ORS Newsletter

July 1992
Issue # 2/92

Operational Research Society of New Zealand (Inc.)

Editorial

This issue marks the introduction of our new-look newsletter. The larger format, the ability to include photographs, and most importantly, what we hope will be a constant supply of articles on OR applications, people, and topics, will all help to bring you a better product.

The use of a commercial publisher has enabled us to upgrade the presentation. It also relieves the editors of much of the routine work, to concentrate on the more "creative" activities. Our thanks to Robert Tait for so willingly taking on this task.

We plan to run with the new format for a year then review the situation, so please let us know what you think. We also plan to expand the size of future issues, so feel free to submit articles, and suggestions for them.

Newsletters need writers as well as readers, indeed we are entirely reliant on the OR community for copy. Contact one of the Editors to discuss your contribution (refer to page 2 of this issue for details about summissions).

Our thanks to John Buchanan, Delwyn Clark, Grant Read, and Harvey Greenberg for contributions to this issue.

Jonathan Lermit
Chris Daké

Society Officers 1992

Dr Jonathan Lermit,
ORSNZ Newsletter Editor

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Members, friends of the Society and those interested in OR matters are welcome to offer contributions. Below are some guidlines to assist you and your volunteer Editors to produce the best possible Newsletter for the benefit of the Society and readers. The Editor may be unable to publish contributions on occasions or may adapt them as required.

- # Articles each quarter on real OR projects, and related disciplines
- # Photographs (colour or b/w) related to articles or of the author(s)
- # Problems of academic interest (i.e. *puzzle corner*)
- # Profiles from Universities and firms, etc., about newly appointed staff
- # Reports from Universities and firms on research activities involving OR
- # News about visitors, teaching programmes
- # News and profiles from Corporate members and Sponsors
- # Reviews of new books, journal articles, and software

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The Editor Operational Research Society of NZ (Inc.) PO Box 904 Wellington NZ.

Please submit copy (on paper, double spaced single-sided, or Mac 800K or IBM 720K 3½" disks, or modem by arrangement) to reach The Editor by the 15th of the month prior to each quarterly (July, October, January, April) issue. Include S.A.E. for return of photos, etc.

From the President

Greetings, and welcome to the first edition of our "new-look" newsletter. Before going any further I would like to assure you that I do not intend to fill up every issue with philosophical ramblings "from the president".

Instead we are hoping that future issues will be so full of articles contributed by you, the membership of the Society, that there will be no room for such rumination.

But I thought it might be appropriate to explain why we are upgrading the newsletter:

- first, we believe that the Society needs to improve the level of services it provides for members. This is reflected in a number of comments received by Council.
- second, we believe that the newsletter should project a more positive image of our profession.

With regard to services, the newsletter is the only contact many members have with the Society, and hence the only opportunity that the Society has to serve them, now that we no longer have our own local journal. Thus we plan to increase the "news" content of the newsletter, to include brief articles about OR people, research projects, and groups in New Zealand.

Although the newsletter can not replace academic journals, OR practitioners need to be kept informed, and stimulated to think about trends in the practice of OR, and in the environment in which it is practised. Thus we will also try to include short articles on topics of particular importance to practitioners.

We believe that improving the content of the newsletter will support our members in doing effective OR, but we also see the need to help our membership explain and "sell" OR in their working environments. A recent UK study on "The Image of OR" concludes that users there are "favourable but not enthusiastic", while non-users do not understand OR very well at all. We would like to think that OR users in New Zealand were more enthusiastic, but must admit that the profession, and the Society, keep a pretty low profile. If we believe that OR offers practical cost-effective solutions to New Zealand businesses, we need to communicate this to business decision-makers in a format to which they can relate.

We appreciate that the present upgrade is a modest step forward, in keeping with the extremely modest subscription income of the Society, and still leaves our newsletter well below the standard of presentation expected in many business environments. But we hope that the new look will help you in communicating what you do, and how OR can help your business.

Finally, we would also like to think that, as the Society improves its services to members, and adopts a slightly higher profile in the business community, new opportunities will arise for OR applications, and new members will be attracted to join the Society.

