



# NEWSLETTER

April 2008

Operational Research Society of New Zealand, Inc.  
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The newsletter is published three to four times per year, regular dates are March, June, September, and December. Submissions deadline is the 15th of the month for the following month's issue. Send contributions by email to the Newsletter editor, Matthias Ehrgott, at [newsletter@orsnz.org.nz](mailto:newsletter@orsnz.org.nz).

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## The President's Column

Welcome to the first edition of the ORSNZ newsletter for 2008. As in previous years it is very ably edited by Mathias Ehrgott. Mathias does an excellent job of rounding up contributors and gently applying deadline pressure. As usual, contributions for forthcoming editions of the newsletter will be gratefully received.



Unlike previous years, the letter from the President no longer flows from the keyboard of Pro-

fessor David Ryan, who has stepped down after four years service. We are all most grateful to David for his contributions to the society over this time, particularly given the heavy demands placed on his time by his Engineering Deputy Dean duties. David's international standing has helped raise the profile of Operations Research in New Zealand, and contributed to the steady stream of distinguished visitors heading down under, many of whom have contributed at our ORSNZ conferences. David has agreed to stay on as a council member in the APORS/IFORS liaison role, and we look forward to his continuing contributions.

I feel very honoured to step into the post of President, where I join a long line of much more distinguished names. I will do my best to maintain the high standards set by Professors David Ryan, Les Foulds, Andy Philpott, and all those before them who have helped guide our society.

I was recently sorting through our old ORSNZ files and came across some early versions of our constitution along with the amendments that created them. You can now find these on our web site [www.orsnz.org.nz](http://www.orsnz.org.nz). For example, in 1991, under the guidance of the then president Vicky Mabin, the constitution was updated to clarify our non-profit status (adding clauses that we still rely on today), and to remove the sexist language. These changes helped move the society into a more modern era.

Vicky Mabin has made huge contributions to the society going back many years. As well as making those 1991 constitutional changes, Vicky was instrumental in organising our 40 year celebration in Victoria Wellington in 2005, has been our



*Vicky Mabin has made a huge contribution to the ORSNZ*



APORS/IFORS representative for the last 7 years, and has been an active and engaged member of Council for many years. Vicky has this year handed over her liaison role to David Ryan. I wish to publicly acknowledge her many contributions to the ORSNZ and thank her for making a difference. We will miss Vicky's presence on the Council.

In other changes, Chuda Basnet of Waikato University has declined nomination to council this year. This leaves the council with no representation from Waikato, a situation we hope to rectify in the future. We are pleased, however, that Paul Rouse, has accepted a position on Council. Paul has been our auditor and financial guide for many years, and will make a valuable contribution in keeping us on the financial straight and narrow. I continue to be very grateful for the support of all our Council members, and in particular would like to acknowledge the major contributions of our secretary, Hamish Waterer, and our treasurer, John Paynter. Along with our newsletter editor, Matthias Ehrgott, Hamish and John bear the brunt of the volunteer work that keeps our society ticking along.

I received my first presidential spam a few days ago, inviting me to tell ORSNZ members about the INFORMS *Transactions on Education*, a peer-reviewed open access education journal available at <http://ite.pubs.informs.org/>. I spent a few minutes browsing this journal and soon turned up several articles useful for my OR teaching. Rasmussen and Weiss (*Advanced Lessons on the Craft of Optimization Modeling Based on Modeling Sudoku in Excel*, Volume 7#3) present a very concise Excel model for solving Sudoku puzzles, while Brown and Dell (*Formulating Integer Linear Programs: A Rogues' Gallery*, Volume 7#2) present a list of requirements commonly found in modelling problems along with the associated 'formulalettes' that represent these mathematically. They also give typical errors that reminded me of the less happy moments I experience when exam marking!



*Analytics – a new online journal from Informs*

Talking electronic journals, the days of issuing this newsletter in a paper based format are, I suspect, numbered. The NZ Statistics society now sends out its newsletter in electronic form; you can read it at <http://nzsa.rsnz.org>. The US Operations Research society *Informs* has just started an electronic magazine *Analytics* – <http://www.analytics-digital.com/> – which takes content from OR/MS Today and re-packages it online. This magazine is targeted at the wider practice consumer, not just members of Informs. It is unusual in that it's not just a PDF, but instead a highly interactive site, including personalization options and an easy mechanism for recommending articles to friends. The International Federation of Operational Research Societies (IFORS) also has electronic newsletters; you will have received email from our secretary about these.

The recent visit of Professor Michael Trick, and in particular his excellent conference plenary *The Science of Better and Better Together*, prompted many of us to ponder the role the ORSNZ can play in keeping the OR community strong and vibrant in New Zealand. Many of you will know



*Professor Michael Trick, ORSNZ Visiting Lecturer, 2007*

Mike as an ex-President of Informs, or perhaps through his Operations Research blog at <http://mat.tepper.cmu.edu/blog/>. Mike is a big fan of blogs, and recommended a regularly updated blog as a replacement for our newsletter. Personally, I have always liked being able to peruse our newsletter before I fall asleep, something that's much harder to do if it is electronic. Your views on this would be most welcome.



*Professor Mikael Rönqvist, ORSNZ member and 2008 Edelman finalist*

Mike's blog re-

minds me to mention that one of our ORSNZ members, Mikael Rönnqvist, is to be congratulated on being a finalist for the 2008 Franz Edelman Award for Achievement in Operations Research and the Management Sciences. This is undoubtedly the most prestigious prize in Operations Research. Mikael is one of contributors behind the project “Operations Research (O.R.) Improves Quality and Efficiency in Social Care and Home Help,” described as a “program that has brought improvements to the complex scheduling of more than 4,000 providers who help the sick and the elderly.” The competition Mikael faces is formidable – the US Federal Aviation, the Netherlands Railways, the Norwegian StatoilHydro, the US Environmental Protection Agency and Xerox – but also a sign that Operations Research is still making a difference.



