GUEST EDITORIAL
CHANGES AFFECTING THE ROLE OF OR

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At the end of my stay as Erskine Visitor in the Department of Management at the University of Canterbury, Hans Daellenbach twisted my arm to write something for the OR Newsletter. I pulled out the notes I had made as background for my talk to the ORSNZ Annual Conference in Christchurch. Having decided to talk about the forces that are changing the role of OR in contemporary society, I thought it would be a good idea to get the opinions of some informed people, especially those who have been through some of the social/political changes like those that have been occurring in New Zealand. I had an opportunity to do so at a meeting of the International Society for Inventory Research in Budapest in August. (Coincidentally, it was the 1100th anniversary of Hungary.)

I was privileged to interview a number of OR professionals who were at that meeting. Most were from Europe with several from former socialist block countries. It was a great opportunity to talk with people who have been a part of the global OR community for a long time as well as some who were isolated for a period. I asked them what they thought was changing in OR and what pressures were causing those changes. The following is a brief account of their observations plus some of my own.

Major Forces of Change

The overwhelming choice for the most pervasive force of change is the development of the personal computer and the decreasing cost of computation. Closely related to this is the development and availability of powerful, user-friendly software. Another major force is the education and background of the current managerial group. In most countries this means there is a better understanding of OR in management than previously. Finally, many of the people with whom I talked suggested that another force is the restructuring that has occurred in many countries and is occurring at the enterprise level throughout the world. I'll elaborate on each of these below.

Contents

Computation

The computer revolution in OR started when the cost of computation on the mainframes began to drop. This, of course, opened up a number of possibilities for solving OR problems that had not existed before. But another change was occurring as well. As mainframes (and later minis) became more widely available on campuses and in companies the "non-professional" users gained access to the computer power. General availability continued to increase as budget and other constraints decreased. Of course, the development of the personal computer has virtually eliminated all constraints on access and computer power is now found nearly everywhere, even in places like China, the former socialist countries and in many emerging economies.

Parallel to the expansion of computer use is the development of powerful and user-friendly software. In addition to the word processing, financial planning and accounting packages that tend to get people started on the computer, spreadsheets have allowed them to develop models of a great variety of processes. This is perhaps the most important software development from an OR standpoint. Current spreadsheet programs put considerable modelling capability in the hands of the users and even include "solver" functions that find solutions to fairly sophisticated problems. The implications of this is that OR (for better or for worse) is now being done everywhere by anyone with access to the software. In addition, there are increasingly sophisticated mathematical and statistical packages available. It is now possible to choose among alternative statistics, linear programming, and other math packages offering a wealth of features. Moreover, no license is required to drive one of these packages.

The development of easy-to-use software has not only made the programs more accessible, but leave the impression that structuring the problems and developing the models is similarly easy to do. Programs that run under Windows, with the "point and shoot" philosophy of the mouse, make it quite easy to both point out better directions for a company or to shoot oneself in the foot. Many OR professionals argue that the programs are too easy to use, allowing the user to confuse precision in the answers with the accuracy of the solutions. All the OR professionals I know would much rather have an answer that is vaguely right than one that is precisely wrong.

The ubiquitousness of powerful software means that there can be a lot of bad OR among the good being practised in organizations. Unfortunately, much of it is buried in spreadsheet programs where it is hard to detect and ferret out. Moreover, there are few good auditing procedures available for spreadsheet programs. There is a real need, therefore, for the development of procedures for monitoring and/or auditing the quality of the work being done in the field. Perhaps the OR community should get involved in this and/or the development of more internal checks in the software itself.

Managers' Backgrounds

Another factor that is influencing the practice of OR is the background of the persons now reaching management levels in organizations. Over the past several years, OR has been taught in engineering and business schools around the world. Graduates of these programs are now moving into management positions in many organizations. In the United States and some other parts of the world this is a major shift in background for managers. Even in Germany, where managers have historically had a technical background, their OR exposure is qualitatively different than before.

This new OR awareness among managers means that they have a better understanding of the objectives and approaches of OR than their predecessors. They have the potential to be intelligent consumers of OR. This means that, even if they have not been involved in OR directly, they can insist that good OR be practised in the organization. By asking perceptive questions, insisting on the use of professional processes, providing rewards consistent with good practice and being open to the implementation of valid findings they can provide a very positive influence on the practice of OR.

The down side to providing training in OR to managers is that they are some of the people using (or misusing) the software. Their very exposure to OR and the seductive ease of using the software combine to give the impression that OR professionals are not necessary. Moreover, these same attributes may make the managers more tolerant of (or even lead them to encourage) having OR widely distributed throughout the organization. Recognizing that many of their employees have the same exposure to OR as themselves, they see nothing wrong with the widespread practice of OR. They are right, of course; nothing is wrong with scattering OR throughout the organization if it is professionally done and the problems discussed above can be avoided.

Restructuring

Restructuring has been the theme of the decade. We tend to think first of the large scale restructuring of economies that is taking place in the former USSR, Eastern Europe and other former socialist block countries. Of course, it is not limited to those locations. New Zealand has gone through a dramatic economic restructuring itself and many other countries from Morocco to Chile

are doing so as well. The phenomena is not limited to economies, however, but is occurring in enterprises around the world. Driven by movements like reengineering, right sizing, focusing on core competencies and globalization, firms (and government agencies) are reshaping themselves. This has lead to considerably more decentralization ("empowerment") and focus on internal operations ("process analysis") than ever before.

The result of all this restructuring is a considerably different perspective for OR. In the former Soviet block, the size of almost all organizations has dropped dramatically. This shift in scale has necessitated the reformulation of organizational models and has sparked a rethinking of some of the assumptions that underlay them. Furthermore, the decentralization has meant that decision making is no longer monolithically driven from the top. This has shifted emphasis from command and control to direction setting and coordination, again a major shift in focus for the OR models.

Even globalization has had its impact on the practice of OR. Global competition and trade has shown us the possible. Quality levels that were once unimaginable have been demonstrated in products from Japan. Reliability of components that is nearly infinite has been produced in some of the US electronic firms and unheard of speed to market of new designs has been shown to be possible by European clothing companies. These changes all modify the basic parameters of the OR models we work with and the geographical dimension itself is a new variable for many OR professionals. Indeed, as companies focus their efforts on core capabilities, their role in the value chain may become more restricted, even while simultaneously spreading globally. These shifts in scope all provide new challenges and opportunities for the OR community.

