INSIDE O.R.

SEPTEMBER 2012 — NO 501
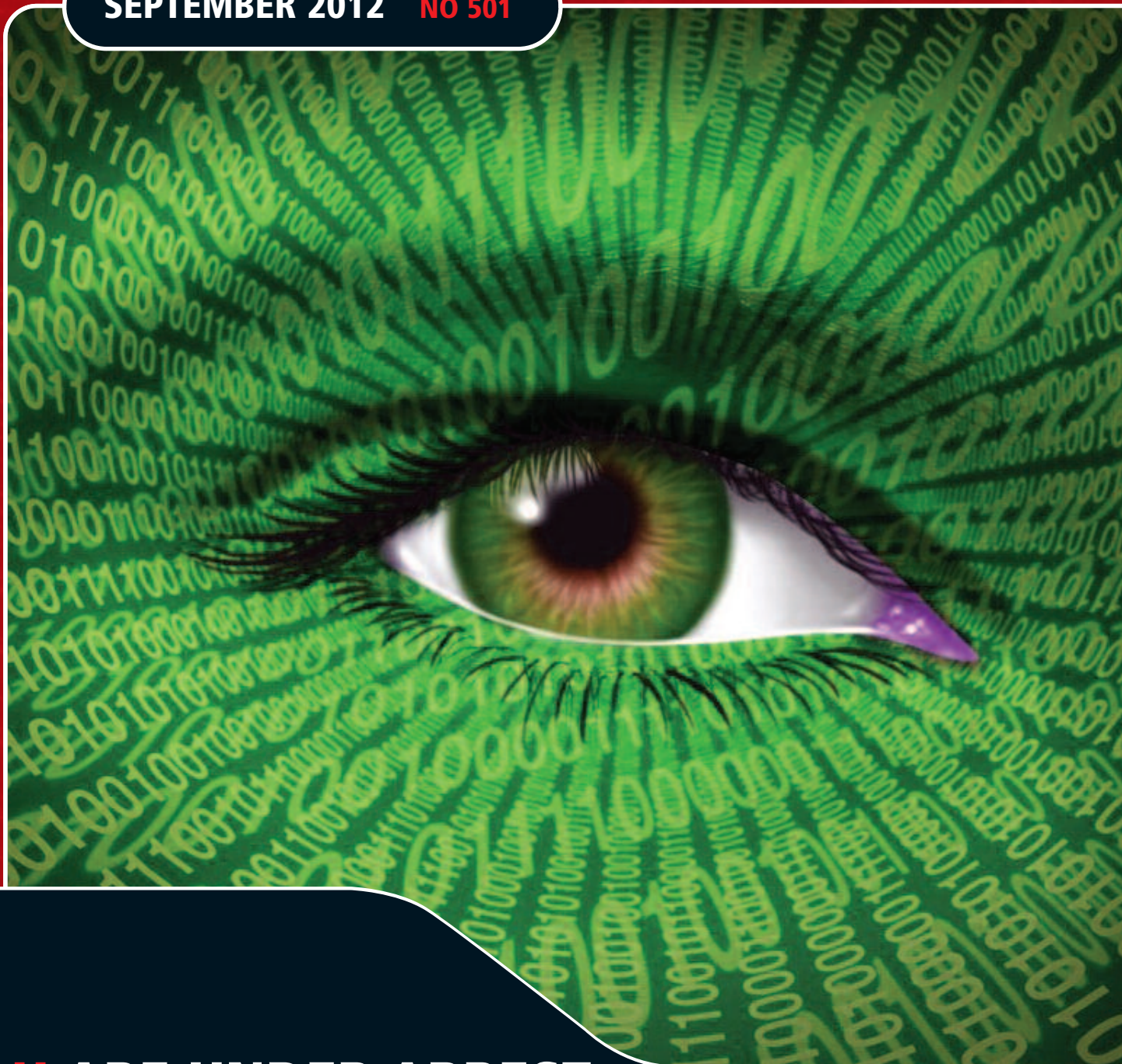
YOU ARE UNDER ARREST FOR A CRIME YOU HAVE NOT YET COMMITTED

: : INSIDE THIS MONTH : : : :

THE OR SOCIETY

www.theorsociety.com

::::::::NEWS::
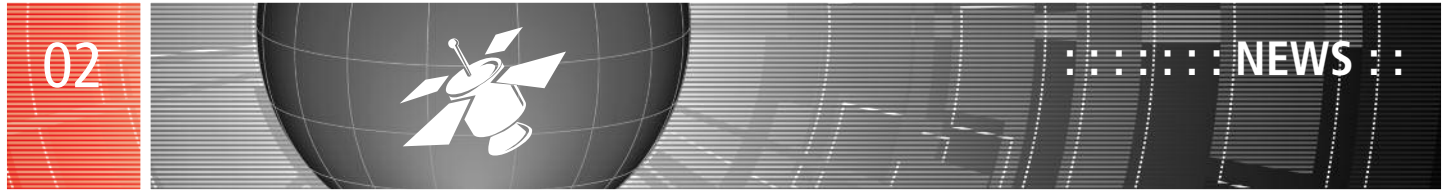
How membership of The OR Society will help your career path

Despite its low cost, membership of the UK Operational Research Society brings you many benefits. These include:

- **INSIDE O.R. EVERY MONTH** keeping you up to date with job opportunities, salary levels and current topics in the O.R. world

- **REDUCED PRICES** for the Society's training courses, which comprise the most comprehensive O.R. training programme in the world.

- **A QUARTERLY MAGAZINE** OR Insight, containing reports of O.R. in action

- **A SUBSCRIPTION** to the Society's main journal, one of the world's leading O.R. journals (print available on request; electronic version available to all members)

- **FREE ATTENDANCE** at meetings of any of the Society's 21 special interest groups and its ten regional branches

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EDITORIAL

JOHN CROCKER

If it is September then the leader writer must be the President. I am expecting this particular article to generate at least one or two responses and so as not to be disappointed in my predictions, I shall make one myself.

Geoff likens O.R. practitioners (not sure if he is including academics) to General Practitioners (i.e. doctors/medics) and architects. He points out that our role includes diagnostics: identifying the causes of the observed conditions and symptoms. He also suggests that we are designers insofar as our solutions or recommendations will likely involve a number of changes to the system to enable it to work more efficiently, cost-effectively, etc.

I believe he has missed out a third string to our bow: Engineering. I agree that we are both diagnosticians and designers but we also have to be practical and pragmatic. Very often we are required to produce solutions to problems in what we used to call a 'quick and dirty' way, i.e. one which often was at variance with normal procedures simply because there was neither the time nor the money to allow the luxury of solving a problem exactly with full supporting documentation and exhaustive testing. I know of many cases where a prototype was developed to test out the feasibility of using a specific approach to solving a problem that was still in productive use many years later.

Also in this issue, see if you can find the links between Lovell, Tizard and Jones. We also have an interesting look at bunching buses, hunting dolphins, arresting criminals both before and after the fact, a report from Vilnius, who is best at buying the right players plus a number on analytics.

This month is the Conference which will be held in Edinburgh and appears to have a very full and interesting programme. I am hoping to be there to find people who would love to write an article about their experiences at the Conference or about one, or more, of the papers presented – I guess that means no one will come near me now but at least I can pretend that it is because they have all read this article and not for any of the usual reasons! If you feel you are a budding journalist or have something in particular you want to say about the Conference then, as they say, a volunteer is worth a thousand conscripts so please feel free to approach me or anyone from the IOR team. If you are a dab hand with the camera then please send in any photos you think captures some aspect of the Conference.

This month is also the month for regional AGMs. If you are holding one could you let me know how many people and/or members attended and who the new officers etc are. I will try to put together an article about the current state of these groups.

As always, if you have anything you wish to share with your fellow members or comments to make about any of the articles, how we can increase membership what we should be doing as a Society or whatever, please send them in.

If you have read this far, you have clearly too much time on your hands, but seriously, please seek out Gavin's article on this year's Careers Open Day.

<OR>

WHERE ARE THEY NOW?

The following members on the Society's mailing list have recently had their mail returned to the Membership section, presumably because they have changed their address.

Would any member who is currently in touch with them please ask them to email Carol.Smith@theorsociety.com advising us of their current whereabouts so that we can update our database and return to a speedy and efficient service.

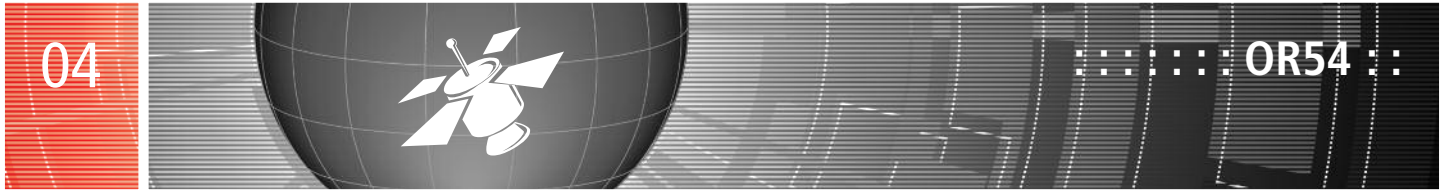|			
Edward J Hagger	London	Faith E Benjamin	USA
David Crawford	London		

<OR>

'MAKING AN IMPACT' PRACTITIONERS' DAY – PART OF THE OR54 CONFERENCE

RUTH KAUFMAN AND JOHN RANYARD

Wednesday, 5 September 2012, University of Edinburgh

'Making an Impact' is a one day event within the OR Society annual conference specially designed for O.R. practitioners, consultants and analysts with workshops, discussions and networking. The day is organised by practitioners for practitioners.

Analytics? Data-mining? Process engineering? Decision support? Or just knocking up a spreadsheet to help somebody work out what's going on? Whatever you call it, if your day job requires you to solve problems in organisations – in-house or external – the 'Making an Impact' day is for you.

You'll meet leading practitioners and others working in the field, share experiences and learn about key topics and see case studies illustrating some of the best in application.

What should you expect on Making an Impact Day?
Practical Applications

Three presentations showcasing the best in O.R. practice, competing for the prestigious President's Medal award; and a conference plenary talk from Jason Field, based on nearly a quarter of a century's experience of O.R. practice at Ministry of Defence, highlighting the challenges in the use of O.R., its place in the decision making process and how best to get the message across.

Speed Networking Session

A structured, fun and focused session specifically designed to help you meet as many people as possible working in O.R., in a series of short face-to-face meetings.

Facilitated Workshops
'Hot' Topics in O.R. Practice
Choose from a variety of topics including 'technique tasters', professional & personal development, networking for introverts, build your own (simulated) pub, and much more.

Practitioner – Academic Collaboration:
Maximising the Impact of academic research
Chaired by Professor Sally Brailsford and introduced by four experienced practitioners and academics, this interactive session will explore how practitioners can get the most value out of O.R. research and help academics to maximise the 'real world' impact of their work.

And round off the day with a drinks reception sponsored by Simul8.

The 'Making an Impact' Day takes place within the three-day OR54 conference, which has much more to stimulate and benefit practitioners, including case-studies showing a wide range of application in a wide range of industries; the opportunity to meet some of the world's leading experts on techniques including forecasting, simulation, logistics; and a variety of inspiring presentations and events.

There's still time to book at
http://www.theorsociety.com/Pages/Conferences/OR54/OR54BookInfo.aspx

We look forward to welcoming you there!

<OR>

OR54 NOT BOOKED YET? THERE'S STILL TIME!

Thanks to the hard work of the committee, everything is now in place for another excellent Annual Conference.

At the time of writing we've received bookings from about 250 delegates of whom more than one-third are from the practitioner community.

OR54 has assembled 24 parallel streams from 'Analytics' to 'Stochastic Scheduling and Dynamic Allocation Problems' and much more in between.

Full details of the streams can be seen at

http://www.theorsociety.com/Pages/Conferences/OR54/OR54Streams.aspx

The OR Society's website has dedicated conference pages which can be located at www.theorsociety.com/OR54 where titles and a schedule of papers can be found. The state-of-the-art conference facilities at the John McIntyre Conference Centre at the University of Edinburgh is the location for OR54.

Networking
Delivering or listening to presentations of papers, plenary talks and keynote addresses are, of course, the main items on any conference agenda. But we also like to include a few recreational events to facilitate networking and leaven the mix. It's customary to arrange a number of visits to local places of interest on the Wednesday afternoon and your OR54 committee has organised three very interesting options.

No trip to Scotland is complete without sampling some of the local produce so the tickets for the visit that's been laid on to Glenkinchie Whisky Distillery were quickly snapped up. Delegates have also liked the idea of taking in some interesting architecture and beautiful gardens at Lauriston Castle so that coach is full, too. But there is still some availability for the museum trip and there's none better than the National Museum of Flight which houses, among other superb exhibits, a Concorde.

As ever, one of the social highpoints will be the Conference Gala Dinner which will be held on Wednesday evening in the South Hall. In addition to the excellent dinner and company, there will be a live Ceilidh band to dance (or listen…) to until midnight and a cash bar will be available for the duration of the evening.

If you've not yet booked, there's still time if you hurry! Online registration is available on the website. We look forward to seeing you in Edinburgh!
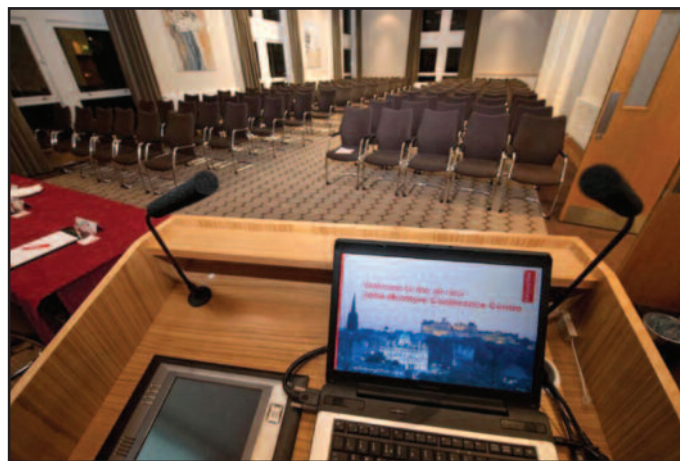
Thank you
We'd like to thank the following organisations for their kindness in being our sponsors, exhibitors and leaflet suppliers: Aimms, Banxia software, Decision lab, Dstl, Elsevier, Edinburgh Napier Business School, GORS, Jaywing (Alphanumeric Ltd), John Wiley & Sons, Natcor, Oxford University Press, Palgrave Macmillan, Palisades, Paragon Business Solutions, Taylor & Francis, Simul8 Corporation, Simulation Solutions, University of Edinburgh Business School, University of Southampton.

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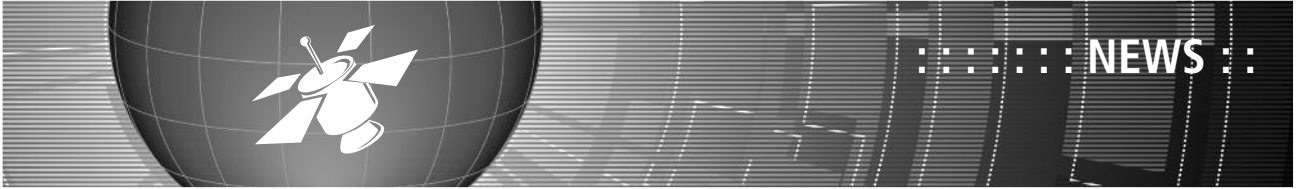
MSPLP 4 IOS

NIGEL CUMMINGS AND JOHN CROCKER

If, while you are enjoying a bit of sunbathing on one of Djerba's white sandy beaches for example, you suddenly have the urge to solve an LP problem that has, perhaps, been bugging you for weeks, fear not. For, as long as you have remembered to tuck your charged-up iPhone or iPad into whatever you might be wearing, you can for just £1:49.

Markus Seidl has developed his MSP LP Solver to run on iPhone and iPad devices in order to provide a simple to use yet powerful linear program solver using the lpsolve library. According to Seidl, his solver uses the simplex algorithm and advanced methods to solve the model the user supplies via an easy to learn LP syntax. He says the use of the application is as simple as 'Just writing down your constraints as you are used to in conventional LP solver applications more commonly found on the desktop'.

Once installed, this tiny but powerful application presents an interface which allows its users to enter the constraints easily and solve the problem quickly. The application he says,

was originally designed to allow students to understand and benefit from the use of LP solving techniques, but it has quickly found favour amongst teachers, Operational Researchers, and the interested hobbyist.

The only limits placed on his MSP LP solver are related to the memory available on handheld and tablet type devices using iOS. With a mere 16 GB of memory one can solve quite large problems but with 32 GB, the world is one's oyster as they say.

Seidl claims that it provides the full power of an evolved LP Solver (lpsolve, not to be confused with something to cure chapped lips which might also be a useful thing to carry with you). He has also paid attention to equipping the application with easy-to-use syntax import, just like the equation input features that are available on more complex solving applications.

This Solver is also said to have an extremely rapid learning curve, as you can see from the screenshot associated with this article it seems to provide all the necessary LP tools to achieve satisfactory solutions without being limited to the constraints of a desk top environment.

According to its author, the Solver is deliberately being pitched as a 'low priced application' to encourage maximum number of sales and get the product seen by as many interested parties as possible. Incorporating the Simplex algorithm into a small cheap application for a handheld device must be no mean feat for the program developer.

Having installed it prior to this review and then worked with some of the example files provided, I can see that Markus Seidl's application is a remarkably powerful LP Solver that belies its cheapness. Dantzig's Simplex algorithm (or simplex method) has been a popular algorithm in linear programming for many years. That it can now be accessed from a handheld device is really quite remarkable.

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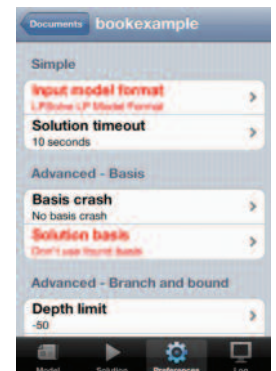
CONFERENCE NEWS

EVENT:	OR54 Annual Conference	DATE:	4 – 6 September 2012	VENUE:	Edinburgh University
EVENT:	Careers Open Day	DATE:	21 November 2012	VENUE:	Nottingham Conference Centre
EVENT:	Blackett Lecture	DATE:	29 November 2012	VENUE:	The Royal Society, London
EVENT:	YOR18 Conference	DATE:	9 – 11 April 2013	VENUE:	University of Exeter
EVENT:	KIM2013 Conference	DATE:	4 – 5 June 2013	VENUE:	Forest of Arden Hotel, nr Coventry
EVENT:	IMS105 2013	DATE:	3 - 4 July 2013	VENUE:	University of Salford
EVENT:	OR55 Annual Conference	DATE:	3 – 5 September 2013	VENUE:	University of Exeter

08

NEW VENUE FOR CAREERS OPEN DAY

GAVIN BLACKETT, SECRETARY & GENERAL MANAGER

Birmingham University's dark and dingy Underground Bar is a thing of the past! Or at least it is as far as our Careers Open Day is concerned. For over 35 years we've held our Careers Open Day at Birmingham University but our patience with the cramped accommodation has finally run out. This November's event will take place at the Nottingham Conference Centre, located in the centre of the city.