*Professor Jeffrey J. Hunter, FNZMS*

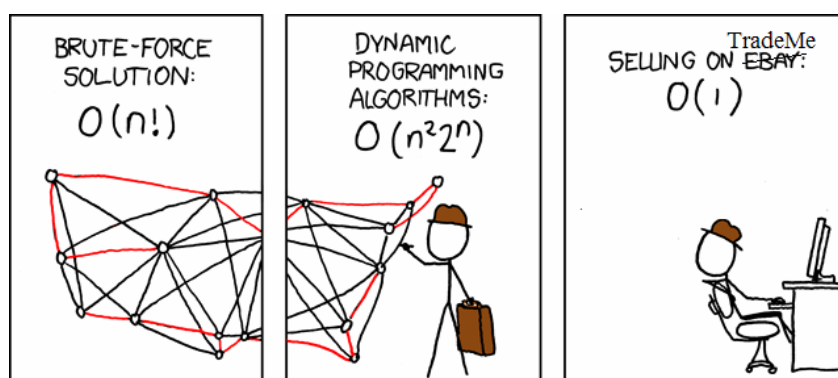
We wish Mikael and his team the best of luck in this tough field.

Finally, I would like mention the retirement of Jeff Hunter, an ORSNZ member since 1969. Jeff Hunter had a distinguished career that started at the University of Auckland where he taught in the Operations Research program. He went on to become the founding Dean of the Faculty of Information and Mathematical Sciences based at Massey University's Auckland campus. Jeff's many contributions are recognized in a special issue of the Journal of Applied Mathematics and Decision Sciences. We wish Jeff all the best in his retirement.

The very last word in my column goes to the cartoonist 'XKCD' for his comment on the need for Operations Research in a changing world.

*Andrew Mason, President*

#### Optimal Routing Algorithms for Travelling Salesmen



<http://xkcd.com/399/> (with minor changes)

## ORSNZ Visiting Lecturer 2008 – Call for Nominations

The ORSNZ invites nominations for ORSNZ honorary visiting lecturers for visits to New Zealand between September 2007 and June 2008. Each visiting lecturer must give a talk on some topic likely to be of general interest to ORSNZ members at least three of Auckland, Hamilton, Wellington, and Christchurch. Each visiting lecturer will be invited to write a guest editorial for the society newsletter. The ORSNZ contributes to the costs up to a maximum of \$1000 plus

GST per visitor. Each candidate must be nominated by a current member of ORSNZ, "the champion". The nomination must include the CV of the nominated visiting lecturer, the date and location of the hosts of the visit, the name of the champion and an undertaking by the champion to coordinate a visit by the nominee to three or more of the above named centres. Enquiries concerning, or nominations for, lectureships should be sent to [president@orsnz.org.nz](mailto:president@orsnz.org.nz). The closing date for nominations is the end of April.



## IFORS Newsletter

IFORS, the International Federation of Operations Research Societies, is publishing an online newsletter.

The third edition appeared in December 2007. It is available online at [http://www.ifors.org/news/news\\_items/newsletter\\_dec\\_07.pdf](http://www.ifors.org/news/news_items/newsletter_dec_07.pdf)



### MANAGEMENT CONSULTANCY

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Working directly with the Principals you'll gain exposure to a wide variety of large organisations and industry sectors. The mix of client facing work and detailed research and analysis will develop your full range of skills. You will also be afforded the scope and freedom to apply your own judgement and extend yourself.

The intellectual and client delivery demands of this role require superior analytical, reasoning and problem solving skills. You may already have some experience in management consulting and be looking for a fresh new environment. Alternatively you may have qualitative or quantitative research experience backed by strong academic credentials.

You will ideally have:

- Postgrad qualifications in a research based discipline however operations research or management science skills will be highly regarded.
- Effective communication and presentation skills.

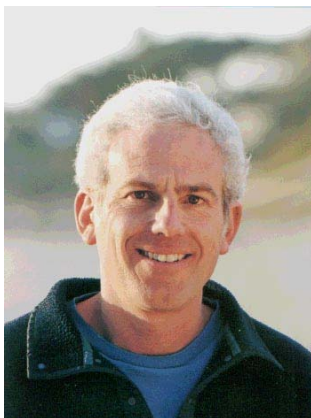
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## People

### Rick Rosenthal



Distinguished Professor of Operations Re-

search at the Naval Postgraduate School in Monterey and is well known for his many contributions to the theory, practice and teaching of our subject but also to the promotion and development of Operations Research through his service to INFORMS.

On 3 January, 2008 a very good friend of Operations Research in New Zealand and a good friend of many of us personally here in New Zealand passed away after a long and courageous battle with cancer. Rick Rosenthal was a

search at the Naval Postgraduate School in Monterey and is well known for his many contributions to the theory, practice and teaching of our subject but also to the promotion and development of Operations Research through his service to INFORMS.

Rick first came to New Zealand as a Fulbright Fellow at the University of Canterbury in 1981. I was fortunate to meet him for the first time when he made a visit to Auckland with his family. I well remember our families being together at our home during his visit and arranging for us to enjoy an afternoon sailing on the Waitemata Harbour. My friendship with Rick continued through the 1980s and in 1989, Rick invited me to spend part of my Sabbatical at NPS. It was an exciting time living in Carmel close to Rick's home and

enjoying life in a very active and successful Operations Research Department. Later Rick was to become Chairman of that Department and over the years he has inspired and mentored many students who have passed through the OR programme at NPS. Rick made a second visit to Canterbury as an Erskine Fellow in 1994 and was due to make a further visit again as an Erskine Fellow in 2005 but unfortunately was unable to come because of his illness.

Ruth and I were fortunate to be able to share in a webcast Memorial Service for Rick that was held at the Naval Postgraduate School on 10 January. A video of the Memorial Service is now posted on the NPS website at <http://www.nps.navy.mil/or/>. There are many wonderful photos also on the website that bring back so many memories of Rick as we remember him.

