

## Beale Medal – Previous Winners

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## Citations

### Citation for Beale Medal 2021

#### Professor Chris Potts (University of Southampton)

With nearly fifty years of sustained contributions in developing new theory and algorithms for a variety of combinatorial optimisation problems, most notably in the area of scheduling, Professor Chris Potts has been instrumental in advancing the discipline of operational research in the United Kingdom and internationally. Professor Potts' academic career included being a Lecturer at Keele University, then subsequently working as a Lecturer, Senior Lecturer and Professor of Operational Research at the University of Southampton from 1986, where he remains active in research and teaching. He has served as Head of Operational Research in Mathematical Sciences at the University of Southampton from 2007–16 and Deputy Head of School from 2013–2016.



Professor Potts has made truly outstanding contributions to the theory of operational research, particularly in the area of scheduling of single and multi-machine production systems in manufacturing, including online scheduling, flow-shop scheduling, supply chain scheduling and scheduling with batching. His later work has focused on developing new theory and methods for problems arising in logistics and transportation, including airport runway scheduling, railway timetabling, vehicle routing and workforce scheduling. He has also contributed to significant research on problems in the healthcare and sport sectors. Professor Potts is recognised as a leading researcher in the field of scheduling, both in the UK and worldwide.

Through his supervision of more than 70 projects with industry, for organisations including Arup, Heathrow Airport, Babcock, Ferrari and DSTL, Professor Potts has also made remarkable contributions to the practice of operational research. His involvement in large-scale projects, such as those to increase airport throughput or the capacity of the rail network, further highlights his contributions in enhancing the impact of operational research.

Professor Potts has provided excellent support to the development of operational research in the UK, including being one of the key members behind securing the LANCS Initiative and also being one of the main contributors to the National Taught Centre in Operational Research (NATCOR) for the Combinatorial Optimisation course at the University of Southampton. His other roles have included being a Statistics and Operational Research sub-panel member for the UK's Research Assessment Exercise in 2008, and serving as Vice-President of EURO, from 2003–2006. He has also acted as Chair of the organising committee of VeRoLoG, an international conference on vehicle routing and logistics, held at the University of Southampton in July 2013. In addition, he played a key role in organising a series of International Symposia in Combinatorial Optimisation in the UK and linked to the ECCO conferences in EURO. These are all evidence of his active involvement in the wider community and contributions to operational research, both nationally and internationally.

To conclude, Professor Potts has made a sustained and significant contribution to combinatorial optimisation, particularly in scheduling research. He has also developed and led large projects in the area and worked with external organisations to translate his research into practice. As head of the OR group at the University of Southampton for many years and through his work supporting NATCOR, he has also been a mainstay of the OR academic community in the UK.

## Citation for Beale Medal 2020

### Professor Val Belton

Over the past 30 years, Professor Belton has established an international reputation for outstanding and innovative research in Multiple Criteria Decision Analysis (MCDA). She is widely recognised as one of the leading researchers of her generation in this field. She has published over 80 scientific articles in all the leading OR journals and has supervised a large number of PhD students.

In her research, important themes include the integration of MCDA with other management science methods and methodologies (and also the combination of several different MCDA methods), most recently with a focus on problem structuring for MCDA. Her research has included work on performance measurement and management.

In addition to her theoretical academic contributions, her work has been hugely influential on practice, and she has collaborated with a wide range of different organisations. She also developed the MCDA software VISA; whose aim was to make MCDA methods accessible to non-expert users in a user-friendly platform.

She has held the post of Professor of Management Science at the University of Strathclyde since 1999. Her wider professional appointments include President of EURO, 2009 – 2010 (President Elect 2008, Immediate Past President 2011); Editor of the *Journal of Multicriteria Decision Analysis* (2000 - 2009); President of the UK Operational Research Society, 2004-2005 (President Elect 2003, Immediate Past President 2006), and President of the International Society for MCDM, 2000 – 2004 (President Elect 1997-2000, Immediate Past President 2004-2007). She is on the Editorial Boards of the *Journal of Multicriteria Decision Analysis* (appointed 2009); *European Journal of Operational Research* (appointed 2010); and the *European Journal of Decision Processes* (appointed 2011).

She has been awarded several prestigious honours over her distinguished career, including Companionship of the UK Operational Research Society (for service to the profession) in 2011, the Georg Cantor Lifetime Achievement Award of the International Society for Multiple Criteria Decision Making in 2008, and the Presidential Award of the International Society for Multiple Criteria Decision Making in 2004.

Over and above her academic achievements in research, she has made major contributions to The OR Society and EURO. In addition to having been president of both societies, she also chaired the 1994 EURO-k conference and co-chaired the 2015 conference, both held in Glasgow.