The NCC entrance on Goldsmith Street

This Grade II listed building should provide the perfect venue to inspire the hundreds of student delegates towards a career in O.R. or analytics.

The day provides a mix of career talks and the chance to speak to employers and universities, to say nothing of the free entry, the free tea and coffee and a free snack lunch.

Previous years have featured up to 25 exhibition stands, and with our new light, spacious venue (see below) we've got room for even more. Please help us make this an event to remember. Even if you don't have job vacancies, come along to tell these future analysts all about the fascinating careers available in O.R. and analytics. If you'd like to give one of the case study or recent graduate presentations, please get in touch with Louise Orpin on louise.orpin@theorsociety.com.

Further details of the event and venue are available from our website. There are also details of previous exhibitors and programmes. Details of the 2012 programme will be posted as soon as it is confirmed.
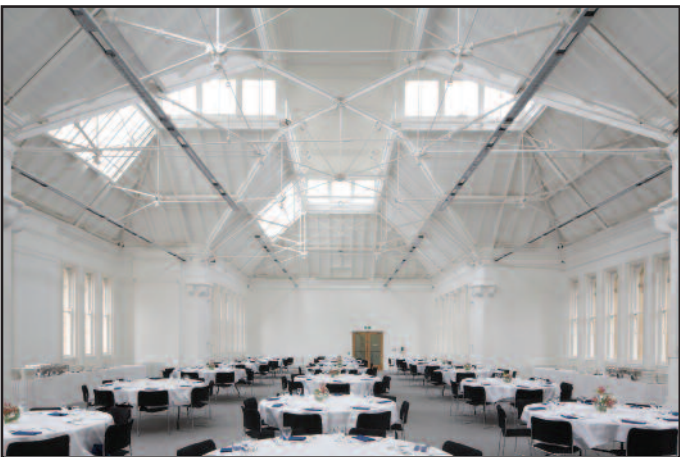
The Old Museum exhibition area and the Adams lecture hall

The event will take place on Wednesday 21st November 2012. Promotional material will be sent out to many University departments, but if you can identify potential attendees, point them to the website and encourage them to sign up.

<OR>

Careers Open Day 2012
Come and meet the future of O.R. and Analytics

For 36 years, The OR Society Careers Open Day has proved valuable for employers wishing to recruit graduates. The event typically attracts around 300 final year and postgraduate students who are interested in a career in an O.R. or analytics based environment. In addition to the Careers Exhibition, the event includes a programme of informal presentations from O.R. practitioners at various stages in their careers and case study streams where graduates can listen to practitioners' first hand experiences of life working in O.R.

The Open Day will be held at the
Nottingham Conference Centre
on Wednesday 21 November 2012

We'd like to offer you the opportunity to meet the people who will form the future of the O.R. and Analytics profession by taking a stand at the Open Day Careers Exhibition. To reserve a stand – which costs £280 + VAT – please email your full contact details to Louise Orpin, louise.orpin@theorsociety.com, at The OR Society **not later than Monday 5 November**. An invoice will then be provided.

THE OR SOCIETY, SEYMOUR HOUSE, 12 EDWARD STREET, BIRMINGHAM B1 2RX

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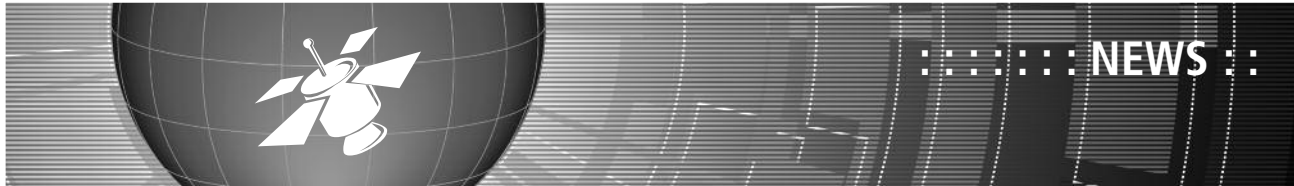
WOULD YOU LIKE TO GET INVOLVED IN RUNNING THE SOCIETY?

GAVIN BLACKETT, SECRETARY & GENERAL COUNCIL

The Society's General Council (GC) and various underlying committees help set the strategic direction and convert its plans into actions.

GC is made up of 36 Society members, serving as representatives of the Regional Societies, a representative of the Special Interest Groups and National members. The five officers of the Society serve on GC, and together with six other members of GC act as trustees on its Board. Members of GC can serve up to two terms of three years.

As a result of this, GC benefits from a regular turnover in membership. The formal election notice, together with details on how to get nominated, has been posted on the website. If you'd like to get involved, the vacancies are listed below. Go online to find the documentation.

The commitment includes attending 3-4 meetings a year, and working on follow-up actions. Please get in touch with me if you'd like discuss this further.

Call for nominations

Officers of the Society to serve on the Board of Directors and on the General Council

Nominations are invited from fully paid up members of the Society for the following vacancies

President Elect	Twelve sponsors
Vice President	Six sponsors
Treasurer	Six sponsors

Members of the General Council

Nominations are invited from fully paid up members of the Society for the following vacancies

Up to 7 national members †	Six sponsors each
Special Interest Group member ‡	Six sponsors
Regional member, East Midlands *†	Six sponsors
Regional member, Midlands *	Six sponsors
Regional member, North West *	Six sponsors
Regional member, West *	Six sponsors

* Regional members must be nominated from among their own number by members within the region.

‡ Special Interest Group member must be nominated from among the SIG officers.

† Some incumbent members are eligible to stand for a second term.

Nominations must be received by the Secretary and General Manager on or before **30th September 2012.**

LATE NOMINATIONS WILL NOT BE ACCEPTED.

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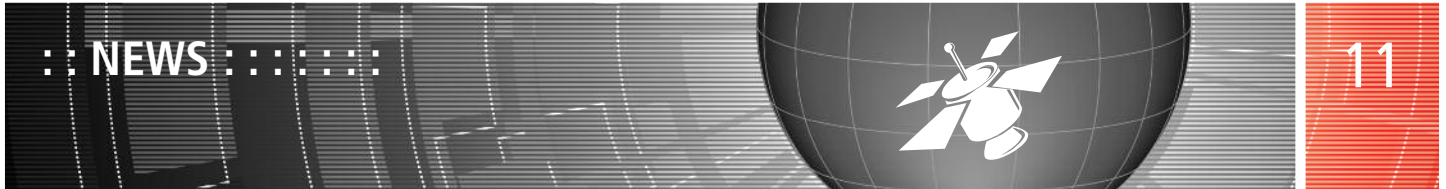
THE FIFTH EUROPEAN CONFERENCE ON INTELLIGENT MANAGEMENT SYSTEMS IN OPERATIONS – IMSIO 5 (2013)

3-4 July 2013, University of Salford, U.K.
Organised by The OR Society

Call for Papers

Operations management poses a number of problems of significant complexity where a solution would lead to more effective operations and bring significant economic benefits. Solving such a problem, however, may require novel approaches that are based on techniques and principles from both Operational Research and Artificial Intelligence.

As with the previous four conferences held since 1997, this conference aims to bring together researchers and practitioners working on the challenging problems in operations management that are at the OR-AI interface. The conference will be held at Media City, Salford Quays.

Media City, Salford Quays

Researchers and practitioners from industry and academia are invited to submit papers in all areas related to aspects of design, development, testing and implementation of intelligent management systems in manufacturing and service operations covering but not restricted to:

- Media Operations
- HealthCare
- Knowledge Management in Operations
- E-Business and E-Manufacturing
- Finance and Credit Scoring
- Logistics
- Maintenance and Fault Diagnosis
- Scheduling and Capacity Planning
- Supply Chains and Inventory Management
- Process Design, Quality Management & Control
- Operations and Control of Intelligent Buildings

Papers describing case studies utilising or evaluating AI techniques such as Neural Networks, Data Mining, Knowledge Discovery, Semantic Ontologies, Knowledge Based Systems, Case Based Reasoning, Fuzzy Logic, Bayesian Networks, Agent Technology as well as Hybrid Intelligent techniques are particularly encouraged.

Key Dates & Deadlines

* Indication of intention to present a paper as soon as possible
* Extended abstract of around 500 words to be submitted by 30 November 2012.
* Accepted papers to be notified by 21 December 2012.
* Full papers to be submitted by 29 March 2013.

Organising committee

Khairy A. H. Kobbacy, University of Salford (Chair)
Sunil Vadera, University of Salford (Co-Chair)
Hilary Wilkes, Conference Organiser, The OR Society

Submission Procedure

Send intent to attend/submit a paper or abstract to:
Khairy Kobbacy or Sunil Vadera,
The University of Salford,
Salford, M5 4WT UK.
EMail: k.a.h.kobbacy@salford.ac.uk; s.vadera@salford.ac.uk

<OR>

SIR HENRY TIZARD BETWEEN THE WARS

JOHN CROCKER

This is the third part of a potted biography of Sir Henry Tizard taken entirely from a biography written by Ronald W. Clark published in 1965.
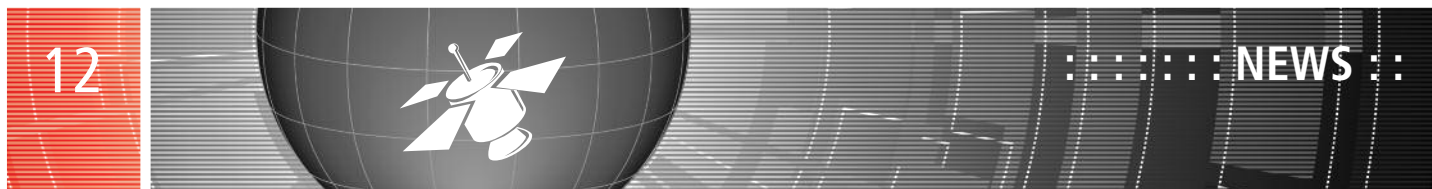
This drew very heavily on Tizard's own unfinished, unpublished autobiography, his papers and those of Lord Cherwell (Frederick Alexander Lindemann). We take up the story just after World War I.

After returning to Oriel at the end of the war and sorting out their finances by selling some of their land when land prices were at a peak, Tizard landed a research contract through (Sir) Harry Ricardo with the Asiatic Petroleum Company to investigate the performance of a range of fuels and in particular their preponderance to pre-detonating (or 'knocking'). Together with a colleague this work led to the toluene number – the fore-runner to the octane rating used today. Very simply, this is the proportion of toluene that has to be added to heptane to achieve the same performance as the fuel being tested.

Tizard had met Lindemann in Berlin at Nernst's laboratory in 1908 where he noted that Planck's lectures on mathematical physics were attracting audiences of some 400 students by contrast with Cambridge where a professor in this area would be lucky to keep half a dozen.

His relationship with Lindemann was a rather interesting one. They would argue to they were red in the face (noted Sir Vernon Brown) over something as trivial(?) as the most economical way to pack oranges in a box. In a letter to Sir Harold Hartley, Tizard noted that Lindemann was a destructive critic with his contributions to Physics over the 20 years he was head of Clarendon Laboratory, Oxford (a post that Tizard had done much to secure for him) 'much fewer than I had expected from him'. He also notes that although his intellectual powers were outstanding, his judgment was poor. But for all that, he gives him much credit for raising the status of the Clarendon Laboratory.

By 1920 most of the research work had been completed but instead of carrying on up the ladder of an academic career at Oriel, he was invited to become an Assistant Secretary on the Advisory Committee with the Department of Scientific and Industrial Research (DSIR). This was set up to try to co-ordinate all the research work being undertaken under the auspices of Defence both within the various research centres and by universities. These ranged from the use of selenium cells in detecting x-rays, aircraft silencing, metal fatigue to the cultivation of artichokes (for the production of industrial alcohol). One particular study was trying to determine the height of the Heaviside layer in the hope of improving radio reception. This work would lead a decade later to the development of radar. Whilst in this post, Tizard had demonstrated his ability to converse equally well with the scientists and the Services. He had shown he was unswayed by personal ambition and this together with his clinical

objectivity and integrity had earned him a trust that was to be of 'crucial importance'.

Tizard did much to try to get the status of scientists and scientific advisors raised to what he regarded as an acceptable level and turned down at least one appointment in the attempt. By this time, he was mixing with many of the great scientists of the day and was starting to make his mark. Following an incident in Canada he identified a deficiency with the 25 Hz frequency of the Canadian grid which resulted in the UK National Grid standard being set at 50 Hz – a none too popular decision with the UK electrical industry at the time.

But it was in the Defence sector where he was to make his biggest impact. In WWI bombers had got through the defences pretty much undeterred. Anti-aircraft guns were neither sufficiently accurate nor agile to stand very much chance of destroying these aircraft. At the same time, fighters could not stay in the air long enough to sit waiting or have sufficient speed and visibility to spot the aircraft in time to close in to within firing range.

Up until the mid 1930's there had been much debate about 'death-rays'. Energy of some form directed at aircraft and/or their pilots with a view of rendering one or the other unworkable. It was Watson-Watt who asked the question of A.F. Wilkins (his assistant) how much energy would need to be transmitted to raise the temperature of a certain quantity of water to a certain temperature. (The quantity was approximately equal to volume of blood in a man and the temperature was that of a fever.) The calculations indicated that it was completely out of the question with the technology available at the time or in the foreseeable future.

Tizard also realised that detection using sound waves either in the form of listening or by using reflected ultra-sonics was also impractical. As early as 1922, Marconi had noted that radio waves could be reflected or deflected by large metal objects which he suggested might make it possible for one ship to detect the presence, speed and direction of another some miles away by sending out a radio wave and using a receiver to pickup any reflections. Appleton had used a similar method for measuring the height of the radio-reflecting ionosphere and extended this to generate a display on a cathode-ray tube.

In January 1931, Butement and Pollard, Signals Experimental Establishment proposed (according to *Inventions Book of the Royal Engineers Board*) a method for detecting ships from shore or from other ships by transmitting short wave (50 cm) pulsed radio transmissions and listening for their reflections using a rotatable

:: NEWS : : : : : :

> 'Tizard's own wartime experience as a pilot also proved invaluable by making sure whatever was being proposed was feasible given the conditions under which pilots had to operate.'

aerial and reflectors to provide a narrow beam. Although they managed to get it to work, it was somewhat limited in range to around 100 yards. In December 1931, two Post Office radio engineers working with short wave radio transmissions reported fluttering of signals whenever an aeroplane passed nearby. Two Bell Telephone workers in the US had detected aircraft even when they were out of sight. But none of this reached the right ears.

Watson-Watt asked Wilkins how much energy would be required to produce a detectable signal from an aircraft at a given range. Making a number of approximations, Wilkins' computations suggested that it might be feasible. Watson-Watt passed this to Wimperis in time for the first meeting of what was to become known as the Tizard Committee, the main purpose of which was to determine whether it would be possible to defend Britain from air attack. (The general consensus at the time was that the bomber would always get through.)

The Committee comprised Tizard, Chairman, Wimperis and Rowe (Air Ministry), Blackett and Hill who added scientific weight and a knowledge of Service Problems (see *OR minus 30* ibid). Blackett had been through Dartmouth and Osborne and had served in the Navy during WWI (including serving on the cruiser HMS *Carnarvon* at the battle of the Falkland Islands and the battleship HMS *Barham* at Jutland). Hill had been an Army Captain while organizing his anti-aircraft research. Tizard's own wartime experience as a pilot also proved invaluable by making sure whatever was being proposed was feasible given the conditions under which pilots had to operate. The Committee over the years leading up to WWII gained considerable respect from those at the sharp end but things were not so easy with those higher up where 'science' was often regarded as being synonymous with 'new-fangled'. (It should be remembered that in those days, possibly even more so than today, politicians would pride themselves on having no knowledge of 'science' and of having failed their mathematics exams.)

The Tizard Committee was to become the custodian of the country's safety with Tizard the unofficial scientific advisor to the Air Ministry with the position of both being very weak. They started by introducing the primitive radar (or RDF as it was then called) system of early warning that revolutionised defence. They managed to get treasury funding of £10,000 for experimenting which was to become the basis of a massive electronics industry. The Committee lacked executive power which meant that whenever they wanted to

test out some new idea or equipment, the resources would have to be begged on the 'old-boy net' often against considerable opposition from those who 'preparing to fight the last war'. Much of the secretarial work (typing etc) was done at Tizard's expense and most of the private interviews were carried out in his flat in St James's Court.

At the first meeting Wimperis gave Watson-Watt's reply on the use of death rays. This led to a discussion on the use of barrage balloons which, it was agreed should operate at 5000 ft. On 14th February 1935, Tizard, Sir Christopher Bullock and Wimperis met for lunch at the Athenaeum to discuss Watson-watts paper on 'Detection and Location of Aircraft by Radio Methods'. On 15th February Wimperis proposed to Air Chief Marshall Dowding that £10,000 should be spent on investigating the new method of detection. Dowding suggested preliminary tests at Slough. It was however decided to carry out the first test/demonstration at Rugby on 26th February. Squadron leader R.S. Blucke piloted a Heyford bomber while Watson-Watt, Wilkins and Rowe (acting as official Air Ministry observer as well as Tizard Committee Secretary) watch a green blip on a cathode ray tube rise and fall as the Heyford flew through the signal. Dowding told Wimperis he could have as much money as he wanted (within reason).

Everything went very quickly and relatively smoothly with an experimental station being set up at Orfordness on the sandspit which became an island at high tide. They had developed the system that would detect aircraft but as yet not their direction, distance or height.

At this point things take a new and rather unwelcome twist with the intervention of Professor Lindemann but you will have to wait until next month to find out more.

Clark, Ronald W., (1965), *Tizard*, Methuen & Co Ltd

Jones R.V., 1982, A Concurrence in Learning and Arms, *JORS* 33.9 Pp 779-791 (jors1982173a.pdf)

<OR>

MEDICINE O.R. ARCHITECTURE?

GEOFF ROYSTON

' The O.R. professional is often faced with problems that have something in common with the challenges faced by an architect.'

Many years ago I wrote a short piece for *Inside O.R.* (back when it was called the *O.R. Newsletter*) in which I discussed the problem that O.R., as seen by others, suffered from some misclassification problems.

In particular that others tended to assume 'operational' meant tactical, that 'research' implied impractical, and that they too often equated the tools of O.R. (especially mathematics and computing) with O.R. itself.

I suggested that one approach to overcome or at least mitigate this problem would be to present our work so it aligned more clearly with a 'general problem cycle' that would be familiar to managers, illustrated in the Figure.