Besides my own personal friendship with Rick, I know that Grant Read, John George, Fritz Raffensperger and Don McNickle have all shared special times with Rick either here in New Zealand or in the US and he will be known to many other members of ORSNZ through his participation in our conferences. It is with great sadness that we note his passing but we will always remember Rick for his generosity of spirit – he always sang the praises of others, his enthusiasm for the power and benefits of Operations Research and his genuine caring friendship.

David Ryan

## Michael Rothkopf



INFORMS records with sorrow the death of Michael H. Rothkopf, a former president of INFORMS, a former editor-in-chief of *Interfaces*, and an active member of the association.

Prof. Rothkopf, 68, died on Monday, February 18, while swimming at the McCoy Natatorium at Pennsylvania State University. He joined the faculty at Penn State in 2007 after teaching for many years at Rutgers University.

An INFORMS press release issued when he became president in 2004 noted that his exper-

tise included energy economics, models of markets and competitive bidding, and other applications of operations research.

In addition to work with the Federal Energy Regulatory Commission, Prof. Rothkopf consulted to the European Bank for Reconstruction and Development; US WEST; Merrill Lynch; The Brattle Group; Cambridge Energy Research Associates; the Analysis Group, Inc.; Bristol-Myers Squibb; and the RAND Corporation. He headed the Energy Analysis Program at Lawrence Berkeley Laboratory before moving to Rutgers in 1988. He held positions at Shell Oil and Xerox PARC.

During his many years of service to INFORMS, Prof. Rothkopf served in many roles, including editor-in-chief of the society's journal for practitioners, *Interfaces*.

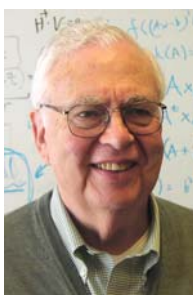
Prof. Rothkopf published extensively. In August 2003 he co-authored a paper published by the New American Foundation entitled "Interlicense Competition: Spectrum Deregulation Without Confiscation or Giveaways." He edited a handbook on public sector applications of operations research and wrote more than 30 papers that have been published in operations research archival journals. In addition, many of his papers have been published in archival journals in the fields of economics, engineering, marketing, medicine, and management.

Professor Rothkopf received his doctorate in operations research from MIT.

He is survived by his wife, Laura.

<http://www.informs.org/article.php?id=1341>

## Gene Golub



Gene Howard Golub (February 29, 1932 – November 16, 2007), Fletcher Jones Professor of Computer Science (and, by courtesy, of Electrical Engineering) at Stanford University, was one of the pre-eminent numerical analysts of his generation.

Born in Chicago, he was educated at the University of Illinois at Urbana-Champaign, receiving his B.S. (1953), M.A. (1954) and Ph.D. (1959) all in the field of Mathematics. His M.A. degree was more specifically in Mathematical Statistics. His PhD dissertation was entitled "The Use of Chebyshev Matrix Polynomials in the Iterative

Solution of Linear Equations Compared to the Method of Successive Overrelaxation" and his thesis adviser was Abraham Taub. He had been at Stanford since 1962 and became a professor there in 1970. He had advised almost thirty doctoral students, many of whom have themselves achieved distinction. Gene Golub was an important figure in numerical analysis and pivotal to creating the NA-Net and the NA-Digest, as well as the International Conference on Industrial and Applied Mathematics.

One of his best-known books is *Matrix Computations*, co-authored with Charles F. Van Loan. He was a major contributor to algorithms for matrix decompositions. In particular he published an algorithm together with William Kahan in 1970 that made the computation of the singular value decomposition (SVD) feasible and that is still used today. A survey of his work was published in 2007 by OUP as "Milestones in Matrix Computation".

Golub was awarded the B. Bolzano Gold Medal for Merits in the Field of Mathematical Sciences and chosen as a Member of the National Academy of Sciences (1993). He is listed as an ISI highly cited researcher. He held several honorary degrees and was destined to obtain an honorary degree from ETH Zürich on November 17, 2007.

Gene Golub succumbed to acute myeloid leukaemia on the morning of 16 November 2007 at the Stanford Hospital.

[http://en.wikipedia.org/wiki/Gene\\_Golub](http://en.wikipedia.org/wiki/Gene_Golub)

## Alex Orden

Linear Programming Pioneer, August 9, 1916 – February 9, 2008. Alex Orden passed away February 9, 2008 at UC hospital. Son of Abraham and Esther and born in Rochester New York in 1916, Alex graduated from the University of Rochester and received a master's degree in physics from the University of Michigan. During World War II he was a member of Project Scoop which pioneered the early development of linear programming models for logistical planning using the newly-invented simplex method and the earliest vacuum tube computers. In 1946 he married Susan Rabinowitz in Manhattan. He received a Ph.D. in mathematics from MIT in 1948 and in 1958 came to the University of Chicago Graduate School of Business to manage the UNIVAC II computer and teach operations research. He was a mem-

ber of the Institute for Computer Research, visiting professor at the London School of Economics and Georgia Institute of Technology, chairman of the Mathematical Programming Society during 1983-86, and a long-term consultant to Inland Steel Company and Amoco Oil Company. Alex remained on the University of Chicago faculty until 1987 and continued to be active as professor emeritus until his death. He also taught at the Knowledge Systems Institute and Wake Forest Graduate School of Management. He was active in Hyde Park peace activities and an avid Shakespearian, tennis player and traveller. He is survived by his sister Lillian Lukaczer in Washington DC, children Ruth, living in Israel, David, in Maryland, and Jeannie in Boston. He has eight grandchildren and one great grandchild.

## 42<sup>nd</sup> Annual Conference of the ORSNZ

The 42nd Annual Meeting of the ORSNZ took place at the University of Auckland on November 28-29, 2007. The meeting was preceded by the workshop on Supply Chain Optimization organized by Andy Philpott. The OR conference attracted 40 participants. We had 2 full days of presentations that included 27 contributed talks and 2 plenaries. Sessions covered a variety of topics including OR in the electricity industry, optimization over networks, and of course the Young Practitioner Prize (YPP) sessions.