Not only has the scope of OR practice changed with restructuring, but new targets of opportunity have arisen. For example, some of the governments facing the aftermath of restructuring (including New Zealand) are using OR professionals to help in the process. As government corporations are privatized, OR models are helpful in determining both how to go about it and what the resulting structure should be like. Non-government organizations (from the United Nations to private relief groups like Save The Children or bodies like Greenpeace) are increasingly disposed to use OR professionals to help make use of their limited resources for meeting the great needs they face. They all have substantial operational problems and a few OR successes will help pave the way for greater involvement in the future.

Concerns

Many of the professionals that I talked with were concerned about other aspects of some of the changes taking place. For example, in discussing the use of spreadsheets and other software in the classroom some commented that rigour may be forsaken by relying too heavily on such tools. Without some effort directed at helping students understand the process of problem structuring and the need for careful definition and clear thinking, they could develop very sloppy habits that the use of software would make hard to detect. Some even argued that it was a bad idea to have the software available before the students truly understood what the software could do for them. There was somewhat of an element of "back to basics" or "basics first" in this argument.

Another concern that was expressed by several people had to do with developing the non-technical attributes of an OR professional. These are things like being sufficiently persistent to get all the facts needed to do quality OR work, recognizing when the marginal value of more technical effort is turning negative, knowing what tests to perform to confirm that results are reasonable and developing a healthy scepticism to use throughout the process. Indeed these attributes may be more important than the technical skills when it comes to producing credible solutions to complex problems. Moreover, they help overcome the disadvantages brought about by the forces of change mentioned above.

Given the pervasiveness of software, several persons argued that software development was too important to be left up to the software houses. They felt that more oversight by other than software specialists was necessary to minimize the risk of misusing the programs and causing real organizational damage. Persons who have the technical skills plus the attributes discussed in the previous paragraph could provide a real contribution to making the software "bulletproof." The concern was summarized by one wag who said, "Management by Microsoft is not the ideal way of the future."

Some Conclusions

All-in-all my excursion into considering the role of OR in contemporary society and the forces shaping its future was instructive. I found OR to be alive, but maybe not completely well. I did talk mostly with well-known and secure people, so there was little argument for a return to the good old past, although there was some of that among some of the people that I met. It is clear that there are monumental changes afoot in the domain in which OR is practised. It is also clear that changes are required in the profession to respond effectively. An old American Indian curse is said to be, "May you live in interesting times." Well, the curse is upon us, so keep the faith.

AREA PROFILE: PROBABILITY AND STOCHASTIC PROCESSES

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1. Introduction

The field of probability and stochastic processes is a large one, with many separate specialisations. The AMS subject classification divides the area into; foundations of probability theory, probability theory on algebraic and topological structures, combinatorial probability, geometric probability, stochastic geometry, random sets, distribution theory, limit theorems, stochastic processes (including martingales), stochastic analysis, Markov processes (again with many sub-classifications), renewal theory, reliability, queueing networks, queueing theory, interacting random processes, and spatial processes.

Since the field gives rise to many applications, there are many links with other fields. For example stochastic modelling has applications in fields as diverse as physics, chemistry, biology, geophysics and economics to list but a few. There is feedback in the other direction as well, many theoretical developments being inspired by natural processes. In NZ, most work in this field is interdisciplinary in nature, and/or motivated by applications.

2. New Zealand's Knowledge Base

2.1 Overview

2.1.1 Historical development in New Zealand

The pattern for New Zealand contributions in this subject was fixed through the setting-up of the Applied Mathematics Laboratory in the 1940's and the appointment to its staff of Peter Whittle. Whittle already had an international reputation in time series from his thesis work with H. Wold at Uppsala, and used the range of problems arising from the consulting work with AML to lead him into pioneering studies of spatial variation, applied time series analysis, econometrics, etc., producing papers now widely regarded as classics. From that time onwards, an emphasis on applications and time series, often involving significant collaboration with scientists outside the mathematical fields, has been a characteristic of New Zealand work in stochastic processes and time series. Through the AML's programme of summer student employment, and under the eye of other high calibre staff, a number of young mathematicians developed an interest in these fields during the 1950's and 1960's, and subsequently proceeded to PhD studies and professional careers in stochastic processes or related areas.

The local emphasis on time series was enhanced by the appointment of Geoff Jowett to the first university chair in Statistics in New Zealand. However, the AML, later the Applied Mathematics Division of the DSIR, remained the main New Zealand centre for work in stochastic processes throughout the 1960's and into the 1970's. It was really only in the 1980's that the university groups became large enough to sustain a research culture of their own. In particular, the setting up of the Institute of Statistics and Operations Research as a separate institution at Victoria University, and the massive expansion of student numbers in Auckland, allowed both universities to develop significant groups working in probability and stochastic processes. The decimation of the AMD, at about the same time or a little later, significantly reduced the national capability in these areas, among others.

2.1.2 Examples of New Zealand research findings significant in development of area

Outstanding in the early work done in New Zealand are Whittle's papers on spectral estimation, spatial processes, smoothing, combinatorial properties of Markov chains, and multivariate extensions of Chebyshev's inequality, all undertaken while with the DSIR/AMD during the 50's. Some of these found later expression in his book "Prediction and Regulation". David Vere-Jones's initial work was in the theory of Markov chains, and he did much to shape the development of quasi stationary distributions. Later he and coworkers made important contributions to the theory of point processes and its links to earthquake modelling (Vere-Jones, 1970). Also in Wellington, Peter Thomson and others have developed an international reputation for their work on improved seasonal adjustment methods, a topic of particular importance for a small country with relatively volatile economic indicators. Jeffrey Hunter did some of the pioneering work on discrete time queues which is just coming into vogue.

2.2 Strengths

2.2.1 Geophysical Modelling

A strong group in Wellington, both University and CRI based, and with connections in Palmerston North, are among world leaders in modelling of earthquakes. Three seminal models/

techniques introduced are the branching model for crack propagation, the stress-release model (Zheng and Vere-Jones, 1991), and methods for probabilistic expression of earthquake hazard.

There has also been recent work of significance in analysis of volcanic eruptions, in climatology, and in oceanography where recent work (Moore, Thomson and Shirtcliffe, 1988) challenged accepted views concerning the interpretation of spectra relating to ocean turbulence. Again, most of these practitioners are in Wellington and Palmerston North.

2.2.2 Probability in Forensic Science/Genetics

While not technically sophisticated from the area point of view, the work under this heading is certainly at the leading edge internationally in their field. Individuals in Wellington and Auckland are collaborating independently with legal/forensic experts on methods for presenting evidence in the courtroom and in DNA evidence. There is also an interdisciplinary group at Massey working on stochastic models of biological sequence evolution, whose work is highly cited internationally.

