From the Editor

Linear Programming (LP) is probably the most widely used of all O.R. techniques. It certainly is one of the most misused and abused. Textbooks on the subject abound, and O.R. students are taught the simplex method, and even non-O.R. people find their own applications amongst production/allocation, transportation, product/feed mix, refinery modelling, economic planning, etc. The basic idea of maximizing or minimizing an objective subject to a set of constraints and having the solution tell you what to do is at once simple and appealing, especially when the recipe is a standard algorithm. In his age of information and computers, data is seemingly no problem; or is number-crunching power, even micros.

However, we hear of as many LP disasters as success stories. Why? Is it the fault of the LPers, the teachers or the technique itself?

In my experience unsuccessful LP users only have themselves to blame. Too many users are unaware that rubbish in is rubbish out. Sponsors of large models (and sometimes the model developers) underestimate the commitment in terms of data, manpower and computing that such models usually require. Often the reason for modelling is fuzzy or lost - for insight or for answers?

The usual lame excuse for an LP failure is usually found among it was the data; there are economies of scale; 3) integer variables; 4) non-linearities. If only the user knew that there are ways around these problems or else you are using the wrong tool.

I once heard a certain economist (a member of ORSNZ!) say that if a model goes wrong you shoot the modeller; not the model! My sentiments exactly! Although to protect myself, I would say the modeller's boss!

During this year's Conference, we are privileged to have the presence of Prof. George Dantzig. He will speak on "The Origins of LP" and "Solving Large Scale LPs". On the morning after the conference he will give a seminar on an application of NLP to "Energy/Economic Growth and Dynamic Equilibrium".

BE THERE to gain some insight into how it is done. And share the expertise and experience of a great LP'er.

ANNUAL CONFERENCE
with
KEYNOTE SPEAKER
PROFESSOR GEORGE B DANTZIG

2 & 3 SEPTEMBER 1985

Victoria University of Wellington
Hugh McKenzie Building, HM1
Kelburn Parade
WELLINGTON
1985 STUDENT PAPER

1st: Ian Twomey - Auck Uni.
"Corporate Planning at N.Z. Steel"

2nd: Craig Mcloed & Nicola Ward - Canty Uni.
"Tunnel House Scheduling for Brookby Farm"

Congratulations!

WELCOME TO NEW MEMBERS

The following are from David Ryan's classes at TAM Dept,
Auckland University:

- Colin Garlick
- Alex Geers
- Malcolm Halliday
- Leon Higgins
- Alister Hookings
- Joanne Keestra
- Beth Regan
- Martin Rowe
- Stephen Tordiech
- Ivan Vuletich
- Thomas Yee
- Ian Twomey (Student Paper Prize winner)

And two student members from the Mainland:

- Nicola Ward - Canty U.
- Craig Mcleod

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BIRTH NOTICE: Gregory (initially known as 'XY'). A son for our President, Bruce Benseman and his (better?) half, Julie. A brother for Timothy.

No fears of the impending communist takeover by Kevin Hall, and SAS. Our ex-V-P has gone to Hong Kong to set up SAS operations on the British colony.

One of our Conference organisers David Whitaker, has been attracted away from Victoria University by the DSIR (Anything the Private Sector can do, we can do too.) He will become AMD's man in Auckland.
If you were after answers to the question "how do I forecast demands for 10000 products in inventory?" then you would have been disappointed. But Professor Scott Armstrong's advocacy of formal methods for strategic (long-term) planning was both humorous and persuasive. He spoke mainly about his research on various published studies, and how successful formal methods had been compared with informal methods. He also gave guidelines for forecasting, though these had been given fuller treatment the previous day.

His main recommendations were to:
1. separate planning from the forecasting process;
2. do separate forecasts for different possible situations eg environments, capabilities, and strategies;
3. develop a model if possible.

Scott said getting commitment was the key to successful planning. There are 4 important steps which should be dealt with explicitly and formally (see the figure). Commitment must be maintained throughout the process.

This is described more fully in Scott's paper "The Value of Formal Planning for Strategic Research" in Strategic Management Journal Vol 3: 197-211 (1982).

The meeting was held in Turnbull House next to Wellington's political hot-spot. Despite the atypically wet and windy day, about 100 people packed the room, some standing, showing what interest there is in this topic. Scott covered a lot of material, with a great deal of pizzaz, providing many useful pointers for better planning.