We were especially fortunate to take advantage of the visits to Auckland of Michael Trick and Gerard Cachon who gave outstanding plenary lectures. As most of you OR practitioners know, Mike Trick is the Professor of Operations Research at the Tepper School of Business, Carnegie Mellon University. He adds to his very active research programme a distinguished record of service to the OR community, including a term as president of INFORMS. Mike was visiting the University of Auckland's Department of Engineering Science as the Hood Fellow for 2007.

He discussed the problems and solutions involved in building a recognized brand for the field of OR, supported by a strong and cohesive community of practitioners. While the science is thriving owing to advances in both algorithms and hardware, with many new applications in the service sectors, OR societies worldwide are not (although many OR meetings are growing in size). Clients have insufficient understanding of the role and value of OR professionals (he illustrated this with some humorous anecdotes from



his work in scheduling Major League Baseball).



What stood out for me was that what we get out of a community is proportional to what we put in. He also pointed out that leaders of our field must be particularly involved in our community building activities such as socials to increase chances of success. Mike said that he had noticed while travelling around NZ that there is not enough communication between OR groups in different regions. He urged the use of new technologies to help build communities, counteracting the "bowling alone" phenomenon. His own major contribution is the blog at <http://mat.tepper.cmu.edu/blog/>.



Gerard Cachon is Fred R. Sullivan Professor of Operations and Information Management at the Wharton School of Business, University of Pennsylvania, and is visiting us on his sabbatical until June 2008. His specialty is games in supply chains. He delivered a captivating lecture giving an introduction to game theory within OR. In our field, we are very much used to optimizing an individual agent's decisions and plans. A natural extension of this topic arises as several agents are involved in a market, each optimizing their decisions and where each agent's decisions affect the optimal returns of the others. His applications ranged from manufacturing to the fashion industry!

Another notable feature of the conference was the awarding of the YPP to Lei Zhang, Martin Peat and Bassy Tam. The YPP was awarded at the conference dinner held at the Royal NZ Yacht Squadron, thanks to our incoming president Andrew Mason, who presented the prizes. He also presented David Ryan with a congratulatory bottle of champagne to recognize David's fellowship of INFORMS.



*Michael Trick congratulates Lei Zhang on with YPP*

The conference was very successful as far as it went. However one very disappointing aspect was the lack of participation from outside Auckland - only one academic from another area of NZ participated! Coupling this with the comments of Mike Trick mentioned above, and the trend in membership numbers, I have some anxiety about the future of the ORSNZ, or at least its annual conference. I can't imagine OR in NZ doing better without the society, but perhaps it needs to add value in more ways in order to seem relevant to academics and practitioners. We should all think hard about how we can help build a really thriving community.

On behalf of the organizing committee I thank the sponsors: The University of Auckland Energy Centre, The Electricity Commission, Transpower, Optima Corporation, and Hoare Research Software, for their contribution to this meeting. I also thank the other members of the organizing committee: Hamish Waterer, Andrew Mason, Oliver Weide, Tony Downward, Amir Joshan, and Ziming Guan.

*Golbon Zakeri*

## Chapter News

### Auckland News

The Auckland Branch of ORSNZ continues to operate, albeit at a slightly slower clock speed than it has done in previous years. Most of this activity has been enthusiastically initiated and led by the younger members of the Engineering Science Department (namely the Society President, Secretary, and Newsletter Editor) rather than your correspondent. I am grateful to them for their contributions.

Members of ORSNZ will be pleased to hear that ORSNZ member Professor Michael Saunders of Stanford University has been elected to an Honorary Fellowship of the Royal Society of New Zealand. This honour comes as recognition for Mike's contributions to the development of fast stable algorithms for solving optimization problems – any of you who have ever used LPSOLVE, MINOS, PATH, NPSOL or SNOPT will have benefited from his brilliance. He was awarded the inaugural Beale-Orchard-Hays Prize by the Mathematical Programming Society in 1985. (Incidentally, the paper on PATH, the MCP code that uses Mike's LUSOL code won the same prize for Michael Ferris and Steve Dirkse in 1997.) Mike has been a long-standing supporter of New Zealanders working in Optimization and Operations Research. He has been a member of ORSNZ for many years and has participated in many of our annual conferences, as well as playing an important advisory role in the formation and administration of the New Zealand Institute of Mathematics and Its Applications. We extend him our warmest congratulations.

On February 29, some ORSNZ members participated in the World Gene Day, a sequence of workshops held around the world to commemorate the life and work of numerical analyst Gene Golub (PhD supervisor of Michael Saunders), who died suddenly earlier this year. The workshop was held in the Department of Engineering Science with contributions from Andy Philpott, David Ryan, John Butcher, Jeff Hunter, Garry Tee, Rosalind Archer and Michael O'Sullivan, followed by a Yum Cha lunch. Details of the workshop can be found at [http://www.math.auckland.ac.nz/wiki/Gene\\_Day\\_in\\_Auckland](http://www.math.auckland.ac.nz/wiki/Gene_Day_in_Auckland).

It is also with some sadness that we note the recent deaths of Rick Rosenthal and Mike Rothkopf, both recorded in more detail elsewhere in

this Newsletter. Both Rick and Mike visited New Zealand on a number of occasions, and were great champions of OR in New Zealand in many different ways. Rick was a good friend to many of us in ORSNZ, and he was a great enthusiast for the work done by New Zealand OR practitioners. Mike Rothkopf was also a supporter. I cannot resist the opportunity to cite his league tables on OR Practice published in *Interfaces*. These placed Auckland University at first-equal outside the US in the first survey, and just below this in the second – perfect ammunition in the continual battle for resources for our subject.