2.2.3 Stochastic Networks

A strong group in Auckland (and an outlier or two in Palmerston North), are working in conjunction with world centres at Cambridge (UK), AT&T/Bell Labs (USA) and Adelaide (Australia) in models for networks of queues and telecommunications systems.

2.2.4 Time Series Analysis

A group in Wellington have expertise in inference for time series and stochastic processes and are active in signal detection, seasonal adjustment methods, and non-standard forecasting problems. This work is internationally recognised and has been part of recent or on-going FRST projects as well as international collaborations. In addition there are more isolated researchers in other centres.

2.3 New Zealand Characteristics

Most research in this area tends to be generic in nature, generating techniques that have universal application. That which has a New Zealand character is usually driven by specific applications. In particular, the earthquake and volcano models use New Zealand data, and the climatology research is tailored to New Zealand conditions. The interpretation of DNA mixtures in forensic science does pose some singular problems due to " ... small populations, undergoing rapid genetic change due to migration and racial mixing, and very diverse in their genetic composition."

2.4 Gaps in the Knowledge Base

This is a large field, with few (<30) practitioners in the country. Some major topics with little, if any, research output are; stochastic differential equations, extreme value theory, stochastic geometry, stochastic optimisation and computational methods. There are single, isolated, researchers in; spatial processes/image analysis, foundations of probability, theory of stochastic processes, convergence of Markov chains, limit theorems, and large deviations.

2.5 Overlap with the Statistics Profile

One major area in the interface is that of epidemiology and population theory, where the researchers involved seem to regard themselves, and their work, as being statistics rather than probability/stochastic processes.

3. New Zealand's Capability

3.1 Strengths

Geophysical modelling (Wellington/Palmerston North) and stochastic processes (Auckland - both universities) are both reasonably large (but cohesive) groups with a clear focus, and strong international links. An advantage for the former is the applicability of the work to New Zealand, and consequent participation by CRIs and the government.

The field has also seen the recent appearance of a number of young, high-potential researchers, some returning to New Zealand from training overseas. The impact from this has yet to be fully seen, but a common characteristic seems to be the keenness with which they approach collaborative work, both within the area and interdisciplinary.

Because of the small number of researchers and the geographic isolation of New Zealand, there has been an emphasis on the practical application of methods, particularly within the now defunct DSIR/AMD. This ethos continues today, with a consequent strength in interdisciplinary research.

3.2 Disadvantages/Limitations

3.2.1 Disadvantages

Because of the inherently technical nature of the subject, few researchers are CRI (rather than University) based (some 3 or 4 out of 30, roughly). Consequently the subject is poorly catered for in the research funding schemes. Also, the small number of researchers means that many are isolated, with the nearest person in the area being in a different institution, or even city.

3.2.2 Limitations

A common theme from the respondents was the lack of time, both to do research, and to keep

up with developments and extend their own knowledge. Many mentioned qualms about research funding, in particular "Much applied modelling is better suited to PGSF funding than the `blue skies' Marsden, but FRST categories don't fit well."

Also mentioned were the lack of research assistance "My main problem, shared by many others, is lack of local graduate students, coupled to the restrictions on overseas students which prevent us from recruiting them."

Inadequate computing facilities and library holdings were other areas of concern.

3.3 Absent and/or Declined

There are few researchers into the more technical aspects of the area, although there is one exceptional researcher of international reputation. The exceptions to this are in point processes and time series analysis, where New Zealand possesses expertise in both theory and applications. There are fewer than a handful of PhD students, due largely to the fact that the mathematical prerequisites are such that prospective students often receive offers from overseas institutions, which their supervisors recommend in the student's interest. This of course contributes to the lack of research assistance mentioned above, and results in the necessity of recruiting researchers from overseas. The comments made in this connection by Bryan Manly in the statistics profile are as valid for this area. There are a large number of expatriate researchers of high reputation in this field.

4. Opportunities

Aside from those groups mentioned in Section 3.1, which should be maintained and further strengthened, perhaps the greatest opportunity is in the field of time series, where New Zealand possesses a number of high quality researchers who are geographically separated, with individuals in Dunedin, Christchurch, Hamilton and Palmerston North. Wellington alone has more than one researcher, but even there they are split between institutions. There seems to be little collaborative work between them, except in Wellington. To a lesser extent, the same applies to reliability theory, with individuals in both Wellington and Palmerston North. With regard to knowledge opportunities, research in this field is technical and fundamental in nature, and thus not specific to New Zealand. Problems of current international interest (Cf. Programme of the 4th World Congress of the Bernoulli Society, Vienna, 26-31 August 1996) where New Zealand possesses researchers with the ability to make significant contributions include limit theorems, stochastic networks, signal processing, large deviations, stochastic models in biology, theory of Markov processes, reliability theory, financial modelling, and queueing theory. Possible New Zealand contributions are not limited to this list, and the breadth of the field makes difficult the recognition of any clearly identifiable opportunities. New Zealand involvement in the development of this field would be both the result of, and motivation for, international collaboration.

5. Conclusions

In this field, there are two main groups; stochastic processes in Auckland, and geophysical modelling in Wellington. Massey University (with it's dual campuses) has strong links to both of these groups. There are also isolated researchers at Hamilton, Dunedin, and Christchurch (3 in different departments).

Aside from the groups identified, the main opportunity lies in the field of time series, where there is already a strong group in Wellington, with extensive collaboration between the university and CRIs, and with overseas institutions. Because of the size and multiple specialisations of the area, it is not really feasible to attempt to cover all the holes. The exception is the desirability of increasing emphasis on technical aspects, since the New Zealand experience shows that this is likely to generate many spinoffs into the more applied areas.

Of the 30 or so active researchers in this area, ages range from the early 30's to the mid 60's. However, just 4 are under 40, indicating that there is insufficient new blood coming through. The lack of current PhD students in this area further exacerbates these concerns.

We would like to thank David Vere-Jones for rewriting the historical development section.

References

Moore, M I, Thomson, P J, and Shirtcliffe, T G L. Spectral analysis of ocean profiles from unequally spaced data. *J. Geophys. Res.*, 93:655-664, 1988.

Vere-Jones, D. Stochastic models for earthquake occurrence (with discussion). *J. Roy. Statist. Soc.* B, 32:1-62, 1970.