Val's impressive achievements over three decades wholly fulfil the criteria for the award of the Beale medal, demonstrating a sustained contribution over many years to the theory, practice, or philosophy of OR in the UK.



## Citation for Beale Medal 2019

### Emeritus Professor Ailsa Land

Emeritus Professor Ailsa Land has pioneered work on branch-and-bound which has reshaped the landscape of mathematical programming and its influence continues to this day. She was also one of the early pioneers of computational operational research, in which effective data structures and clever implementation strategies are developed to produce efficient computer code. Moreover, over the past several decades she has made outstanding contributions to the methodology and practice of Operational Research in a variety of applied problem domains. In addition, she helped to establish an innovative two-year diploma in Operational Research at the London School of Economics (LSE) for the graduate apprenticeship scheme set up by the British Iron and Steel Association. Later, as Professor of Operational Research at the LSE she mentored both master's level and PhD students, several of whom have achieved international distinction.

Ailsa Land began her education as an Economics student at the LSE in 1946, obtaining a BSc in Economics in 1950 and a PhD in 1956 [7] for her thesis entitled "An application of the techniques of linear programming to the transportation of coal". Her economics training has illuminated the study and solution of a wide variety of applied problems: in transportation (1957, 1958) [8, 3], international trade (1959) [13], manufacturing layout (1963) [9], machine scheduling (1978) [14], sports analytics (1985) [18], and combinatorial auctions (2006) [19]. The range of these application areas is truly impressive.

Significantly, Ailsa Land and Alison Doig were part of a team that carried out research at the LSE under the sponsorship of British Petroleum. They were tasked with studying how to enhance linear programming models for refinery operations in which some variables are necessarily integral. The successes of linear programming then seemed to have encountered the unrelenting roadblock of combinatorial explosion. In a thoroughly original breakthrough, Ailsa Land and Alison Doig proposed and developed the so-called branch and-bound method for optimization problems with integer variables. This innovative approach provided a systematic (and efficient) enumeration of candidate solutions for discrete optimization problems. They published their ground-breaking work in *Econometrica* (1960) [11]. This approach and its extensions have become widely used in the mathematical programming community. Indeed most serious implementations of OR optimization software include branch-and-bound routines. Furthermore, according to Google Scholar, there have been over 3000 citations to their *Econometrica* paper, which has as well been reprinted in *50 Years of Integer Programming, 1958-2008* [12]. The influence of the branch-and-bound method continues to the present time, and it appears as a key construct in machine learning contexts, such as MAP (Maximum A Posteriori) inference (2014) [6].

Influential early work on the travelling salesman problem began with the publication by Ailsa Land and George Morton (1955) [21]. In subsequent work (1979) [10], Ailsa Land applied cutting planes and a heuristic for sub-tour constraints to this challenging problem.

To quote from a prestigious 2007 work on the topic [2], her research provided "a considerable improvement on previous algorithms ... A major contribution is a mechanism for automatically dealing with the large number of variables that can appear in the LP relaxations ... Variants of Land's technique are adopted in all recent studies of the cutting plane method for large-scale problems".

In addition, Ailsa Land has advanced the methodology of Operational Research through publication of significant work on shortest path algorithms (1967) [5, 20], quadratic programming (1973) [15], bicriteria decision problems (1981) [4], and statistical data fitting (1993) [1]. Such work has appeared in the top academic journals of Europe and the USA. In 1994 she received the Harold Larnder Prize from the Canadian Operational Research Society for her contributions to mathematical programming. Since retirement from the LSE in 1987, she has continued research projects, resulting in contributions to Data Envelopment Analysis, Combinatorial Auctions, and the Quadratic Assignment Problem.

It is significant that Ailsa Land has not been content with methodological contributions alone. She has devoted much effort to the parallel development of computational tools for efficient solution of such problems. Indeed, she was at the forefront of computational OR, in which well-tested computer code is implemented, taking into account both theoretical considerations and efficient data structures. A significant work of this nature is the book

*Fortran Codes for Mathematical Programming: Linear, Quadratic and Discrete* (1973) [16], written jointly with her PhD student and colleague Susan Powell, which provides detailed documentation for computer implementations of optimization techniques as well as the underlying mathematical background and a suite of test problems. This valuable resource has garnered several hundred citations according to Google Scholar. Further considerations that guide consumers of mixed integer programming and combinatorial programming products are provided in a subsequent book chapter (1979) [17]. In addition, Ailsa Land has developed computer code for Data Envelopment Analysis problems and for the Travelling Salesman Problem, all made freely available to the optimization community. Ailsa Land was notably the first woman professor of Operational Research in Britain and she was an inspiring role-model and supporter for women at earlier stages of their career. She mentored a number of highly successful students, both male and female. Many of these have gone on to distinguished careers and leadership roles in academia. Her students have become Editors-in-Chief of international journals (*Computers & Operations Research*, *INFOR*, *Networks*, and *Transportation Science*), academic administrators (Department Chair, 3 Associate Dean, Vice Rector), and have received prestigious honours (Order of Canada, INFORMS Fellow, Lifetime Achievement Award in Location Analysis).