Figure: A General Problem Cycle
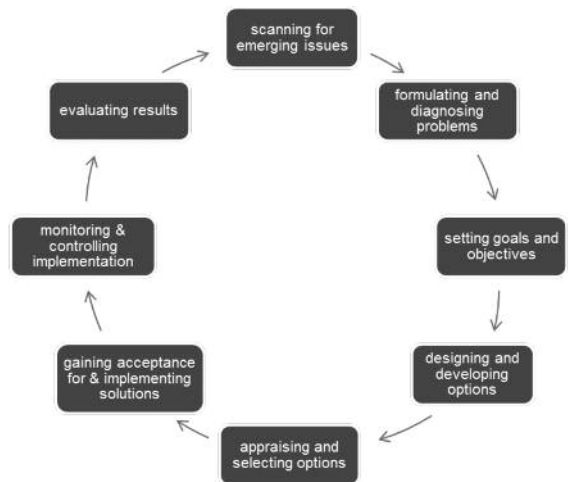
The idea was that presentation of our work on these lines might provide a more marketable agenda for O.R. than one based on the tools of the trade or on narrowly technical problems.

To accompany that generic approach, I suggested that we might usefully present ourselves as 'general analysts'. This drew on some analogies with general practitioners of medicine (who, in examination, diagnosis and prescription, follow their own version of the above problem cycle).

The analogy with medicine, particularly with the work of a G.P., seemed - still seems - useful. Firstly it places the focus on a client and their problem rather than on tools and techniques. Medicine needs and uses disciplines like biochemistry or physiology, but as a means to the practical end of helping a patient, not for knowledge for its own sake. Similarly, O.R. needs and uses disciplines like mathematics or computer science, not as ends but as means to its primary goal of helping with a client's (or at least a potential client's) problems.

Secondly, it emphasizes the importance of taking a systemic view. G.P.s need to take a holistic approach when considering the problems of, and interventions for, their patients, who frequently present with multiple conditions with more than one cause. A systems perspective is also essential in public health medicine, to help understand and control the spread of disease in a community. Just as the G.P. or the public health medic, by taking a broad systemic view, offers something distinct to patients and the public from those who specialise in a narrower area such as orthopaedics or cardiology, the O.R. professional, seen as a general analyst, offers something different to the world of management and organisation from that provided by those working in a single more specialised area such as economics or psychology.

So, medicine provides one useful analogy for us. But there is another profession with which analogy might usefully be drawn: architecture.

Like the O.R. worker, the architect is concerned with helping in a structured way (literally so in the latter's case!) with a client's problem, and also like the O.R. worker, the architect uses diagrams and models as virtual worlds on which to experiment. Like clinicians, architects follow their own version of the general problem cycle, but with a particular emphasis on innovation and the problems of design.

Design is challenging because it requires conceiving and assessing what can be a vast range of alternatives, with much iteration to find feasible and desirable solutions, because many design problems cannot be neatly subdivided into independent sub-problems, and because the process of designing, especially when done together with clients, often brings about changes in the perception of what needs to be designed.

Sounds familiar? The O.R. professional is often faced with problems that have something in common with the challenges faced by an architect. Although we may sometimes be asked simply to help with the choice between pre-existing options, more often we are given - or discover - a much more open-ended problem: the conception and creation of something that will improve a situation. That is a broad question of design; yet O.R. is persistently characterised as being primarily concerned with the important but narrower task of assisting decisions. This sells O.R. short.

The importance of design for operational research and management science was recognised in the 1960s by early luminaries such as the Nobel laureate Herbert Simon. He considered design to be the *'core of all professional training',* including in management, and in his seminal book 'The Sciences of the Artificial' called for *' a science of design'* which would concern itself with topics such as the representation of design problems and the search for alternatives. He included in this science many of the then new methods of operational research.

Simon warned that design skills were being squeezed out of management training, and the later well-known series of papers on O.R. by Russ Ackoff noted that such skills were also being sidelined in management science. Ackoff argued that traditional techniques of analysis – techniques he had done much to promulgate - were insufficient for tackling important managerial and societal problems. He argued that also needed were the skills of synthesis.

His stated view was that the paradigm of O.R. should involve *'designing a desirable future'* and his explicit challenge to O.R. professionals was *'not so much to improve our methods of evaluation, but to improve our methods of design and invention'*.
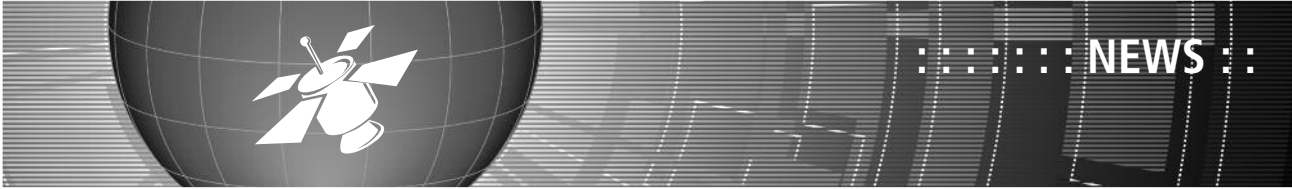
Such concerns were noted and acted on by a number of people in the O.R community, at least on this side of the Atlantic. The most obvious result was the development of what came to be called 'soft O.R.'. This sought to widen the role of the O.R. professional from technical expert with an emphasis on solving precise and sometimes unrealistic problems to that of reflective inquirer with an emphasis on framing and structuring problems of the real world in helpful ways.

This undoubtedly helped widen the vision of O.R. and did much to meet the criticisms of Ackoff and others, but the development of 'soft O.R.' appears more a response to the general criticism on the limitations of 'hard' technical approaches than to the specific call to accord a central role to design. There has been the occasional acknowledgement of the relevance of aspects of design thinking to O.R. – for example the strong but hidden similarities between engineering design and O.R. has been discussed by Albert Holzman, the implications for MS/OR of the shift in managerial interest from analysis for marginal improvements to design of complete systems has been noted by Robert O'Keefe and the relationships between operations management and design have been considered by Jan Holmstrom. Generally however such recognition has been sparse.

A passable case for the defence, or at least a plea in mitigation, could be made that O.R. is deeply involved with design, but just does not make this sufficiently explicit. We should not forget that O.R. in the modern era was founded in a challenge of design - creating the British air defence information system that played such a crucial role in WW2. Design clearly continues to feature in O.R. work to this day - a look at, say, the winners over the years of the OR Society President's Medal, or of the INFORMS Edelman award, shows that many of the projects have involved sizeable amounts of system design work. So maybe the main challenge is to recognise, publicise and develop this hidden expertise.

How might we market our design skills more explicitly and effectively? (The slogan developed to help publicise O.R., 'the science of better', hints at something that goes beyond decision making but the associated publicity materials have not highlighted design thinking). More importantly perhaps, how can we improve our design skills - how do we educate and train O.R. people better for these more creative aspects of our work? Developing our capability to embed technical problem solving and decision analysis in a wider activity of reflective inquiry and innovative design must surely increase our range, relevance and impact.

In operational research we need the diagnostic expertise of a physician. We need the architect's skills of design. We are – or should be - both medics and architects.

< OR >

HEY BIG SPENDER

IAIN HUBERT, CAPGEMINI

The European championship that has just finished has seen some of the best display of football talent that the planet has to offer. So now attention turns to who will own this talent in the season to come. Of the clubs that have the cash to splash, which are the best at targeting talent?

Getting hold of data on football transfer fees is not easy, as clubs sometimes do not disclose the total spends, however enough data is available to produce some interesting analysis. The graph below shows all of the teams that have been in the Premier League at some point over the last five years. The transfer data has been compiled by transfer league.

Money makes points make prizes

So what does the data show? Well if we plot average spend against average points scored, then as could be easily predicted, we get a chart that indicates that as you spend more you get more points.
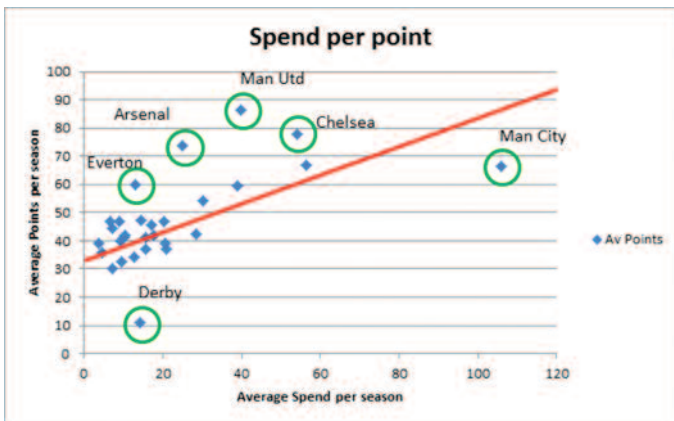
Figure 1: Premier League team spend per point

However the chart also shows something else that is interesting. The rising gradient of the graph indicates that not only do you have to spend more money to get more points, but you also have to spend more money per point to get more points.

This is shown in Figure 2 which shows the top and bottom of the £m per point of each of the teams being considered: -

Manchester City	1.59
Derby County	1.30
Liverpool	0.84
Chelsea	0.69
Sunderland	0.67

Tottenham Hotspur	0.65
Queens Park Rangers	0.56
Aston Villa	0.56
Portsmouth	0.53
Manchester United	0.46
…..	…..
Wigan Athletic	0.25
West Bromwich Albion	0.25
Burnley	0.25
Bolton Wanderers	0.24
Everton	0.22
Swansea City	0.19
Blackburn Rovers	0.17
Norwich City	0.14
Reading	0.13
Blackpool	0.09

Figure 2: Premier teams of the last 5 seasons and their £m per point

As you can see, the top of the table includes the top clubs like Manchester City, Chelsea and Liverpool, whilst the bottom of the table includes those who have either been relegated or who are perennial relegation fodder like Wolves, Bolton and Blackburn.

So whilst Blackpool are perhaps the most efficient team in terms of £s per point – i.e. the best at targeting talent – this does not do them any favours when it comes to even staying in the Premier League, let alone winning trophies.

So who is the best (spender)?

To determine the best team for 'targeting talent', then we may need to look at the teams that are achieving better than their peers in terms of efficiency. In the graph these teams are shown as the ones that are well above the average line such as Everton, Arsenal and Manchester United.

However the question remains, what is the purpose of efficiency? Everton may be very efficient at £220,000 per point, but they have only achieved an average of sixth in the Premier League. Similarly Arsenal at £338,000 per point looks good, and they have qualified

for the Champions league in each of the last five seasons, however *what have they actually won*?

So ultimately the acid test may well be not the £s per point, but the £s per trophy. Of the major trophies available to English clubs, four teams have won 12 major trophies over the last five years. Their £s per trophy is shown in the following table: -

From this table, and from the graph above, it does indeed look as if Manchester United is the best spender in the Premier League.

... and the worst?

If Manchester United is the best, who is the worst? There is absolutely no doubt about that. It is Derby County who spent £14.3 million in 2007/8 and ended up with only 11 points!

If you have any comments you wish to share with Capgemini then please follow this link. http://www.uk.capgemini.com/business-analytics-blog/2012/07/05/hey-big-spender-2/

Team	Premierships	Champions League	FA Cups	£m per trophy
Manchester City	1		1	264.64
Portsmouth			1	61.90
Chelsea	1	1	3	54.06
Manchester United	3	1		49.65

Figure 3: Major trophy winners and the £m per trophy

<OR>

ICORD WORKSHOP IN TUNISIA: 12-13 OCTOBER 2012

GAVIN BLACKETT, SECRETARY & GENERAL MANAGER

Do you fancy swapping the misery of (most of) the British Summer for the white sandy beaches and blue sea of Tunisia's Djerba island? Well, by participating in IFORS' latest workshop on 'O.R. in Development', you could.

Since 1992, IFORS has organized a series of International Conferences on O.R. for Development (ICORD), approximately every three years. It has now been decided to formalise this timing, and to hold ICORD conferences on a regular basis in conjunction with the IFORS Triennial Conference.

In addition, and in order to enhance continuity and interest in the field, IFORS is now launching an additional program to conduct workshops in non-IFORS Conference years, to be held across IFORS'

different regions. The hope and intention is that representatives from these workshops will make presentations at the subsequent ICORD Conference.

The aims of the new structure are to achieve a greater momentum for the O.R. in Development programme through greater frequency and visibility of actions, and an improved focus for O.R. in Development activities on selected problem-oriented themes.

The 2012 ICORD Workshop will be held on Djerba island, Tunisia. Located south of Tunisia, Djerba is famous for its excellent white sandy beaches, blue sea, dramatic sunsets, and rural Mediterranean farms. The island is surrounded by many small islands where the only inhabitants are birds and is a popular tourist destination.

If you're tempted by this (the workshop), you can find more details at **http://ifors.org/web/icord-workshop/**

<OR>

MIT PROFESSOR GABRIEL BITRAN HONOURED IN POMS JOURNAL

NIGEL CUMMINGS

MIT Professor Gabriel Bitran, well known in the world of O.R. and a key figure in hierarchical planning techniques and the provision of duality and algorithmic results for fractional programming problems, has been honoured by POMS Magazine, an O.R. Journal published in the U.S.A., for his 'Exceptional Service And Leadership in his Field'.

Gabriel Bitran, born in 1945, attended the Polytechnic School at the University of Sao Paulo, in Brazil, and received a PhD in O.R. from MIT in 1975. His doctoral thesis provided several results related to the characterisation of the structure of admissible points with respect to cone dominance, as well as the study of duality for optimisation problems in that context.

Bitran was awarded the Distinguished Fellow of the Manufacturing and Service Operations Management (MSOM) Society (June 2009). He was also awarded the INFORMS Revenue Management and Pricing Section Historical Award (2009). This award recognised his critical contribution to the science of pricing and revenue management published in English, prior to 1999.

Bitran was Editor-in-Chief of Management Science from January 1990-December 1996, and President of POMS (Production and Operations Management Society) in 2004. He has also received several awards for his research. In parallel to his PhD thesis Bitran worked with Arnoldo Hax, who had written, with Harlan Meal, a seminal paper on Hierarchical Planning for Large Scale Systems. In that paper the authors reported on several heuristics used in practice.

Bitran's contribution to this topic was to show, in a paper co-authored with Hax, that the heuristics used in practice corresponded to approximating the solution of specific optimisation problems. This result allowed a more formal analysis of the heuristics, including identifying instances where the procedures could lead to infeasible solutions.

Work on Hierarchical Planning inspired Bitran's research from 1982 to 1987. During that interval he studied non-capacitated as well as capacity constrained production systems under deterministic and stochastic conditions. During this time he addressed topics which included, computational complexity, heuristics, and the determination of parametric bounds. During the following 10 years, 1988-1998, his research was sponsored by companies in the semiconductor and telecommunication industries.

Entrepreneurial research was then undertaken by Bitran to understand and model the complex production processes typical of those industries. The underlying model used was that of Stochastic Networks processing a wide range of products through hundreds of steps.

Bitran is also a source of information on the design of service delivery and manufacturing systems. His work in this field addresses topics that include matching the supply and demand in service systems, capacity planning, technology selection, pricing of perishable and seasonal products, and understanding consumer behaviour in highly interactive services such as the Internet.

He is also known for work on the concept of Trade-off Curves which show that under mild assumptions manufacturing network of queues can be characterised by a signature and by trade off curves between capacity and work in process or average service time. This property allows the development of algorithms to determine, at the tactical and strategic levels, the effective sequence of changes in resources in networks to achieve a desired output.

Gabriel Bitran is the Society of Sloan Fellows Professor of Management and a Professor of O.R. at the MIT Sloan School of Management.

<OR>

OR54 GOES MOBILE!

## The OR Society's Annual Conference, OR54, has gone mobile using Guidebook!

We strongly encourage you to download our mobile guide to enhance your experience at OR54. You'll be able to plan your day with a personalised schedule and browse exhibitors, maps and general conference info.

The app is compatible with iPhones, iPads, iPod Touches and Android devices. Windows Phone 7 and Blackberry users can access the same information via our mobile site at m.guidebook.com.

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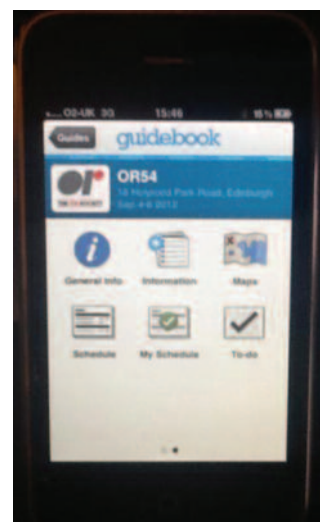
BOOKS FOR REVIEW

If you would like to review a book, please contact Jim Chilcott at:
JORS-bookreviews@sheffield .ac.uk

Economic Time Series - Modeling and Seasonality
William R Bell, Scott H Holan, Tucker S McElroy (Eds)

Handbook on Semidefinate, Conic and Polynomial Optimization
Miguel F Anjos & Jean B Lasserre (Eds)

Modeling Dynamic Economic Systems 2nd Edition
Matthias Ruth & Bruce Hannon

Multilevel and Longitudinal Modeling Using State - Volume I: Continuous Responses and Volume II: Categorical Responses, Counts, and Survival 3rd Edition
Sophia Rabe-Hesketh & Anders Skrondal

Stochastic Optimization Methods in Finance and Energy - new financial products and energy market strategies
Marida Bertocci, Giorgio Consigli, Michael A H Dempster (Eds)

An Introduction to Exotic Option Pricing
Peter Buchen

Applied Operation Research with SAS
Ali Emrouznejad

Option Valuation: A First Course in Financial Mathematics
Hugo D Junghenn

Quantitative Problem Solving Methods in the Airline Industry - A Modelling Methodology Handbook
Cynthia Barnhart, Barry Smith (Editors)

<OR>

DATA ANALYTICS APPLICATION AVAILABLE FREE FOR ACADEMIC RESEARCH

NIGEL CUMMINGS

Datameer, Inc., a data analytics company providing applications that discover insights and trends in data, is offering free licenses of its data analytics application for qualifying academic research.

Academic researchers are particularly challenged by the massive amounts of data needed for their research. Collecting and analysing data requires enormous computational effort and this has typically been a slow and tedious process requiring a computer science background.

Datameer's analytics range of applications can provide a speed boost to analysis and they do not assume the user will have a computer science background. The applications apparently provide users with a simple spread-sheet like interface for data input. This enables integration of large quantities of data to do complex analysis, and then visualise the results which can be easily understood, communicated and shared.

The Datameer approach is to offer an analytics solution built on Apache Hadoop that helps its users to access, analyse and use massive amounts of data. The company behind the range of Datameer applications was founded just a short while ago in 2009 by a group of Hadoop veterans. Being such a new product in the highly competitive analytics software world, the founders thought it would be both beneficial to their new company and to academics alike to make free licences available.

These analytics applications bring the power of Apache Hadoop directly to the desktop, with Hadoop natively embedded in two of three new editions of the application (Datameer Version2). The Personal version runs on a single desktop, and a Workgroup version has been engineered to run on a single server. There is also an Enterprise version which scales up to thousands of nodes and runs on any Hadoop distribution.

Datameer 2.0 combines a familiar spread-sheet interface with unlimited data storage for enterprise users and the computing powers of Hadoop, this apparently enables its users to improve company performance, better understand customer behaviour, and optimise business processes.

The Personal version available with free licencing for one user can only be run from one desktop though and the data limit per user per year has been set at 100GB, but it is free to qualifying users. The workgroup version has a 1 TB yearly limit and the Enterprise version is said to be unlimited.