We have had short visits early in the year from ex-ORSNZ member Mark Craddock, now working for International Power in London, and Horst Hamacher from Kaiserslautern, who was here to officiate in the February oral examination for Matthias Ehrgott's PhD student Jenny Shao. I am pleased to announce that Jenny's PhD defence was successful.

We have also been enjoying the visit of Professor Gerard Cachon from the Wharton School, who is spending a sabbatical year in Auckland. He is enthusiastically contributing to the research of the OR Faculty in Engineering Science in areas ranging from the strategic analysis of airline pricing, to electricity transmission pricing, to modelling pricing-inventory games in dairy products. Gerard will be with us until May. Kim Allen Andersen of Aarhus Business School in Denmark arrived in December. He is in Auckland until July, working with Matthias Ehrgott on multiobjective combinatorial optimisation during a sabbatical.

*Andy Philpott*

### Canterbury News

No News was reported from Canterbury.

### Waikato News

No News was reported from Waikato.

### Wellington News

Planning is under way for the ORSNZ annual conference in late November 2008 in Wellington. We hope that as many people as possible will be able to come, give a talk, renew old friendships and make new ones. Stay tuned for further details.

Dr Anne Wein (USGS) gave a Wellington branch talk in December 2007 on "Analysis of improved government geological map informa-



tion for mineral exploration: incorporating efficiency, productivity, effectiveness, and risk considerations.” More branch talks are in the pipeline and we would be very interested in hearing from any volunteers.

*Mark Johnston*

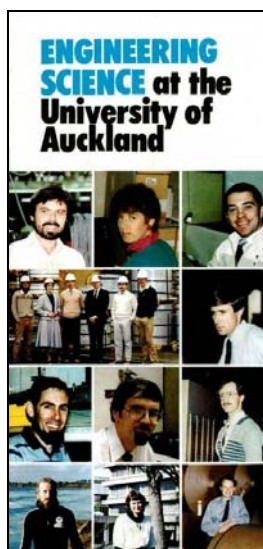
## Engineering Science 40<sup>th</sup> Birthday Celebrations

Originally known as the Department of Theoretical and Applied Mathematics, the Department of Engineering Science at the University of Auckland is celebrating 40 years since the first graduation, and 45 years as a department.

All TAM/EngSci graduates are invited to a celebratory birthday dinner at The Langham Hotel, Symonds St, Auckland on 30 August 2008.

We will be attempting to contact all our graduates to send out formal invitations, so please help spread the word. For more information, visit <http://www.esc.auckland.ac.nz>.

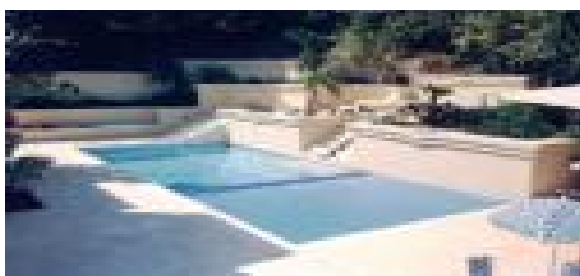
*Andrew Mason*



*1988 Brochure*

## Puzzle Corner

### PUZZLE 11



An inflatable boat is floating in a swimming pool. Which will raise the water level in the pool higher?

- Throwing a coin into the boat.
- Throwing the same coin into the water in the pool.

*Les Foulds*

## The Mother of all Spectrum Auctions: An Exciting Time for Auction Fans

In his statement of March 18 Chairman Kevin Martin announced that auction 73 was closed, having raised 19.6 billion U.S. dollars for the FCC, Federal Communications Commission, the telecommunications U.S. regulator. After 261 rounds spread over 40 days, this auction known as the 700 MHz auction has yielded more money for the U.S. Treasury than any other spectrum auction in history. In fact, the sum of the other 68 auctions conducted by the FCC in the last 15 years raised almost 19.2 billion dollars. This "mother of all auctions" sold 1,090 licenses to old and new telecommunications providers allowing them to start operating mobile services all throughout the United States, including Alaska, Hawaii and Pacific territories in the next months.

The auction design and related conditions have proven to be ahead of all previous auctions because of at least three important features. First, bidding was anonymous; second, one of the blocks allowed package bidding, and third, the conditions for operations included a requirement to deploy the networks fast and open platforms. With open platforms it is expected that markets for mobile services will be more dynamic and innovative.

As I am spending half of my research and study leave at the FCC, I find myself learning from one of the best applications of the concepts and methods at the core of my own research. I have witnessed not only the successful results of a very ingenious market mechanism that significantly improves the efficiency of public goods allocation, but also the changes in the original designs made to accommodate solutions to previously unforeseen problems. For instance, it would seem that anonymous bidding provides a less stressful playfield than a setting where identities are known and big players could use their bids to threaten weaker competitors.

But perhaps the most important feature from an auction design point of view is the use of package bidding. The so-called C block, one of the five blocks auctioned off, consisted of rights to exploit 22 MHz in each of 12 geographical regions, divided into three groups or packages. Those three packages plus a national license for

operating the 22 MHz made up the four packages over which bidders would compete. So if a large and powerful bidder wanted to gain a national license it would have to bid for the single national license or, alternatively, for the three other packages. However some, probably less powerful, bidders would be only interested in providing mobile services in one of the three groups defined by the auction rules. In short, a bidder may choose among some pre-defined license packages. This feature was introduced to minimize the effects of the "exposure problem" present in most of the previous auction designs. The exposure problem is the undesired possibility that bidders end up short of gaining all licenses that make up a package if they only had been allowed to bid for individual licenses. In conclusion, by design, the auction encouraged vigorous competitive bidding between regionally focused bidders and those aiming for the whole country. And this was exactly what happened: C Block sold for 4.7 billion.