In view of these significant contributions, extending over the past several decades, to methodology, practice, and education of OR, we can confidently recommend Ailsa Land for the 2019 Beale Medal. She is truly one of the pioneers of post war operational research in the UK.

## Citation for Beale Medal 2018

### Professor Russell Cheng

Professor Russell Cheng played a major role in developing simulation as a widely used quantitative tool for both academic and industrial use. His theoretical contributions to the use of statistics in all aspect of simulation are truly outstanding and extensive, coming over a career that began in 1973, following completion of his PhD at the University of Bath, and is still ongoing today, where he remains active as an Emeritus Professor at the University of Southampton.

Russell's main contributions to the field are in the areas of:

Computer generation of random variables: Russell's algorithms for generating gamma and beta random variables are still among the most efficient known today.

Design and analysis of computer simulation experiments: these include practical methods for improving the efficiency of simulation experimentation as well as sensitivity analysis.

Estimation in non-standard problems: the subject of Russell's book, *Non-Standard Parametric Statistical Inference* published recently by Oxford University Press, this work deals with the practical analysis of real data, acknowledging that in the real world data do not always follow a normal distribution.

Computer-generated imagery: this work dates back to the 1990s when Russell was involved in building realistic simulation models for marine simulations.

Within the UK, Russell has been key to maintaining the mathematical basis of simulation within the Operational Research community and to introducing statisticians to the interesting problems of simulation. This has come about through his significant contributions to the simulation community including to: academic leadership, simulation societies, journals, conferences, PhD supervision and development, and practice.

Russell has been recognised internationally, having been presented with the Lifetime Professional Achievement Award by the INFORMS Simulation Society in 2016. Within the UK, he is a Fellow of the Royal Statistical Society (RSS) and a Fellow of the Institute of Mathematics and its Applications (IMA). Indeed, within the UK Russell is widely recognised as a leading academic in the field of simulation, and most certainly the leading UK academic in the mathematical analysis of simulation models.



*OR Society President John Hopes presenting the Beale Medal to Professor Russell Cheng*

## Citation for Beale Medal 2017

### Mike Jackson

Mike Jackson was awarded the Beale Medal for an outstanding and sustained contribution to OR that took place in five key phases: an initial critique of Soft OR (1982-1985); a proposal for methodological pluralism to overcome the Hard/Soft divide (1984-1987); a description of an 'enhanced OR' approach that acknowledges the complexities, uncertainties and conflicts regularly encountered in OR practice (1987-1988); the further development and popularization of his enhanced OR approach under the banners of 'Critical Systems Thinking' and 'Total Systems Intervention' (1990-1999); and finally, the consolidation of his work in a mature presentation of his perspective (2000-2003).





## Citation for Beale Medal 2016

### Richard Ormerod

Richard Ormerod is awarded the Beale medal for his outstanding contribution to understanding the practice of OR through his many publications. Richard has been instrumental in raising the profile of research into the important topic of OR practice through his creative, productive and broad ranging work programme, leading to many publications, especially in the Journal of The OR Society.

Richard spent 25 years in industry as a bridge engineer, 1967-71; factory manager, 1972-73; operational researcher (British Coal), 1973-78; Deputy Director, Central Planning Unit, British Coal, 1978-87; senior management consultant, PA, 1987-91. He moved to academic life in 1991, joining Warwick Business School as Professor of Operational Research and Systems. Subsequently he was appointed Associate Dean of Executive Education and Professor of Management. Richard was also a Franz Edelman Award finalist in 1995 for his work with Sainsbury's.

The focus of Richard's research has been the practice of operational research; how practice can be described, understood and improved. The perspective pursued is that of a practitioner. Particular topics include: the philosophy of OR; the process of OR; the intellectual basis of pragmatism; the transformation competence perspective; case studies of OR interventions; development of information systems strategies; strategic modelling; and soft OR.

