I.F.O.R.S.

INTERNATIONAL FEDERATION OF OPERATIONAL RESEARCH SOCIETIES

letter from the president

TWENTY-FIVE YEARS AGO

No. 10, October 1983

What a year, 1958, a quarter of a century ago! It was extremely rich in fundamental innovations in mathematical programming and related fields. Many of these innovations became the corner stones for further developments. So, twenty-five years ago:

- Gomory published his first cutting plane technique in integer programming;
- Dantzig and Wolfe invented the first decomposition principle in linear programming;
- Dennis published the first efficient computer code for the linear programming transportation problem;
- Network analysis techniques, such as CPM and PERT, were in development.

Many important books, textbooks and monographs, were published in 1958 whose subsequent influence in O.R. was profound:

- C. Berge: Théorie des graphs et ses applications
- R. Dorfman, P.A. Samuelson, R.M. Solow: Linear Programming and Economic Analysis
- S.I. Gass: Linear Programming - Methods and Applications
- Ph.M. Morse: Queues, Inventories, and Maintenance
- N.V. Reinfeld, W.R. Vogel: Mathematical Programming
- V. Riley, S.I. Gass: A Bibliography of Linear Programming and Associated Techniques
- S. Vajda: Readings in Linear Programming
- A. Vazsonyi: Scientific Programming in Business and Industry

And extraordinary as 1958 was it seemed to set a pattern for the years that followed. All the late fifties and early sixties were pioneer years in which basic techniques were developed and highly influential books were published. These were exciting years, full of stimulating visions and ideas.

In these years, O.R. became more and more organised in many countries, O.R. societies were founded, and the organised international co-operation began. The first International O.R. Conference was held in 1957. The Statutes of IFORS were formulated in 1958. IFORS was officially founded in 1959. By 1963, IFORS covered under its roof already 17 Member Societies.

The paths that the development of O.R. took - scientifically and from the organisational aspect - can be traced back quite precisely to a quarter of a century ago.

Heiner Müller-Merbach
President of IFORS

NEWSLETTER

Operational Research Society of New Zealand (Inc.)

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EDITOR: Susan Nicoll,
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WGTN.

DECEMBER, 1983

From the Editor

Christmas and the New Year are upon us - so here's some holiday reading full of good cheer, good wishes and good articles(?!). Plus ..., it's a bumber issue in true festive colours!

I've just run my 1984 optimisation model and the results are astounding:

To maximise the society's benefits, a member must put in a staggering 80% more effort. A sensitivity analysis on the newsletter showed critical parameters to be the number of articles received and editor's state of mind - the latter having a high correlation with feedback and encouragement. So surprise, surprise! Now how about some New Year resolutions to resolve the above? (I have optimistically built these into the model so beware!)

Merry Christmas and a Happy New Year folks!

Sue Nicoll

ORSNZ COUNCIL 1983/84

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THE 20th AGM

About 30 people attended the Society's 20th Annual General Meeting, held at B.P. House in Wellington on 17 November. Our president Mervyn Rosser, refrained from reading the Annual Report, but instead emphasised its main points. He mentioned that it was written with the assistance of other council members and hence contained somewhat diverse views, especially on the question of raising membership fees. The treasurer then presented the Society's accounts and some illuminating slides on the healthy level of society funds. During much discussion on whether or not to raise subscriptions, the treasurer's totally convincing performance resulted in the passing of a motion for fees to remain at their current levels this year.

Election of officers for 1984 followed, with the president, vice-president, secretary and treasurer being re-elected unopposed, and Gib Bogle (MAF) and Tony Vignaux (VUW) as new faces on council.

General business covered such diverse issues as Don McNickle's apologising for a missing page in the latest Conference Proceedings; whether the Society should celebrate next year (its 21st birthday) or 1988 (its 25th); and ways of subsidising students to attend the annual conference. The meeting moved that a further $50 be donated to the N.Z. Futures Trust, and it was left for council to decide on a suitable grant to the Royal Society's Prince and Princess of Wales Science Awards Scheme.

The entire meeting was over in just on an hour!

K. Garner,
Hon. Treasurer

N.Z.Council
Box 904,

Wellington Branch
Box 904,

Auckland Branch
C/- Dept TAM

Canterbury Branch
C/- Economics Department
University of Canterbury

DIVISIONAL NEWS

Auckland Branch

The Auckland Branch AGM was held on 28 November. It was preceded by a talk by Dr Arthur A. Brown on 'Manufacturing Control System Audits'. Dr Brown, is the chairman of the IFORS Educational Committee and is presently and touring member societies of IFORS, preparing a report on the current state of OR education.