DSIR Applied Mathematics Group is Moving

As part of the restructuring the Applied Mathematics Group Wellington office is to join the Industry CRI, now called Industrial Research Limited where it will be part of the *Measurement, Applied Mathematics and Analysis* Group. It will move from Victoria University to Gracefield in September. The substations at Auckland, Palmerston North and Lincoln will join the Horticulture, Pastoral and Crop CRIs.

Of the 21 science staff at Wellington, 14 staff have transferred to *Industrial Research Limited.* Three of the four science staff at Auckland transfer to the CRI structure as do the staff at Palmerston North and Lincoln. All the OR people are transferring to the CRI. There have, regrettably, been redundancies among the statisticians and computer people.

The AMG library will be integrated with the main library at Gracefield. It is vitally important that this resource be maintained, as there is a wealth of OR material which is of benefit to all OR practitioners.

The CRI will be "more market focussed and competitive". So, if you have that difficult OR problem, get in touch with *Industrial Research Limited,* and get it solved!

The Applied Mathematics Division of the DSIR was for many years the home of the OR Society. The Society takes this opportunity to acknowledge the invaluable contribution of the group to the Society and the profession, over the years and particularly to thank the long line of past and present members who have served as officers of the Society. We wish you well in your new venture.

Strategic Management Study Underway

What are the connections between "Management Science" and "Strategic Management"? Delwyn Clark of Waikato University is undertaking a major research project to find out, starting with a comparative survey of practitioners in the UK and NZ.

Management Science/Operational Research (MS/OR) and Strategic Management have typically been portrayed as focussing on distinctly different

«« *continued page 5* »»

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types of organisational problems so that they are, in effect, mutually exclusive. A quick scan of the OR literature including the International Abstracts in OR indices, keywords for OR journals, study-groups of OR Societies, as well as conference proceedings and presentations, would seem to suggest that this is true. However, the absence of a formal **strategic focus** within the MS/OR discipline does not mean that the two areas are incompatible. Rather, **a strategic** role for **MS/OR has** yet to be defined and recognised.

A detailed review of the literature shows that there have been several recent advocates of a strategic role for MS/OR, there are detailed descriptive papers on the use of some specific MS/OR tools within Strategic Management, successful applications of MS/OR modelling for strategic decision support, and 'new' MS/OR tools which are designed to identify and evaluate strategies. Therefore, it appears that there is a case to be made for MS/OR to contribute to Strategic Management.

To date, there have been no empirical studies on the strategic use of MS/OR tools, and the areas within Strategic Management which are potentially suitable for the MS/OR tools have not been described in any detail. Furthermore, the empirical work on tool usage within Strategic Management is minimal, with no studies on the comparative value of tools for specific tasks or on the factors affecting tool selection and usage.

These gaps are currently being addressed by a major research project which is being carried out by Delwyn Clark, with supervision from John Scott, at the University of Waikato.

To **evaluate the Use of** Modelling Tools **within Strategic Management,** Delwyn has prepared a normative framework based on the Strategic Management process model. A large sample of 66 Strategic tools and a further 40 MS/OR tools have been evaluated theoretically using this framework. Now she is preparing to obtain empirical data from a comparative survey of Strategic tool usage in the UK and NZ, using a random sample of practitioner members of the Strategic Management Societies.

As there is a strong MS/OR profession in the UK, and as many of the 'new' MS/OR tools have been developed there, a comparative survey of practitioner members of the OR Societies in the UK and NZ is also in the pipeline! As the ORSNZ is very small compared with the UK Society, a high kiwi response rate is needed. Your cooperation and support of this research by completing a postal questionnaire (probably in August), will help to ensure the success of the project and thereby contribute to this important and challenging research.

Delwyn would be interested to hear from people with experiences of successful and unsuccessful strategic modelling projects. She may be contacted at:

✍ Department of Management Systems
University of Waikato
Private Bag 3105
HAMILTON

☎ (07) 856-2889 ext 8643

On The Development of an Intelligent Mathematical Programming System

by Harvey J. Greenberg University of Colorado at Denver

Professor Greenberg will be the keynote speaker at this year's Conference. He writes on the topic of Intelligent Mathematical Programming Systems, and is to give a full day workshop on this subject at Conference.

