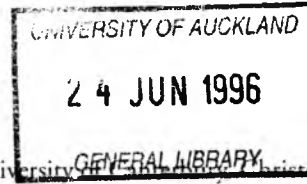# OR NEWSLETTER

Operational Research Society of New Zealand (Inc.), PO Box 6544, Wellesley St, Auckland, New Zealand   **June 1996**

EDITORIAL

Hans G. Daellenbach, Dept. of Management, University of Canterbury, Christchurch, N.Z.
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Editorials should be short and sweet. This one is definitely the former! As you will have noticed, the size of this newsletter is again reduced to eight pages. In fact, it took some imaginative thinking to stretch it to that length.

The short-lived burst of enthusiasm for the newsletter in response to the obituary in the January issue turned out to be simply a hiccup. It filled the March issue. Since then the normal state of silence has returned. Is there in fact anybody out there? HELLO! ???????

As a believer in the existence of stochastic processes not only as a mental construct for what we cannot explain otherwise, but as a fact of nature (praised she be!), I should obviously see this hiccup as simply a manifestation of a stochastic process. My difficulty is to decide what the steady state of that stochastic process is. All evidence seems to point to a trapping state, i.e., the editor writing the newsletter by himself (with the much appreciated help of some colleagues at Canterbury, particularly Don McNickle, who manages to have a contribution for practically every issue).

If the steady state is as experience seems to indicate, I really should call this epistle the 'HGD Newsletter', but then I do not feel any real need to publish a newsletter. If I have the need to say something, I might as well send it directly to the UK OR Newsletter or to MS/OR Today, rather than have them copy it from our newsletters. They seem to appreciate the occasional refreshing blast from the antipodes.

I took on the editorship on the urging of Grant Read, when he was president of the society. I thought that with a little bit of organization and some forceful arm-twisting it should be possible to publish a newsletter every three months, and on time! Boy, was I naive! I had no trouble with the organization part — you know me — but these arms turned out to be made of rubber. No amount of twisting seemed to cause any emotional pain, normally referred to as 'a bad conscience'. But heck, I am probably talking just to myself right now again!

Contents

Palmerston North contribution

Hamilton contribution

Wellington contribution

Auckland contribution

EXPERIMENTAL DESIGN FOR SIMULATION — SUMMARY OF THESIS

Twan A.J. Vollebregt, University of Canterbury, Christchurch, N.Z
(Twan completed his Ph.D. at Canterbury in February 1996 and is temporarily in the UK)

The research reported in this thesis is concerned with experimental design, in the context of stochastic simulation. Current experimental design methods for simulation are critically examined, and existing alternative methods investigated. A new approach to experimental design is then proposed, and its properties discussed and illustrated through a number of examples. This thesis finishes with a discussion of an area for future research, namely sequential experimental design.

The focus in the initial stages of the research was on the more general area of Response Surface Methodology (RSM). This methodology consists mainly of experimental design theory, parameter estimation methods, and function optimisation methods. Chapter 1 provides a review of the literature in this area. Many different design, estimation, and optimisation methods can be used as part of RSM. The initial research objective was to determine which of the many different methods suggested in the literature were suitable for practical implementation into experimental design software. Such an implementation would ideally allow practitioners to use the methodology to answer quantitative questions about a simulation model, without requiring (i) full knowledge of the theory behind the methodology, and / or (ii) input data that the practitioner is unlikely to have.

The component of Response Surface Methodology which appears to have received the most attention in both the simulation and general statistical literature is experimental design. However, a closer investigation into experimental design theory revealed that there were no obvious candidate methods in the design literature that are suitable for practical implementation in software. In addition, many design methods that were originally developed for an agricultural context appear to have been applied in the simulation context with little consideration as to the difference between the contexts, and the implications of a number of classical assumptions.

As a result, the focus of this research shifted away from the general Response Surface Methodology area, and towards experimental design theory. The aim of the research then became the development of experimental design theory specifically for the simulation context. A major emphasis of the research was to develop a design method that can easily be coded up in software, and requires a minimum of user input.

In Chapter 2 we critically examine the literature on experimental design for simulation, and conclude that there are a number of significant concerns with the application of classical design methods to simulation. These concerns include a number of important restrictions placed on the experimenter, and the potential for very inefficient experimental designs. We then propose a new approach to experimental design in Chapter 3. This approach is similar to the classical optimal design approach, in that the design is found by solving an optimisation problem (design problem). However the focus of our approach is quite different from the classical approach, and we introduce an element of sequentiality. In Chapter 4 we consider the elements of our design problem, and how they can be selected. We also investigate solution methods, and develop a solution heuristic. Some properties of our approach are illustrated in Chapter 5. It is found to be most efficient for very large experiments, and can lead to bias if the usual regression and variance estimators are used. Finally, in Chapter 6 we discuss fully-sequential experimental design, and conclude that a number of research issues (mostly issues concerning estimation bias) must be resolved before sequential design methods can be confidently applied.

