Christmas Issue

New Members

A warm welcome to new members since the last newsletter.

Chee Wong Law	Student	Wellington
Louis Casas-Peschard	Consultant	Auckland
Barbara Höck	Software Developer	Christchurch

1990 Conference

Planning is underway for the 1990 conference, to be held at the **University of Waikato**, Hamilton. So please put the dates in your diary:

Monday and Tuesday, August 20 and 21

You can also start thinking of how you may wish to contribute. If you have any bright ideas for the conference, then please let us know soon. For example, has anyone any suggestions for a guest speaker? Also, you could start working on that paper which would inform us all of the wonderful work you are doing.

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Coming Events

1990 International Conference
Operations Research: Management Science
Techniques and Applications

11-14 December 1990
Manila, Phillipines

Contact: Ms Elise de Rosario
             Assistant Vice-President and Manager
             San Miguel Corporation
             40 San Miguel Avenue, Mandaluyong
             Metro Manila, Philipines

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2nd International Conference: Economics and Artificial Intelligence
2-6 July 1990
Paris, France

Contact: AFCET-CECOIA
             156, boulevard Péreire
             75017 Paris, France

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Call for papers:

3rd Conference of the Asian Pacific Quality Control Organisation
18 - 22 March 1991
Sheraton Hotel, Auckland

Contact:
Conference Secretariat
C/- New Zealand Organisation for Quality Assurance,
P.O. Box 622, Palmerston North.

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Annual Conference
New Zealand Organisation for Quality Assurance
Taranaki Country Lodge
14-16 May 1990

Contact:
Roger Metcalfe
1990 Conference Committee
P.O. Box 30-320, Lower Hutt

FORUM LETTER

No. 1

August 1989

by: Prof. Dr.
Heiner Müller-Merbach
IFORS President
1983-84-85.

OR and Lessons from the Greeks - No. 4: Plato's Warning of Expert Systems

It is unbelievable what Plato (427 - 347 B.C.) said about expert systems. Almost precisely 2,400 years ago, he wrote the dialogue "Phaedrus" in which Socrates argued as follows.

"SOCRATES: There remains the question of the propriety and impropriety of **expert systems**, and the conditions which determine them. We have still do discuss that, haven't we?
PHAEDRUS: Yes. ...
SOCRATES: They say that there dwelt at Naucratis in Egypt one of the old gods of that country, and the name of the god himself was Theuth. Among his inventions were number and calculation and geometry and astronomy, not to speak of various kinds of draughts and dice, and, above all, **expert systems**. The king of the whole country at that time was Thamus. To him came Theuth and exhibited his inventions, claiming that they ought to be make known to the Egyptians in general. Thamus inquired into the use of each of them, and as Theuth went through them expressed approval or disapproval, according as he judged Theuth's claims to be well or ill founded. When it came to **expert systems**, Theuth declared: 'Here is an accomplishment, my lord the king, which will improve both the wisdom and the memory of the Egyptians. I have discovered a sure receipt for memory and wisdom.' 'Theuth, my paragon of inventors,' replied the king, 'you, who are the father of **expert systems**, have out of fondness for your offspring attributed to it quite the opposite of its real function. Those who acquire it will cease to exercise their memory and become forgetful; they will rely on **expert systems** to bring things to their remembrance by external signs instead of on their own internal resources. What you have discovered is a receipt for recollection, not for memory. And as for wisdom, your pupils will have the reputation for it without the reality: they will receive a quantity of information without proper instruction, and in consequence be thought very knowledgeable when they are for the most part quite ignorant."

Plato goes on and lets Socrates add quite a few serious arguments against expert systems, with which Phaedrus agrees.

Hold it! To be honest, they did not discuss **expert systems**. Instead, they discussed the "propriety and impropriety of **writing**". But the warning of writing can immediately be applied to expert systems.

Socrates himself never published a single line about his philosophy. However, he did not keep others from writing, not even his own scholar Plato.

Nobody should be kept from designing expert systems either - or any other kind of computer aided information systems. However, we - as potential designers of such systems - should be aware of the warning. We are approaching the age in which we all become **information giants** - but **knowledge dwarfs**. This is a fundamental change **of** mankind, **by** mankind and, hopefully, **for** mankind. Is society prepared for this change? It is a challenge for the OR community to participate in the process of this change.

It seems to be unlikely - and inhumane - that man will only become a user society of "given" expert systems and that mankind has to adapt to what computing machinery is able to perform; and it seems urgent to overcome the first industrial revolution's common practice that man's tasks are defined by the deficiencies of machinery. Instead, the humane way into the information age - the only way that can ethically be justified - is **man-oriented** and requires the **holistic** design of **man-machine tandems**, i.e. systems in which technology is purposefully designed in order to **support** the endeavours of man.