According to Stefan Groschupf, CEO of Datameer, the goal of the company and its product line-up is to provide the democratisation of data by giving its users the tools they need to make data-driven decisions faster. It does this by bypassing the traditional, slow, multi-step process of creating static schemas, and enables users to get right to analysing and visualising data without needing to rely on IT.

Mark Smith, CEO and Chief Research Officer of Ventana Research said of the new product, 'Organisations have a need to analyse more data and increase the speed of analysis, these are the top two demands of big data technologies, and this is what Datameer 2.0 is addressing with its newest release.'
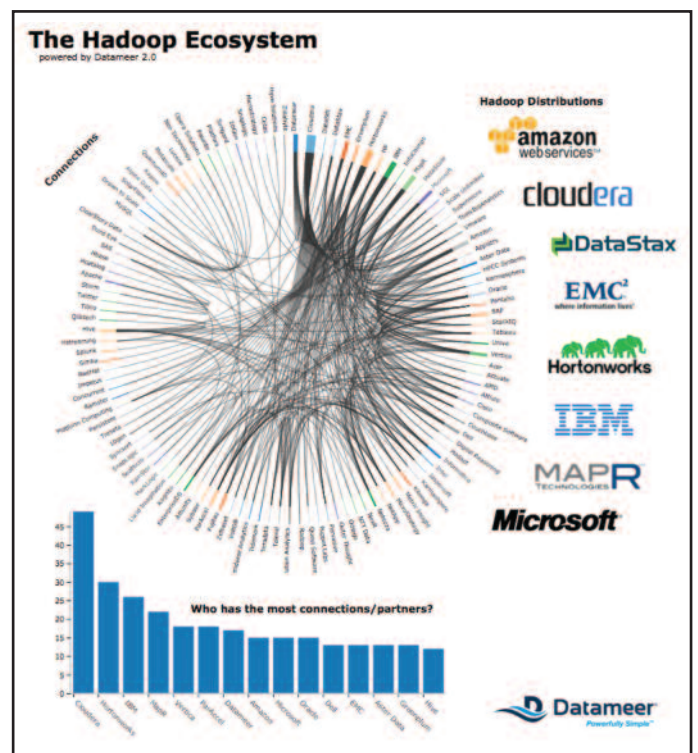
Built on HTML5, Datameer 2.0 runs on virtually any device, letting users work with and visualise their data on smart phones, tablets, desktop and laptop computers. It also supports all of the popular operating systems including Windows, Mac OS, Linux and VMWare. The fact that a new and powerful application like this is now available to academic users with a free licence agreement is a compelling reason to at least 'try-out' its analytics capabilities.

Datameer 2.0 also supports integration with Twitter and Facebook, Netezza and COBOL as well as Teradata export. It also offers HIVE integration, including the ability to export to HIVE as well as the previously supported HIVE data import.

One example of work done in academia with Datameer has recently been provided by Dr. Douglas Grubb, of Leibniz Institute of Plant Biochemistry, Halle, Germany. He spoke about the use of the application for setting up an analysis that identified functional RNA structures in the genomes of plants.

Dr. Grubb's work demonstrated that biologists can use this type of analytics application to perform analyses on a Hadoop cluster, which could then scale on demand, for instance, on the Amazon Elastic Compute Cloud (EC2). 'With the right big data analytics tools, the possibilities are really endless,' said Dr. Grubb. 'Datameer lets me focus on my research rather than complex data storage or analytics infrastructure. This will significantly increase the pace at which we can conduct meaningful scientific research.'

Those interested in evaluating or purchasing any edition of Datameer 2.0 can immediately sign up at Datameer.com. Free licencing for academic users will be available for a limited time. Alternately the company is offering an introductory subscription pricing where Datameer Personal will be available for $299 (approximately £152 at the time of this article going to press). Datameer Workgroup will be available for $2999, (approximately £1520) Datameer Enterprise pricing will vary depending on needs.

<OR>

LACK OF ANALYTICS EXPERTISE

NIGEL CUMMINGS

Slowing growth predicted for business analytics.

Software that businesses use to analyse ever-rising volumes of data - and then use that analysis to improve business - has helped drive growth for IBM, Oracle and SAP, some of the largest makers of business software. According to a survey conducted by IDC, the sector's annual sales growth is predicted to fall to single digits this year. It blames a slowing global economy coupled with a maturing market and a lack of workers trained to make the best use of the analytics.

'The market has definitely matured,' said IDC analyst Dan Vesset. 'It's primarily macroeconomics. But there is a level of complexity (with the software) and we are generally finding a lack of a sufficient number of analytics experts.'

According to IDC, Global sales growth of business analytics software, used by banks, retailers, and others, will fall to 9.8% this year from 14.1% last year. Sales will remain healthy though as a reduction to 9.8% still equates to predicted worldwide sales of around $50.7 billion in 2016, up from $35.1 billion this year.

Helping to drive this growth is media attention focused on Big Data, putting broader business analytics on the agenda. Additionally, new business analytics software options based on non-relational data management technology are forcing vendors to accelerate research and development on new tools and applications and the integration of new and existing technologies.

Of the three primary segments of the worldwide business analytics software market, the data warehousing platform software segment grew the fastest in 2011 at 15.2%, followed by the analytic applications segment, at 13.3% and the BI and analytic tools segment, which only managed a 13.2% growth.

Additional findings from IDC's research include:

As more organisations with less business analytics experience are becoming interested in this technology, vendors and users will have to devote more resources to business analytics services.

A growing emphasis on industry and business process-specific analytic applications is going to take hold over the forecast period. Recent acquisitions by large business analytics vendors such as IBM and SAP will require ever finer segmentation of target audiences by industry, region, and organisation size.

The growth in outsourcing deals for business analytics technology will likely mean that end users will pay increasingly less attention to specific technology components, instead focusing on business value and overall functionality.

The study, Worldwide Business Analytics Software 2012-2016 Forecast and 2011 Vendor Shares (IDC #235494) examined the business analytics software market for the period from 2007 to 2016, with vendor revenue trends and market growth forecasts.

More information pertinent to the study can be located at: www.idc.com

< OR >

YOU ARE UNDER ARREST FOR A CRIME YOU HAVE NOT YET COMMITTED

NIGEL CUMMINGS

In 2002 a sci-fi film called 'Minority Report' depicted a future where special police units would be able to arrest murderers and other criminals before they committed crime. Ten years on that sci-fi has become sci-fact.

What seemed farfetched ten years ago, now appears to have become reality as predictive analytic and artificial intelligence technologies are now routinely utilised by law enforcers to track potential terrorists.

The field of Artificial Intelligence research started at Dartmouth College in 1956, when computer experts of the time - men like John McCarthy and Herbert Simon and their students produced computer programs that could perform mathematical and logical tasks that most people thought only humans were capable of.

By the 1960s, computers and the idea of artificial intelligence soon entered into the realm of national security, when both the United States and the Soviet Union became concerned that the other side would establish an advantage over the other.

AI is no less a national security concern today than it was back in the 1960s, today however the 'enemy' is the cyber-terrorist, or the foreign state with intent to cause damage to Western computer networks, or influence the integrity of the growing, interconnected system of data communications and data storage.

This concern was documented in a 1962 CIA document describing several secret Soviet documents leaked by a Soviet source. The documents were all marked with code name IRONBARK and came under Richard Helm's tenure as CIA Director. The documents detailed soviet research into artificial intelligence – in particular work done by Colonel P. Savinskiy in devising 'Methods of Achieving Tactical Surprise in Ground Troop Operations'.

In that article, Savinskiy wrote: 'For this all possible means of deceiving the enemy will be used: setting up of mock-ups; simulated activities of communications means and radio technical stations, which service subunits using nuclear means; creation of artificial intelligence indicators of the location of nuclear means, such as, for example, evacuation of the civilian population and reinforced security in specific areas…'

Savinskiy's work referred to a careful analysis for areas potentially requiring civilian evacuation and enhanced security. However, what the use of the term in this document shows is that the concept of 'artificial intelligence' was in use within intelligence circles and academia long before it became a commonly used term throughout society and in the media.

Artificial intelligence was always a concept under study and development by U.S. academia and the intelligence community. On 3 April 2001, John C. Gannon, National Security Telecommunications and Information Systems Security Committee, said: 'These changes [pace of change in information technology] could improve processing power, information storage, and bandwidth enough to make possible application of advanced software technologies-such as artificial intelligence-to cyber warfare. Such technologies could provide the defender with improved capabilities for detecting and attributing subtle malicious activity, or could enable computer networks to respond to attacks automatically.'

Outbreaks of terrorism in recent years have stimulated academia to look more closely into how artificially intelligent systems can be applied to the detection of potential terror attacks via 'pre-crime data mining'. The terrorist attacks of 9/11 in New York City only served to fuel that interest and intensify efforts to make better use of IT technologies and to focus on further developing artificially

: : ANALYTICS : : : : : : :

intelligent prediction tools – particularly those applied to intelligence collection and analysis.

By 2003, the National Science Foundation had established the Artificial Intelligence and Cognitive Science (AICS) program which has the primary focus of 'advancing the state of the art in Artificial Intelligence and Cognitive Science.' Around the same time COPLINK was launched in the United States. COPLINK used techniques from artificial intelligence and other fields to help detect 'faint trails' woven through vast databases, potentially across police divisions or other agencies, and provide investigators with leads for their cases.

COPLINK was one of the first systems to actively use predictive analytics to anticipate criminal activity and pinpoint likely geographic locations where crimes were most likely to be committed. Today variations on the original COPLINK software are in use in Great Britain and Europe – such software is proving invaluable in identifying criminal clusters and anticipating the likelihood, whereabouts and timings of acts of crime and/or terrorism before they actually occur.

AI pre-crime data mining applications can undertake behavioural profiling of individuals suspected of being crime or terrorism oriented. With every call these people make on their cell phone and every swipe of their debit and credit cards, a digital signature of 'when, what, and where' is incrementally built every second of every day in the servers of their credit card providers and wireless carriers.

Monitoring the digital signatures of these consumer DNA-like codes are models created with data mining technologies, these codes look for deviations from the norm, which once spotted instantly and routinely issue silent alerts to monitor cards and phones for potential theft. Behavioural profiling, by the way, is not racial profiling, which is not only illegal, but a crude and ineffective process; race is simply too broad a category to be useful, it is one-dimensional.

What is important however is suspicious behaviour and related digital information found in diverse databases, which data mining applications can use to analyse and quantify. Behavioural profiling

provides us with the capability to recognise patterns of criminal activity, to predict when and where crimes are likely to take place and to identify its perpetrators. Pre-crime detection is no longer science fiction; it is the objective of data mining techniques based on AI technologies.

Similar data mining technologies have been used by marketers for years to provide 'personalisation' - the exact placement of the right offer, to the right person at the right time, now similar techniques can be used for providing the right inquiry to the right perpetrator at the right time: before they commit the crime. Investigative data mining is the visualisation, organisation, sorting, clustering, segmenting and prediction of criminal behaviour using data attributes such as age, previous arrests, modus operandi, type of building, household income, time of day, location, countries visited by the potential perpetrators, length of residency, utility usage, IP address, VISA type, number of children, place of birth, average usage of ATM card, number of credit cards, etc.

Pre-crime detection is an interactive process of predicting criminal behaviour by mining this vast array of data using several AI technologies, including:

Link Analysis for creating graphical networks to view criminal associations and interactions;

Intelligent Agents for retrieving, monitoring, organizing and acting on case related information;

Text Mining for searching through massive amounts of documents in search of concepts and key words;

Neural Networks for recognising patterns of criminal behaviour and anticipating criminal activity; and

Machine Learning Algorithms for extracting rules and graphical maps of criminal behaviour and perpetrator profiles.
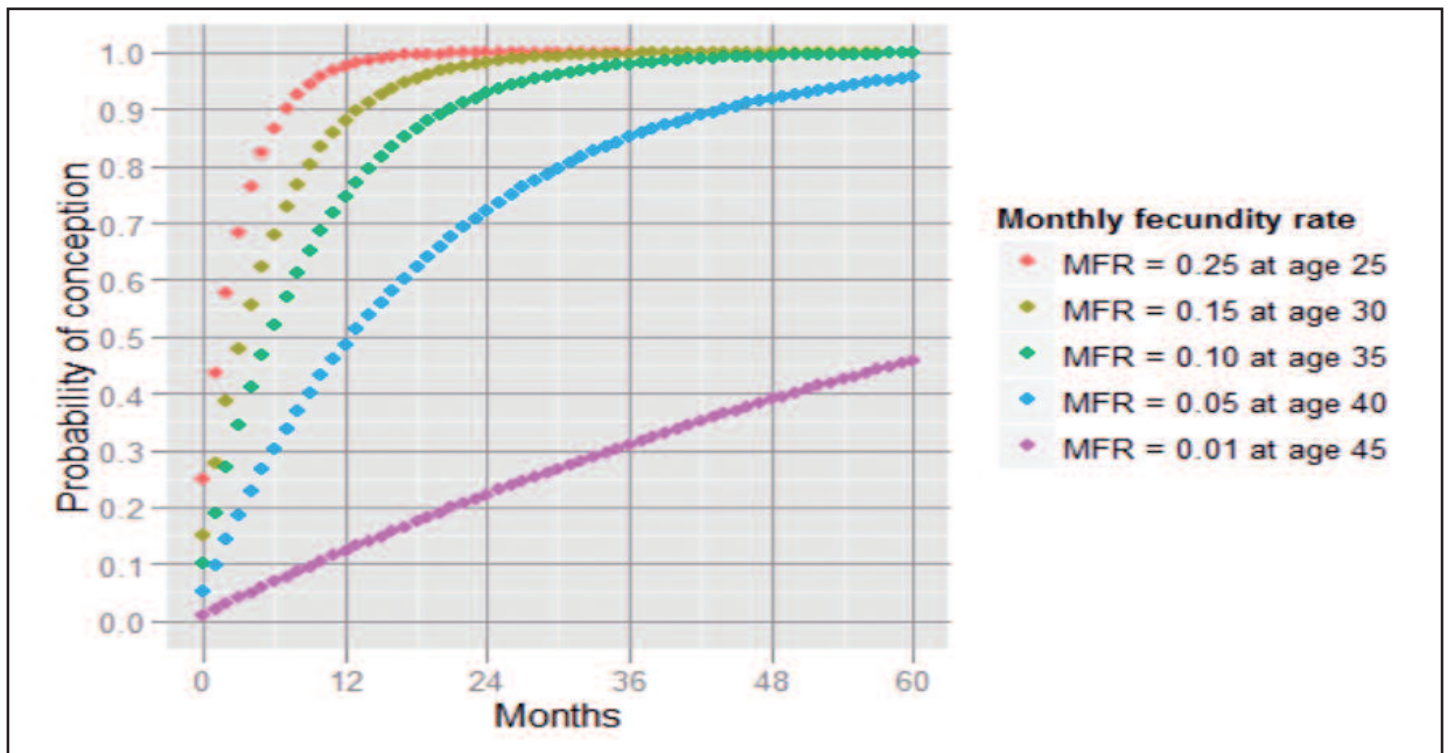
IF AT FIRST YOU DON'T SUCCEED… BUT DON'T LEAVE IT TOO LATE!

NIGEL CUMMINGS AND JOHN CROCKER

Women tend to be less fertile as they get older, but by how much, exactly? Richie Cotton at www.4dpiecharts.com decided to figure it out with a chart and came to the conclusion that it follows the negative binomial distribution.

Cotton, who is trying to have a baby with his girlfriend Janette, used data from the Journal of Human Reproductive Sciences and Social Fertility to figure out 'monthly fecundity rate' (MFR) or likelihood of getting pregnant each month if you are having connubial relations without birth control.

Cotton suggests it is surprisingly difficult to find out the MFR. There is a general consensus that age has a big effect, with women's peak fertility occurring somewhere around the age of 25. Beyond that point, the internet is filled with near-useless summary statistics like the chance of conceiving after one year.

For example, the usually reliable NHS website says; 'Women become less fertile as they get older. For women aged 35, about 94 out of every 100 who have regular unprotected sex will get pregnant after three years of trying. However, for women aged 38, only 77 out of every 100 will do so.'

According to Cotton's chart, based on a paper by George and Kamath, on Socal Fertility, after two years, nearly all healthy 25-

year-old women will get pregnant. A healthy, woman of 25 has an MFD of 25% which decreases to 10% for a woman of 35 and to around 1% by the time they reach 45 (assuming they have not gone through the menopause). Age clearly is an important factor. If the woman is too fat, too thin, a smoker, or has hormone problems, or is stressed, then these will have a negative effect on the rates.

Given the MFR, he says, the probability of getting pregnant after a given number of months can be calculated with a negative binomial distribution. The same chart for men, on the other hand, would look very different.

Cotton says. 'From a male point of view, conception is an embarrassingly parallel problem: you can dramatically reduce the time to conceive a child by sleeping with lots of women at once.' Though he hastens to add the following disclaimer 'Janette, if you're reading this, I'm not practising or advocating this technique!'

<OR>

CLOUDS ARE NOT JUST ABOUT WEATHER FORECASTING

NIGEL CUMMINGS

It was once thought that if one knew the positions and velocities of everything in the universe at any given moment in time, one could calculate where they would be at any time in the future. Alas, Heisenberg put paid to that idea by proving that one could not know both the position and the velocity of a subatomic particle at the same time. The current equivalent appears to be that if one has sufficient data one can predict anything and everything.

In order to store these vast amounts of data, the concept of cloud computing was created a few years ago. Since then it has developed into three types of computing (IaaS, PaaS and SaaS) where the first letter stands for 'Infrastructure', 'Platform' and 'Software' respectively and the 'aaS' simply stands for 'as a service'. This enables anyone with the right kind of device to run software, store data or perform analyses without having to worry about how the data should be held, whether the software has been maintained up-to-date or, in theory at least, whether ones data is secure.

The principle is based on the economies of scale. It also utilises the fact that peaks and troughs in demand on computing and communications occur at different times of the day in different parts of the world thus effectively allowing constant high usage. It can also mean that users have access to significantly more computing power than they could possibly afford if they had to buy the equipment themselves.

Contacts, appointments, certification credentials and financial data are routinely written to remote servers during their day to day operation.   Fortunately this is generally done automatically, although it can slow down processing. Its main advantage is that it is [nearly] always possible to retrieve lost or deleted data from these backup devices.

Outside of domestic usage though, cloud computing has become routinely adopted by business users, some of whom are making the case that it provides the processing power and big data support needed for predictive analytics which utilises the matching of current datasets against historical patterns to determine the probability of events occurring in the future.

According to James Taylor, Automated Decision Management proponent and author/co-author of two books on the topic, cloud computing could 'elevate the art and science of predictive analytics to a whole new level'.

With online, sharable resources, there is no longer any limit on the amount of data that can be stored. A survey conducted by James Taylor among 200 Business Intelligence specialists revealed that 43% have already developed predictive analytics solutions within their companies, and 82% have predictive analytics in their plans.