READ ELSEWHERE

In the February 1996 issue of *Systems Practice* R. L. Ackoff, the father of 'Messes", reminds us that a problem may not have a solution or a conflict may not be resolvable because of the manner in which it is formulated or approached. Often a change of point of view or of our frame of reference will lead to discovering a solution or resolution.

Systems scientist, he says, and by extension, operations researchers, should view an apparently intractable problem as a challenge. They should approach it with the a priori assumption that it is solvable or resolvable. It becomes then largely a matter of casting it in the right frame of reference. Obviously, if you approach a problem with the self-imposed constraint that 'It can't be done!', you are bound to seek confirmation of this.

SPECIAL ISSUE OF OMEGA
Call for papers for performance measurement in the Asia-Pacific countries

The success of the Asia-Pacific economies is widely remarked. The contribution of management science to this success is of wide interest. A special issue of Omega is planned which will be devoted to the role and effectiveness of aspects of management science in the Asian-Pacific countries. In order to give a focus, the special issue will concentrate on methods of performance evaluation, including in particular, but not exclusively so, data envelopment analysis (DEA) and its variants. It is hoped to elicit papers from as wide a range of evaluated activity as possible, thereby providing a perspective on the many kinds of developments occurring in the Asia-Pacific region. Papers which combine methods of evaluation employed in an intrinsically interesting field would be particularly welcomed. Examples of such papers might be (i) a combined use of the analytic hierarchy process and DEA to evaluate textile manufacturing performances in China, or (ii) a combined use of DEA and stochastic frontier regressions to evaluate the performances of water districts in Japan.

The guest editors for this special edition are Professor W. W. Cooper (The University of Texas at Austin); Professor K. Tone (Saitama University, Japan); and Professor T. Sueyoshi (Science University of Tokyo). Papers should be submitted in quadruplicate to them of the above by 31 December 1996. The papers should be prepared according to the normal Omega guidelines set out in 'Instructions to Authors' in each issue of the journal. They will be reviewed to the normal Omega criteria.

It is planned to publish the special issue in the later part of 1997.

Professor W. W. Cooper, Dept of Management Science & Information Systems
College and Graduate School of Business
The University of Texas at Austin, CBA 5.202
Austin, TX 78712-1175, USA

WRITING FOR THE NEWSLETTER

Don McNickle, University of Canterbury, Christchurch, N.Z.
e-mail: d.mcnickle@mang.canterbury.ac.nz

The newsletter is usually first assembled as a WordPerfect file, and then finally formatted on a Macintosh using Pagemaker. So please send us:

1: A printed copy of your item, showing how you want it to look, where the pictures are to be, and so on.

2: If you are using a Macintosh send the document down as a Macintosh disk, but please enclose a PC formatted disk with the text of the item on it so we can assemble it.

3: If you are using a PC send us a copy of the text on disk in Word, WordPerfect or as an ASCII file. Keep formatting in this to a minimum.

4: Send the pictures in any file format that a Macintosh can read. For PC-produced pictures Windows Bitmap (.BMP) files like those produced by Paintbrush or .PCX files are OK. Tiff (.TIF) or Encapsulated Postscript (.EPS) files also work well.

5: Just in case include clean copies of the pictures. If all else fails we can scan them in. Photos can also be scanned in if you want them.

WHY NOT WRITE SOMETHING FOR THE NEXT ISSUE?

32ND ORSNZ ANNUAL CONFERENCE ANNOUNCEMENT

Ross J. James, Conference convenor, Dept. of Management, University of Canterbury, Christchurch, N..Z.
e-mail: rjj@mang.canterbury.ac.nz

Important Dates

30 June	Deadline for Halls Accommodation with full payment
1 July	Deadline for Papers
1 August	Last day for Conference Registration before late fee imposed
29 August	The 32nd ORSNZ Conference

Papers

F. Amos, M. Ronnqvist and G. Gill, "Modelling the pooling problem at the New Zealand Refinery Company"

J.K.Sankaran and G.R. Balu, "Controlled Periodic Order Release in Dynamic Job Shops: Analysis and Simulation"

C.B. Basnet, L.R. Foulds, and J.M. Wilson, "A Heuristic for Vehicle Routing over Tree-Like Networks"

C.B. Basnet, "A Decision Aid for Milk Tanker Pump Scheduling"

G. Bell, "Applications and Solution of Nonconvex Network Flow Problems"

D. Boland, "Cumulative Graphical Representation of Queues"

I. Bowden, "Optimal Lumber-Marketing Decisions with Uncertain Prices"

S Braddon-Parsons, W. Stewart and D. McNickle, "Revising G1/AS1"