Branch officers and committee were elected at the meeting and are as follows:

Chairman: D.M. Ryan
Secretary: A. MacCormick
Treasurer: J.J. Hunter
Committee: Linda Wannan-Edger
David Jack
John Paynter
Chris Patterson

Wellington Branch

Times have been pretty lively for the Wellington branch with several meetings since the last newsletter. In mid-October, Brian Smith from Control Data gave a talk entitled 'Time-sharing : Dead or Alive' and outlining the services provided by time-sharing as well as some comments on future trends. The AGM was held on 25 October and was followed by a talk by Linda Wannan-Edgar on 'OR Contributions to Airline Management'.

Canterbury Branch

On November 9 the branch held an evening meeting entitled "Microcomputer Applications in Operations Research". This was a practical demonstration of the microcomputer owned by the OR Department at Canterbury University. In keeping with our desire to widen contacts with persons practising OR but who have not had any formal training, we invited a number of industrial firms and local authority groups to send representatives of their organisations. Between 50 and 60 persons attended. As with all of our meetings there were two addresses. The first was by John George and entitled "A Demonstration of LP software for Microcomputers"; the second by Les Foulds entitled "Drawing a Building Plan with a Microcomputer". Although the talks ran for more than two hours they were well received by the audience and many participants commented later that they would enjoy being invited to further meetings.

During 1984 we will hold two meetings of this nature and we hope to increase the level of non-member participation. This is essential if we are to continue to find suitable student projects and achieve a wider acceptance of OR leading to increased employment opportunities for graduates. This meeting produced a number of new contacts and there has been follow-up on the part of two organisations who who feel that OR could be used to resolve their production problems.

As well, Prof. Geoffrey Gregory gave a talk at each branch in late November on 'Production Planning in the Small Firm'. Professor Gregory is professor of Management Science at Loughborough University of Technology in the U.K.

Professor Gregory addressed the Wellington Branch on 25 November.

He spoke of OR's poor record in small firms. OR tended to be enshrined in large organisations. Even if entrepreneurs were aware of OR, small firms find the cost of OR employees or consultants prohibitive.

Since small firm entrepeneurs tend to have overall knowledge of their firm's operations they could easily benefit from some of the OR approaches to production planning. There are four main variables in the production process:

1. lead time for customer orders,
2. lead time(s) for raw material(s) delivery,
3. production lead time, and
4. the planning horizon.

It is the juxtaposition of these and whether raw materials acquisitions and/or sales are known or need to be anticipated that indicate which OR methods might be useful, e.g. forecasting, 2-bin systems, MRP.

Other aspects which particularly affect small firms briefly discussed were industry practices, government policies and locational factors.

Those interested may refer to the article "Stock Control in Small Companies" in the Int.J.Prodn.Res., Vol.20(1982), pp.475-482.

Gary Eng.

STOP PRESS

The society is negotiating with the U.K. OR Society for a reduction in the fees for our members. Contact Vicky van den Broek-Mabin for details (727-855 or Box 1335).

N.Z. President attends ASOR Conference

In the 1983 Annual Report of the ORSNZ I spoke briefly about my attendance at the 6th National Conference of the Australian Society for Operations Research held at Brisbane in August 1983. It was felt by Council that a more detailed account should not form part of the Report but should be published separately in the Newsletter. Here it is.

The ASOR Conference is held every two years, but even so is considerably younger than the N.Z. series (which will celebrate its 20th birthday in 1984). The Brisbane Conference was held on the attractive gum-tree campus of Griffith University on the southern outskirts of Brisbane City close to the QE II stadium built for the 1982 Commonwealth games. Distances and therefore costs are noticeably much greater in Australia. In N.Z. dollars the attendance fee was $225, the official dinner an optional $37 extra and accommodation on top of that, although very reasonable rates applied in student rooms.

About 120 delegates attended, their home distribution being roughly: Queensland 42, Victoria 32, New South Wales 26, South Australia 7, West Australia 7, ACT 6, and overseas 3. The balance between industry and education was not unlike ours but with a little more emphasis on the practitioner. Certainly their council attracts more people from outside the university/government grouping than its N.Z. counterpart. Industry backing was therefore more noticeable; larger firms sent four or five representatives, many successful applications of OR were reported in papers and attendance costs were obviously covered by sponsoring institutions in virtually all cases.