Mathematicians and Industry

Stavros Busenberg
Harvey Mudd College
Claremont
USA

Graeme Wake
Department of Mathematics and Statistics
Massey University
Palmerston North

In the last several years there has been a blossoming of programs that foster the interaction between academic and industrial applied mathematics. The highly successful Claremont Mathematics Clinics and the Oxford Study Groups have served as inspiration and sometimes as models for other such programs each with its own local flavor and innovations. Such programs are now flourishing in many settings (Duke, Waterloo, Kaiserslautern, Rensselaer Polytechnic Institute, to name some) and are all addressing the same basic issues: Anyone who has attempted to teach industrial and applied mathematics in a university setting has, no doubt, become acutely aware of the difficulty of bringing realism into the traditional course setting. The vast majority of industries have no internally supported applied mathematics research staff so that access to modern mathematical modelling and analysis expertise often seems impossibly remote. Nontraditional programs like the Mathematics Clinics and the Industry Study Groups help resolve these problems and provide a good setting for University-Industry interactions in applied mathematics, statistics, engineering, technology and computer science.

A program of this type has recently been launched at Massey University in New Zealand and it has had an auspicious start, partly because of the benefit it had from experiences with previous such efforts. One of us, Stavros Busenberg, has been with the Claremont Mathematics Clinic since it started with a project he directed in 1972 and had a short term Fulbright Fellowship aimed at helping the initiation of the Massey program earlier this year. The other, Graeme Wake, was first involved with the Oxford Study Group when he was visiting that University in the early 1970's, and is heading both the Mathematics and Statistics Department as well as the group of Massey staff who are supporting this project. The program has been named the "Quantitative Problem Solving Consultancy" (QPSC) and involves staff from the Departments of Mathematics and Statistics, Production Technology, Management Systems and the Computing Centre of the University.

On August 14-15 1989, the Consultancy organized the first of what promises to be an annual workshop which brought together at Massey over forty people from universities, industry, and various government departments. The two-day program of the workshop had two objectives. The first was to present convincing examples of successful Industrial Mathematics and Statistics projects in New Zealand and elsewhere, and the opening day was devoted to this. The second objective was to have industrial and government personnel present new problems which they felt needed mathematical, modelling or statistical expertise, to provide some preliminary analysis of these problems and to make initial contacts for starting collaborative projects. The second day of the workshop was devoted to this latter objective. Perhaps a measure of the timeliness of the workshop was the fact that instead of the six planned presentations by potential industrial or government clients, two of the industrial representatives, who initially came only as observers, requested time to present problems also. Sacrificing an hour of the lunch-time break was the only possible solution, and the full attendance at these impromptu presentations attested to the enthusiasm and feeling of accomplishment that permeated the two days of the workshop. We describe below in a little more detail the program of the workshop concentrating on two rather different problems that were presented during the second day.

The first day opened with a key-note talk by Stavros Busenberg describing various University-Industry collaborations in the United States as well as elsewhere and giving a synopsis of the aims of the consultancy and the workshop. A half-hour spirited discussion spilled over into the traditional Kiwi tea-break. This was followed by half hour presentations of a variety of industrial mathematics projects that had been successfully completed at Massey and other places in New Zealand. The presentations included the description, led by Alex McNabb of Massey University, of a novel method of estimating the time for freezing irregularly shaped objects with applications to the food industry. John Burnell of the Applied Mathematics Division (AMD) of the Department of Scientific and Industrial Research in Wellington presented a description of the modelling and analysis of a novel fuel injection device, and gave a kaleidoscopic view of the work that was being done at the AMD, particularly in geothermal problems. Graeme Wake and Robert Sisson combined to present a case study of the analysis of the cause of fires due to spontaneous ignition. Paul Austin presented a case study involving the use of modern control theory methods in optimizing a biotechnology production plant. Two other case studies were given describing statistics, and scheduling problems.

The planned activities of the second day involved three presentations by industrial and government personnel in the morning followed by a break-up of the participants into three groups, each of which went to a separate room where they discussed intensely one of the problems for an hour or so. Two discussion leaders were designated at the start, and they had the responsibility of keeping the group on track and at a good clip. The attendance bell had to be rung repeatedly, and loudly, in order to get these groups to return to the other scheduled events. The afternoon session paralleled the morning with three more problems presented and discussed. The day ended as planned with brief presentations by each of the group discussion leaders of the preliminary views that emerged about the modelling of their particular problem. As mentioned above, two more presentations were squeezed into the lunch time, but time did not allow discussion groups to be formed for these. Perhaps the flavour of the workshop can be best conveyed with brief descriptions of two rather dissimilar problems which were presented and discussed.

One of the problems of the second day consisted of modelling the causes of corrosion of metal surfaces which are coated by water based polymer paints. The problem was clearly presented in physical and chemical terms by Tony Van Dyk of Resene Paints Company, stressing the fact that the concern with pollutants is driving his industry to the predominant design and production of water based paints. The discussion group focused on the primary cause of the corrosion which was determined to be the diffusion of atmospheric water to the metal surface. A model was proposed for this, based on the hypothesis that water diffuses through the paint film in an anomalous way with part of it becoming immobile and the rest being able to move. This type of model appears to reflect some of the observed phenomena and it was determined that it will be pursued further by Tony Van Dyk in collaboration with members of the QPSC at Massey. The second problem was presented by David Leathwick of the Ministry of Agriculture and Fisheries, and concerned the explosive population levels of rabbits in the Otago district of the country, and of the need to control them because of the damage they cause to agriculture. The discussion group's attention centered on the possibility that predators are controlling the rabbit population in other parts of the country, however, in the harsher climate of Otago, they do not over-winter in large enough numbers to provide an effective control. A dynamical systems model was proposed which would enable the testing of this hypothesis, and the design of alternate means of population control other than the current rabbit poisoning methods. It was decided that this project could be handled by a student at the Master's level and will be pursued in that way.