Zheng, X-G, and Vere-Jones, D. Applications of stress-release models to historical earthquakes from North China. *PAGEOPH*, 135:559-576, 1991.

SOFTWARE REVIEW: CAPS LOGISTICS TOOLKIT

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The *CAPS LOGISTICS TOOLKIT* (hereafter referred to as the *LT*) is a Windows-based program designed to model a company's strategic, tactical, and operational logistics planning decisions. These decisions include vehicle routing, driver and truck scheduling, supply chain distribution management and planning, and a host of related logistics support functions.

The package stands at the crossroads of a set of operations research optimisation algorithms (both exact and heuristic), a geographical information system (GIS), a relational database, and a high-level modelling language. Being in the middle of all these crossroads makes for a busy intersection; and I found the comprehensiveness of the package somewhat daunting at first. However, once I got a taste of how the modules operate, I actually found the package great fun to use.

There are two groups of users who will appreciate the package—modellers and practitioners. To support the OR modeller, the toolkit contains (not surprisingly) tools. The tools are, in fact, a set of functions (rather like procedures in the C language). Being a "network nerd", I zeroed-in on the "Network Optimization" module of tools. Here, I found functions with enticing names such as

GeneralizedAssignment( )
GeneralizedMinCostFlow( )
LongestPath( )
MaximalFlow( )
MultipleFacilityLocate( )
ShortsetPath( )
TravellingSalesperson( )

and many more. On top of this, the more recent versions of the *LT* have embedded CPLEX capabilities. This means that the *LT* can also be used to solve more general LPS and MIPs.

For me, though, the most satisfying aspect of the *LT* is its integration of the OR algorithms with pre- and post-processing data handling. On the one hand, the *LT* tools make it easy to access information in other database and spreadsheet packages as well as to manipulate that data. On the other hand, once the algorithm has been solved, the results can be displayed in tabular or graphical form. Again, the tools help the modeller "tell the story" of the optimisation results. For instance, the graphical tools allow the user to highlight which facilities will be closed or which links are experiencing bottlenecks.

The modeller can use the tools individually or combine them with the *LT* modelling language (called *ModL*). The statements and tools in *ModL* are stored in macros and can be evoked by the user when required. This permits a high degree of customisation of the *LT*.

For the other group of users (the practitioners), the *LT* offers two "platforms". A "platform", in *LT* parlance, is a set of pre-written macros designed for a specific purpose. Because the macros customise the *LT*, the user need not deal with the macros or the modelling language directly. Rather he/she can focus on menu selection and dialogue boxes to achieve the desired functionality.

There are two platforms that have been developed for the *LT*. The first is the "Supply Chain Platform". This platform focuses on supply chain management involving multiple products, multiple time periods, suppliers, factories, warehouses, distribution centres, and customers. The platform determines product flows using the generalised minimum cost network flow algorithm. The platform also evaluates facility location decisions using both an implicit enumeration algorithm and an add/drop heuristic.

The second platform available in the *LT* is the "Routing Platform" for vehicle routing and scheduling problems. The user can select from among a variety of heuristics including the Boundary, Cluster, Ellipse, Nearest Neighbour, and Pie methods. Most importantly, the *LT* allows the user to edit and modify the results of the heuristics either by querying the database or by clicking with the mouse. Moreover, in many cases, these modifications can be incorporated within the rules used by the heuristics and the problem can be resolved. In this way, the *LT* can produce routes that "make sense" to the individual user.

In order to see how the *LT* would operate using information from this part of the world, I ran the package using the Digital Chart of the World GIS data file for Australia and New Zealand. First, I simply displayed the data (see Figure 1). This screen contains over 40,000 highway links, nearly 30,000 nodes, and 65,000 map segments. Second, to see the display a bit closer to home, I zoomed-in on the area around Banks Peninsula (see Figure 2). Third, to try the network optimisation component, I dug out a transportation example on page 153 of Daellenbach, George, and McNickle, *Introduction to Operations Research Techniques* (sometimes called the "red peril" by the Stage 2

students). The results, using the GeneralizedMinCostFlow( ) tool, are shown in Figure 3. There are many alternative ways for displaying the results depending on which aspects of the results the user wishes to emphasise. Finally, I had a crack at customising the menu display and functionality on the *LT*. The *LT* capabilities here are similar to those of VisualBasic and it is easy to tailor the screen display for a specific need. For instance, the New Zealand ***faculty*** location problem (pun intended) might look something like Figure 4.

All in all, the *LT* is a very comprehensive package. As with everything, there is a price to pay for this comprehensiveness; and, in this case, the price is rather high. The package is leased in the States for $US24,000 per year! Fortunately, the Department of Management at the University of Canterbury has an Academic Link arrangement with CAPS Logistics, Inc. This means that the *LT* can be used without charge for teaching and research purposes (but not commercial purposes). Therefore, if you have an educational research project for which you think the *LT* might be useful, please let me know. If you have a commercial venture and are interested in the *LT*, I'm sure that CAPS Logistics, Inc. would be glad to hear from you too.
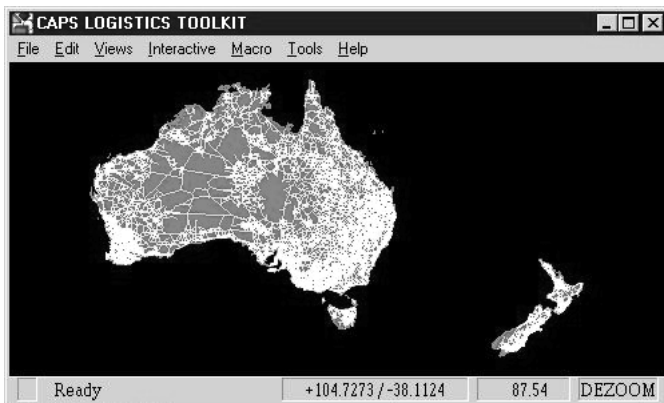

Figure 1

Figure 2
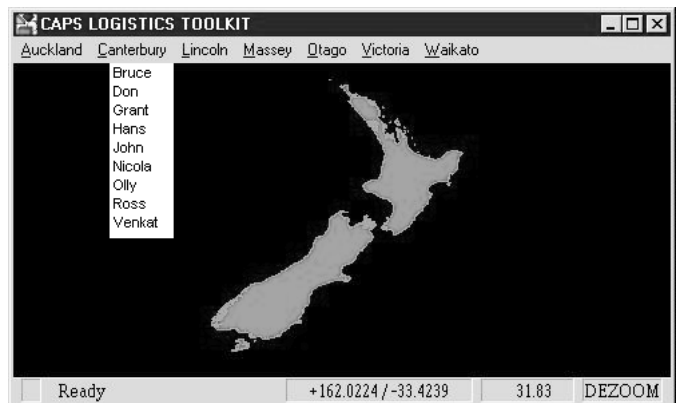

Figure 3

Figure 4

POLITICS AND OPERATIONAL RESEARCH

David Boland, Independent management consultant, BOLAND ASSOCIATES, a member of the IQC Group