Of particular importance at the ASOR Conference was the chance to meet both rank-and-file members and officials of the sister society. The residential nature of the gathering meant increased contact and communication, and we enjoyed living in for three days (greatly helped by clear blue skies and moderate to warm temperatures). Two parallel sessions attracted many excellent papers and three prizes were awarded at the conclusion (my paper must have ranked fourth equal). Professor Martin Starr from Columbia University was the guest speaker (obtained at short notice and some cost); he was both lively and friendly and would be a worthwhile visitor to attract to New Zealand. His theme was, in brief, the pursuit of excellence in industrial activity, motivated clearly by several recent contacts with the Japanese. An abbreviated version of one of his anecdotes is as follows. A Japanese firm tackled the ever-present problem of expensive storage for inventory not merely by calculating an EOQ but by reducing their production set-up time from 26 hours to half-an-hour. The inventory problem virtually disappeared as their ability to respond to change improved dramatically.

A glance at the paper titles gives almost a feeling of deja vu. I suppose it is inevitable that similar problems will need to be solved on both sides of the Tasman. The three dozen or so papers included the following:

"More Earthmoving on Construction Projects : In Time with Out-Of-Kilter".
"Perishable Inventory Problems".
"Real Time Flood Forecasting".
"Microcomputers and Linear Programming: Feedstock Revisited".
"Gas Storage in an Energy Network".
"A Computer Model for the Management of a Hospital Surgery Unit".

Several expatriate New Zealanders were at the Conference. Some readers will know previously ORSNZ members Dudley Foster and Steve Tucker, as well as Ken Dooley who spent a year in Auckland in the mid-70s. The Australian president, John Flanagan, represents Lysaght's and brings a wealth of experience to the Society from industry as do other members of their council and the conference organising committee. (If I seem to be hammering this point it is because I believe that the N.Z. Society needs such a strengthening. Those of us from academic areas would gladly give way to greater industrial representation). I conveyed to the Conference as a whole greetings from across the Tasman and issued a warm invitation to attend our 1984 Conference. I pointed out some of the attractions: a lower fee, an exchange rate very much in Australian favour, scenic package tours and the fact that the Conference will be in Auckland.

My memory of the 1983 ASOR Conference will be of sunny days, friendly people and the OR mixture largely as before. In the inevitable comparisons I am sure that our N.Z. conferences need not feel overshadowed. We cover (proportionate to our population) at least as much at much lower cost. It would be a pity not to profit from some of the good points of ASOR. These almost all reflect a slightly

I.F.O.R.S.

INTERNATIONAL FEDERATION OF OPERATIONAL RESEARCH SOCIETIES

letter from the president

THE HOUSE OF ARTS AND SCIENCES No. 5, May 1983

Let us consider a house with many windows. A new born baby lies in the centre. It has a view through any window - but not very clear, due to the distances. As the child grows up, somebody guides him slowly - over the years - to one window and puts him in irons such that he can only look through this window - his window. This may happen to anybody in the house, until every window has its prisoner. Now, should somebody at a West window talk to somebody at a North, East, or South window, they would not be able to understand each other because they see completely different things and make different observations. They might not have anything in common to talk about.

Is this not the situation of man? Each individual receives his education and his experience which forms his world view - his window to the world. The world views can be as different as the panoramas on the different sides of the house. Let a sociologist talk to a physicist, an economist to a chemist, a physician to an accountant, a painter to a mechanical engineer, a computer scientist to a lawyer. They may perceive reality so differently that they can hardly agree on any observation they make. They are prisoners of their discipline.

It is often emphasised that one of the characteristics of operational research (OR) is its interdisciplinary approach. How can we achieve interdisciplinarity? Has OR the key to deliver others from their irons? No;and we too, the individual operational researchers, have our windows and bear our irons. Can therefore our interdisciplinary approach be accomplished at all? I believe it can - at least to some extent! It requires two things though, (i) the individual will and (ii) the central tool of OR: the model, not necessarily a mathematical one.

(i) He who confesses to interdisciplinarity has to have the strong will to move within his iron and to turn his head and have a distant look through other windows - even if the iron hurts. That means that he has to develop some basic understanding of and appreciation for the single disciplines and has to try to communicate with their representatives. This may be difficult and strenuous, but it is indispensable.

(ii) In order to understand a particular system of reality or to develop a solution for a particular problem, the operational researcher designs models and studies their behaviour. The models enable him to capture different views in that he lets his companions from quite different windows report what they see and transforms their outspoken perceptions into models. Thus, typical OR models may - at the same time - contain information from as different disciplines as physics, chemistry, engineering, accounting, management, economics, sociology, law, and others. It is the potential strength of OR that many types of models have been developed which are available for our endeavours today.