Five of the eight problems that were presented led to the beginning of collaborative arrangements for further work. The QPSC at Massey has developed a flexible array of methods for accommodating collaborations with industry. These range from the funding of Master's and PhD students to short term contracts work involving lecturing staff and other staff members. The success of this first workshop has led to plans for repeating it next year.

ZONTA
International

THE NATIONAL ZONTA SCIENCE AWARD

Zonta International has established a National Science Award open to women graduates with tertiary qualifications in the fields of pure and applied sciences. It is intended that the Award will be given every biennium, starting in 1990. The objectives of the Award are:

- To recognise, and pay tribute to, the valuable contribution of women scientists both to their disciplines and the community at large.

- To encourage young women to enter the field of science, thus making their special talents available to society.

Contributions to science have to be identified with New Zealand. The intent of the Award is to enable the recipient to continue further study, research, or to assist in their returning to the science arena.

The recipient will be chosen by a selection panel made up of Zontians, industry heads, public figures and academics in the appropriate fields. The finalist will be approved by a Nationally chosen panel of Zontians.

ELIGIBILITY

Women graduates with tertiary qualifications including degrees and diplomas; teachers of science; those involved in research; and women wishing to return to the workforce. Consideration will be given to the excellence of the contributions made to science and to New Zealand society in general.

Recipients will be asked to give media interviews and supply photographs where appropriate.

AWARD

The recipient will receive the Zonta Science Medal, $5000 cash, and return air travel to Europe, U.K. or U.S.A. courtesy of British Airways for a conference/meeting overseas, of the recipient's choice. Air travel has to be taken within the first year of the biennium.

APPLICATIONS

Application forms are available from all University Registrars and major educational institutions throughout New Zealand, or from:

Zonta Science Award
P.O. Box 10-274
Wellington
New Zealand.

Closing date is 31st March 1990, with presentation of the Award in May 1990.

Subscriptions

The AGM agreed that the subscriptions will remain the same as last year, viz:

Standard Membership	$33
Student Membership	$15
Corporate Membership	$80
Corporate Sponsorship	$200
Journal-Only (Libraries)	$30

Rona will be sending out bills in January, so leave a little over after your Christmas shopping.

Wellington Branch Meeting

Professor Mike Powell

A view of Karmarker's Algorithm for Linear Programming

When we were all students, newly initiated into the intricacies of the Simplex method for solving LP problems, and marvelling at the way it hopped from vertex to vertex in its often painfully slow path towards optimality, we felt that "there had to be a better way".

Many of us, therefore, followed the rise, fall, and rise again of Karmarker's algorithm with great interest, both from a theoretical and practical point of view. However lucid explanations of the algorithm and its relative merits were hard to come by.

We were therefore most fortunate in having Professor Powell, well known for his work in OR and numerical analysis, explain the workings of Karmarker's algorithm in a clear and concise way. We were all a lot wiser about the potential of this method, and the types of problem that it could be used for. His illustrative examples, particularly the imaginative use of a problem with an infinite number of constraints, were particularly interesting and informative. Not only has Mike Powell's work shed fresh insight on the algorithm, but he was able to convey this to us in a way that was both interesting and informative.

Merry Christmas,   and happy ORing in 1990

Workshop for quantitative analysts on problem formulation in operational research

Course objective:
To provide participants with the ability to formulate a variety of quantitative problems in an Operational Research framework for which solution technology already exists.

Relevant for:
Quantitative analysts with little formal knowledge of OR techniques, but who are keen to expand their repertoire.

Time & place:
The workshop is now planned for February 1990, and will be held at the Centre for Continuing Education, Victoria University of Wellington.

Cost:
Not yet finalised, but expected to be about $250 per person, this includes notes, lunches, teas, and GST.

Numbers:
In order to give all participants personal attention, attendance will be limited to about 25 people.

Topics to be covered:

<div align="center">

Optimisation
Inventory & production scheduling
Decision analysis
Queueing theory

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This will be an excellent opportunity to expand your knowledge and skills.

Please complete the form below if you are interested in attending.

For further information: Frances Sutton   ☎   (04) 727-627
             or   Jonathan Lermit   ☎   (04) 742-370

✂--

To: Frances Sutton, Continuing Education Officer, NZOR Soc,
P.O. Box 904, Wellington   ☎ (04) 727-627

Yes, I am interested in the Quantitative Analysis Workshop.

Name...   ☎ ....
Address...