'*Sex, Politics, and Religion! They are the three most important imperatives in life. We should take them more seriously*' (Allen Smithee, Film Director)

Company politics is a factor in all enterprises. As operational researchers we may not like politics, but we cannot avoid them. '*Politics*' can be defined as: *the taking into account a wider range of issues than those directly involved in the matter in hand.*

Example 1

NZ Production Corp (NZPC) set up Nifty Calc as a computer supplier and services subsidiary. Initially Nifty Calc had been profitable. But they were no longer successful. Their systems had become obsolete in the fast developing computer market. They were now not able to compete and were beginning to lose money. Head Office tried to prop up Nifty Calc by instructing all managers at NZPC that they were only allowed to purchase hardware and software supplied by Nifty Calc.

An operational research team had been working on an accounting project in NZPC. One of their conclusions was that using the new FA software package was the best for controlling fixed assets. But Nifty Calc did not supply FA, nor any other suitable software.

This is a typical case of company politics. The results of the operational research investigations pointed in one direction (to purchase the FA software package). But company politics, taking a wider range of issues into account, pointed in another direction (to purchase unsuitable software from Nifty Calc).

The operational research team was left with the difficult task of resolving the problem. The politics of the situation could not be ignored. They therefore decided to purchase the FA software package as they had originally proposed. But they made the purchase through Nifty Calc, and gave them a 10% commission on the transaction.

Example 2

The manager of the New Zealand branch of an international company found it necessary to attend head office conferences three times a year in Hawaii. The work at these conferences had been getting more and more onerous, and recently she had been taking the accounts clerk along to assist her. (He was an amateur athlete, but fortunately he had been able to reschedule his training programme.)

The operational research group had, on their own initiative, found a method of eliminating the need for her to make these time consuming and expensive trips, by means of a video link up. From now on she would be able to concentrate on her work in the New Zealand office, and the accounts clerk would no longer have his duties disrupted. They expected her to be very pleased.

They thought that their problem was about making optimal use of managerial resources, which they easily solved by using operational research techniques and modern technology. They had not realized that the manager might want to arrange overseas trips for herself, on a regular basis, in a desirable location, on company expenses, with the man of her choice. Because of company politics (i.e., taking a wider range of issues into account) their proposed solution was clearly not acceptable. They could not get away with depriving the boss of one of her most cherished perks. The project was killed by company politics.

In this case the operational research team were not given the opportunity to resolve the issue, they were assigned to a project in one of the company's coal mines.

In OR it is conventional wisdom to ignore political issues. If after carrying out an OR project, we are told that a particular recommendation could not be accepted because of company politics, our typical response would be:

'*I concentrate on the problem in hand and make my recommendations accordingly. I will not allow myself to be influenced by company politics.*'

But unless we in operational research take company politics into account, most of our projects will be frustrated, and our recommendations will be ignored. The irony is that, although OR is supposed to be about making decisions scientifically based on objective analysis, unless the results please those in charge, they will not be accepted. The final decision on whether to implement a proposal is almost always subjective, taking political issues into account, and rightly so.

As operational researchers, we must be aware of the political implications of the work we do, and cope with them. We certainly cannot ignore politics, nor should we think of politics as somehow tarnishing the purity of our discipline.

Politics is not often covered in OR courses. Perhaps we should reassess the curriculum.

(Note: the above examples are fictional.)

A PERSPECTIVE FROM AN ISRAELI VISITOR

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Many Israelis consider New Zealand to be the antipode of Israel: green, pastoral, tranquil, with no land borders and rarely in the focus of the world news. After two visits with John Buchanan in the Department of Management Systems at the University of Waikato (June-September 1991, December 1996), I can confirm this. But we have notable similarities: Israel has a similar small population (5 million) and roughly the same number of universities (6-7). All in all, we have less than 50 active researchers in OR in academic institutes. That means, of course, that many of us do not have local colleagues to cooperate with in research. All the universities are subsidized by the government, and our salaries are a bit more than the average (US$1500-2000 a month net of tax). In addition we receive generous support for attending international conferences and for cooperation (which explains why we are on the move much of the time), but we have few internal research grants.

It seems that we have some advantage over New Zealanders; we are virtually in Europe, with 4-5 hours flight time to Paris and London. Nevertheless, it seems that we prefer to spend 12 hours in the air and 3 days of jet lag to immerse our teaching and research effort in North America. Most professors graduated in the US, and many academics will spend a summer each year, and sometime more, in some institute in the US or Canada. Our OR has an American face. Many of our papers are co-authored by a North American academic. Actually, most of OR graduates will stay in North America for the rest of their professional lives. We do have the brain-drain phenomenon, but we are compensated by importing educated immigrants from Russia.

Very few got interested in working with the nearby continent of Europe. I "discovered" Europe as part of my research in multi-criteria decision making (Henig, 1994, Henig and Katz, 1996, Henig and Buchanan, 1996) and found that, at least in the decision making arena, the European approach is different from the American's (see Roy and Vanderpooten, 1996 and Daellenbach, 1994). Now I mix the pleasures of the European culture with research.

So here is an obvious thing that we have in common: we are neutrals — neither European nor Americans. This might explain the cooperation I enjoy with John Buchanan and the rest of the people in the Department of Management Systems at the University of Waikato. We are a "bridge" between Europe and the America.

My conclusion, which I think is valid for New Zealand researchers: cooperate with colleagues from over the seas. My way to get acquainted with them is by attending overseas conferences. And here is one of the great differences between our respective countries. No, it is not the driving on the right side or the size of the sheep population. It is to do with the timing of winter and summer. And most of the conferences are during the Northern Hemisphere summer when you are preoccupied in teaching.

This leads me to the main point. In summer 1998, Tel Aviv University will host the international INFORMS meeting. Jacob Hornik is the general co-chair (with Beny Lev) and I (with Bezalel Gavish) the program committee co-chair. It will be held on 31 June-4 July. Obviously you are all invited. I think that the shortest route is to take a flight to Bangkok where ELAL (the Israeli airline) will fly you to Tel Aviv via India. Recently I came across an announcement of 'round the world ticket' handled by ELAL and Air New Zealand. It takes you, to Europe and North America as well, for 2,000 US$. This is a bargain.