Recent advances in computing technology have created a situation where we can solve larger problems than we can understand. This is true for most linear programs, and it is becoming increasingly true for nonlinear and integer forms. In addition, model management can be confounded by large models, especially when they are eclectic. To deal with this bottleneck in productive use of mathematical programming for decision support, I began a research project in 1985 to develop an *Intelligent Mathematical Programming System* (IMPS).

The problems we address in this project include the following:

- Find a reformulation that simplifies the model.
- Infer data relations that are necessary for the instance to be well posed (i.e., feasible and bounded).
- Give different views of the model and instances of it that enable different insights.
- Answer questions of sensitivity: *What if*... ?, *Why* ... ?, and Why *not*... ?
- Form responses in English, graphics and other forms under user control.
- Provide aids for model debugging, such as why an instance is infeasible.
- Provide aids for documenting a model and managing scenarios.

Sponsored by companies that experience these problems and that want to advance the state of modelling and analysis in mathematical programming, I formed the IMPS Consortium. The IMPS Consortium is presently supported by Amoco Oil Company, IBM, Shell Development Company, Chesapeake Decision Sciences, GAMS Development Corp., Ketron Management Sciences, MathPro, Inc., and Maxima. Colleagues working with the Consortium are: John Chinneck, Fred Glover, Leon Lasdon, Weldon Lodwick, Roy Marsten, John Maybee, Gautam Mitra and Frederic Murphy.

To develop a truly new role for the computer as an *intelligent* participant in applied mathematical programming, it has become necessary to return to basics and rethink what we mean by a model. At the simplest level, a model is a collection of objects and relations among those objects. We must, however, be more precise about objects and relations. Structured modelling offers one formalism, and the simulation community has developed other formalisms for model description. These have provided a foundation upon which we have built extended constructs necessary for comprehensive representations of not only models, but also of their instances. Much of our development uses object-oriented concepts, but we have found reasons to deviate from this paradigm, particularly in knowledge representation.

Our research into modelling formalisms has been applied to the development of prototypical software. Although the software developments have been for proof of concept, some of the systems we have developed are of production quality and used by some Consortium members. Broadly, we have three modules: formulation, analysis and discourse. These interrelate and subdivide into smaller parts.

The formulation module has responsibilities beyond traditional systems, which have focused on representation and instantiation, the latter being in the form of generating input to an optimizer. Two of the extended responsibilities are to provide aids for model management and rule-based support for downstream analysis.

The analysis module contains a rich command-driven collection of query and procedural facilities that address not only standard sensitivity questions, but also diagnostic aids, such as when an instance of the mathematical program is not feasible. Beneath this, there is a rulebase to provide analysis support for the non expert to obtain deep knowledge of the meaning of a solution and answers to questions about anomalies or inconsistencies.

Formulation and analysis modules are supported by a discourse module that includes algebraic, graphic and English interfaces. Discourse is how a human being communicates with a computer, and we orient this towards the human's knowledge domain rather than the traditional computer language. A multi-view architecture provides flexibility to deal with people's differences in cognitive skills. In some cases, responses are formed in English; in other cases, graphic views are most insightful.

Some experiments with learning have been conducted with this triad of formulation, analysis and discourse modules. Currently, this is in an early stage and several avenues are under study. Learning models differ by form and content. Forms of learning include associative (when pattern matching is underlying the intelligent support), logical (when a rulebase is underlying the intelligent support), and other refinements (when a semantic network is underlying the intelligent support). Contents include vocabulary and related lexical elements of not only English discourse, but also of graph grammars and algebraic constructs. These elements are learned through expert intervention or through monitoring sessions with non-expert users who can give feedback on the quality of the intelligent support. An example of expert intervention is when the model manager changes the rulebase to support analysis. An example of session monitoring is when an infeasibility diagnosis is eventually achieved, but after some dead ends in the reasoning. Hindsight is used to change the heuristic search procedure to improve the diagnosis for future situations.