Richard has published extensively since joining academia in 1991. His transition from consultant to academic has been the basis of much of his research and in particular, the importance of structuring the organizational interventions including case studies in which he has been involved. Four of his top seven cited publications have analysed these interventions, in particular two influential examples of the application of SSM to information systems development at Sainsbury. This case study was a finalist in the INFORMS Edelman competition in 1995 and presented by Richard. This focus on taking OR concepts into practice stimulated him to analyse various OR journals including JORS in order to categorise the type of research articles they published. The analysis led him to lament the relatively paucity of true applications with too much theoretical work unrelated to any real-world problem. These same important themes still concern Richard; see his 2014 JORS publication on 'the mangle of practice' and his review of some of the problems of problem structuring methods (EURO Journal on Decision Processes, 2013.)

Richard's vigour in engaging with the debate about the nature of practice and the role of systems thinking have led him to publish some 20 pieces in JORS, many of which have sparked a response (through the Viewpoint section). In this we think Richard has made a major contribution to the health of OR in the UK and in so doing identified some of the challenges which lie ahead if it is to continue to develop. Richard Ormerod is a worthy winner of the Beale Medal.



*Richard Ormerod and Ruth Kaufman (President of The OR Society)*

## Citation for Beale Medal 2015

### John Friend

John Friend joined the Institute of Operational Research (set up jointly by The OR Society and the Tavistock Institute of Human Relations) in 1964, the year after its foundation, by which time he had already worked for 10 years in manufacturing industry and air transport. He remained in IOR until setting up as an independent consultant in 1986. He has held visiting chairs at four British universities; however (unlike all

Beale medallists to date) he has never held an established university post. His original contributions have been developed out of his experience as a practitioner.

IOR was established jointly by The OR Society and the Tavistock Institute of Human Relations with the aim of expanding the fields of application of OR, and to counter the tendency for it to settle down as a mainly in-house, industrial activity deriving its strength from mathematics and the hard sciences. John led a group within IOR that carried out a series of practical engagements with planning in a public sector context. Out of this experience, and through close observation of the complexities, uncertainties and dilemmas of decision-making, emerged the approach which came to be called Strategic Choice.

In the Strategic Choice Approach problem structure is elicited interactively from multiple participants in the problematic situation; and a rich array of tools (many of them graphical in nature) enables the consultant/facilitator to manage the whole process of developing a shared view of the problem and helping group members towards commitment to consequential actions. Leading characteristics of the approach include treating uncertainty as a key element of strategic decision situations, and re-envisioning decision-making to include the potential for making partial commitments.

These were and are radical departures from OR mainstream. In retrospect it can be seen as part of the family now known as Problem Structuring Methods, of which it was chronologically the first to be developed. It shares with other PSMs the OR-characteristic of using models to help illuminate and structure choice. It may be recalled that the 2004 EPSRC review concluded that PSMs (or 'soft OR' as they called it) was one of just two "unique selling points of significant strength" within the British OR research agenda.

John Friend is the unchallenged progenitor of the Strategic Choice Approach, and has continued to develop and enrich the approach over the decades. It has a network of users and enthusiastic champions around the world. Note the chapter of applications in the 3rd edition of *Planning Under Pressure*, which contains cases from six different countries. This book, first published in 1987 and still in print, has been translated into Japanese and Spanish. Handbooks on the Strategic Choice Approach in Dutch, French, Portuguese and Swedish have also been produced. John's international reputation is reflected in his 1998 award of an honorary doctorate by the University of Amsterdam. The Strategic Choice Approach has given operational research an entry point to problem situations and structures which have proved



*John Friend with Stewart Robinson (President of The OR Society)*

resistant to more conventional operational research methods, in particular those with high levels of non-probabilistic uncertainty and/or multiple organisational actors. A case in point is that of Structure Plans, the strategic level of UK local development planning for over 30 years from 1968. Strategic Choice was the formal method most widely used in their development. The symposium in the international journal *Planning Theory* (Volume 3, No. 3, 2004) dedicated to an appreciation of John's work is an indication of his influence in the field of urban and regional planning.

John's contribution to the development of operational research has lain not only in his methodological originality, but also in his accounts of and reflections on this experience. A series of books, for all of which he was the principal author, record the approach pioneered in IOR and which he has continued into the present. His publication record in books, book chapters and papers matches in scale those of many leading academics, yet has been achieved as a full-time practitioner. His papers in refereed journals give an idea of his intellectual reach - across operational research, systems, town planning, the environment and leading social science journals. They cover such topics as decision support, community operational research, complexity, policy making, development planning, group process, and inter-organisational planning. These papers are never pure theory – they are, rather, essays in improving the understanding and the practice of rational support for decision-making.

In an operational research career of over 50 years it is inevitable that some of the contributions and turning points may by now seem historical. John has retired several times, but he has never been able to stick to his decision. From 2000-2, already in his 70's, he was Vice-President of The OR Society, and played an active part in the 2002 IFORS Conference in Edinburgh. Throughout his generous availability and enthusiastic support has been especially appreciated by younger members of the OR community.