Members of the Office of Strategic Planning at FCC and I have been working on ideas that should further improve the outcome of future spectrum auctions. To mention one: analog TV stations are shutting down their networks as the country prepares for high-definition digital TV. This move will free spectrum that needs to be allocated. Ideally the spectrum manager could do without dictating the uses for the newly available chunks of frequencies. In reality FCC still needs to determine many of the technical characteristics for spectrum use.

A recent working paper by OSP staff addresses the growing debate as to whether such bands should be awarded on a licensed or an unlicensed basis. When a spectrum band is awarded on a licensed basis, the winner has exclusive rights over it and can eventually constrain usage as well as technology (hand devices, receivers, terminals, etc.); such is the case of cellular telephony companies all over the world. On the other hand, there are a large and growing number of parties pushing for unlicensed use of the spectrum. Under unlicensed use anyone gets to operate the band. Unlicensed use is seen as a source of innovation in the mobile telecommunications industry. Usually the FCC would have to determine the conditions for using the spectrum – being lobbied from all sides – and then run an auction to sell the licenses. But now the proposed auction would have the parties bidding at the same time for

spectrum and the use rule, while competing against other bidders.

I am looking forward to contribute some ideas to test the new design in collaboration with FCC staff. I hope to report more about my progress and, perhaps, relevant results in a future newsletter.

*Fernando Beltrán*

## PhD Thesis

### **Lizhen Shao "Multiple Objective Linear Programming in Radiotherapy Treatment Planning"**



On 22 February Lizhen Shao successfully defended her PhD thesis in the Department of Engineering Science at the University of Auckland. Jenny worked under supervision of Assoc. Prof.

Matthias Ehrgott and developed new mathematical models and algorithms for the optimisation of radiotherapy treatments of cancer. Below is an abstract of the thesis

The aim of intensity modulated radiation therapy (IMRT) is to kill tumour cells while at the same time protecting the surrounding tissue and organs from the damaging effect of radiation. To achieve these goals computerized inverse planning systems are used. Given the number of beams and beam directions, beam intensity profiles that yield the best dose distribution under consideration of clinical and physical constraints are calculated. This is called beam intensity optimization problem.

We formulate the beam intensity optimization problem as a multiobjective linear programme (MOLP) with three objectives. For clinical cases this optimization problem involves thousands of variables and tens of thousands of constraints and existing methods such as multiobjective simplex methods can not handle it. The work is focusing on developing methods to solve this large MOLP efficiently and to the application in the beam intensity optimization problem.

Solving an MOLP in objective space needs less computation time than solving it in decision space if the number of objectives of the MOLP is much smaller than the number of variables,

therefore we consider solving MOLPs in objective space. Also, for clinical purposes it is perfectly acceptable to solve the MOLP approximately to within a small fraction of a Gy (Gray, the unit of measure for radiation dose) as imprecision exists in dose calculation and delivery. We look at two exact and two corresponding approximation methods; they are Benson's (approximation) algorithm and a dual (approximation) variant of Benson's algorithm. We proved that both the approximation methods are guaranteed to find  $\epsilon$ -nondominated sets.

Considering that the set of nondominated points is infinite, it is not very useful from the planners' point of view. We address the problem of finding well distributed nondominated points for an MOLP. We propose a method which combines the global shooting and normal boundary inter-

section methods. By doing so, we overcome the limitation of normal boundary intersection method that parts of the nondominated set may be missed. Discrepancy analysis of the nondominated points from a geometry point of view shows that this method produces evenly distributed nondominated points. Moreover, the coverage error and the uniformity level can be measured.

We apply the above five methods to the beam intensity optimization problem for some clinical cases, some results are given. For all the clinical cases, the dual method always shows a computational advantage in our experiments.

*Lizhen Shao*



Impressions from MCDM 2008





## More Photos from the ORSNZ Conference





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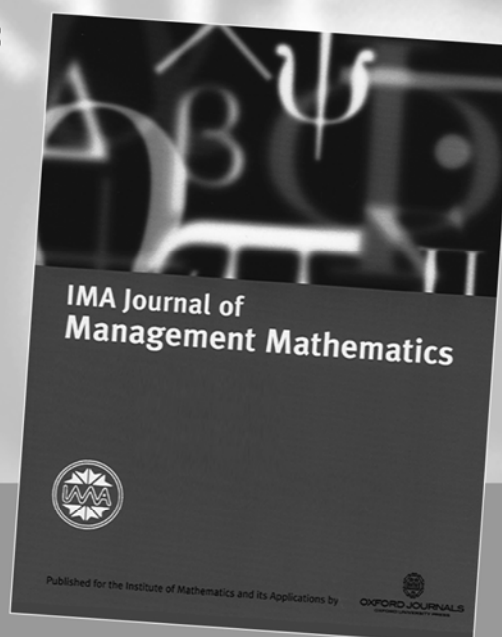
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## 19<sup>th</sup> International Conference on Multiple Criteria Decision Making

In its 33 year history the International Conference on Multiple Criteria Decision Making venues first followed a zigzagging itinerary between Europe and North America before venturing to cities in other continents (Kyoto, Taipei, and Cape Town). Finally, in its 19<sup>th</sup> edition the conference reached “the most beautiful end of the world” (as New Zealand is often promoted by the travel industry). Also known as the city of sails, Auckland boasts the tallest building in the southern hemisphere and 50 volcanoes among its attractions. As conference chairmen I am honoured that Auckland has been selected as only the second venue for the conference in the southern hemisphere.



*The delegates of MCDM 2008 at Mudbrick Vineyard*



*Prof. Michael Davies*

Prof. Michael Davies, Dean of the School of Engineering, welcomed the delegates on behalf of the university, noting that this was the first major event in the university's 125<sup>th</sup> anniversary year. Following the opening sessions, the delegates were plunged into an experience of indigenous Maori culture during a powhiri (welcoming ceremony). We gathered outside Waipapa marae (sacred meeting place) and were welcomed with a haka (dance) and songs onto the grounds by representatives of the local tribe, ngati whatua. Theo Stewart, as society president, responded to the Maori speeches with the words “Tena koutou katoa, he mihi nui, he mihi aroha, he mihi mahana ki a koutou katoa” (Greetings everyone, greetings to you all). Tradition also demands that the visitors sing a song in Maori. It was later mentioned that the visitors did better than the locals. The welcome was completed by a hongi, the pressing of noses between visitors and local people. After morning tea in the whare kai (eating house) everyone was ready for the first parallel sessions.