Our progress has relied on an extensive network into a research community, which we bring together twice a year at what we call Roundtable Discussions. In addition to Consortium members and colleagues, researchers are invited to attend and explain their results. This interaction has been an invaluable part of the Consortium's activities, and part of our mission is to seek out such research activities and remain at the cutting edge of this technology. It is especially useful to have interactions with companies who can envision the practical value such research can have on their operations.

Dr. Greenberg received his B.S. in Industrial Engineering from University of Miami (1962), and his Ph.D. in Operations Research from The Johns Hopkins University (1968). He is presently Professor of Mathematics at The University of Colorado at Denver, and was formerly with the U.S. Department of Energy (1976-83). Dr. Greenberg directs a project to develop an Intelligent Mathematical Programming System, sponsored by a consortium of companies. As part of that research, Dr. Greenberg developed the ANALYSE system, which gives intelligent support for analysis of linear programs, and for which he received the first ORSA/CSTS Prize for *Excellence in research in the interfaces of operations research and computer science* (1986). He has also received a research award from CU-Denver (1988). Dr. Greenberg has numerous publications, and he was the founding editor of the *ORSA Journal on Computing.*

OR at Canterbury

There is no longer a Department of Operations Research at Canterbury University. *Grant Read* explains what is going on in the Management Science Group of the new Department of Management.

OR became a separate department at Canterbury in 1989, almost 20 years after John George and Hans Daellenbach started teaching OR in the Economics Department. However, in 1991 this department merged with Business Administration to become the Management Science group in a new Department of Management.

The new group has an establishment of 8, including Hans, John, Don McNickle and Grant Read from Operations Research and Marty Gimpl and Himu Paul from Business Administration. They have been joined by Bruce Lamar and P (Venkat) Venkaterswalu (see boxes below) and currently by Olly McCahon and Nicola Petty as temporary assistant lecturers. John is head of the new department, and Hans is Professor and academic leader.

The merger was motivated by the belief that Operations Research, or "Management Science" as it is alternatively known, should be seen, practised, and taught as an integral part of Management. The combined Department is in a much better position to support the MBA, into which Hans, in particular, has had a major input over the years, and to develop links with the local business community. According to John:

> "The aims of the Department include further integration of its constituent disciplines, and improving relationships with the business community while strengthening our commitment to research."

He hopes that, as a result, OR will be applied in a wider variety of settings, while OR people will benefit from the stimulation of exposure to other disciplines. He believes that OR always needs to be seen in this inter-disciplinary light. Initially, most staff kept on doing what they've always done, but joint research programmes are now being explored, and significant benefits are expected from cross-fertilisation of ideas in future.

All of the teaching programmes of the old OR department have been maintained, with expansion in some areas via rationalisation with Business Administration courses. OPRE course codes have been replaced by MSCI, pronounced M-Sci. (Beware! course numbers were also changed).

«« *continued page 9* »»

Dr Bruce Lamar, previously an Assistant Professor of Management at the University of California, Irvine, has recently been appointed a senior lecturer in Operations Research in the Department of Management.

Dr Lamar taught at Irvine in the areas of linear programming, queuing models, and simulation. His research areas include network analysis, physical distribution, energy modelling and disaster management. His current focus is on nonlinear single and multi commodity network flow models, particularly the use of mathematical programming techniques to analyse minimum cost network flow problems involving fixed charges and other economies of scale.

He holds B.S. and M.S. degrees from the University of California and S.M. and Ph.D. degrees from the Massachusetts Institute of technology. He is married with two sons.

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Hans teaches MSCI101 "Systems and Decision-Making" to 600 Stage 1 students. The success of this course has attracted international attention, particularly at ORSA/TIMS 91 in Anaheim, where Hans presented a paper to a capacity audience. Enrolments in three Stage II papers range from 60 to 140, with 30 to 60 taking four papers at Stage III.