At John's proposal The OR Society funded in 2013-4 a project to promote to new generations the achievements of the IOR heritage in the field of public policy. This culminated in June 2014 in an invitation-only meeting at the Royal Society targeted at analysts and policy makers in the civil service and other public agencies. That the meeting was packed out is testimony to the continuing relevance of the work he put in motion and has carried forward since the 1960's. The initiative has also given rise to a new ORS special interest group in Public Policy Design.

This is a career of great intellectual and practical achievement. In the end, however, the case for the award of the Beale Medal rests predominantly on his invention, development, elaboration, practice and promotion of the Strategic Choice Approach. It has been used with grass-roots groups in East London, and at cabinet level in Venezuela. This is a uniquely sophisticated methodology, a noted addition to the analyst's toolbox, which has been adopted and used on all of the world's continents. It is rare for such an achievement to be attributable to one person only, but this is such a case.

## Citation for Beale Medal 2014

### Robert Fildes

Robert Fildes is a Distinguished Professor of Management Science in the Department of Management Science at Lancaster University Management School.

Following a first degree in Mathematics at Oxford and a PhD in Statistics at the University of California, Robert joined the staff of Manchester Business School as a lecturer in 1971. He became a Senior Lecturer in Business Forecasting in 1979 and in 1990 moved to Lancaster to take up a Professorial post. At Lancaster, Robert has been Head of the Department of Management Science for more than one term of office and has been the Management School's Associate Dean for Research.

Robert's notable contribution to the development of operational research is in the area of forecasting where he is an international expert. He was a key contributor in early forecasting competitions that have had significant influence in the development of theory and practice. Two early influential contributions were published in the Journal of the OR Society (JORS) where he surveyed first time series (1979) and in 1985 econometric forecasting from an OR perspective. This focus on the relationship of forecasting to OR, both in theory and practice, has been revisited, again in JORS, in an attempt to encompass the dramatic developments of the previous 30 years. Robert is a past president of the International Institute of Forecasting (IIF). He was co-founder and editor in 1981 of the Journal of Forecasting and in 1985 of the International Journal of Forecasting.

He has made extensive contributions to the literature through books and articles. A list of his publications can be found in [www.lancaster.ac.uk/lums/people/robert-fildes](http://www.lancaster.ac.uk/lums/people/robert-fildes). Much of his work has been on research for forecasting in a business environment with links to important business decisions concerning areas such as stock control and the adoption of new technologies. In recent years, he has turned his attention to the important topic of climate forecasting, where his research work (with colleague Nikos Kourentzes) has shown the large simulation models used in developing the IPCC's view of global warming could be improved for decadal forecasting by simple statistical models: this suggests the climate models are misspecified.

Robert has always been concerned that the best forecasting methods are applied and are used in practice. He is Director of the Lancaster Centre for Forecasting, which is involved in training courses and consultancy for many different organisations where the aim has been to take the latest research ideas and test them in practical situations ([www.lancaster.ac.uk/lums/forecasting/](http://www.lancaster.ac.uk/lums/forecasting/)).

Robert's great concern for practice has extended more generally than just in his particular area of expertise in forecasting. In the mid-90s he was joint leader of a survey of practitioner OR groups in the UK (Success & Survival of OR Groups, SSOR), which was sponsored by The OR Society and is probably the most comprehensive such survey ever carried out. The work



*Robert Fildes with Stewart Robinson (President of The OR Society)*

led to several influential papers in JORS and Interfaces as well as a diagnostic tool for assessing the effectiveness of an OR group which was applied successfully to some Government OR groups.

Robert has been a regular supporter of The OR Society's activities, starting in 1979 with his work with the then forecasting study group which supported the publication of a bibliography he compiled four. He was Vice President of the society from 1995 to 1997.

Over the course of his long career, Robert Fildes has made an outstanding contribution to the development of operational research in the UK and is a worthy recipient of the Beale Medal.

Fildes, R. (1979) "Forecasting - the State of the Art: Extrapolative Models", *J. Operational Research Society*, 30, 691-710.

Fildes R. (1985) "Quantitative forecasting: the State of the Art - Econometric Models", *J. Operational Research Society*, 36, 549-580.

Fildes, R., Nikolopoulos, K., Crone, S. and Syntetos, A. (2008) "Forecasting and OR", *J. Operational Research Society*, 59, 1150-1172.

Fildes, R., Dews D. and Howell S. "A Bibliography of Business and Economic Forecasting", Gower Publishing, Farnborough 1981.

