Organisers ..... 1 July
Full Payment due for O'Rorke Accommodation ..... 1 July
Student Travel Grant Registrations due ..... 1 July
Early Registration Deadline ..... 1 August
Late Fee of $20 becomes payable ..... 2 August

Conference Dates

Vineyard Tour & Registration ..... 22 August
Conference Day 1, Registration and Banquet ..... 23 August
Conference Day 2 ..... 24 August

29th Annual

The Operational Research Society of New Zealand



23 & 24 August 1993 Auckland University New Zealand

Conference

ORSNZ 1993 Preliminary Conference Programme

Registration, day-time meals and most presentations will take place in the University of Auckland Conference Centre situated in the Architecture Building, 22 Symonds Street. Stream B on Tuesday will take place in the adjacent Engineering School. Please note that this programme is preliminary and therefore subject to change.

Sunday August 22 1993

12:45-5:00 Wine Trail. Buses depart from 22 Symonds St.

5:30 Registration & Informal Reception (Conference Centre)
No organised meal is provided tonight, but there are many suitable eating places in the city centre 10 minutes walk from University.

Monday August 23 1993

8:00-9:00 Registration & Breakfast in the Conference Centre

9:00-9:20 Welcome

9:20-10:40 Session 1

Integrated Modelling Systems for Decision Support: A Review and An Implementation Approach, J. Davis, A. Srinivasan, D. Sundaram, University of Auckland

Experimental Consideration of Preference in Decision Making Under Certainty, J. Corner, J. Buchanan, University of Waikato

A Research Agenda for Spreadsheet Modelling, P. Cragg, University of Waikato

10:40-11:00 Morning Tea

11:00-12:00 Keynote Address:

The Optimization of Production and Distribution, Professor Bruce Murtagh, Macquarie University

12:00-1:00 Lunch

1:00-2:20 Young Practitioner Prize Session:

Optimal Expansion Strategies for the Telecommunications Local Loop, J. Laws, Air New Zealand

Determining New Zealand Electoral Districts using a Network-based model, C.A. Wallace, University of Canterbury

A Network Model for Optimal Power Generation in a Hydroelectric System, M. Craddock, University of Auckland

Reallocation of Capacity in a Time-Staged Network with Fixed Charges, N. Smith, Fisher and Paykel Ltd.

Optimal Container Packing to Fill an Order Book, G. Gill, University of Auckland

2:40-3:00 Afternoon Tea

3:00-4:00 Young Practitioner Prize Session (cont.):

A Technique for Solving Single Machine, Distinct Due Date, Early/Tardy Machine Scheduling Problems, R.J.W. James, University of Waikato

Using Genetic Algorithms and the Petal Method to solve Vehicle Routing Problems, C.A. Hjorring, University of Auckland

Stochastic Methods for Weather Dependent Race Planning, G. Leyland, University of Auckland

4:00-5:00 Session 3A: OR in the Electricity Sector

Optimal Pricing for Reserve Electricity Capacity, B. Ring, E.G. Read, University of Canterbury

Optimising Reservoir Management in a Deregulated Electricity Market, T. Scott, E.G. Read, University of Canterbury

Two Dimensional Cost Revelation in Electric Power Auctions, J. Bushnell, S. Oren, University of California

4:00-5:00 Session 3B: Simulation

Visual Simulation: A Coolstore Application, B. Benseman, R. Bailey, Industrial Research Limited

Dynamic Port Simulation Model, C.D. Irwin, A.J. Taylor, Beca Carter Hollings & Ferner Ltd.

The Micro-World: A Decision Support System for the Learning Organisation, E. Deakins, University of Waikato, G. Winch, University of Plymouth

7:00pm Conference Banquet. Please organise your own transport to Langtons Restaurant, Mt Eden Domain. Drinks at 7:00pm for 7:30pm.

Tuesday August 24 1993

8:00-9:00 Breakfast

9:00-10:40 Session 1A: Linear And Integer Programming

A Simplicial Approach to Integer Programming, C. Dang, H. van Maaren, Delft University of Technology

On the Relationship between the Knapsack Problem and the Group Knapsack Problem, Z. Nan, Victoria University

Error Analysis for Dual Dynamic Programming, M.Yang, E.G. Read, University of Canterbury

Optimising the Optimiser, J. Roper-Lindsay, Christchurch

Dissecting Genetic Algorithms, A.J. Mason, University of Auckland

9:00-10:40 Session 1B: Production Planning

A New Paradigm for Production Planning, Scheduling and Control, J.B. Moore, University of Waterloo

An Asymptotically Optimum Heuristic for the "Stones Problem": A New Approach to Discrete Warehouse Management Problems, E. Houghton, The University of Sydney, V. Portougal, University of Auckland

Selection of Dispatching Rules in Simulation Based Scheduling of Flexible Manufacturing Systems, C. Basnet, University of Waikato

Asymptotic Convergence and the Flow-Shop Scheduling Problem, V. Portougal, University of Auckland, J.L. Scott, University of Waikato

Approaches to Log Truck Scheduling and Despatching, T. Robinson, Logging Industry Research Organisation

10:40-11:00 Morning Tea

11:00-12:00 Keynote Address:

Algorithms for Solving Crew Scheduling Problems, Associate Professor John Holt, University of Queensland

12:00-1:00 Lunch

1:00-2:20 Session 2A: Control and Game Theory

A Decision Support Tool for Controlling a Dam to Environmentally Acceptable Standards, J.B. Krawczyk, Victoria University

Continuous-Time Shortest Paths, A. Philpott, University of Auckland

Equilibrium Strategies and the Value of Information in a Two Line Queueing System with Threshold Jockeying, R. Hassin, Tel Aviv University, M. Haviv, The University of Sydney

Optimal Timber Harvesting for Wood, Water and Wildlife Habitat, J. Kennedy, K. Jakobsson, La Trobe University

1:00-2:20 Session 2B: OR in Practice

Cross Cut Optimization of Wooden Boards based on Automatic Defect Detection, M. Rönnqvist, E. Åstrand, Linköping Institute of Technology

Staff Planning for a Service Organisation, A.J. Mason, D.M. Ryan, University of Auckland, D.M. Panton, University of South Australia

A Markov Analysis of Student Flows in an Undergraduate Business Program, M. Jones, T. Sumartono, J. Corner, University of Waikato

Forecasting Milk Supply: A Comparison of the Accuracy of Quantitative Methods, L. Foulds, T. Waddell, University of Waikato

2:20-2:40 Afternoon Tea

2:40-4:00 Session 3A: Organizations and Management

Modelling Concurrency in Organizations: Application of Petri Networks, J.J. Plocinski, La Trobe University

Using the Configuration Approach to Assist with Business Change, N.D. Burns, University of Technology, L.R. Foulds, University of Waikato

Survey findings on the use of MS/OR tools in Strategic Management, D.N. Clark, J.L. Scott, University of Waikato

A Dynamic Model for the New Zealand Wine Industry, J. Chester, J. Cooper, R. Cavana, Victoria University

2:40-3:40 Session 3B: Stochastic OR Models

A Stochastic Control Approach to Option Pricing in Incomplete Markets, W.J. Runggaldier, Carla De Francesco

Infinite Variance Time Series, T. Mikosch, Victoria University

Derivation of Conjugate Priors for Continuous Exponential-type Families and L1-isotropic Models with Right Censorship, Y. Hayakawa, Victoria University