The conference programme consisted of 125 talks in 39 parallel sessions and five plenary talks. Attendees came from over 40 countries in six continents. The spectrum of topics was wide, encompassing multiobjective optimization support systems, fuzzy systems, various fields, and methods. Many colleagues related to the conference for sustainable energy and systems". We could learn energy, management of and sustainable of the talks were presented special track on Multiob-Algorithms, a novelty at conference. The EMO by Boris Naujoks of the Dortmund, Germany.



*Prof. Gwo-Hshiung Tzeng lectures on fuzzy MCDM*

optimization, decision support systems, applications in problem structuring reported on research theme of "MCDM transportation about renewable natural resources, development. Eight in two sessions of a jective Evolutionary this MCDM track was organised University of

On Tuesday morning Prof. Anna Nagurney of the University of Massachusetts, Amherst, delivered her invited plenary lecture "Multicriteria Decision-Making for the Environment: Sustainability and Vulnerability Analysis of Critical Infrastructure Systems from Transportation Networks to Electric Power Supply Chains". In her talk, Anna demonstrated how multicriteria decision-making can be utilized as a powerful framework for evaluating the sustainability of the critical infrastructure networks that underpin our societies and economies. She showed how environmentally conscious decision-makers can achieve the same environmental standards/results acting independently as would be achieved from certain governmentally imposed environmental standards.



*Prof. Anna Nagurney*



*MCDM award winners Kalyanmoy Deb, Valerie Belton, and Theodor Stewart*

Traditionally, half a day during the conference is reserved for an excursion. On Wednesday afternoon delegates were invited to a Maori cultural performance at Auckland Museum. Browsing the extensive and internationally renowned collections on Maori culture and the peoples of the South Pacific, quite a few visitors had to rush to make it to the ferry departure for the conference banquet (the boat had already started to pull out as a former president of the MCDM society jumped on). The banquet took place at Mudbrick Vineyard Restaurant on Waiheke Island in Auckland's Hauraki Gulf. A thirty minute ferry ride lets everyone forget the hectic city and relax in a calm atmosphere. New Zealand cuisine (not limited to lamb!) and the restaurant's own wines were served. During the banquet the winners of the MCDM awards were announced.

The 2008 MCDM award winners are

- MCDM Gold Medal: Prof. Theodor J. Stewart, University of Cape Town
- Edgeworth-Pareto Award: Prof. Kalyanmoy Deb, Indian Institute of Technology Kanpur
- Georg Cantor Award: Prof. Valerie Belton, University of Strathclyde

The award winners had the arduous task of giving plenary talks the following morning. It was well worth attending to listen to Theo Stewart's thoughts on MCDM as a field bridging the gap between hard and soft sciences in his talk "MCDA – Integrating social and mathematical sciences". Valerie Belton's talk "MCDA: The importance of integration" emphasised the potential for MCDA to provide an integrating framework as well as the need for integration within the field and externally. Kalyanmoy Deb gave an overview of the rapidly growing field of EMO and its place in MCDM in his talk "Evolution's niche in multiple criteria Optimization and decision making".



*Prof. Jim Petrie*

On Friday Jim Petrie of the Universities of Sydney and Cape Town presented an invited plenary lecture on "Multi criteria decision making within energy networks for electricity production in emerging markets" where he spoke about the need to consider multiple objectives, stakeholder diversity, system dynamics and key uncertainties in any structured decision making approach related to development of sustainable energy networks for electricity production.

No conference in New Zealand can be complete without a BBQ. This was served by SPIES, the South Pacific Indigenous

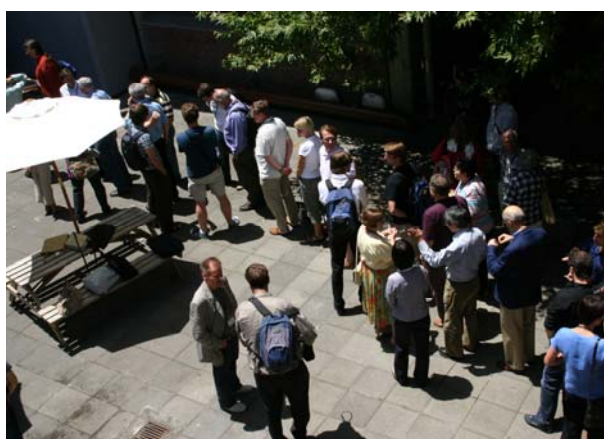
Engineering Students at lunchtime on Friday. On Friday afternoon the delegates embarked on their long journeys back home after a week of inspiring interaction with colleagues and friends. Once again, the conference showed the truly international nature of the MCDM society that is at the heart of this community. We are all looking forward to meeting again in Chengdu in June 2009.



*Lively discussions during breaks*

As the chairman of the conference I cannot end this report without thanking all those colleagues and PhD students who put in many hours of work to make the conference happen: Elizabeth Chandy, Sushani Jayasinghe, Dishani Jayasuriya, Ivan Kojadinovic, Richard Lusby, Andrea Raith, Lizhen Shao, Judith Wang, Hamish Waterer, Oliver Weide, and Kim Williams.

*Matthias Ehrgott*



*Waiting for the BBQ*



*Two generations of MCDM researchers*



# The Second International Workshop on Game Theory in Communication Networks 2008

**October 20, 2008, Athens, Greece**

GameComm2008, the second International Workshop on Game Theory in Communication Networks, will take place this year in Athens, Greece on October 28, in conjunction with VALUE TOOLS'08 <http://www.valuetools.org/>.