## Citation for Beale Medal 2013

### Kevin Glazebrook

Kevin Glazebrook is a distinguished Professor of Operational Research in the Department of Management Science at Lancaster University. After obtaining his PhD in Mathematics from Cambridge University in 1976, he worked for many years in the School of Mathematics and Statistics at Newcastle University. In 2002 he moved to Edinburgh as Professor of Management Science. Then in 2005 he joined the Department of Management Science, Lancaster University (until 2011 this was a joint appointment with the Department of Mathematics and Statistics).



*Kevin Glazebrook and Geoff Royston (President of The OR Society)*

Kevin's research interests concern how complex random systems should be optimally controlled. This work ranges from the theoretical analyses of novel methodologies through to more applied work, with relevance to practical applications. Application areas include:

- The optimal management of networks of inventories (e.g. retail outlets);
- How manufacturing companies should manage the outsourcing of warranty repair work;
- How customers should be routed for service in complex service systems;
- Cargo revenue management;
- The optimal processing of intelligence information; and
- The optimal deployment of resources for defensive surveillance.

Kevin has published extensively in top academic journals in Europe and the USA. In 2011, he co-authored a book with John Gittins and Richard Weber on Multi-Armed Bandit Allocation Indices concerning the theory behind an important class of stochastic models.

In recent years Kevin has had a significant influence on the development of operational research in the UK.

In 2006 he was the founder and initial director of NATCOR, an EPSRC-funded national taught course centre in operational research. He directed NATCOR for its first six years, including securing follow-up funding from EPSRC in 2011.

He currently directs the LANCS Initiative, a £13M Science and Innovation project to expand research capability in foundational OR in the UK. This project is co-funded by EPSRC and Lancaster, Nottingham, Cardiff and Southampton universities.

He chairs STOR-i, an EPSRC-funded Centre for Doctoral Training in statistics and OR with substantial industrial engagement. The centre is joint between the Departments of Management Science and Mathematics and Statistics. It is one of only a few funded centres in the mathematical sciences in the UK.

He is a member of the EPSRC Peer Review College and currently serves EPSRC as a member of a working group, the 'People Pipeline Project' looking at career progression for early stage

researchers. He has also advised on changes to the peer review systems and served as Chair of several prioritisation panels.

He has been appointed by EPSRC to serve on the Mathematical Sciences Strategic Advisory Team until April 2015.

He is a member of sub-panel 10 for REF2014, which will be evaluating the quality of research in UK universities in mathematical sciences which includes operational research.

Kevin has served The OR Society by being a member of council from 2007-2012, contributing to the work of the Education & Research Committee.

He currently serves on the editorial boards of the journals Mathematical Methods of Operational Research, Naval Research Logistics and Queuing Systems.

In summary, Kevin has made an outstanding contribution to operational research by the excellence of his research contributions and his influence on the support and development of the discipline in the UK. He is a strong candidate for the award of the Beale Medal.

## Citation for Beale Medal 2012

### Mark Elder

Mark first studied Operational Research at Lancaster University from where he graduated in 1978 with a BSc. He started his career in the automotive company British Leyland in the UK, simulating the introduction of new car derivatives to existing plants. In the late 1970s he was one of the team who created SEE-WHY, the world's first Visual Interactive Simulation software. Mark then went on to help found the simulation company Insight Logistics which developed the GENETIK simulation software package.

Mark has been a pioneer in the field of visual interactive modelling and simulation, obtaining his doctorate for research in this field from the University of Strathclyde. He spent some time as an academic teaching and conducting research on simulation at the University of Strathclyde.

In 1994 Mark founded SIMUL8 Corporation and has been CEO until announcing his retirement in 2012, though he will continue as Chair of the Board of Directors of the company. The SIMUL8 software has had a significant impact on the field of simulation. For the first time it provided readily affordable simulation software which has been widely used in industry and the public sector both in the UK and overseas. Through SIMUL8's educational licences and support for academics, simulation has been introduced to thousands of undergraduate and postgraduate students across the world. Mark's vision is that everyone working in any process should be thinking about how to improve it - by simulating their own ideas for change. He has gone a long way to achieving that vision.

Mark has been an influential speaker at many events in the UK and overseas. He was a plenary speaker at OR49, the society's Annual Conference in Edinburgh in 2007. More recently he was one of the invited speakers to the society's Developments in Advanced Analytics event that took place in London in April 2012.

Mark has also served the society by being a member of Council and he is currently a member of the Accreditation panel.

Mark has made a significant difference to the use of operational research methods, particularly in simulation, through his research, teaching and the software companies that he founded. He is a worthy recipient of the Beale Medal.



## Citation for Beale Medal 2011

**Frank Kelly FRS, Professor of Mathematics of Systems and Master of Christ's College, Cambridge**

Frank Kelly has made sustained and highly influential contributions to the theory and application of operational research over the course of his career. He has developed profound mathematical theory for stochastic networks and has applied these theories for the understanding, control and design of large scale networks, especially telecommunication and transport networks.