But, you will argue, what about the winter semester? Somehow 31 June-4 July falls during the examination period (that is the most I could arrange for my kiwi friends). But I want to elaborate about that. Please notice that December is in the midst of my winter semester and I am here in New Zealand (and before that I spent two weeks in India). A year ago I was facing a similar problem to yours: The biannual International MCDM conference was scheduled for January 97 in Cape Town. As an enthusiastic traveller I did not like the idea of taking just a week off my teaching (which I am allowed to take if I present a paper in a conference). My decision was to take the winter semester off, by teaching in the summer and having heavier load in the spring. The offer to do research in Waikato University came much later.

The moral lesson. A "decision problem" (how to attend the conference in Cape Town and stay two weeks for travelling in South Africa) is not a problem. Rather it is an opportunity to attain your 'values' (Keeney, 1992). But this is not a research paper, so I'll stop right here, before writing things that will require a review.

References

Daellenbach H., (1994). *Systems and Decision Making: A Management Science Approach*, John

Wiley & Sons.

Henig, M.I., (1994). Efficient Interactive Methods for a Class of a Multiattribute Shortest Path Problems. *Management Science* 40, pp. 891-897.

Henig, M.I. and J. Buchanan, (1996). Solving MCDM Problems: Process Concepts (with comments and response to comments). *Journal of Multi-Criteria Decision Analysis* 5, pp. 3-12 and pp. 19-21.

Henig, M.I. and H. Katz, (1996). R&D Project selection: A Decision Process Approach. *Journal of Multi-Criteria Decision Analysis* 5, pp. 169-177. Won the 94 Wiley Prize in Applied Multi-Criteria Decision Analysis.

Keeney, R.L. (1992). *Value Focused Thinking*, Harvard University Press.

Roy B. and D. Vanderpooten, (1996). The European School of MCDA: Emergence, Basic Features and Current Works, *Journal of Multi-Criteria Decision Analysis* 5, 22-38.

BRANCH GOSSIP COLUMN
A Word from Massey

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John Giffin is on vacation enjoying a cold winter in Toronto leaving me the great honour of taking care of the students' enrolment.

The Journal of Applied Mathematics and Decision Sciences is going ahead strongly with dozens of submissions (albeit mostly Stochastic flavoured papers) to our editorial board. I am still acting as its managing editor (aka secretary) with help from colleagues in the USA, Canada, Australia, and of course New Zealand. The journal is structured so that we have an editor for each core area: John and I take care of OR, Chin Diew Lai is responsible for Statistics, and Robert McKibbin is the Applied Mathematics editor. We have another fifteen people who have agreed to join the journal as associate editors. Given the small volume of papers, we have been successful in having a short turn around time (so far anyway). Please check our Web page for submission and subscription information: *http://fims-www.massey.ac.nz/maths/jamds/*

Department of Management Systems — University of Waikato

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For this instalment, I will update you on some of the graduate work going (or recently gone) on in the Department of Management Systems. More information can be found from our web site:
http://www.mngt.waikato.ac.nz/depts/mnss/home.htm

Annette Mills has just been awarded her DPhil. The title of her thesis is *Investigating the Determinants of User Sophistication: A Perspective from Social Cognitive Theory*.

This thesis reports on a study designed to identify and investigate the factors which further worker sophistication in using computers in the workplace. User sophistication was conceptualised in this research in terms of: I) breadth of capability, ii) depth of capability, and iii) finesse. Quantitative data were gathered from 328 computer users in two New Zealand organisations. The PLS implementation of structural equation modelling was then used to test the conceptual model of user sophistication developed in this research. The overall findings emphasised the importance of 'on the job' opportunities to use computers, computer-related training, computer self-efficacy, and computer use; all were found to have positive effects on user sophistication. Task uncertainty was shown to negatively impact user sophistication. Contrary to expectation, organisational support was found to have a negative effect on user sophistication; this finding was further investigated in the qualitative work which affirmed prior expectations of the value of organisational support to the development of user sophistication. Corroboratory evidence was found for the role of computer self-efficacy as a predictor of computer-related behaviours, and for the value of Social Cognitive Theory in explaining computer-related behaviours.

Ned Kock has just submitted his DPhil. The title of his thesis is *The Effects of Asynchronous Groupware on Business Process Improvement*

Group-based business process improvement efforts have been the change dynamics of worldwide and revolutionary management movements, such as total quality management and business process re-engineering. This research investigates the effects of asynchronous groupware

on such efforts. Thirty-eight business process improvement groups were facilitated in three organisations over four iterations of the action research cycle proposed by Susman and Evered. The asynchronous groupware tool used to support these groups was an e-mail conferencing system. At the group and individual levels of analysis, the study suggests a large decrease in group interaction and perceived demand for leadership skills, and a large increase in member contribution effort and response time. At the organisational level of analysis, the study suggests a large increase in the efficiency of group-based business process improvement efforts. However, both increases and decreases in the effectiveness of such efforts were equally observed in different iterations, apparently due to the existence of two moderating variables - top management support and perceived contribution threats.

From a practitioner's perspective, our research indicates that asynchronous groupware support is likely to be beneficial to business process improvement groups, particularly those searching for incremental improvements. However, our study suggests that this support may not yield positive results in groups searching for radical improvement, such as business process re-engineering groups. The main reason is a perceived increase in the likelihood of future negative personal repercussions associated with contributing written postings to groups making radical business process change decisions.

Robert Wellington is in process... His research is on "Asynchronous Communication Technology: The Effects on Legitimation in Strategic Decision Making".

It has been suggested that legitimacy be used as a vehicle for studying the social dimension of the impacts of organisational information systems. The resurgence of sociology in information systems research, the 'post-modernisation' of the field, demands that such approaches be considered seriously. This D.Phil research topic centres on the interaction between an emergent asynchronous communication phenomena {e-mail, electronic discussion lists, bulletin boards} and the social contracts that people make using language and symbols. It is believed, through literature and initial research evidence, that e-mail and perhaps other of the more conversational Asynchronous Communication Technologies (ACT), have quite different social characteristics from verbal and written communication. Status effect minimisation, lack of physical presence, and equivocality are some of the effects that will alter the representation of social systems in strategic decisions through the use of ACT.