K. Broad, "Power Generation Planning Using Scenario Aggregation"

J. Buchanan, J. Scott and N. Haigh, "Reflections on Student-Centred Learning in a Large MS/POMS/MIS Class Setting"

S. Butt and D. Ryan, "Using Column Generation to Solve the Multiple Tour Maximum Collection Problem" R. Cavana, "Community OR in Action: Wellington Girls' College Cricket Facilities Project"

H. Daellenbach and N. Petty, "Systems and OR/MS Methodology Module for MENTOR"

C. Dang and H. van Maaren, "An Arbitrary Starting Variable Dimension Algorithm for Computing an Integer Point of a Simplex"

G. Gill, "Blending petroleum products at NZ Refining Company"

N. Hawcroft and R Cavana, "Systems Modelling as an Aid to Decision Making by Retail Electricity Suppliers in New Zealand"

E. Houghton and V. Portougal, "Lean-JIT Production"

R.J.W. James, "Comparing the Performance of Search Heuristics in Solving the Early/Tardy Machine Scheduling Problem"

M. Johnston, "A Game Tree Search Based Heuristic Strategy for the Competitive Prize Collection Problem"

K. Moshirvaziri and M. Amouzegar, "A Subdivision Strategy for Reverse Convex Programming Problems"

A. Kerr, E.G. Read, and J. George, "Short-Term Hydro Scheduling using Integer Programming: Management and Modelling Issues"

V. Mabin and J. Gibson, "Productivity Improvements from Spreadsheet LP used with the Theory of Constraints"

A. Mason, "A Roster Construction Heuristic for Generating and Allocating Shifts to Staff"

K. Mayes, "Drama Theory as a Tool for Strategy Development"

D. Noble and M. Al-Amin, "Locomotive Rostering: The Analysis of Two Problems Arising in Victoria, Australia" D. Robb and J. Heyl, "Operations Management Education in New Zealand Universities"

C. O'Sullivan, "Short-term National Electricity Dispatch Subject to Uncertain Demand"

A. Philpott, D. Ryan and G. Zakeri, "Inexact Cuts in Stochastic Benders Decomposition"

H.V.V. Prasad and J.K. Sankaran, "Optimization-Based Distribution Planning for Consumer Electronic Items"

S. Rennie, "A Comparison of Methods for Portfolio Optimization"

M. Ronnqvist and A. Philpott, "Scheduling fault-repair workers"

M. Ronnqvist and G. Zakeri, "Parallel Solution of facility location problems using Repeated Matching"

M. Ronnqvist, E. Astrand, A. Astrom and M. Osterberg, "A Solution Approach for a Spectral Classification Problem"

D. Ryan, A. Philpott and G. Zakeri, "Techniques for solving large-scale set-partitioning problems"

C. Stevens, "Sequencing Robotic Component Placement at Fisher and Paykel"

S. Sun, D. Hoffman and C. Newton, "Can AHP Reflect True Judgmental Weights?"

S. Sun, D. Hoffman and C. Newton, "Extension of Cost/Benefit Analysis in Decision Analysis"

R. Thalieb, C. Newton and D. Hoffman, "Modelling the Problem of Waiting Times in Defence Manpower Systems"

C. Todoroki and M. Ronnqvist, "Edging Optimzation with Dynamic Programming"

J. Ventura and S. Radhakrishnan, "A Lagrangian Relaxation Method for scheduling Mixed Model Assembly Lines for JIT Production Systems"

J. Ventura and M. Weng, "Tight Upper Bounds on Optimal Broadcast Networks"

H. Waterer, "Hydro-electric Unit Commitment Subject to Uncertain Demand"

N. Zhu and K. Broughan, "On Reducing the Number of Variables in Integer Programming Problems"

MEETINGS CALENDAR

1996 IFORS Conference in Vancouver, B.C.
8 - 12 July 1996
Venue: Hyatt Regency, Vancouver
Conference theme: OR bridging the theory and practice of decision making
Conference Secretariat, IFORS 96, Venue West Conference Services Ltd., 645 - 375 Water Street, Vancouver, BC, Canada V6B 5C6, FAX (604) 681 2503
Chairman program Committee: Prof. Theo Stewart, Dept. of Math. Statistics,
University of Cape Town
Rondebosch 7700 South Africa
FAX +27 21 650 3918/3726
e-mail: *TJSTEW@maths.uct.ac.za*

ORSNZ 32nd Annual Conference
Thursday/Friday 29-30 August 1996
University of Canterbury, Christchurch, New Zealand
Convenor: Ross J. James, Dept. of Management, University of Canterbury, Christchurch
e-mail: *rjj@mang.canterbury.ac.nz*
See above for a list of papers received.