Vicky van den Broek.
### Conference Calendar

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<th>Year</th>
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<td>1985</td>
<td>Sept</td>
<td>10-12</td>
<td>12th IFIP Conf. on Systems Modelling &amp; Optimization (Budapest, Hungary)</td>
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<td>Dec</td>
<td>27-30</td>
<td>Modelling &amp; Simulation - Int. AMSE Conf. (Gorakhpur, India)</td>
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<td>1986</td>
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<td>The Society for Computer Simulation Multi-conference (San Diego, California)</td>
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<td>Mar</td>
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<td>8th Annual Conf. on Computers &amp; Industrial Engineering (Orlando, Florida)</td>
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<td>May</td>
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<td>CAPE '86 - 2nd Int. Conf. on Computer Applications in Production &amp; Engineering (Copenhagen, Denmark)</td>
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<td>Sept</td>
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<td>Economics &amp; Artificial Intelligence - 1st IFORS/IFIP/IFAC Int. Conference (Aix-en-Provence, France)</td>
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<td>16-19</td>
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Further details available from Vicky van den Broek-Mabin, Box 904, Wellington (ph 727-855)

### PRIME & PRINCESS OF WALES SCIENCE AWARDS

Closing date for these awards is 31 August. (See March newsletter.) Application forms available from Royal Society of NZ, P.B., Wellington.

### NEW JOURNALS/BOOKS

- "Annals of Operations Research" (Editor-in-Chief P.L. Hammer)
- "Queueing Systems" (Ed-in-Chief N.U. Prabhu)

Special private subscription rates. Contact: Drs W.H. Wimmers, Science Publisher, Limburghof 4, 1083 Amsterdam, The Netherlands


- "Journal Contents in Quantitative Methods", ISSN 0142-5951, is a monthly publication that lists contents pages of about 120 journals in O.R. (24), statistics (51), economics (16), finance (7), marketing (8), production (5) and the behavioural sciences (11). $116 approx/year. Inquiries to: The Editor, Journal Contents in Quantitative Methods, Dept of Mgmt Sciences, University of Manchester, Institute of Science & Technology PO Box 88, Manchester M60 1QD, England
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DEC a trade mark of Digital Equipment Corp.
Immanuel Kant (1724-1804), the German philosopher, wrote in the preface to his "Metaphysical Foundations of Science" (1786): "I however declare that each particular discipline contains only as much science as it contains mathematics." This statement was based on the insight that only formal reasoning - in the sense of mathematical precision - could produce "a priori" knowledge about the nature of objects and that only such knowledge is apodictic, i.e. certain.

This applies to the role of mathematics in Operational Research and Management Science (OR/MS) as well. Take for example the "a priori" knowledge about queuing systems that has been developed by queuing theory. In the simplest case (M/M/1), random arrival with an average of \( \lambda \) per time unit is assumed. Formal reasoning leads to an exponential distribution of the time distance between two arrivals or - as its inversion - to a Poisson distribution of arrivals per time unit. Similar derivations lead to the equivalent distributions of service time or units served per time unit, respectively - with a service rate of \( \mu \) units per time unit in the average. One can then derive a formula for the probability that \( i \) units are in the system at the same time. Further deduction leads to the well-known formula for the average number \( n=p/(q-p) \) of units in the system. Its application brings about surprising results, for example: The queue contains \( n=2 \) units in the average if the system is only occupied at a rate of \( p/q=2/3 \), and \( n=4 \) units for \( p/q=80\% \) and \( n=9 \) units for \( p/q=90\% \). Such knowledge about queues is apodictic for any case in which the assumptions are met (and can be used as a good approximation for many other cases).

Without such formal - mathematical - reasoning, only empirical "a posteriori" knowledge could be produced. Independent of how many real queues were examined, empirical results would never lead to apodictic "a priori" knowledge.

However, Kant ought not to be misunderstood in the sense that mathematics per se would raise a discipline to the level of a science. It is not mathematics as such, it is the internal content of mathematics in a discipline that makes it a science. That means that mathematics (or formal reasoning) have to contribute to the understanding of the objects under study. These objects ought not to be only virtual, instead they have to have significance in reality.

Kant would also be misunderstood if one assumed that "a priori" knowledge could be produced for any kind of question. This is not true. For instance, there exist no doors towards "a priori" knowledge of the outcome of most social and political processes in "purposeful systems" (Ackoff and Emery). "A priori" knowledge (through formal reasoning) can be produced primarily for cause-effect mechanisms, to a much lesser extent for means-end relations and to no degree at all for the evaluation and setting of ethical values and aesthetical qualities. In OR/MS we have to deal with all of these four dimensions.

Heiner Müller-Merbach
President of IFORS