Many current problems in the world cry for an interdisciplinary approach. Thus, there is a great potential demand for OR. Are we, the OR community, prepared to face this demand?

Heiner Müller-Merbach
President of IFORS

more professional (and more expensive) approach: rather glossy brochures, produced appropriately by a Gold Coast specialist firm; a very full set of papers in the Proceedings, available at pre-registration on the day before the Conference; the residential form of the Conference; the willingness to obtain a world-renowned keynote speaker, at some considerable expense. These are of course not clear-cut advantages and I hope they may spark off some debate in Newsletter columns.

Finally I believe that we should foster closer OR relations with our Australian counterparts. Certainly the even years (currently the Auckland and Christchurch conference venues) provide a good opportunity to attract people to our meetings. Perhaps the N.Z. Society could offer a partial sponsorship every other year for one of our members to attend the ASOR Conference.

Mervyn S. Rosser
President

Wellington Branch AGM

The Wellington branch held its AGM on 25 October. John Davies nobly agreed to carry on as chairman for another term, and Francis Sutton took over as secretary from John Hayes, who was warmly thanked for his two year stint. The main item of discussion was the idea of holding Wellington's next conference out of Wellington, in order to attract more participants. Opinions were divided. Low student attendance at the 1983 conference was noted and regretted; the meeting supported the suggestion of assistance for top OR students to attend in the future.

After the AGM Linda Wannon-Edgar (OR consultant, Air N.Z.) gave a lively and well-received talk on current and potential work in Air N.Z., entitled "Operations Research Contributions to Airline Management". The applications Linda discussed spanned a broad spectrum from personnel management to aircraft maintenance scheduling. Linda also explained the role of AGIFORS (Airline Group in the International Federation of OR Societies) in spreading the benefits of airlines' research and experience.

COMPUTER CONSULTANTS

The two young bulls stood in the top paddock gazing wistfully at the herd of cows, tantalisingly only in the next and lower paddock, but separated from them by a barbed wire fence.

The junior of the two was adamant that there must be some way of getting into the lower paddock. His colleague suggested that they survey the terrain and give the matter much deep thought. Planning is necessary to make enthusiasm manageable! Their survey eventually found what they were looking for a long downhill run which terminated at a mound little more than a metre from the barbed wire fence. Eureka! They gamboled up the hill, turned at the top, and without pause set off at a thunderous rate down a long hill. The cows in the lower paddock sensed the excitement in the air and watched in a mixture of fear and anticipation. The bulls gathered speed, charged up the mound and leapt towards the lower paddock. Alas, both failed by half-a-metre, and landed their hind quarters onto the barbed wire fence. Ever since that day, the two young bulls have been Consultants to the other bulls.

1984 CONFERENCE

The 1984 conference is being hosted by the Auckland branch. Tentative plans are for a two day conference preceded by a one-day symposium, both to have a distribution/transport theme and to be held 22-24 August. The organisers are also hoping to arrange an overseas speaker! So it all sounds like it's **shaping up to a good conference!**

O.R. IN EDUCATION

Department of Management Studies
Auckland University

Members of the third-year Operational Research Paper are engaged in a novel learning situation. Their task is to apply what they have learnt in theory to an actual case. To this end they spent a weekend, on location, in a workshop to analyse the oyster farming industry. The first day was spent at Snells Beach, on Kawau Bay analysing the competitive strengths and weaknesses of the marine farming industry. Marine farmers were invited along to express their views and to be questioned by the students.

On the second day the students visited an oyster farm and worked on the various harvesting, processing and packaging operations involved in sending the product to the market.

From these studies the following areas were identified as being of concern to the industry - demand estimates (both quantity and quality) including action by competitors and substitute goods; supply estimates based on farming areas available, yield, and the learning effect; production methods and costs; costs of capital acquisition and return; and macroeconomic effects (export earnings, revenue generation, government subsidies, employment generation, evaluation of value-added products).

Each of these areas is being modelled by the students, the results to be combined in the last of the above models. It is envisaged that the results so obtained will be produced in a working paper evaluating the current state of the industry and its future options.

John Paynter

If you are involved in an OR course then how about 'educating' the rest of us via an article outlining the who, why, whats etc?

Department of Mineral Technology
University of Otago

Members of the Operational Research Society of New Zealand occasionally express some pessimistic views on the future of OR. Whether one shares this pessimism depends, perhaps, on the way one looks upon OR: as a stand-alone discipline or as a scientific code of problem definition and solution, that, to be truly effective, is to be married to a second discipline. If one is somewhat biased towards the latter viewpoint then, surely there are no grounds for pessimism. More in particular, any good engineering course contains strong elements of OR in various guises, and many good contributions to OR originated in engineering schools, especially overseas. In mineral engineering OR is alive and hale (although perhaps often not in a form that would entirely meet with the approval of every OR professional). The fact that 18 international symposia have been held on the applications of computers and operations research in the mineral industries (APCOM) bears testimony to that.