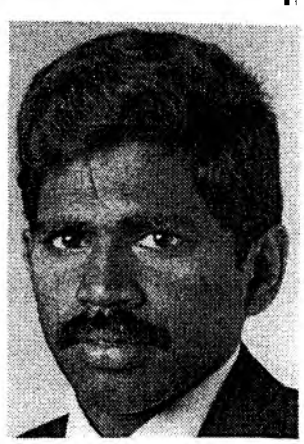
The MCom/BSc(Hons) aims to produce OR practitioners who have not just the technical skills, but also the practical and personal skills to contribute in a business environment. Thus all students at this level do a practical project with a local firm, as well as a range of theoretical and applied papers. Two Diploma courses offer a flexible combination of graduate and advanced undergraduate courses for students without the requisite background for the full range of graduate papers. At this level, student numbers are up from 3-4 in past years to 12-14, apparently indicating a perception among top students that OR, while not guaranteeing employment, provides better career prospects than many other options.

In the past many of the best students have gone on to PhD studies overseas, but more are now staying on to do their's locally. Yang Miao, Brendan Ring, Tristram Scott and Olly McCahon are studying electricity sector problems.

Grant, who has reduced his university commitment to half time in order to pursue his consulting interests, is supervising this group, and Bruce is now taking a keen interest in this area, currently working on optimisation of spinning reserve requirements in power systems. He is also working on physical distribution models involving bulk discounts and other forms of economy of scale.

Hans is pursuing his interests in the teaching and application of "The Systems Approach", and writing a textbook based on his course notes for MSCI 101. Don continues to teach and do research on forecasting, simulation and queuing theory, particularly time dependent results in networks of queues. John is working on packing algorithms the application of OR to data gathering and presentation problems.

Marty, Venkat and Himu concentrate on Production management. Himu's interests lie in systems dynamics, manufacturing strategy and simulation of manufacturing systems. Venkat is working on TQM Reliability Engineering and Operations Management. Marty's current work is in the management of innovation and chaos *(maybe these techniques are relevant to the production of the newsletter - Ed).*



Dr. P. Venkateswarlu, has been appointed as a lecturer in Operations Research in the Department of Management. Prior to joining the University of Canterbury in 1991 he was teaching for four years at the University of Sterling, Scotland, and for nine years at the National Institute for Training in Industrial Engineering, Bombay, India.

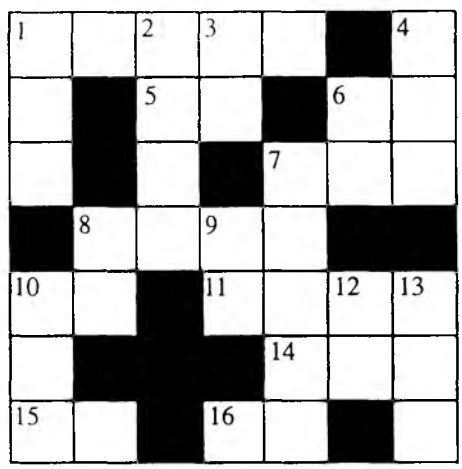
His educational background includes a Master's degree in Statistics from the Indian Institute of Technology, Kanpur, a Post Graduate Diploma in Statistical Quality Control and Operations Research, Calcutta, and a Ph.D. in Reliability Engineering from the Indian Institute of Technology, Bombay. In addition, Dr. Venkateswarlu is a member of the Institute of Quality Assurance, U.K., and the New Zealand Organisation for Quality.

Dr. Venkateswarlu's teaching interests are primarily in the areas of Total Quality Management, Reliability Engineering, and Production and Operations Management.

Puzzle Corner

This puzzle has been contributed by Dr. John Buchanan of Waikato University. First correct solution received by the Editor will be awarded free membership of the Society for 1993. Solution to be published in next issue.

DOG'S MEAD



The year is 1939.

The clues are concerned with the Dunk family farm - a rectangular piece of ground known as Dog's Mead.