OR 38, Warwick
3 - 5 September 1996
Warwick Business School, University of Warwick, Coventry CV4 7AL
Contact: Prof. Robert Dyson or Dr Emmanuel Thanassoulis
e-mail: *orsrd@warwick.ac.uk*

INFORMS Atlanta Fall 1996 Meeting
3 - 5 November 1996
Atlanta Hilton & Towers, Atlanta GA
General Chair: Faiz A. Al Khayyal, Georgia Institute of Technology
School of Industrial and Systems Engineering, Atlanta, GA 30332-0205
e-mail: *FALKHAYY@GTRI01.gatech.edu* (note: it is gtri zero one)

INTERNATIONAL CONFERENCE ON OPERATIONS AND QUANTITATIVE MANAGEMENT
5-8 January 1997
Jaipur, India
Call for papers: abstract of max. 100 words with US$20 submission fee by 25 June 1996.
General chair: Omprakash K. Gupta, Indiana University Northwest, 3400 Broadway, Gary IN 46408-1197, USA
FAX: 001 219 980 6579
e-mail: *ogupta@ucs.indiana.edu*

13th INT. CONFERENCE ON MCDM
6-10 January 1997
University of Cape Town, Cape Town, South Africa
Contact: Theodor J. Stewart, Dept. of Stat. Science, University of Cape Town,
Cape Town, South Africa
e-mail: *mcdm97@maths.uct.ac.za*

THE INTERNATIONAL INSTITUTE FOR GENERAL SYSTEMS STUDIES
9 - 11 Jan. 1997
Southwest Texas State University, San Marcos, Texas USA
Main speakers: George J. Klir, Tuncer Oren, Lofti A. Zadeh
Call for papers: Two copies of abstracts of at least 800 words plus a one page summary by 10 June 1996. For more details contact
Dr Yonghao Ma, Co-chair
Dept. of Math., Southwest Texas State University, San Marco, TX 78666 USA
e-mail: *ma@iigss.math.swt.edu*

AUSTRASIAN CONFERENCE ON TECHNOLOGY FOR MANUFACTURING
12-13 February 1997
Massey University, Palmerston North, New Zealand
Call for papers: 15/8/1996
Contact: Technology for Manufacturing Conference, Attn: Conference Coordinator,
Dept. of Production Technology, Massey University, P.B. 11222 Palmerston North, New Zealand
e-mail: *D.J.Houston@massey.ac.nz*

INFORMS San Diego Spring 1997 Meeting
4 - 7 May 1997
Town and Country Hotel, San Diego CA
General Chair: Fred Raafat, San Diego State University, College of Bus. Adm.
San Diego, CA 92182

INT. CONFERENCE ON METHODS AND APPLICATIONS OF MCDM
14-16 May 1997
Mons, Belgium
Call for papers: 15/9/1996
Correspondence: Mrs Diana Raulier (B), MAMDM, FUCAM,
Chaussée de Binche 151, B-7000 Mons, Belgium
e-mail: *meskens@message.fucam.ac.be* or *raulier @message.fucam.ac.be*

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*

APORS' 97 - 4th Conference - PRELIMINARY ANNOUNCEMENT
30 Nov. 1997 - 4 Dec. 1997
Melbourne, Australia
Invitation to be added to mailing list, contact: APORS' 97, c/o ASOR Melbourne Chapter
GPO Box 1048H, Melbourne, Australia 3001
e-mail: *P.Lochert@sci.monash.edu.au*
FAX (61) 3 903 2227

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*

Vacant Position
Editor of ORSNZ Newsletter

This prestigious position is being offered on a first come/first sucker basis. The duties are to edit, publish and distribute the society's newsletter promptly at the beginning of January, April, July and October each year. It involves about two days work for each issue, preceded by two months of frustrations.

The successful applicant is supposed to have infinite patience, send out prior to the deadline for each issue e-mail reminders to potential contributors and correspondents (although there will be little need to actually check for incoming mail messages), and in the end be willing to write most of the newsletter by her/himself. The aspiring editor would be well advised to see this state of affairs not as a negative point, but as an opportunity to show off her/his literary ability. It is a real ego booster to see yourself in print and know that you have done it almost by yourself. Hence, it would be an ideal position for a young aspiring academic in need of self-administered warm fuzzies. Other qualifications needed are the ability to spell, a minimal background of grammar and sentence structure, as will as the willingness to use these skills on any contributions submitted (although the latter event is rather remote!), and a sense for consistency and aesthetics in presentation. Naturally, the position is honorary!

Send applications to: Dr. A. Philpott
                     Dept. of Engineering Science
                     University of Auckland
                     P.B. 92019
                     Auckland
                     New Zealand
                     e-mail: a.philpott@auckland.ac.nz

(This advertisement was placed by the current editor!)