In the Mineral Technology course OR is taught as a compulsory package, but it is in several ways integrated with other engineering papers. The OR package itself is comprised of 50 lectures within a paper entitled Mineral Operations Management in the fourth year of the course, the other part being mineral economics theory and some traditional management topics. Emphasis is solidly placed on understanding the methods of OR, rather than on skill of execution of solution methods. Topics covered presently are the following.

- Linear Programming - including duality and post optimality analysis.
- Dynamic Programming - discrete, deterministic.
- Networks - Transportation, CPM-PERT.
- Non-linear Programming - (very) restricted to deriving Kuhn-Tucker conditions and steepest decent method.
- Inventory Control.
- Queueing theory - only M/M/1 queues.
- Simulation.

The topics chosen are not arbitrary: they do link in with other papers and build on other papers as will now be indicated.

In one of the general engineering papers at the third year level a small parcel of mathematical statistics is presented as a preface to the principles of reliability and maintainability, centred on Weibull's bathtub, and that can be referred to in the fourth year when dealing with topics such as Inventory Control and the very basic principles of stochastic processes. In the fourth year mathematical statistics continues and grows out into geostatistics for the purpose of orebody evaluation. It enables some of the rapid progress in the OR package and it is in turn enabled by the NLP part of the OR which is essential to an understanding of the geostatistical estimator's governing set of equations. Geostatistics then gradually turns into mine planning for which mathematical programming as well as, of course, CPM-PERT are important tools.

Finally, in mineral process modelling -- an optional paper -- the same mathematic prerequisites of queueing theory form the basis for modelling liberation processes.

If this short article has gone some way towards explaining how OR forms an integral part of a modern mineral engineering course it has served its purpose, perhaps a useful purpose.

Wal Schaap

*** STOP PRESS ***

In the Preceedings of the 19th Conference, there is a page missing in Rod Brodie's paper (between pages 14 and 15). Write to Rod (Ag. Econs and Mkting, Lincoln College, Christchurch) to get a copy.

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BOOK REVIEWS

"INTRODUCTION TO OPERATIONS RESEARCH TECHNIQUES"
Daellenbach, George and McNickle

The breathlessly awaited second edition of Daellenbach and George, "Introduction to Operations Research Techniques", has finally appeared. It has mutated into Daellenbach, George and McNickle, a fact that may account for the ease with which the OR group at Canterbury decided on the textbook for most of their courses next year. Requests can be printed exactly as written for examination copies for instructors seriously considering adoption can be sent to the agents, Benton Ross Publishers, Box 33-055 Takapuna. An instructors manual is available direct from Allyn and Bacon.

"GRAPHICAL METHODS FOR DATA ANALYSIS" by John Chambers, William Cleveland, Beat Kleiner, and Paul Tukey, Wadsworth International, California (395 pages)

Most OR practitioners need to know the various methods for analysing, communicating and displaying data. This book provides a useful reference of methods. Methods range from the simple pencil and paper, such as stem and leaf, through to computer based analysis.

The book looks at six groups of methods: portraying the distribution of a set of data, comparing distributions, studying two dimensional data, plotting multivariate data, assessing distributional assumptions about data, and regression models.

To quote from Chapter 1 "There is no single statistical tool as powerful as a well chosen graph". A book well worth having on one's shelf.

Hugh Barr

'LOGISTICS MANAGEMENT' Educational Services, Digital Equipment Corporation (109 pages)

This book is about carrying spares for a computer system, and covers replenishment of spares (inventory) and forecasting demand. The main objectives, naturally, are to maximise service, and to minimise inventory investment. There is considerable conflict between these two objectives, which the book seeks to discuss and reconcile. Such items as ABC analysis, target stock level, economic order quantity, Bell curve, fixed period and fixed quantity models and forecasting are discussed.

The books runs over level of service, obsolescence (common with computer spares), failure rates, repair rates. There are some very helpful illustrations, (one enclosed) and a down to earth practical approach, that should help to get computer maintenance engineers (logistics managers) in the right ballpark. The book is readily adaptable to inventory control of systems other than computing. All in all a very practical guide to inventory control.

Hugh Barr

P.S. This book is available from the Applied Mathematics Division, DSIR Library, 7th Floor, Rankine Brown Building, University Campus.