Several interventions in business enterprises will be conducted using an Action Research methodology. The interventions will consist of the expansion of the strategic discussion through the use of a discussion list server. Several iterations incorporating different contexts and negotiated interventions will be undertaken in order to be able to develop a general theory of the effects of ACT on the strategic decision process in a New Zealand business culture.

Peter Gilmour is about to move from an MPhil to a DPhil. He is investigating the decision making of experts.

A study of the capture and synthesis of data by experts will be undertaken to determine why experts are apparently able to transcend the competence of people with similar training. The research will consider the decision strategies of experts, and some cognitive factors. Case studies will provide data for comparison with published research.

In addition, we have about 4-5 Master's students, two of whom will be undertaking theses on the general topic of decision making, with specific consideration of the gap between descriptive and prescriptive decision making.

IDLE GOSSIP

Hans G. Daellenbach, University of Canterbury

"Vacant Position: Editor of ORSNZ Newsletter": Remember that ad in the June 96 issue? It was reproduced in the *Bulletin 4/1996* of IFORS, asking how many applicants it drew. Answer: None! (*Our members display more sense than I expected! The Editor*)

"Faulty Towers: Is academe hurting OR?" — a reprint in the UK OR Newsletter of the October 95 editorial in our newsletter brought a telling response from E. A. del Rosario in the Philippines, a practising operations researcher at the San Miguel Corporation. Submitting a paper on OR in logistics at San Miguel to an OR journal, she got two diametrically opposed referees' reports, the first damning the paper as failing to demonstrate a significant research contribution, the second praising it as a highly significant application. With more important work on her desk than the impossible task of satisfying both reviewers, she forgot about the paper and was rather heartened

by my comment "If you get your thrills from doing real OR work, would you want to waste your time going through this kind of exercise when the next adventure already beckons you?"

"Efficiency in Art": (reprinted from Medicine's Summer Newsletter, Canada) The president of a large managed health care facility also served on the board of his community's symphony orchestra. Finding that he could not go to one of the concerts, he gave his ticket to the facility's director of health care cost containment. The next morning, he asked the director how he enjoyed the performance. Instead of the usual polite remarks, the director handed him a memo which read as follows:

"The undersigned submits the following comments and recommendations relative to the performance of Schubert's 'Unfinished Symphony' by the city's symphony orchestra as observed under actual working conditions:

1. The attendance of the conductor is unnecessary for public performances. The orchestra has obviously practised and has the prior authorization from the conductor to play the symphony at a predetermined level of quality. Considerable money could be saved merely by having the conductor critique the orchestra's performance during the retrospective peer review meetings.

2. For considerable periods, the four oboe players had nothing to do. Their numbers should be reduced, and their work spread over the whole symphony, thus eliminating peaks and valleys of activity.

3. All twelve violins were playing identical notes with identical motions. This is unnecessary duplication: the staff of this section should be cut drastically with consequent savings. If a large volume of sound is required, this could be obtained through electronic amplification, which has reached very high levels of reproductive quality.

4. Much effort was expended playing 16th notes or semi-quavers. This seems an excessive refinement, as most of the listeners are unable to distinguish such rapid playing. It is recommended that all notes be rounded up to the nearest eighth. If this is done, it would also be possible to use trainees and lower grade musicians with no loss of quality.

5. No useful purpose would appear to be served by repeating with horns the same passage that has already been handled by strings. If all such redundant passages were eliminated, as determined by the utilization review committee, the concert could have been reduced from two hours to about 20 minutes, resulting in substantial savings in salaries and overhead. If Schubert had addressed these concerns on a cost containment basis, he probably would have been able to finish the symphony!"

(Does this sound familiar? the editor)

NEW ORSNZ SECRETARY

Hi, my name is Megan Thornley, and I have just taken on the role of ORSNZ secretary, following Mikael Ronnqvist's departure to work in Sweden. After completing my Conjoint Bachelor of Commerce/Bachelor of Science degree I worked at Air New Zealand on aircrew rostering optimisations. During this time I also studied for a masters degree in Operations Research. My work generated my thesis topic which involved solving the aircrew rostering problem for the International pilots. The Pilots rostering problem differs from existing aircrew problems at Air New Zealand because a new contract requires the rosters to be built based on a seniority preferential bidding system as opposed to the already well established fair and equitable systems. Along with Professor David Ryan I developed a solution for the aircrew rostering problem using column generation. I presented my work at an airlines conference in Frankfurt, and at the 1994 ORSNZ conference where I was awarded the Young Practitioners Prize. I subsequently left Air New Zealand, where work in developing solutions using column generation is continuing, and after working as a corporate analyst for Southpac Corporation I have now taken on a 1 year contract with the University of Auckland as a lecturer.

SOME HIGHLIGHTS FROM THE IFORS GENERAL MEETING

Vancouver IFORS 96 Conference, 7-11 July 1996

It was the largest IFORS triennial conference ever with 927 papers in 273 sessions, organized into 21 streams, with 948 delegates represented 48 countries.

Dr Hugh Bradley of Shaklee Corporation, San Francisco, has been appointed as the new Treasurer of IFORS. He was the IAOR editor from 1968 to 1979 and has served as ORSA president and treasurer.

Prof. Andres Weintraub, Dept. of Industrial Engineering, University of Chile, has been nominated IFORS President for 1998-1999-2000. He has achieved international recognition for his work in the use of OR models for forestry and forest products processing.

Dr Graham Rand has been nominated IFORS Vice President for 1998-1999-2000. He was the editor of IAOR from 1979 to 1990, and readers of JORS will know him as the editor of that journal from 1991-96.

(Extracted from the *IFORS Bulletin*)

SUMMARY OF ORSNZ COUNCIL MEETING MINUTES FOR JANUARY 29 1997

Matter arising:

The council has adopted the motion that first time graduating students retain their student membership status for the financial year following their graduation.

The next AGM is planned to be held at the APORS conference in Melbourne (November 1997).

ORSNZ secretary: The Council thanked Mikael for his term as secretary and wished him luck for his new position in Sweden. Megan Thornley was appointed (unopposed) as the new secretary.

ORSNZ visiting lecturer: Dr James Ho, professor of information and decision sciences at the University of Illinios, Chicago, is currently considering a proposal to visit Christchurch. He offered to present a seminar while in New Zealand on using the Internet for business. It was suggested that the ORSNZ invite him to give a seminar in Auckland while he is in New Zealand

Rationalizing or library holdings: It was suggested that every MS and OR Department should have a core supply of OR journal, while more specialised journals might only be held at one site. Council will investigate the possibility of offering these institutions help in streamlining their holdings, with a list of the holdings available on the WWW.