In his early work, Frank Kelly made fundamental contributions to the theory of product form queueing networks. In particular, he extensively developed the notion of quasireversibility for multiclass queues. This variant of the classic notion of reversibility for Markov chains is particular to queueing systems and as demonstrated by Kelly is key to understanding generalizations of the classic results of J. R. Jackson on product form steady-state distributions for single class queueing networks to more general multiclass (BCMP) networks. Kelly's insights also led to a clear understanding of certain insensitivity properties of such networks. This theory is featured in Frank Kelly's classic book "Reversibility and Stochastic Networks" which has inspired much further theoretical research and fostered applications in a wide range of areas, including computer communication networks, production and logistics, biology and chemistry. To this day, his book remains an excellent introduction to (quasi)reversibility and related applications.

Beginning in the mid-80s, Frank Kelly turned his attention to the study of loss networks, motivated by applications to circuit switched networks. These stochastic network models are relevant to telephone networks and some cellular and computer communication networks. Key issues of interest for such networks are loss (or blocking) probabilities for calls, and optimal capacity allocation and routing. Working in the natural asymptotic regime where the link capacity grows in proportion to the rate at which calls are placed on each of the routes, Kelly provided rigorous justification for a simple, elegant and widely used approximation for the blocking probability on any given route. Following this, working in a different asymptotic regime, where link capacities and loads are fixed, but the numbers of links and routes tend to infinity, Kelly developed and analyzed dynamic alternate routing strategies for rerouting initially blocked calls. Kelly's work in this area of loss networks was developed in a series of papers that have influenced call routing strategies worldwide and led to a scheme that has been implemented in some digital telephone networks, including that of British Telecom.

In more recent years, Frank Kelly has been deeply involved in modeling and analysis of the Internet. He has artfully combined economic and engineering principles in formulating mathematical models for congestion control and fair allocation of resources. He has combined mathematics from several different areas, including optimization and probability, to analyse these models. His work has provided fundamental insights into the behavior of rate control algorithms such as TCP and on the effects of fair sharing on network performance. In particular, his mathematical framework, based on principles of dual decomposition, for implementing congestion control and fair resource allocation through distributed pricing schemes has greatly influenced the networking community. Concepts that Frank Kelly has developed also have application to other large scale engineered networks. In particular, he has been using insights and extensions of this work in analyzing strategies for the control of road traffic.

Besides his outstanding contributions to the theory and application of operational research, Frank Kelly has also been a major contributor in service to the profession and to government. In the realm of stochastic networks, through his writings, students, scientific committees and individual interactions, he has been a key catalyst in establishing a vibrant interdisciplinary community of stochastic network researchers. More broadly, he has served on the Scientific Board of HP's Basic Research Institute in Mathematical Sciences, the Scientific Council of EURANDOM, the Conseil Scientifique of France Telecom, and the Council of the Royal Society. He has chaired the Advisory Board of the Royal Institution/University of Cambridge Mathematics Enrichment Project, and the Management Committee of the Isaac Newton Institute for Mathematical Sciences. He is a member of the RAND Europe Board of trustees, a non-executive director of Autonomy, and chair of the UK Council for the Mathematical Sciences. From 2003 to 2006 he served as Chief Scientific Adviser to the United Kingdom's Department for Transport.

## Citation for Beale Medal 2010

### K B Haley

Brian Haley has been at the centre of OR, both nationally and internationally, for more than fifty years. He has been active as an academic, as a practitioner and as a servant of the OR community.

During his Birmingham University-based academic career, Brian participated in the earliest OR courses in the UK, developed a highly regarded MSc, supervised numerous PhD students, and took OR into the wider sphere of the engineering disciplines. His position as Professor of Operational Research for a period of no less than 31 years is surely unsurpassed for a UK Chair in this field.

His earlier time as a direct practitioner in the National Coal Board included formative work in mathematical programming, work which was further developed when he moved to Birmingham University. This work is still cited today, especially that on the so-called multi-index problem. Moreover, the research and projects that he undertook or supervised from his academic base were always rooted in practical issues and usually affected decisions in the practical world.

Brian has been a highly influential figure in The OR Society and in IFORS. He has held many significant positions in each, including the two Presidencies. He has been the continuous face of British OR in the IFORS world for many years. He has also been a prominent figure in the world of OR Publications, including a period as an influential editor of The OR Society's own journal, which he helped steer from its early house journal style towards something much like its present form, and an editor of several IFORS Conference Proceedings.