Another survey of 1,364 IT managers by Gartner, recently found that almost a third of the survey participants (27%) already use or plan to use cloud/SaaS options to augment their BI capabilities for specific lines of business or subject areas in the next 12 months.

The 'sweet spot' for cloud-based predictive analytics appears to be in the effective acquisition, management and retention of customers, the top two areas for predictive analytics projects are marketing/customer acquisition and customer retention (50%). Cloud-based analytics applications can provide new and rapid ways to add value in business, such advantage could be critical to gaining competitive advantage. Rapid time-to-value is also generating interest in cloud-based solutions for testing, experimentation and development even where deployment will ultimately not be cloud-based. These focus on simple, standardised interfaces which are easy to access and operate which also helps minimise integration effort and cost, hence reducing an organisation's dependency on conventional IT resources.

Rapid and easy access 'Big Data' (another buzz word in the Cloud computing community) is allowing organisations to be less restricted by data transmission rates - all this increases the value of moving analytic modelling to cloud based systems where it can be near these new sources of data.

<OR>
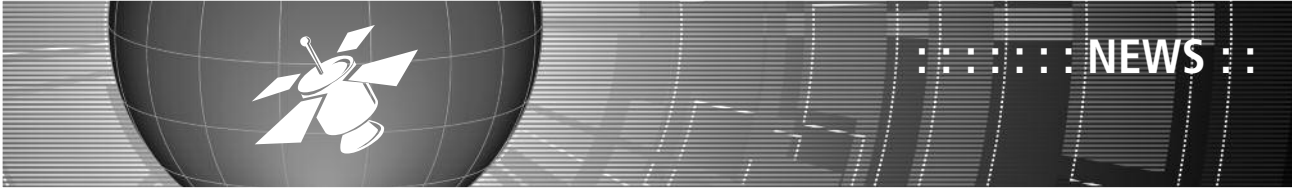
YOU WAIT AGES THEN THREE COME ALONG TOGETHER

GAVIN BLACKETT (INTRODUCTION)

Buses that is. Those lucky enough to live on a bus route will recognise the issue of bus bunching. A team of researchers from the Georgia Tech university in Atlanta solved the issue for their campus bus service using a novel approach. This article first appeared in the June 2012 IFORS newsletter – see www.ifors.org for more.

SCHEDULING SELF CO-ORDINATING BUSES

Buses tend to bunch. This is because inevitable disturbances will cause one or more buses to fall behind the others, and any large gap tends to grow because the trailing bus must serve more passengers and so will be further delayed. Large gaps get larger and small gaps get smaller with the result that riders experience long waits, after which several buses may arrive together.

Schedules have only limited ability to resist bunching. If a disturbance is sufficiently large, such as a bus breaking down, severe bunching will occur as a schedule is unable to recover any regularity of service.

Bunching is the most frequent complaint about any urban bus system, as a web search on 'bus bunching' will confirm.

A solution

Abandon the schedule! A schedule is merely a goal and in practice it is hard to achieve. Anyway no one cares about a schedule as long as the gaps between buses (that is, the headways) are small as in a busy urban bus system. Instead, control headways by strategically delaying buses at the ends of the route or at special locations such as transfer points.

Don Eistenstein (University of Chicago) and John Bartholdi (Georgia Tech) have devised a new way of computing the delays so that headways tend to equalise, without management direction or driver intention. Furthermore they have confirmed its performance on a real bus route and have built a software system that will run the bus route full time later this year. Actual headways are determined by local traffic conditions and are not under the control of the bus manager, so it makes sense to abandon the idea of a target headway and focus on equalising headways.

:: NEWS : : : : : :

One of the Georgia Tech buses is mounted with a tablet which recognizes when the bus has arrived at a control point, computes the time to wait, and then signals to the driver when it is time to resume driving.
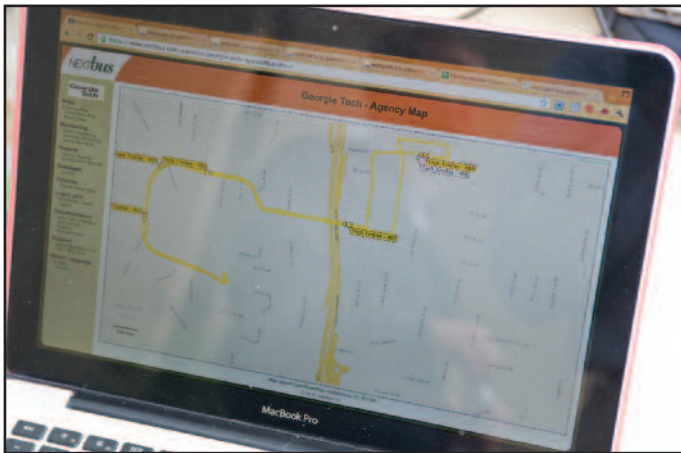
How it works

The main component of their scheme is this:

When a bus arrives at one end of the route, it looks at the bus immediately following and estimates the time until its arrival. Then it performs a simple calculation that determines how long to pause. This pause changes the headway of the newly arrived bus to an average of its former headway and the former headway of the following bus. If its former headway was larger, its new headway becomes smaller, and vice versa. The result is that headways are constantly adjusted to become more nearly equal. Bartholdi and Eisenstein built an idealized model that shows how the headways of the buses change under their method of determining how long buses should pause. The change of headways is described by a simple, finite, irreducible Markov Chain, whose convergence is of course guaranteed by the Markov Chain Theorem. Convergence within the model suggests resistance to bunching in real life, and such has proven to be the case. (Details appear in their technical paper, which recently appeared in Transportation Research B.) The scheme requires only a tidbit of local information – the estimated time until the next bus arrives – but this is sufficient to coordinate all the buses on the route: The relative positions of the buses will be adjusted to be more evenly spaced, so that no one has to wait too long for a ride. Moreover, this technique works without knowing a map of the route or even the number of buses. Without changing operations or processes, buses can be added or removed from the route at any time; the route can be changed (for example, to detour around construction); and bus stops can be inserted or removed. After any such change the headways will autonomously re-equalize.

Success on a real bus route

There is a large and admirable academic literature on bus coordination, none of which seems to have been tried in practice. This is understandable: Managers of public transit systems are highly reluctant to experiment, as it is very costly to interrupt a core service on which so many customers rely. The simplicity of this scheme was important in 'selling' it to management. Thanks to the bravery of David Williamson and Aaron Fowler of Georgia Tech's Department of Parking and Transportation, the Bartholdi/Eisenstein scheme has been tested extensively on the central bus route that carries over 5,000 riders a day through the heart of the Georgia Tech campus. The results were clear: Average headways were smaller so there was less wait for a bus. And there was less variability in headways, so service was more reliable. More importantly, tests confirmed the ability of the scheme to respond to large disturbances. In one experiment, they removed one bus from the route, leaving a large gap in service. Under a scheduled system, such a gap would tend to grow, but under the Bartholdi/Eisenstein scheme the headways of the remaining buses spontaneously reequalized, thereby re-establishing regular service without intervention by management or even awareness of the drivers.

Implementation

Georgia Tech students, working with the GT Department of Parking and Transportation, have built a software system based on Bartholdi and Eisenstein's control scheme in which each bus contains a tablet computer with GPS and wireless networking capabilities. They have been conducting live trials for several months and held a public demonstration on 20 April 2012. The new system is expected to be fully operational by Fall 2012.

To learn more

Please see http://www.isye.gatech.edu/~jjb/ buses/buses.html and the FAQ therein for more information and for a link to the published article.

Thanks

28

Frequently asked questions

• Don't buses already have GPS installed? How is this different?

Yes, most buses have Global Positioning Systems (GPS) installed. But our scheme does much more than simply track locations of the buses: Our contribution is a mechanism that automatically adjusts the positions of the buses so that they are equally spaced in time; that is, they arrive with the same headway (time between arrivals). This provides the best service and gets maximum use from each bus.

• What is special about this method of headway control?

Its simplicity and practicality. As far as we know, ours is the only scheme in a large academic literature that has actually been tested on a real bus system. Public transit is not an experimental science and managers of transit systems are understandably reluctant to try out new schemes, but our approach is easy to understand and easy to try.

• Is this scheme suitable for routes with long average headways?

Probably not: Research has shown that people want a schedule if headways are longer than 10-12 minutes.

• Won't passengers be annoyed if the bus waits at a control point?

We recommend choosing endpoints of the route as control points because there will generally be no on-board passengers. Otherwise, a good choice of control point is any bus stop where passengers can change to other transportation, such as other routes or trains. At such stops passengers generally appreciate the waiting time, which increases their opportunities to make seamless connections.

• Where should control points be located?

The ends of an out-and-back route are natural locations for control points, because buses can pause there without delaying in-transit passengers.

Other natural locations are wherever the route intersects with other transport modes, such as train or other bus routes.

• How many control points should there be?

There is a tradeoff: More control points provide more assertive control; but buses pause at each control point and so more control points mean more idle bus capacity. There is no right answer but rather a management decision. Fortunately, it is easy to experiment.

• How do you schedule breaks, lunch, end-of-shift, etc. for drivers when there is no bus schedule?

Because the buses have no schedule under our scheme, the drivers have no schedule either. This means that the drivers must be flexible. (Scheduled services have the same problem because it is impossible in practice to keep to a schedule.) This is not so much a technical problem as one of driver expectations and management. This has not caused any significant problems on the Georgia Tech route: the drivers have been very cooperative. It might be a problem on routes that require a very long time to circumnavigate.

• If there is no schedule, how is the performance of a driver judged?

Instead of managing by schedule adherence, we manage by wait-time adherence: Our system reports how well each driver follows instructions about when to depart the control points. (Other issues, such as safe driving, courtesy, etc. remain the same.)

• Can't a driver game the system by traveling as fast as possible so that they get a longer break at the next control point?

Yes, but this is a management problem and is easily recognized from the recorded logs of bus positions. Anyway, a driver can do this under a scheduled system too.

• What do the drivers think of this scheme?

Georgia Tech drivers have been very cooperative and claim to prefer this scheme, be-cause it removes the constant pressure of schedule adherence.

• Isn't dynamic headway control an old idea?

Others have suggested various schemes to adjust the headways, but we have seen no other scheme of comparable simplicity and practicality. Indeed many others seem wildly impractical, assuming, for example, perfect knowledge of instantaneous bus locations and velocities and passenger queues and arrival rates.

• How is this different from time frequency scheduling , such as is used on the DC Circulator?

Time frequency scheduling is the setting of a target headway (rather than a target schedule). It is a step in the right direction but still suffers from the problem that, except in unusual circumstances, the system manager cannot control traffic velocities. It is fine to have a target headway, but the question is whether it can be achieved. It is not enough to show the drivers where the other buses are, and expect them figure out how to fix problems. Our system abandons target schedules or headways as distractions, and focuses on the essential: that headways be as nearly equal as possible. Furthermore, no one has to figure out how to fix an imbalance because headways equilibrate spontaneously. (Incidentally, the DC Circulator uses a schedule; the schedule, however, is not published.)

• You have proved a theorem that shows convergence to a common value of headway, but this theorem describes an idealized set of buses. What does it mean for the real world?

Because of inherent and ineradicable variability in traffic velocities, we do not expect real buses to achieve exactly equal headways. Instead, we interpret the theorem to mean that our scheme resists bunching. We expect that bus headways will vary less under our scheme than under a schedule and that gaps in service will not tend to grow, as they do under a schedule. The mathematics shows that our scheme will continue to resist bunching as long as the forecasts are not both wildly and frequently inaccurate.

• How does bus capacity affect this scheme?

Our scheme is independent of bus capacity. But, as for any other system, if buses are regularly full, additional buses are probably needed.

<OR>

STUDENT MEMBERSHIP RECRUITMENT

LOUISE ORPIN, EDUCATION OFFICER

A strong student membership base is important to the future success of the Society as well as growth of the wider O.R. community.

Students interested in a career in O.R. or an analytics based profession can benefit from membership of The OR Society during their time at university.

We look to our members who have contact with students to help promote student membership and encourage students to apply.

Benefits include:
* CandORS accreditation
* Access to O.R. journals and publications
* Meet employers at our annual Careers Open Day
* Network with other students and O.R. professionals
* Discounted student rates for conferences and training courses

The student membership page on the website can provide more detailed information,
http://www.theorsociety.com/Pages/Membership/BenefitsStudent.aspx.

We will be sending out information packs and posters in September ready for the start of the academic year. These packs are designed to help you outline the benefits of membership to your students. We will also include details of our annual careers day that is held in November.

For more information or to request packs for your students please email **louise.orpin@theorsociety.com.**

<OR>

SIR BERNARD LOVELL – ASTRONOMER AND RADAR PIONEER

NIGEL CUMMINGS

The radio astronomer and physicist Bernard Lovell, who died 6 August 2012 aged 98, was known worldwide for developing the 76m (250ft) radio telescope at Jodrell Bank Observatory, in Cheshire. He also made significant contributions to the development of Radar Technology.

Sir Bernard Lovell

His pioneering work on radar helped swing World War II decisively in the allies' favour, while the huge radio telescope that bears his name at Jodrell Bank remains one of the most impressive and significant scientific instruments in the world after almost 60 years of operation

Bernard Lovell was born in the village of Oldland Common, Gloucestershire (where the senior school has been named in his honour). His father was a keen amateur musician and his mother came from a family of cricketers, so it is no surprise that music and cricket remained two of Bernard's passions throughout his life. His interest in science though appears to have started after he attended a public lecture given by A. M. Tyndall, Professor of Physics at Bristol University, in which Tyndall contrived to project an electric spark across what seemed to the young Bernard to be an impossibly large gap.

After attending Kingswood grammar school (now King's Oak Academy), Bristol, Bernard went to Bristol University and received a first-class degree in physics in 1934. His research on the conductivity of thin metallic films allowed him to obtain a PhD in 1936. After which time, and at Tyndall's suggestion, he applied for positions in London and Manchester.

Although Lovell's preference was to work with Patrick Blackett in London, he was appointed instead to a position at Manchester University in 1937. In the same year Patrick Blackett replaced W. L. Bragg as head of physics at Manchester, and Lovell was led into the study of cosmic rays (Patrick Blackett's field).It was his continued study of cosmic rays that would eventually lead to the construction of the Lovell Telescope.

His work on cosmic rays under Blackett was interrupted by the second world war during which time, at the Telecommunications Research Establishment (TRE), Bernard worked first on radar interceptors for night fighters, then on centimetric radar for the detection of submarines, and ultimately on the H2S radar used by British bombers. He later wrote about his radar work – which earned him an OBE in 1946 – in the book Echoes of War (1991).

Following the Battle of Britain in September 1940, British bomber command had increased the number of night time raids on German cities, but reconnaissance was indicating that many of these bombs were falling on open country. So, at the beginning of 1942, having spent the last couple of years developing short wavelength air interception radar and blind firing systems for fighter planes, he was told to form a group to develop a blind bombing system.

Based at TRE in Worth Matravers, near Swanage, (later moved to Malvern following the Bruneval Raid) he set to work on the development of a precision bombing device that would use a rotating antenna within a cupola attached to the underbelly of bomber aircraft to build up a map of the terrain below.

The system was the first ground mapping technology ever to be used in combat. It was a triumph of engineering complex science and bulky ground equipment into a device that could operate in one of the most demanding environments. Christened H2S (standing for 'home sweet home') and using a 10cm radar to provide unprecedented levels of accuracy (at that time), it was largely made possible by the invention of the cavity magnetron; a high-powered vacuum tube that generated coherent microwaves (the basis of microwave ovens).

: : FEATURE : : : : : : :

Jodrell Bank radio telescope

Bernard Lovell's efforts were somewhat frustrated during this time by the fact that Lord Cherwell, Churchill's chief scientific adviser, wanted his team to design the system around the Klystron, a far less powerful source of microwaves than the cavity magnetron. Cherwell feared that in the event of a crash over Germany, the more rugged magnetron would survive and pass its secrets on to the enemy. 'The cavity magnetron was regarded as so secret that we were not allowed to use it, we had to use the Klystron which was destructible.' Ironically the Germans were already aware of cavity magnetron technology which had been developed in Leningrad in the 1930s, so there really was no advantage whatsoever in adopting Klystron technology at that time.

Returning to Manchester in 1945, Bernard Lovell explored how to use wartime radar techniques for the detection of large cosmic-ray showers in the high atmosphere. Instead, meteors were detected, and a number of long outstanding problems in meteoric astronomy were solved as a result of his work.

When a large fixed aerial system was constructed to detect cosmic-ray showers, this led to the realisation of the importance and potential of radio astronomy. Because meteors come at the Earth from all directions, a telescope capable of pointing anywhere was considered ideal, and it was this thought that led to the Lovell Telescope, a device that may never have been built were it not for Lovell's inexhaustible efforts at finding backing and support for its eventual construction.

The telescope began operating in 1957, just in time to track the carrier rocket for Sputnik 1, the world's first artificial satellite. In more recent years the device has been used to search for the Beagle 2 lander on Mars and to discover the first known double pulsar system. Threatened with closure in 2008, the Lovell telescope now operates with several other telescopes in the Merlin array of observing stations. The Lovell Telescope came top in a BBC poll of unsung landmarks in 2006 and was shortlisted to bid for World Heritage site status in 2011.

A life as rich as Sir Bernard's could easily lead to my writing a multipage tribute for publication here, but publishing space constraints prevail, so I shall end on a personal anecdote regarding my first meeting with Sir Bernard. I attended a lecture of his at Imperial College, South Kensington in the 1990s.

His presentation finished prior to lunch break and the beginning of the afternoon sessions. I had with me on that occasion a 'sub-miniature' laptop computer, one of the first of its kind, an Olivetti Quaderno. I decided to forego lunch and remain alone in the lecture theatre there to type up my notes on it, about his presentation.

Lost in thought whilst typing up my notes, I was suddenly startled to find the firm but gentle pressure of a hand on my shoulder, and then the soft gentle burr of a West Country accent – 'May I look at that please?' It was Sir Bernard speaking, he had seen me with my computing paraphernalia from the lecture stage area during his presentation and he had decided to enquire what on earth I was up to.

There followed an animated exchange about computers, die density sizes for micro computer chip manufacture, computer operating frequencies, radio astronomy, merits and demerits of electronic mail, cricket, music, family and gardening. He apparently liked the idea of a being able to carry around a computer which was only the size of a paperback book, and he expressed a desire to embrace such technology, so much so in fact, that he asked me where he could buy one – I directed him to an Olivetti computer stockist on the Tottenham Court road. (I have no idea if he did purchase such a device.)

We talked for at least half an hour on that occasion, the conversation ended with a short discourse about his early work with computers, devices that he said would fill a whole room, yet possessed less computing power than a modern day pocket calculator, and then Sir Bernard ended the conversation, encouraged me to pack up the Quaderno, and grab some lunch as he was feeling a 'bit peckish too' and return to my note writing later.

He offered to supply me with notes about his morning presentation to assist me in constructing my report; I wish I could find those notes now. Thereafter however, on any occasion that I attended a lecture of his, and there were many, on a diverse range of subjects. He always had the time to say hello, offer a few bon mots, talk about computing technology or simply pass the time of day.