ACROSS

1. Area in square yards of Dog's Mead
5. Age of Martha, Father Dunk's aunt
6. Difference in yards between length & breadth of Dog's Mead
7. Number of roods in Dog's Mead times 8 down
8. The year the Dunks acquired Dog's Mead
10. Father Dunk's age
11. Year of Mary's birth
14. Perimeter in yards of Dog's Mead
15. Cube of Father Dunk's walking speed in m.p.h.
16. 15 across minus 9 down

note: One acre = 4840 square yards = 4 roods.

DOWN

1. Value in shillings per rood of Dog's Mead.
2. Square of the age of Father Dunk's mother-in-law.
3. Age of Mary, Father Dunk's other daughter.
4. Value in pounds of Dog's Mead.
6. Age of Ted, Father Dunk's son who is twice the age of his sister Mary in 1945.
7. Square of the breath of Dog's Mead.
8. Time in minutes it takes Father Dunk to walk $1\frac{1}{3}$ times around Dog's Mead.
9. The number which, multiplied by 10 across gives 10 down.
10. See 9 down.
12. Addition of the digits of 10 down plus 1.
13. Number of years Dog's Mead has been in the Dunk family.

Local and International Events

N.B. The editor has some extra details on all these events if you are in a hurry to get further information.

Euro XII/TIMS XXXI
Joint International Conference
Operational Research / Management Science

Helsinki, Finland *29 June-1 July 1992*

Contact: Helsinki School of Economics and Business Administration
Department of Management Science
Runeberginkatu 14-16
SF-00100 Helsinki, Finland
E-mail: eurotims@finfun.bitnet
Fax: (358) (0) 431 3217

FINANCIAL MODELLING
for Business Planning and Profitability

Auckland *30-31 July 1992*

Contact: AIC Training
P.O. Box 5321, Wellesley St, Auckland
☎ (09) 358 5566 Fax (09) 358 5577

International Institute of Forecasters 1992 Conference

Wellington, New Zealand *7 -10 August 1992*

Contact: Allan Catt
Business & Economic Research Ltd
Box 10-277, Wellington
☎ (04) 472-5564

Commercialising Research and Technology

The James Cook, Wellington *17-18 August 1992*

Contact: AIC Conferences
P.O. Box 5321, Wellesley St, Auckland
☎ (09) 358 5566 Fax (09) 358 5577

VI CLAIO - 6th Latin-Ibero American Congress on Operations Research

México City, México *7- 11 October 1992*

Contact: Javier Márquez,
Departmento de Administración, ITAM
Rio Hondo No 1, Tizapán San Angel
México, D.F., México. C.P. 01000
Fax: (52) (5) 500 7637

ORSNZ 28th Annual Conference

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ORSNZ Conference,
c/- Management Department
University of Canterbury.

In conjunction with the conference:
Workshop: Wednesday, 26 August 9-5pm
Computer Assisted Analysis of Linear Programs

Led by: **Professor Harvey Greenberg**

International Conference on
Operational Research for Development

Indian Institute of Management,
Ahmedabad, India *14-16 December 1992*

Contact: Jonathan Rosenhead
London School of Economics
& Political Science
Houghton Street
London WC2A 2AE
England
Fax: (44) 71 955 7416 ☎ (44) 71 955 7637

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 Estevão Pinto
1000 LISBOA, PORTUGAL
Fax: (351) (1) 387 1105

WHAT IS THE OPERATIONAL RESEARCH SOCIETY?

Operational Research is a scientific approach to solving management problems. The Society exists to support OR professionals and the application of OR to improve and further managerial decision-making in New Zealand. The Society holds an Annual Conference and branch meetings in main centres. Members receive a quarterly newsletter and a semi-annual journal, the Asia Pacific Journal of Operations Research.

Clip or copy and send to:

The Secretary
Operational Research Society of New Zealand (Inc.)
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)

Annual Subscriptions:

* Current fees for 1992

Auckland, Wellington, Christchurch & Overseas ☐ $35.00

Other areas ☐ $31.50

Sudent Members ‡ ☐ $15.00

‡ Student certification: _____
(Signature of Instructor)

Name of Institution: _____

Name : _____
(block letters please)

Address : _____

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_____ Tel. No.: ( ) _____

Occupation : _____

Organisation : _____

Special interest areas : _____