Student participation at APORS 97: Concern was raised about the NZ student representation at the APORS conference in Melbourne. In the past ORSNZ has provided grants to students to attend the ORSNZ conference. In 1997 this becomes an issue because our society is not running the conference and hence also no 'ORSNZ Young Practitioners Prize or Student Paper Prize' will be offered. Council will look into how support can be provided for students. .

Other business: ORSNZ currently has tenuous links with the Computer Society. It will try to strengthen these links, and proposes swapping of newsletters.

The 1997 subs will be sent out soon and will include a question asking members to provide permission to publish their name as a member of the ORSNZ society.

The ORSNZ is not continuing with their APJOR subscription. So the May 97 issue will be the last issue distributed free of charge to members. Members will be asked later in the year if they wish to carry on receiving the APJOR journal at an additional fee.

APORS 97 UPDATE

Vicky Mabin, Management Group, Victoria University
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Our AGM will be held at APORS 97 — the organising committee are including this in the timetable. An e-mail from Paul Lochert, Chair APORS 97 Organising Committee, in response to a query about proceedings states: " In both the info' on the WEB and the Brochure we refer to the facility for the full paper to be available over the WEB. We felt this was a better option as the paper would then be available to participants before the conference. We propose to encourage those who want paper publication rather than having it electronically available to submit it to APJOR. We are reluctant to publish an unrefereed document. The cost of producing and distributing a post conference publication would have meant a significant increase in the registration fee which we decided was already high enough."

SOME USEFUL WEB PAGES

ORSNZ: *http://www.esc.auckland.ac.nz/Organisations/ORSNZ/*
IAOR: *http://www.stockton-press.co.uk/iaor/index.html*
IFORS: *http://www.ifors.org*
APORS97: *http://www.maths.mu.oz.au/~worms/apors/apors.html*
INFORMS: *http://www.informs.org/*
ORS (UK): *http:/www.orsoc.org.uk*

MEETINGS CALENDAR

INFORMS BARCELONA 1997 INTERNATIONAL MEETING
7 - 10 July 1997
Barcelona, Spain
Organizing Chair: Jaime Barcelo, Navarro Reverter 33, Barcelona 08017, Spain
e-mail: *BARCELO@EIO.UPC.ES*

5th INT. CONFERENCE OF THE UNITED KINGDOM SYSTEM SOCIETY
7 - 11 July 1997
De Montfort University and The Open University, Milton Keynes
Theme: Systems for sustainability: people, organisations, and environments
For more details e-mail: *ukssconf@dmu.ac.uk*
or Prof. Ray Ison: *r.l.ison@open.ac.uk*

NZSA 48th ANNUAL CONFERENCE
9 - 11 July 1997
University of Auckland
Call for papers: deadline 23 May 1997
For details, see *http://www.stat.auckland.ac.nz*
or e-mail: *d.scott@auckland.ac.nz*

DECISION SCIENCES INSTITUTE 4th INTERNATIONAL MEETING
20 - 23 July 1997
Sheraton on the Park, Sydney, Australia
Submission deadline: 31/12/96 (sorry)
For details, see *http://www.gsm.mq.edu.au/conferences/dsi/97inter.html*
or e-mail: *Norma.Harrison@mq.edu.au*

IASTED INT. CONF. ON APPLIED MODELLING AND SIMULATION
27 July - 1 August 1997
Banff (beautiful), Canada
Contact: IASTED Secretariat AMS'97, #80, 4500 16th Ave. NW, Calgary, Alberta T3B 0M6, Canada
e-mail: *iasted@cadvision.com*

SYMPOSIUM ON OR 97
3-5 September 1997
Friedrich Schiller University, Jena, Germany
For details see http://www.wiwi.uni-jena.de/sor97.html/

OR 39 CONFERENCE OF THE UK OR SOCIETY
9-11 September 1997
Bath Spa, England
For details, e-mail: *barrett@orsoc.org.uk*

THE SWISS OR SOCIETY (SVOR/ASRO) 5th AUTUMN TUTORIAL
22-23 September 1997
Telecommunications in the 21st Century: A challenge for OR Methodologies
Hotel Seepark, Seestrasse 47, CH 3602 Thun, Switzerland
Contact: Dr. Heinz Schiltknecht
e-mail: *hschilt@dial.eunet.ch*

INFORMS DALLAS FALL 1997 MEETING
26-29 October 1997
Hyatt Regency, Dallas, Texas
Paul Jensen, University of Texas, Dept. of Mech. Eng., 62200, Austin, TX 78712

INT. CONF. ON OR AND MANAGEMENT SCIENCE: ICORMS - ICORD 1997
25-28 November 1997
Manila Mandarin Hotel, Metro Manila, Philippines
Contact: Dr Elvira A. Zamora, College of Bus.Ad., Univ. of the Philippines, Diliman, Quezon City 1101
e-mail: *elvira@mnl.sequel.net*

APORS'97 — THE FOURTH CONFERENCE OF THE ASSOCIATION OF ASIAN-PACIFIC OR SOCIETIES WITHIN IFORS
Nov 30 - Dec 4 1997
Theme: "Coexistence Between Human, Natural & Technological Resources"
World Congress Centre, Melbourne, Victoria, Australia
For more details, see *http://www.maths.mu.oz.au/~worms/apors/apors.html*
e-mail: *APORS97@sci.monash.edu.au*

INFORMS/CORS MONTREAL SPRING 1998 MEETING
26 - 29 April 1998
Queen Elizabeth Bonaventura Hilton, Montreal, Canada
General Chair: Paul Mireault, École des Hautes Études Commerciales,
5255 Avenue Decelles, Montreal, Quebec
e-mail: *Paul.Mireault@HEC.CA*

INFORMS ISRAEL INTERNATIONAL MEETING 1998
28 June - 1 July 1998
Chair: Jacob Hornik, Tel Aviv University, Recanati Grad. School of Mgt., Ramat Aviv 69978, Israel

INFORMS SEATTLE FALL 1998 MEETING
25-28 October 1998
Seattle, Washington
Chair: Marisa Altchuler, Boeing Computer Services, P.O.Box 24346 M/S 7A TH, Seattle WA 98124-0346

IFORS'99 BEIJING
Early August 1999
If you want to be on the mailing list e-mail: *ifors99@amath11.amt.ac.cn*
(Note 11 is eleven)