Sir Alfred Charles Bernard Lovell, OBE, FRS and Emeritus Professor of Radio astronomy, founder and first Director of The University of Manchester's Jodrell Bank Observatory in Cheshire (1945-1980).

1946 — Officer of the Order of the British Empire

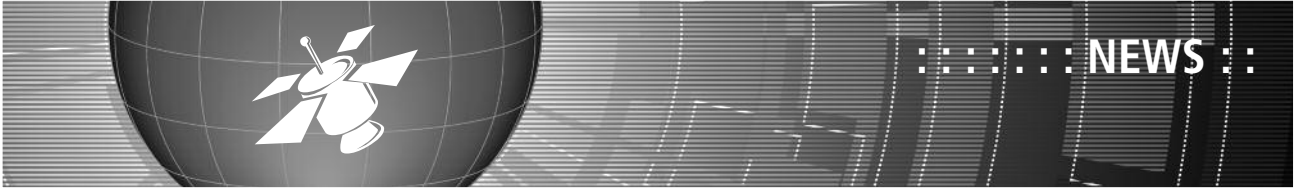1960 — Royal Medal

1961 — Knighthood

1967 — Honorary Degree (Doctor of Science), University of Bath

1969 — Lorimer Medal of the Astronomical Society of Edinburgh

1980 — Benjamin Franklin Medal

1981 — Gold Medal of the Royal Astronomical Society

B.31 August 1913, Oldland Common, Bristol – D.6 August 2012.

<OR>

THE TALK: 'O.R. – A VIRTUAL REALITY?'

JO SMEDLEY

The talk 'O.R. – a virtual reality?' will be aimed at stimulating discussion by considering some of the realities of operational research - what its practitioners and academics do and how they can effectively relate, how O.R. is seen and used - or not seen and not used – by managers, and the role of the OR Society in giving – or not giving - its members useful support.

Dr Geoff Royston - Brief Biography

Dr Geoff Royston is former Head of Strategic Analysis and Operational Research in the Department of Health for England, where for almost two decades he was the professional lead for a large group of health analysts. He is now an independent analyst and researcher and is the current President of the OR Society.

He is also an Associate of the Public Health Action Support Team (PHAST) and a Senior Associate of the Centre for Health Service Economics and Organisation at Nuffield College Oxford.

He has had a wide range of activities and responsibilities involving analysis and research to inform the design, implementation and evaluation of evidence-based policies and programmes in the health field. He has particular experience of modelling and understanding the behaviour of complex systems; of monitoring performance and evaluating the impact of innovations; of resource allocation methods; of analysis and communication of risk; and of horizon scanning and futures thinking.

Much of his work has involved assisting others to develop strategies, policies and programmes, and developing their capacity to do this more effectively. This has included designing and running participative events up to and including Chief Executive and Board level.

He has also worked on information and communication technology in the health sector, and has been an adviser to the UK communications industry regulator (OFCOM). He made the original proposal for the development of the telephone and internet service *'NHS Direct'* and subsequently led its national launch.

Dr Royston has been a member of various university advisory groups, has been an external examiner for postgraduate courses in operational research and management science, and has served on both scientific and medical UK Research Council panels. He has published extensively in both health and management journals and is a member of the editorial board for the journal Health Care Management Science, and is its Guest Editor for a forthcoming Special Issue on Global Health.

He has a variety of experience in the international health arena including being a consultant for the World Health Organisation, an adviser to the HIFA (Health Information for All) 2015 programme and a long standing member of the EURO Working Group on Operational Research Applied to Health Services.

He was Chair of the UK Government Operational Research Service in 2003/4. In 2008 he was elected Companion of Honour of the Operational Research Society and in 2010 he was elected to be the Society's President for 2012-2013.

WORDS/SWORDS - The talk 'O.R. – a virtual reality?'
Date/Time: Tuesday 13th November
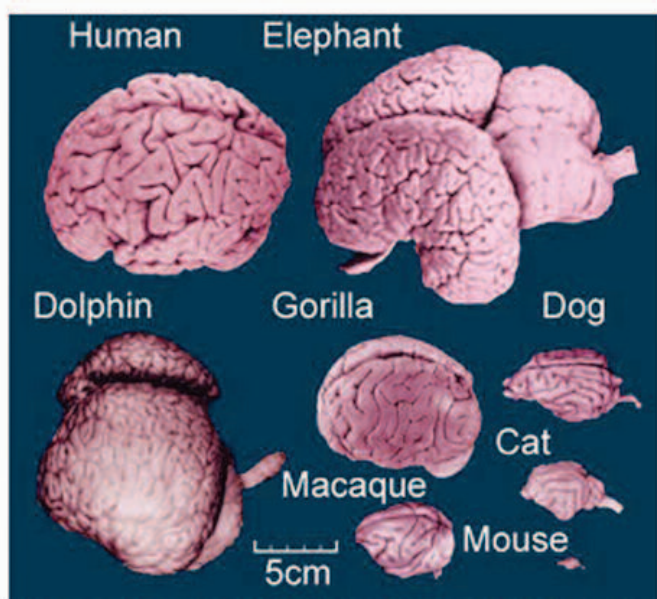**Venue:** School of Mathematics, Cardiff University
Speakers: Geoff Royston (OR Society President)

<OR>

ARE DOLPHINS EXPERT IN NONLINEAR MATHEMATICIANS?

NIGEL CUMMINGS

New research indicates that dolphins appear to use mathematical methods for processing sonar echoes.

Observe the size of the bottlenose dolphin's brain (1500-1700g, 0.9% of body weight) compared with those of other animals, particularly the human's brain (1300-1400g, 2.1% of body weight), the human being an animal of comparable size.

According to recent research undertaken by scientists at Southampton University, dolphins may use complex nonlinear mathematics when hunting. Inspiration for the research, published in the latest *Proceedings of the Royal Society*, came after lead author Tim Leighton watched an episode of the Discovery Channel's 'Blue Planet' series and saw dolphins blowing multiple tiny bubbles around prey as they hunted.

According to Tim Leighton, Associate Dean and Professor of Ultrasonics and Underwater Acoustics, University of Southampton, 'No man-made sonar would be able to operate in such bubbley water. These dolphins were either 'blinding' their most spectacular sensory apparatus when hunting — which would be odd, though they still have sight to reply on — or they have a sonar that can do what human sonar cannot. ... Perhaps they have something amazing?'

Professor Leighton, Paul White and Gim Hwa Chua decided to determine how dolphins echo locate. The team started by modelling the types of echolocation pulses that dolphins emit. These signals were then processed using nonlinear mathematics instead of the standard means of processing sonar returns. The technique worked and could explain how dolphins achieve hunting success with bubbles.

It would appear that dolphins emit pulses of varying amplitude and are able to process the echoes in such a way as to 'illuminate' their prey. Mathematically, this would require echoes to be scaled inversely proportional to the ratio of their amplitudes and added together.

Professor Leighton also believes there is a second stage to dolphin prey location. He says that the emission of bubbles cause false alarms because they scatter strongly, and a dolphin cannot afford to waste its energy by chasing false alarms while the real fish escape. The second stage similarly involves scaling the signals but this time subtracting one from the other to see if this causes the prey to 'disappear'. If a fish that has been made visible can then be made to disappear in this way then there is a much higher probability it exists.

'Until measurements are taken of wild dolphin sonar as they hunt in bubbly water, these questions will remain unanswered,' Leighton said. 'What we have shown is that it is not impossible to distinguish targets in bubbly water using the same sort of pulses that dolphins use.'

The dolphin sonar model may prove to be of benefit to humans. If scientists can replicate the methods employed by these remarkable creatures, we might be able to detect covert circuitry, such as bugging devices hidden in walls, stones or foliage. It could also dramatically improve detection of sea mines. According to Professor Leighton, 'Currently, the Navy uses dolphins or divers feeling with their hands in such difficult conditions as near-shore bubbly water, for example in the Gulf.' Adopting a technological means of detection would save both dolphin and divers' lives

<OR>

EURO XXV CONNECTING SCIENCES ACROSS EUROPE AND BEYOND

IAN MITCHELL AT EURO XXV

Conference report from Ian Mitchell, OR Society representative to the European association of Operational Research Societies (EURO).

In the second week of July over 2,100 participants gathered for the twenty fifth EURO-k conference in Vilnius, the capital of Lithuania. The Lithuanian Minister of Education and Science, Gintarus Steponovicius welcomed the largest scientific conference ever held in the country.

Minister of education and science Gintarus Steponovicius welcomes EURO to Lithuania

EURO XXV was a testament to the efforts of Leonidas Sakalauskas, president of the Lithuanian OR Society (LitORS), the Organising Committee and Marielle Christiansen and her Programme Committee who spent several years in preparation.

Leonidas Sakalauskas

Marielle Christiansen address the plenaries

EURO-k conferences are striking in their scale and offer material logistic challenges. Participation has been close to 2,000 since 2006, reaching 2,119 at Vilnius from over 120 countries.

Participants EURO reception and auditorium opera

The venues for EURO XXV lay north and south of the River Neris in central Vilnius. On the northern bank EURO XXV occupied the Radisson Blu Lietuva's conference suites and most of the 21st floor, the Co-operation College and the Holiday Inn with 524 streams of technical presentations.

Radisson – EURO XXV central location

Across the Green Bridge was the National Opera and Ballet Theatre where the plenary events took place, including 'Quattro Amici' a string quartet and a performance by the Vilnius Ballet Theatre. The farewell party took place in the Grand Courtyard of Vilnius University.

The Neris and Vilnius from the Radisson 22nd floor's Sky Bar

Farewell at the University Square

Every third year the international Federation of OR Societies (IFORS) meets. The first EURO-k was held in 1976, so the twenty fifth EURO-k conference occurred in 2012.

Line of Presidents

To mark the 25th conference Hans-Jürgen Zimmermann, the original president compared the worlds of 2012 and 1972 noting the differences to technology and culture. A line of past EURO Presidents formed across the stage of the National Opera house. Some names were familiar; Rolfe Tomlinson, and Maurice Shutler, appearing in slides rather than in person but applauded just the same, with the most recent past president, Val Belton.

Academics are well established at EURO-k conferences. There were practitioner sessions to be found, such as Multi Criteria Decision Analysis applied to Swiss water planning. Soft Systems Methodology featured in several papers. The National Audit Office presented on assessing the value for money of UK public services. The last plenaries came from practice at IBM and Google. The practical benefit of EURO lies in the exchange of ideas, reinforcing some, expanding others and introducing new approaches.

The Council of EURO

My conference started early on Sunday with the EURO Council meeting. This is the only time each year that all the national Society representatives actually meet. The President of EURO M Grazia Speranaza chaired the meeting reviewing the last year's activities. These include Summer and Winter Institutes, Working Groups and mini conferences and the Operation Research Peripatetic Postgraduate Programme ,ORP3, a biennial EURO conference for young O.R. researchers, each edition of which is hosted by a European university.

The Accounts suggested that like the OR Society EURO relies heavily on a flotilla of Journals, with its flagship, the European Journal of Operational Research (EJOR). EURO has also been able to expand its scope of operation despite the various crises affecting its namesake currency.

Professor Sally Brailsford is the new EURO Vice President with particular interest in conferences. It was in 1994 that the last EURO-took place in the UK, combined with OR36 in Glasgow. EURO XXVI will take place in Rome in 2013 and the IFORS conference follows in Barcelona in 2014. 2015 and 2016 are the next possibilities.

If you would like to help make Euro-k in the UK a reality, please get in touch with me on **IanMitch1@gmail.com**

< OR >

August – September 2012

DEA2012 - 10th International Conference on Data Envelopment Analysis
27-30 August 2012, Natal, Brazil http://www.deazone.com/dea2012/index3.html

PATAT2012-The 9th International Conference on the Practice and Theory of Automated Timetabling
28-31 August 2012, Son, Oslo, Norway, www.patat2012.com

29ISMOR 29TH INTERNATIONAL SYMPOSIUM ON MILITARY OPERATIONAL RESEARCH
28-31 August 2012 Southampton, UK www.ismor.com

ICARIS 2012 The 11th International Conference on Artificial Immune Systems
28-31 August 2012 Taormina, Italy. http://www.artificial-immune-systems.org/icaris/2012/callForPapers.php

PPSN2012 - 12th Int. Conf. on Parallel Problem Solving from Nature
1-5 September 2012, Taormina, Italy www.dmi.unict.it/ppsn2012/

OR54 The 54th Annual Conference of the UK Operational Research Society
4 – 6 September 2012 Edinburgh, UK http://www.theorsociety.com/Pages/Conferences/OR54/OR54.aspx

OR2012 International Annual Conference of The German Operational Research Society
4-7 September 2012, Hannover, Germany, www.or2012.de

ANTS 2012 - Eighth International Conference on Swarm Intelligence
12-14 September 2012, Brussels, Belgium, http://iridia.ulb.ac.be/ants2012

EURO-CBBM 2012 Mini EURO Conference on Computational Biology, Bioinformatics and Medicine
13-15 September 2012, Nottingham, UK, http://ima.ac.uk/cbbm2012

76th MCDA: Euro MCDA Workshop
13-15 September 2012, Portsmouth (United Kingdom), http://www.mcda76.port.ac.uk/

ORSSA 2012 41st Annual Conference of the *Operations Research Society of South Africa*
16-19 September 2012 Johannesburg, South Africa http://www.orssa.org.za/wiki/pmwiki.php?n=Conf.ORSSA

Matheuristics' 2012
16-21 September 2012 Angra dos Reis, Rio de Janeiro, Brazil http://www.ic.uff.br/matheuristics2012/

CO 2012 International Symposium on Combinatorial Optimization
17-19 September 2012, University of Oxford, UK http://www.sbs.oxford.edu/co2012

October – December 2012

EDPN 1st Conference
4-5 October 201, Amsterdam http://www.edpn.org/wp/?page_id=199

MEC-VNS 2012 2nd Mini EURO Conference on Variable Neighbourhood Search
4-7 October 2012. Herceg Novi, Montenegro http://www.mi.sanu.ac.rs/~vnsconference2012

ICORD Workshop on Problem Structuring Methods
12-13 October 2013, Tunisia www.informs.org/content/.../file/ICORDWorkshop%20poster.pdf

2012 International Annual Conference of the American Society for Engineering Management
17-20 October 2012 Virginia, USA, www.odu.edu/asem2012

IEEE Global Humanitarian Technology Conference
21-24 October 2012, Seattle, Washington USA, http://www.ieeeghtc.org/

ESM'2012 26th Annual European Simulation and Modelling Conference FOM
22-24 October 2012 Essen, Germany http://www.eurosis.org/cms/index.php?q=node/2112

SCCG 2012 1st International Workshop on Soft Computing Techniques in Cluster and Grid Computing Systems
12- 14 November 2012 Victoria, Canada http://www.fing.edu.uy/cluster/sccg

3PGCIC Seventh International Conference on P2P, Parallel, Grid, Cloud and Internet Computing
12- 14 November 2012 Victoria, Canada http://www.lsi.upc.edu/~net4all/3PGCIC-2012/

GAMEON'2012 The 13th annual Simulation and AI in Games Conference
14-16 November 2012, Malaga, http://www.eurosis.org/cms/?q=taxonomy/term/325

:: EVENTS WORLDWIDE :::::::

MESM'2012 The 13th annual International Middle Eastern Simulation and Modelling Conference
10-12 December 2012, Muscat – Oman http://www.eurosis.org

IEEE 2012 International Conference on Industrial Engineering and Engineering Management
10-13 December 2012 Hong Kong www.IEEM.org

2013

EMO 2013 - the 7th International Conference on Evolutionary Multi-Criterion Optimization
19-22 March, 2013, Sheffield, UK, www.shef.ac.uk/emo2013

EVO2013, 16th European Conference EuroGP, EvoCOP, EvoBIO, EvoMUSART and EvoApplications
3-5 April 2013, Vienna, Austria www.evostar.org

ISCRAM2013: The 10th International Conference on Information Systems for Crisis Response and Management
12-15 May 2013, Baden-Baden, Germany   http://iscram2013.org

KIM2013 Knowledge and Information Management conference
4-5 June 2013 Meriden, UK www.theorsociety.com/Pages/Conferences/KIM2013/KIM2013.aspx

IMSI05 2013
3-4 July 2013 University of Salford, UK. Web tbc

International Conference on Operations Research
3-6 September 2013, Rotterdam, The Netherlands, www.or2013.org

JOURNALS & SPECIAL ISSUE CALL FOR PAPERS

Special Issue
Knowledge Management Research & Practice (KMRP)
Sustainable Quality: Knowledge and Information Management
Further information:
www.theorsociety.com/Pages/Conferences/KIM2013/KIM2013.aspx

Abstract: This Special Issue, in conjunction with KIM2013 (the OR Society's inaugural Knowledge and Information Management conference) is dedicated to the theme of Sustainable Quality. This wide-ranging topic is relevant to organisations and individuals working in any sector of the economy. Knowledge Management has become a key process in understanding organisations and their use of resources and, ultimately, quality is a major differentiating factor when considering goods and services. Sustaining quality requires taking a strategic view that may present short to medium term challenges and knowledge management should be able to help address such challenges. For large organisations, knowledge management may be seen as an intra-organisation activity, but sustaining quality for small to medium enterprises may require inter-organisational cooperation. Papers that relate to the theme and to knowledge and information management will be welcome. Areas of particular interest include (but are not restricted to) the management, practical application, limitations, implications, lessons learned and challenges related to KM and sustainable quality in the areas of services, education, health and manufacturing.

IMPORTANT DATES (in conjunction with key dates for KIM2013)

KIM2013 conference paper titles and abstracts submitted:

7 December 2012
Full conference papers submitted: 11 January 2013
Notification of outcomes of reviews of conference papers:
1 March 2013
Final manuscripts submitted (for conference): 10 April 2013
Conference: 4-5 June 2013
Final manuscripts submitted for KMRP: 1 July 2013
Electronic publication expected in KMRP: 1 September 2013

CALL FOR PAPERS
SIMULATION MODELLING PRACTICE AND THEORY SPECIAL ISSUE ON 'Energy efficiency in Grids and Clouds'
Further information: http://ees.elsevier.com/simpat.

Abstract: Computational and data grids and clouds are large scale distributed systems used for serving very large and complex applications. Grids and Clouds performance became more important due to the tremendous increase of users and applications. However, the usage of energy has become a major concern for grid and cloud computing since the price of electricity has increased dramatically.

IMPORTANT DATES

Manuscript submission deadline: November 30 2012
Manuscript reviews to authors: February 28 2013
Manuscript revision due: May 30 2013
Final notification of acceptance: July 31 2013
Final manuscript submission deadline: August 31 2013
Expected publication of the special issue: December 2013

<OR>

INTRODUCTION TO O.R. II

17-21 September, Birmingham
£2,875 + VAT for OR Society members
Hands-on course

Course provider: Frances O'Brien et al

Understand the role of Operational Research in management; understand the requirements for successful Operational Research interventions; have knowledge of a range of Operational Research techniques; be able to identify the suitability of a technique for a problem situation; be able to apply those techniques.