The distributed nature of wireline and wireless communication networks gives rise to many challenges related to their analysis, control, and management. The selfish nature of users, development of decentralized control mechanisms, and fair allocation of system resources are among major issues in networks research. Consequently, game theoretic methods are increasingly utilized to gain a deeper understanding of these complex problems and systems. Specifically, game theoretic models have been used in the context of Internet pricing, flow and congestion control, routing, power control, and recently security, among many other topics. The application of game theory to communication networks has attracted researchers from a variety of disciplines, including computer science, operations research, control theory, and economics.

This workshop aims to bring together researchers who are interested in all aspects of the application of game theory to the analysis and design of communication networks. The goal is to display the state-of-the-art in this field, stir discussion, and outline possible directions for further progress.

Workshop Topics encompass all aspects of game theoretical analysis as it applies to communication networks, including (but not limited to) the following methods and application areas:

- \* Repeated and dynamic games
- \* Stochastic games
- \* S-modular and potential games
- \* Network formation games
- \* Mechanism design
- \* Fairness and efficiency
- \* Robustness and worst-case design
- \* Evolutionary games
- \* Learning in Games
- \* Medium access control
- \* Power control
- \* Routing and message forwarding
- \* Congestion control
- \* Cognitive radio

\* Pricing

\* Security

Papers: Technical papers describing original, previously unpublished research, not currently under review by another conference or journal, are solicited. The conference language is English.

Publication: All submitted papers and posters will be rigorously reviewed by the technical program committee members and the reviewers they invite. Accepted papers will be published in Valuetools conference proceedings. Selected papers will be considered for publication in a special issue of the Telecommunication Systems Journal dedicated to GameComm 2008.

Submission deadline: June 2, 2008

Notification of Acceptance: July 8, 2008

Camera-ready Manuscripts due: August 8, 2008

Conference Date: October 20, 2008

Submission Instructions: Prospective authors are encouraged to submit a PDF version of the full paper in the ACM conference proceedings format, which are limited to 10 two-column pages in a font no smaller than 10-points. All submitted papers will go through a peer review process. All of the papers should be submitted electronically through GameComm08 section of EasyChair Conf. Management System <http://www.easychair.org/conferences/?conf=gamecomm2008>. At least one listed author on the final paper must register by the camera-ready due date and attend the workshop to present her/his paper.

Please visit <http://www.gamecomm.org/index.html> for more information.

## Meetings Calendar

### New Zealand

#### **43<sup>rd</sup> Annual Conference of the Operational Research Society of New Zealand**

Wellington, New Zealand  
[www.conference.orsnz.org.nz](http://www.conference.orsnz.org.nz)

### Asia Pacific

#### **7th International Symposium on Operations Research and Its Applications**

31 October – 3 November 2008, Lijiang, China  
<http://www.aporc.org>

### International

#### **CORS/Optimization Days 2008**

12-14 May, Quebec City, Canada  
<http://www.cirreлт.ca/scrojopt2008/>

#### **2008 Israel Operations Research Society (ORSIS) Conference**

18-19 May 2008, Shefayim Hotel, Israel  
[www.bgu.ac.il/~orsis08](http://www.bgu.ac.il/~orsis08)

#### **GDN2008 - Group Decision and Negotiation**

17-20 June 2008, Coimbra, Portugal  
<http://gdn2008.fe.uc.pt/>

#### **2008 IEEE World Congress on Computational Intelligence (WCCI 2008)**

1-6 June 2008, Hong Kong  
<http://www.wcci2008.org>

#### **18<sup>th</sup> Triennial Conference of the International Federation of OR Societies**

14-18 July 2008, Sandton, South Africa  
[www.ifors2008.org](http://www.ifors2008.org)

#### **SAGO International Workshop on Stochastic and Applied Global Optimization**

19-23 July 2008, Kruger Park South Africa  
[web.wits.ac.za/NewsRoom/Conferences/sago/](http://web.wits.ac.za/NewsRoom/Conferences/sago/)

#### **The 7th International Conference on the Practice and Theory of Automated Time-tabling (PATAT 2008)**

19-22 August 2008, Montreal, Canada  
<http://w1.cirreлт.umontreal.ca/patat2008/>

#### **International Conference Operations Research (OR 2008)**

3-5 September 2008, Augsburg, Germany  
[www.or2008.de/](http://www.or2008.de/)

#### **OR50 The OR Society's 50th Annual Conference**

9-11 September 2008, York, UK  
[http://www.orsoc.org.uk/orshop/\(5gpwhnvq0putoi55x1lmxqae\)/orcontent.aspx?inc=or50\\_main.htm](http://www.orsoc.org.uk/orshop/(5gpwhnvq0putoi55x1lmxqae)/orcontent.aspx?inc=or50_main.htm)

#### **1st International Conference on Applied Operational Research (ICAOR'08)**

15-17 September 2008, Yerevan, Armenia  
<http://www.tadbirstm.org.ir>

#### **AIRO 2008**

Ischia, Italy, 8 – 11 September 2008  
[www.airo2008.unina.it](http://www.airo2008.unina.it)

#### **XIV Latin-Ibero American Congress on Operations Research (CLAIO 2008)**

9-12 September 2008, Cartagenas de Indias, Colombia  
<http://www.socio.org.co/CLAIO2008/>

#### **MOPGP08, 8<sup>th</sup> International Conference on Multiple Objective and Goal Programming**

24-26 September 2008, Portsmouth, UK  
[www.mopgp.com](http://www.mopgp.com)

#### **INFORMS Annual Meeting 2008**

12-15 October 2008, Washington DC, USA  
<http://meetings.informs.org/DC08/>

#### **Valuetools 2008 - 3rd International Conference on Performance Evaluation Methodologies and Tools**

20-24 October 2008, Athens, Greece  
<http://www.valuetools.org>

See also <http://meetings.informs.org/> for extensive listings of conferences.

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