Problem Structuring Methods; System Dynamics; Statistical Methods in O.R.: multivariate models; Data Envelopment Analysis; O.R. in Strategy

THE COLLABORATIVE APPROACH TO SIMULATION MODEL BUILDING

26-27 September, Birmingham
£1,220 + VAT for OR Society members
Hands-on course
Course provider: University of Warwick and Loughborough University

Anyone who is developing and using discrete event simulation models will benefit. You'll learn the collaborative modelling process and the tools that support this process. Know how to get stakeholders to discuss implementation and engage in searching for the solution.

Develop models to include active engagement with a group of stakeholders; Learn a structured approach to collaborative modelling supported by non-technical paper-based tools; See how to engage stakeholders in the modelling process as this can lead to learning and improved implementation of study findings; and Improve rigour and transparency in the collaborative modelling process

INTRODUCTION TO O.R. FOR NON-O.R. PROFESSIONALS

4 October, Birmingham
£465 + VAT for OR Society members

Course provider: Independent Consultant

This course will help your clients, colleagues and others in your organisation that interact with O.R. professionals to understand the way O.R. people see the world, work and solve problems. They will be able to identify when and how O.R. professionals can really help, work more closely – and more effectively – with O.R. people and blend O.R. into an overall consultancy service offering.

The origins of O.R.; How O.R. concepts like measurement, queueing and simulation are everywhere; How the media 'stole' decision making, forecasting and game theory from O.R.; Seeing the world through O.R. tinted glasses

INTRODUCTION TO CREDIT SCORING

24 October, Birmingham
£615 + VAT for OR Society members
Hands-on course

NOTE NEW DATE!

Course provider:
University of Edinburgh

This course provides an introduction to credit scoring: what credit scoring is; how it developed and how it fits into the credit industry; the business problems it addresses. Gain the information needed to develop scoring; legal limitations; ideas of generic scoring and segmentation. Learn statistical techniques used in scorecard development: linear and logistic regression; choosing characteristics and attributes; splitting continuous variables. Understand other approaches to credit scoring: how to assess if a scorecard is good, how to monitor scorecards and the necessity to segment.

Statistical and alternative methods of constructing scoring rules; How to process data prior to model building; How to assess and monitor scorecard with a review of current developments; Current developments and new applications of credit scoring techniques

FUNDAMENTALS OF PRICING STRATEGY AND REVENUE MANAGEMENT

1 November, Birmingham
£595 + VAT for OR Society members

Course provider:
Lancaster University Management School

This course will help you to think differently about pricing and become aware of the options a company has when pricing products and services. You'll learn how to analyse customer needs and assess alternative pricing methodologies. You'll also be able to determine when it makes sense to compete on price and when it does not. The course will help you to maximise customer satisfaction by successfully overcoming price sensitivity.

Change customers' price perceptions to capture more value; Become familiar with the more technically challenging aspects of pricing; Optimise pricing strategy by determining the value of your product or service; Understand the concepts and implementation of various pricing strategies; Combine pricing and revenue management strategies to optimise revenue

CRIMESTOPPERS OPTIMISES PRODUCTIVITY AND PERFORMANCE THROUGH ORITS AND PRISM

KEVIN SHEEHY, LANNER

Crimestoppers is an independent charity helping the police to find criminals and solve crimes.

Crimestoppers is best known for the anonymous 0800 555 111 phone number where the general public can pass on information about crime, though in recent years this has been augmented by the Crimestoppers website where users can complete an online form. Callers do not give their name or any personal information and calls cannot be traced since there is no requirement to appear in court or give a statement to the police. Last year Crimestoppers received 95,276 calls and online forms with useful information. As a result of this information:

• 8,097 criminals were arrested and charged

• £22,340,328 worth of illegal drugs was seized

• £7,723,373 worth of stolen goods was recovered[i]

In April 2012, Crimestoppers took on a substantial increase in business but did not have large budget for new staff. The challenge was therefore to find the most efficient way of dealing with the extra demand. The challenge was made all the greater because, as a charity, Crimestoppers does not have large funds to draw upon the expertise of consultancies.

Instead, Crimestoppers turned to the OR Society's recently formed OR in the Third Sector (ORiTS) group which provides free support to charities and voluntary organisations. This group aims to help Operational Research analysts that work or plan to do voluntary work in charities, social enterprises, voluntary and not-for-profit organisations so they can do a better job, helping promote the opportunity to practice in a wider arena.

Two experienced independent analysts, Jane Parkin and Sue Merchant volunteered.

Lanner was a natural choice for both Crimestoppers and the ORiTS team. Lanner has been working with police forces around the UK for 15 years to help them improve their operations. Lanner PRISM is a simulation tool designed to support forces in their drive for efficiency. As a 'virtual' police force – PRISM has helped revolutionise the way police forces across the UK make decisions, reducing risk, saving time and saving money. PRISM incorporates a suite of simulation modules covering call handling, incident response, investigation and custody. It was using this tool that Jane and Sue sought to help Crimestoppers meet their challenge.

PRISM was used to build a simulation model of the Crimestoppers call centre, spanning three types of personnel: call handlers, online staff and shift leaders. This was then validated against known KPIs, assessing the impact of different shift patterns and recommending dynamic staffing levels.
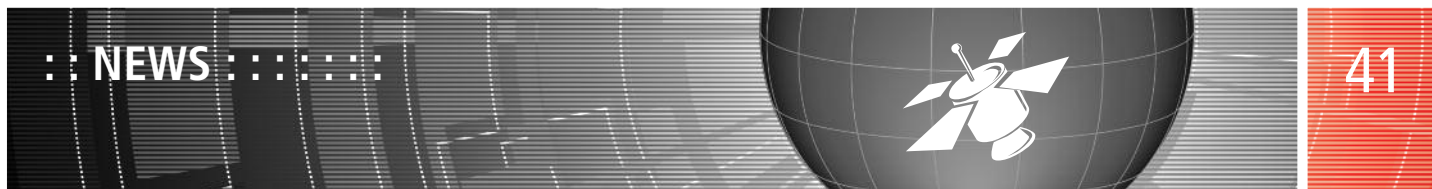
This approach led to:-

- Thorough data analysis allowing identification of variations in demand

- The ability to simulate and optimise different shift and staffing patterns with a comprehensive assessment of the impact

- Proposals for new shift patterns, which the model indicated would significantly increase performance for no increase in staffing costs

- The development of staffing profiles for optimal performance for quiet, average and busy weeks

- Comparison of current and proposed shifts over an actual week's operations

The analysis indicated that the resulting changes in shift patterns and staffing would lead to a 7% increase of those calls answered within the target time of 20 seconds, taking the contact centre over its 90% service level target. In addition, the average time to answer a call should decrease by 41% and there is expected to be a 47% decrease in abandoned calls. Soft benefits include releasing shift managers from taking calls and enabling them to better deliver training to call handlers during quieter periods.

'We've benefited hugely from the work and the support received in all areas of the project. From an organisational perspective, you've enabled us to take a highly professional approach to increasing the efficiency of our charity' (Karen Ogborn, Head of Performance, Crimestoppers).

Jane Parkin, Operational Research analyst, said: 'The strength of PRISM is that it is designed specifically for this environment and is backed up by a wide array of simulation expertise at Lanner. When a charity such as Crimestoppers gives you positive feedback that the simulation will improve the efficiency of the organisation, you know it has been time well spent and that the tools such as PRISM, do the job.'

Lanner was very happy to assist in this project and believe that the work was a classic example of simulation enabling an organisation to optimise its productivity and performance. PRISM is used by a number of UK police forces such as Derbyshire, West Mercia and Nottinghamshire, so Crimestoppers is in good company when it comes to building better processes and allocating resources in the best possible way.

i http://www.crimestoppers-uk.org/how-we-help

<OR>

YOUNGOR18 – GREAT WAYS TO GET INVOLVED:

The Peter Chalk Centre, Exeter University 9, 10 and 11 April 2013

Peter Chalk Centre, Exeter University

The YoungOR conference is always a highly popular event for those whose O.R. careers are less than ten years in duration. YoungOR18 offers a great opportunity to gain experience and present a paper in front a sympathetic audience. Presentations will be on a wide variety of areas, including traditional O.R., lean management, knowledge management and so on.

For more details, see www.theorsociety.com/Pages/Conferences/YOR18/YOR18.aspx

RUN A STREAM
Why not run a Stream? If you'd like to put your mark on YoungOR18, or discuss – with no obligation – how you could play your part in assuring the success of YoungOR18, please contact our Conference Chair, Antuela Tako, or Hilary Wilkes at The OR Society in the first instance, see below for contact details:
Conference Chair - Antuela Tako, Loughborough University; A.Takou@lboro.ac.uk
Administrator - Hilary Wilkes, The OR Society, hilary.wilkes@theorsociety.com

WOULD YOU LIKE TO SPONSOR AND/OR EXHIBIT
The YoungOR conference is a great place to meet other O.R. people. You can promote your services, speak directly with potential customers and find out more about what they need. Perhaps you could make yourself better known as a consultancy, offer software or other products that will help O.R. professionals to solve their problems. The two previous YoungOR conferences have attracted over 150 people who are keen to learn more about the products and services that will help them in the years ahead.

What it costs and who to contact
The cost of **sponsorship** ranges from £250 to £1,500 + VAT, and if taken up, will be acknowledged in the conference handbook, on our website and, where appropriate, will have your logo printed on the item itself.

To reserve an **exhibition space**, please contact Hilary Wilkes at the address below. An exhibition space costs £250 per day or £550 for the full three days (excluding attendance at sessions).

If you would like to exhibit at or sponsor YoungOR18, please send your contact details straight away to:

Exhibitor/Sponsorship Organiser - Kuangyi Liu, PricewaterhouseCoopers, kuangyi.liu@uk.pwc.com

or Hilary Wilkes, The OR Society, hilary.wilkes@theorsociety.com

<OR>

:::::::NEWS::
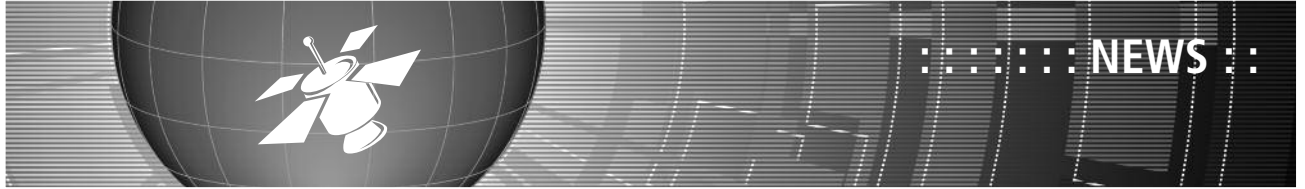
KEY DATES ANNOUNCED FOR KIM2013

Forest of Arden Hotel & Country Club

KIM2013 Knowledge and Information Management Conference,
4-5 June 2013
Forest of Arden Hotel & Country Club, Meriden, CV7 7HR, UK.

KIM2013 is the OR Society's inaugural Knowledge and Information Management conference. Full details can be found at: www.theorsociety.com/KIM2013

The Conference Call for Papers and Poster Guidelines can be found at:
http://www.theorsociety.com/Pages/ImagesAndDocuments/docume nts/Conferences/KIM2013/KIM2013CallPapers.pdf

The KMRP Special Issue Call for Papers can be found at:
http://www.palgrave-journals.com/kmrp/index.html

The theme of Sustainable Quality is relevant to organisations and individuals working in any sector of the economy. The different quality and knowledge management issues faced by different sectors and differently sized organisations, and how these are addressed in practice and in theory, will help to make this a very interesting conference.

We are extremely fortunate in having three highly knowledgeable and exciting plenary speakers, who will present very different and challenging thoughts: **Dr Jay Liebowitz**, University of Maryland University College, **Professor John Edwards**, Executive Dean, Aston Business School and Editor of *Knowledge Management Research and Practice (KMRP)*, and **Trevor Howes**, Director, BRM Fusion Ltd.

PLEASE NOTE THE FOLLOWING KEY DATES FOR THIS CONFERENCE:

1 October 2012	Title and abstract submission opens
1 October 2012	Full conference paper submission opens
7 December 2012	**Deadline for title and abstract submission for full papers and poster presenters**
7 January 2013	Early bird booking opens
11 January 2013	**Deadline for full conference papers to be submitted**
11 January 2013	**Deadline for KMRP SI papers to be submitted**
11 January 2013	Provisional programme
1 March 2013	Notification of outcomes of reviews of conference papers
1 March 2013	Notification of outcomes of reviews of KMRP SI papers
8 March 2013	**Deadline for early bird bookings**
11 March 2013	Standard booking opens
12 April 2013	**Deadline for final conference manuscripts for proceedings**
12 April 2013	**Deadline for author, exhibitor and sponsor bookings in order to appear in the programme**
26 April 2013	Final programme
17 May 2013	**Deadline for receipt of printed leaflets for distribution**
3 June 2013	Pre-conference evening
4 June 2013	Conference starts
5 June 2013	Conference ends
1 July 2013	**Deadline for final KMRP SI manuscripts**

<OR>

THE HUMOR COLUMN

GAVIN BLACKETT, SECRETARY & GENERAL MANAGER

We start with some historical showmanship and finish with a few 'shorties'….

After having dug to a depth of 10 feet last year, French scientists found traces of copper wire dating back 200 years and came to the conclusion that their ancestors already had a telephone network more than 150 years ago.

Not to be outdone by the French, in the weeks that followed, American archaeologists dug to a depth of 20 feet before finding traces of copper wire. Shortly afterwards, they published an article in the New York Times saying : 'American archaeologists, having found traces of 250-year-old copper wire, have concluded that their ancestors already had an advanced high-tech communications network 50 years earlier than the French.'

A few weeks later, 'The British Archaeological Society of Northern England' reported the following: 'After digging down to a depth of 33 feet in the Skipton area of North Yorkshire in 2011, Charlie Hardcastle, a self-taught amateur archaeologist, reported that he had found absolutely sod all. Charlie has therefore concluded that 250 years ago, Britain had already gone wireless.'

A tourist has just taken Ryan Air to court after his luggage went missing. He lost his case.

Battersea dogs' home was broken into last night and all the dogs set free or stolen. Police say they are not sure who did it, but they do have plenty of leads.

I've had such a terrible day. This morning I ended up in a fight with a man dressed as a medieval poet, then almost choked to death on a German sausage. Things have just gone from bard to wurst.

I recently have become involved in the science of salad-making: one of the first things I learnt is that for each ounce of mayonnaise there must be half an ounce of carrot and two ounces of cabbage. This is known as Cole's Law.

Towels. Biggest cause of dry skin known to man.

I knew I should never have invested in that online origami company, it folded last week.

Police were called to an accident involving a B&Q lorry carrying 5,000 tins of paint today. They were surprised to find the driver, covered in paint, rolling around laughing hysterically. Apparently he was overcome with emulsion...

I've just seen a bloke driving a tractor and shouting 'THE END IS NIGH'. I think it was Farmer Geddon.

A paper bag goes to the doctors because he's all itchy and has an embarrassing little rash. The doctor gives him an examination and tells him he's got a sexually transmitted disease. The paper bag starts sobbing & says 'But I've only ever slept with one other bag in my life!' The doctor replies 'Well, she must have been a carrier'.

<OR>

: : : : : : : NOTICEBOARD : :

NEWS OF MEMBERS

NEW MEMBERS

NEW MEMBERS (September 2012)

The Society welcomes the following new members,
STEVEN BATTY, Leeds; CHARLENE BECKFORD, West Midlands; CHRISTOPHER HOLLAND, Bolton; STELLA FAGG, Hants.; MICHAEL FOX, Fareham; NATHAN HANLEY, Hants; PHILIP HULL, Surrey; AMIT KUMAR, India; ANTONELLA MARTINI, Italy; AJAY PANDEY, India; BRIAN REILLY, Henley in Arden;   JAMES SMITH, London; MILES WEAVER, Edinburgh; COLETTE WRIGHT, Hants

and Reinstated members,
NEIL WARD, Kent; LOSIF BELOUKAS, Athens; IAN BROWN, Kent; SEAN MCCANN, Cumbria;

and the following student members,
MICHAEL ASARE, Hants; SHONA BLAIR, Glasgow; THOMAS JEFFRIES, Kent; NARGES HAGHI, Hants; KYUNG HUH, Birmingham; ELENI KOTZAMPASAKI, Edinburgh; MENG MA' Edinburgh; JASON YOUNG, Swansea;

Total Membership
2365

<OR>

REGIONAL SOCIETIES

EAST MIDLANDS (EMORG)
CONTACT: Chris Smith
TEL: 01530 416426
EMAIL: chrissmith677@gmail.com
EMORG - The talk 'O.R. – a virtual reality?'
Date/Time: Tuesday 9th October 2012. The meeting will commence at 6pm, Tea and Coffee will be available from 5.30 pm.
Venue: Loughborough University Business School Room BE1.42
Speakers: Dr Geoff Royston (ORS President)
The talk 'O.R. – a virtual reality?' will be aimed at stimulating discussion by considering some of the realities of operational research - what its practitioners and academics do and how they can effectively relate, how O.R. is seen and used - or not seen and not used – by managers, and the role of the OR Society in giving – or not giving - its members useful support.
Dr Geoff Royston is former Head of Strategic Analysis and Operational Research in the Department of Health for England, where for almost two decades he was the professional lead for a large group of health analysts. He is now an independent analyst and researcher and is the current President of the Operational Research Society.

LONDON & SOUTH EAST (LASE OR S)
Programme 2012
Location (unless otherwise specified): In the upstairs bar of Ye Olde Watling, on the Corner of Bow Lane and Watling Street nearest stations are Mansion House (Bow Lane exit) and Bank (exit 8) for tube, or Cannon Street and City Thameslink for rail. The event is open to all and with a free buffet of sandwiches available afterwards.
FOR FURTHER DETAILS CONTACT:
Sandra Weddell
TEL: 020 7918 4591,
EMAIL: Sandra.Weddell@tube.tfl.gov.uk
or Martin Caunt
TEL: 020 7215 3317,
EMAIL: Martin.Caunt@dti.gsi.gov.uk

MIDLAND (MORS)
CONTACT: Jen East (Secretary)
EMAIL: MidlandsORSociety@live.co.uk
OR in the 3rd Sector: Improving RNLI Response
Date/Time: Wednesday, 17 October 2012 Time - TBC
Speaker: Stuart Nicholas (Atkins), Kevin Sheehy (Lanner) and Andy Verity-Harrison (FICO)
Venue: TBA
Abstract: TBA

Operational Research techniques applied to Crowd Safety
Date/Time: Wednesday, 21 November 2012 Time - TBC
Speaker: Prof. Dr. G. Keith Still FIMA, G4S Professor of Crowd Sciences, Bucks New University
Venue: TBA
Abstract: TBA
This will be a joint talk with the West Midlands branch of the IMA. Please email MidlandsORSociety@live.co.uk if you would like to attend or require any further information.

NORTH WEST (NWORG)
CONTACT: Nathan Proudlove
EMAIL: nathan.proudlove@mbs.ac.uk

SCOTLAND (ORGS)
CONTACT: Mike Pearson (Chair)
EMAIL: m.pearson@napier.ac.uk or
CONTACT: Anthony Swain (Secretary)
TEL: 0131 451 3357
EMAIL: ajs27@hw.ac.uk

SOUTHERN OR GROUP (SORG)
CONTACT: Patrick Beullens
TEL: 023 9284 6357
EMAIL: p.beullens@soton.ac.uk

SOUTH WALES (SWORDS)
CONTACT: Dr Jonathan Thompson.
TEL: 029 2087 5524 Fax: 029 2087 4199
EMAIL: ThompsonJMI@cardiff.ac.uk
WORDS/SWORDS - The talk 'O.R. – a virtual reality?'
Date/Time: Tuesday 13th November
Venue: School of Mathematics, Cardiff University
Speakers: Geoff Royston (ORS President)
The talk 'O.R. – a virtual reality?' will be aimed at stimulating discussion by considering some of the realities of operational research - what its practitioners and academics do and how they can effectively relate, how O.R. is seen and used - or not seen and not used – by managers, and the role of the OR Society in giving – or not giving - its members useful support.

WESTERN (WORDS)
CONTACT: Dr Jo Smedley
TEL: 01633 432573
EMAIL: jo.smedley@newport.ac.uk
WORDS/SWORDS - The talk 'O.R. – a virtual reality?'
Date/Time: Tuesday 13th November
Venue: School of Mathematics, Cardiff University
Speakers: Geoff Royston (ORS President)
The talk 'O.R. – a virtual reality?' will be aimed at stimulating discussion by considering some of the realities of operational research - what its practitioners and academics do and how they can effectively relate, how O.R. is seen and used - or not seen and not used – by managers, and the role of the OR Society in giving – or not giving - its members useful support.
WORDS Talk 'Using OR to inform learning and teaching developments' followed by AGM
Date/Time: Tuesday 2nd October 2012 Commencing at 5.30pm
Venue: University of the West of England (Frenchay Campus), Bristol.
Speakers: Dr Jo Smedley - More details to follow.
The WORDS/IMA - Is 42 the real answer?
Date/Time: Wednesday January 23rd 2013
Venue: University of the West of England (Frenchay Campus), Bristol.
Speakers: Dr John Crocker
Abstract: Simulation, whether Monte Carlo (MCS), discrete-event (DES) or agent-based (ABS), can be a very powerful and often useful tool but it is not reality. This is especially true when used in conjunction with optimization methods. We shall look at some of the ways the results of a simulation model can lull you into a false sense of security, so to speak.

YORKSHIRE & HUMBERSIDE (YHORG)
CONTACT: Stuart Johns.
TEL: (0114) 225 3136
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<OR>

SPECIAL INTEREST GROUPS

COMMUNITY OR NETWORK
CONTACT Leroy White
EMAIL: leroy.white@bristol.ac.uk
TEL: 0117 954 5683

COMPLEX SYSTEMS DISCUSSION GROUP
CONTACT: Kevin Gilligan
TEL: 0208 977 8553
EMAIL: GilliganMauve@geo2.Poptel.org.uk
Group meetings to be held at 12 Noon
Last Friday of the month
The Adelaide, Park Road, Teddington

CRIMINAL JUSTICE
CONTACT: Ian Newsome
TEL. DDI: 01924 292244 **Extension:** 22244
EMAIL: ian.newsome@westyorkshire.pnn.police.uk
CJSIG NEXT MEETING:
Date/Time: Monday 26th November 2012, 2.00pm-4.30pm
Venue: MoJ in central London
There are likely to be three or four speakers covering a range of topics from international benchmarking of justice indicators to the simulation of roster patterns in Crimestoppers' call centre. Further details on speakers and topics will be posted on the CJ sig website and hopefully in Inside OR in the next couple of months so watch these spaces!
Please contact Sue Merchant for more details at suemerchant@hotmail.com

DECISION ANALYSIS
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DEFENCE
CONTACT: Noel Corrigan
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ACTING CHAIR:
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Chief Scientist
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Defence Science and Technology Laboratory (Dstl)
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EMAIL: arobinson@dstl.gov.uk
OR Society Defence Special Interest Group
Decision Support in the MoD , The presentations will be preceded by the Annual General Meeting of the Defence Special Interest Group
DEFENCE NEXT MEETING:
Comparing Analysis Support for Urgent Operational Requirements to traditional Acquisition Investments – Speed vs Rigour?
Date/Time: Wednesday, 10 October 2012 at 14:00 - 16:00
Venue: Atkins, The Hub, 500 Park Avenue, Aztec West, Bristol, BS32 4RZ
Speakers: Representatives from MOD, Dstl and Industry

Abstract: Operational Analysis support to traditional MOD acquisition and investments has been viewed in some quarters as long winded and delaying to investment decisions. In supporting Urgent Operational Requirements (UORs), analysis appears to have moved up a gear, but to what extent has this compromised the rigour and certainty of evidence. This event is to explore these issues and identify the lessons for traditional acquisition that arise from the analysis support to recent UORs.
The presentations will be followed by a discussion period where the topics raised can be explored in more depth. This will be followed by tea and biscuits.
Pre- registration: Non-Atkins attendees will need to ensure that they are pre-registered in order to obtain directions and arrange parking. This can be done by contacting:
Sally Skuse - Tel 01454 662611,
Email: sally.skuse@atkinsglobal.com
Further information about the event can be obtained by contacting the following:
Stuart Nicholas, Tel 01252 738528,
Email: stuart.nicholas@atkinsglobal.com
Chris Johnson, Tel 02392 537853, Email: cjjohnson@dstl.gov.uk

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CONTACT: Peter Cohen.
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FORECASTING
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CONTACT: Rong Qu (secretary)
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O.R. AND STRATEGY
CONTACT: Frances O'Brien
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O.R. FOR DEVELOPING COUNTRIES
CONTACT: Eric Soubeiga
TEL: 020 8659 3265
EMAIL: eric.soubeiga@hotmail.co.uk or
eric.soubeiga@orpagroup.net

O.R. IN THE THIRD SECTOR
CONTACT: Katherine Byrne
EMAIL: katherine.byrne@voa.gsi.gov.uk
OR in the Third Sector Special Interest Group Meeting and AGM
OR in the 3rd Sector: Using data to drive charitable impact
Date/Time: Thursday 13 September 2012, 2-4pm
Speaker: David Pritchard (New Philanthropy Capital)
Venue: New Philanthropy Capital, 3rd Floor, 185 Park Street, London, SE1 9BL

Abstract: Many charities are unsure what data to collect and how to use data they already have to increase impact. New Philanthropy Capital has developed an approach to helping charities identify what they should they be measuring, and how. David will describe the challenges that charities face and how NPC's approach addresses those issues.
Please email Katherine.byrne@voa.gsi.gov.uk if you would like to attend, noting that places are limited to 30 people.

PROBLEM STRUCTURING METHODS
CONTACT: Giles Hindle (Chair)
TEL: 01482 463457
EMAIL: giles.hindle@hull.ac.uk
or **CONTACT:** Dr. L Alberto Franco, University of Warwick
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EMAIL: alberto.franco@wbs.ac.uk

PRODUCTIVITY MEASUREMENT
CONTACT: Ozren Despic
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SD+ (SYSTEM DYNAMICS)
CONTACT: David Lane (Chair)
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SIMULATION
CONTACT: Christine Currie
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OR-30

September 1982 **(John Crocker)**

Professor Samuel Eilon was awarded the Silver medal in 1982 and awards committee citation is printed in full. There is also an interesting paper on the use of microcomputers in simulation – to be precise 'visual colour simulation on APPLE computers' and the readers were invited to vote for the paper 'you found most interesting and useful' from those published in issues 5 through 8. The prize for the period January to April was awarded to Hilarie Sutclieff, North Thames Gas for her paper 'Forecasting emergency workload for day ahead' (apologies to Hilarie for not having spotted this prize winning paper back in February).

Professor R. V. Jones who was made a Companion of Operational Research in 1983, presented the Blackett Lecture entitled *A Concurrence in Learning and Arms* . This gives an extremely interesting history of the origins of O.R. pre-ORS days from WWI through to the end of WWII with particular reference to those who had learned their skills and gained their experience in time of war. RV as he was generally known had, himself played a very important part in the defence of Britain by convincing a such people as Tizard, Lindemann, Sinclair, Newall, Dowding, Beaverbrook, Portal, Watson-Watt and Prime Minister Winston Churchill that the Germans had created a system of directing bombers to their targeting using intersecting short wave radio beams sent from transmitters on the European coast (known as Knickebein – bent leg). His theory was soon proved correct when RAF aircraft were able to pick up the beams and follow them to an area containing a Rolls-Royce factory in Derby. Jones introduced his talk by noting that Francis Bacon had not had the effect he had hoped for by launching his book *The Advancement of Learning* at the opening of Parliament as he had been somewhat upstaged by a certain Mr Fawkes.

In establishing the credentials of learning in society, Bacon says, 'For experience doth warrant both in persons and in times, there hath been a concurrence in Learning and Arms, flourishing and excelling

in the same men and the same ages'. Jones notes that Lord Blackett was such a man. Amongst his many other achievements, Blackett established Coastal Command's Operational Research Group. He then moved to the Admiralty to become Chief Advisor on Operational Research and then as Director of Naval Operational Research. Coincidentally, Sir Bernard Lovell, who obituary can be found in this issue, wrote an excellent biography of Blackett in *Biographical Memoirs of Fellows of the Royal Society.* Blackett was President from 1965 to 1970.

Jones suggests that Benjamin Franklin was one of the first to have investigated operations scientifically. He wrote to Joseph Priestley pointing out how much each of the 150 Yankees killed had cost Britain (£20,000) how much land they had gained (1/2 a mile) and how many American children had been born during this time (60,000) leaving Priestley to calculate the time and expense to conquer the whole country. Apparently Amrom Katz of the Rand Corporation performed a similar calculation to show that the Americans were spending per Vietcong killed approximately fifty times as much as he would have earned in the whole of his life (noting that it would have been ten times cheaper to suborn him).

The talk is peppered with fascinating stories and examples of the application of O.R. and I would thoroughly recommend it to anyone. I would also like to close with Jones' quote from Pasteur, 'The greatest derangement of the mind is to believe in something because one wishes it to be so.'

Anon, 1982, Awards Committee Citation for the Silver Medal 1982, Professor Samuel Eilon, *JORS* 33.9 p 777 (jors1982172a.pdf)
Jones R.V., 1982, A Concurrence in Learning and Arms, *JORS* 33.9 Pp 779-791 (jors1982173a.pdf)
Crookes, J.G. and B. Valentine, 1982, Simulation in Micro-Computers, *JORS* 33.9, Pp 855-858 (jors1982181a.pdf)
Anon, 1982, Announcement – The Pergamon O.R. Prize, *JORS* 33.9, Pp 869-870 (jors1982190a.pdf)

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OR-20 Extracted from OR Newsletter September 1992

A Young Wrinklies Conference
The Oracle

I was talking to my old friend Max Giddens last week and the conversation drifted round to the subject of conferences once again. I should perhaps apologise for the absence of my public words of wisdom for quite some time, but the fine weather this summer has renewed Max's enthusiasm for gardening and I have not seen much of him. In fact the only contact we'd had for some time was when he phoned to suggest a new O.R. conference, 'The young at Heart O.R. Conference'. Anyone who's been to a Spanish hotel out of season will know what that means.

Being of a slightly manic nature myself I persuaded Max to come round for the evening so we could wallow in the think tank for a while. My cellar's not so full at the moment and so a couple of bottles of Vincent's 1989 St Veran had to do. Having not met for a while, it took a bottle or so before we really warmed to our theme of a Young At Heart O.R. Conference.

Why should these young people have all the breaks? After all they have so many other things going for them, so why should they be the only ones with their own conference? So, minds whirring (voices slurring too) we set to work and came up with some ideas. Firstly, no paper which mentioned personal computers or Unix (whatever that is) would be allowed into this conference. Secondly we'd have a special stream for 'Back of the fag packet' papers – after all isn't real O.R. best done on one of these? It can be no coincidence that the decline in smoking has paralleled a decrease in the status of O.R. As for other subject streams at the conference, Max suggested that we choose any from O.R. conferences in the last 20 years; most seem to stay much the same. Prospects for linear programming sounded a good one.

Now various witty readers will doubtless suggest that a conference reception for such an event would presumably serve Sanatogen. Anyone who knows the alcohol content of that product might feel this an idea not to be sniffed at. However, we might also need to provide cocoa for those who prefer the occasional snooze. Max wondered if the cocoa was really necessary – he'd found that listening to most conference papers sent him to sleep very quickly. It would be, of course, essential that our speaker at the banquet regales us with stories about the early days of O.R., preferably in the second world war. There would also be a display of Facits and other mechanical calculators.

All in all, this sounds a jolly good idea don't you think? It could be an international conference and we could apply to the EC for funding, how about 'Conference on O.R. for Professional Seniors in Europe' (CORPSE for short)? Although on second thoughts, I'm not too sure how well some of the delegates might travel and we might lose some en route. So perhaps we'd better stick with a UK YAHORC, but I'm afraid there'll be no special rates for senior citizens.

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PROSPECT
RECRUITMENT

SIMULATION & BUSINESS MODELLING
£33,000 - £37,000 + Bonus

A leading professional services firm operating worldwide, our client provides simulation-enabled business transformation solutions for an established client base. Continuing business growth prompts their current need for an energetic, motivated graduate, with a track record of 1-3+ years success to date. Experience of/an aptitude for dynamic simulation, advanced spreadsheet modelling, database systems and optimisation would be highly beneficial.
West Midlands

ANALYTICS MANAGER
£60,000 - £80,000 + Benefits

Our client demonstrates their impressive growth record by doubling in size in the last five years. Analytics such as segmentation and modelling are viewed as increasingly important, both in the context of bid preparation and ensuring process optimisation, prompting the creation of this new role. Your experience should include clustering and regression techniques, supported by SAS or SPSS and excellent networking/communication skills. **Central London**

MODELLING & PROGRAMMING
£30,000 - £50,000 + Bonus

Recognised as an innovative leader in the field of simulation and optimisation, our consultancy client seeks a top calibre professional to contribute to their continuing growth. Offering a sound track record of modelling experience to date, including proven object oriented programming capabilities, the person appointed will need a 1st or 2i degree in a numerate subject, together with well developed communication and client interaction skills. **Surrey/Hants**

HEAD OF YIELD ANALYSIS
£Competitive

Providing insight and critical analysis on trading performance in order to develop, implement and monitor strategies for improvement, you will be responsible for drilling into and synthesising large data sets with sophisticated analytical techniques. The successful candidate will have proven experience from within a similar role, advanced skills with a range of analytical tools (Excel, VBA, SQL and/or Oracle) in addition to advanced analytical techniques such as regression analysis and commercial acumen of the highest level.
Peterborough

SUPPLY CHAIN CONSULTANT
£40,000 - £45,000

Experienced 'analytical consulting' professional sought with a minimum 3 years experience able to offer a blend of numerate/analytical expertise, well honed consulting skills and a sound appreciation of logistics. Ideally having come from an operational research, business modelling or similar quantitative problem solving background, the successful applicant will have a good numerate degree, an understanding of 3rd party logistics, consultant practitioner skills and the ability to develop credibility in End to End supply chain processes.
Oxford/ Northants

INSIGHT MANAGER
To £62,000 + Bonus

An excellent opportunity for an Insight Manager to lead our client's FMCG Campaign Analytics team and develop the capabilities of their propositions. Although this is not a 'hands on' delivery role, you will use your SAS and SQL experience to take accountability for code, processes and analytical output. You will authoritatively represent the fast paced team of Analysts, identify opportunities, implement change and establish collaborative working relationships to pave the way for new projects. **Central London**

With over 30 years of specialist market knowledge, Prospect is uniquely positioned at the forefront of Operational Research and related areas.

- Forecasting & Optimisation
- Business Modelling
- Process Re-engineering
- Financial Modelling
- Credit & Risk Management
- Change Management
- Simulation
- Customer Relationship Management
- Revenue/Yield Management
- Marketing Analysis

BRAND MATCH ANALYST
To £35,000 + Benefits

Highly respected Retail Company seeks high calibre, ambitious Analyst to work on their remarkably effective Brand Match Initiative. The successful candidate will have a strong numerate degree (2.1 or above) with at least 18 months proven commercial experience; able to demonstrate good analytical skills; with an ability to analyse, present and communicate data in a compelling format. Strong Excel skills required, SAS skills useful but definitely not essential. **Central London**

HIGH CALIBRE 'GRADUATE' ANALYSTS
£Competitive Package

Our client is looking for exceptionally able Graduates who have the drive and determination to help deliver major improvement projects to their supply chain; applying a scientific approach to retail problems and delivering solutions to improve the customer's experience. Applicants will need a good (2.1 or above) numerical or operational degree from a top tier university and be able to demonstrate strengths in business awareness, communication and analytical expertise.
Hertfordshire (c30 min journey from Liverpool Street)

DECISION SUPPORT CONSULTANTS
To c£42,000 DOE + Benefits

This dynamic consultancy provides analytical and management consultancy to help government and businesses make better-informed decisions. Due to demanding growth targets, they have a current need to recruit high energy, exceptional people to fill several positions as Decision Support Consultants. You will work across a range of areas covering services based on modelling and operational research techniques such as simulation, and providing decision support and business consulting expertise. **Hampshire/Surrey boarder**

CAMPAIGN ANALYST
£35,000 + Benefits

Impressive global consultancy is seeking smart, driven data analysts to work on one of their largest client accounts. Successful candidates will need to offer a numerate degree supporting c3 years' proven campaign analysis and insight data provision; be proficient in SQL, with good working knowledge of one or more of the following: Siebel, Alterian, Unica or similar. Individuals with excellent data presentation skills will be given priority. **Milton Keynes or Watford**

GRADUATE OPPORTUNITY
£20,000 - £28,000 + Benefits

Leading provider of simulation, modelling and optimisation software is looking to augment their team with a numerate {OR, Mathematics, Computer Science or Statistics} graduate with software development ability, to apply their skills to exciting 3D computer modelling and scheduling algorithms. Gained from studies or work experience, candidates should have demonstrable C# and ASP.NET ability, with additional knowledge of MVC, HTML, Javascript, JQuery, Ajax, being advantageous. **Hampshire**

eCOMMERCE ANALYTICS
c£50,000 + Benefits

Leading online brand is looking to recruit talented individuals to provide analytical insight through to business recommendation, with the intellectual curiosity to challenge existing thinking and the ability to present data in an uncomplicated, compelling fashion. Candidates will need to offer a quantitative degree, typically 4+ years analytical success and advanced Excel modelling skills. Pan European or multi-country experience would be highly beneficial. **Surrey**

For an informal discussion in total confidence on any of these positions or the market in general, please contact: Mark Chapman, Teresa Cheeseman, Kate Fuller or Sarah Sambrook. Alternatively visit our website to view our current vacancies.

Telephone: 01892 510892 **Email: or@prospect-rec.co.uk** **Web: www.prospect-rec.co.uk**