Since his retirement Brian has maintained interest and activity in the society's affairs. He is a regular attender at ORS conferences, and has been a member of general Council and the Board of Directors for many years. One of Brian's most important contributions has been as Chair of the Publications Committee, a position he held for a period of 11 years. During his time as Chair, the journals in the society's portfolio have flourished, and Brian has overseen the development of a variety of initiatives, including the birth of the new Journal of Simulation. The expansion of the society's publications and their increased effectiveness, has advanced the spread of knowledge and understanding of OR and helped disseminate its successful application. It is well-known that the income from publications has brought financial stability to the society, and the society owes a debt of gratitude to Brian for his outstanding stewardship during his period of office. On the world stage, Brian still regularly attends IFORS and EURO conferences, and on many occasions the society has drawn on his vast experience on the international scene to respond to various queries that have arisen in these contexts.

In the UK operational research world more generally, Brian served on, and in some cases chaired, important Research Council and government committees, especially in the defence field where he gave long and valued service.

Brian's early work as a practitioner, his long and active academic career, his work internationally, his editorship of JORS and his leadership in publication matters within the society have significantly advanced the knowledge, understanding and practice of OR. He is a truly worthy recipient of the Beale Medal.



## Citation for Beale Medal 2009

### Professor Jeff Griffiths, School of Mathematics at Cardiff University

Jeff Griffiths is Professor of Operational Research in the School of Mathematics at Cardiff University. He has been a member of staff at Cardiff University since 1964 and was Head of the School of Mathematics for most of the period from 1983 to 2007, was appointed Dean of the Science Faculty in 1991, and is head of the Operational Research and Statistics Group. Jeff is widely known internationally for his contributions in queueing theory, transportation problems and healthcare modelling.



*Jeff Griffiths with Elizabeth Beale*

His PhD was in Stochastic Processes, and he first became interested in Epidemiology and Healthcare when investigating the world-wide eradication of smallpox in the late 1960s and early 1970s. Since that time Jeff has undertaken a large number of consultancies and contracts with government establishments and with a variety of public and private companies, including GlaxoSmithKline, University Hospital of Wales, National Health Service, and the Welsh Assembly Government. He has also worked extensively in the field of transport, with particular reference to congestion problems, and has held consultancies with BP Oil Ltd, Department of Transport, British Steel, Welsh Office, Maunsell Consultancy Services, Suez Canal Authority and Transport Research Laboratory. He has been an invited speaker at a large number of conferences both in the UK and overseas, and has organised several international conferences. The author of over 130 publications and reports, Jeff has also appeared in expert capacity in several television and radio programmes, as well as an expert witness in High Court actions. He has been awarded a number of Research Council grants during his academic career, and recently was instrumental in the successful application for EPSRC Science and Innovation funding to OR. From 1987 to 1997 he was the UK representative on the EU Concerted Action to investigate the control and spread of HIV/AIDS in Europe, funded by the European Union and World Health Organisation.

In summary, Jeff has made an outstanding and sustained contribution to operational research. Although he passed retirement age a few years ago, Jeff continues to be highly active in both research and practice. Indeed after 45 years of service to Cardiff University and OR, one cannot imagine Jeff ever wishing to stay away from the University! He is an outstanding candidate for the Beale medal.

## Citation for Beale Medal 2008

### Professor Lyn Thomas, Professor of Management Science at the University of Southampton

Lyn Thomas is Professor of Management Science at the University of Southampton, a post he has held since 2000, having previously held academic posts at the Universities of Manchester and Edinburgh and the US Naval Postgraduate School in Monterey, California. From 1985 to 2000 he was Professor of Management Science at the University of

Edinburgh. He is widely known internationally, both in academic and practitioner circles, for his groundbreaking research over the past 30 years in

the fields of stochastic modelling, game theory, Markov decision processes and financial mathematics, and is the author of over 150 articles and books. His work underpinned the development of mathematical approaches for credit scoring which are now used throughout the financial services industry to assess the creditworthiness of potential customers. He founded the Credit Research Centre at the University of Edinburgh and is one of the principal investigators for the EPSRC-funded *Quantitative Financial Risk Management Centre* based at Southampton and Edinburgh Universities and Imperial College London. There is now a biennial conference on Credit Scoring which attracts greater numbers of delegates than The OR Society's annual conference.

Lyn has made a major contribution to the work of The OR Society. He was President from 1994 to 1995 and in 2002 was Chair of the organizing committee for IFORS, the largest OR conference ever to take place in the UK, held in Edinburgh jointly with The OR Society's Annual Conference. He is a Fellow of the Royal Society of Edinburgh and of The OR Society. He is very well known in the OR community as one of the kindest, nicest people one could hope to meet. He is an outstanding candidate for the Beale medal.



*Professor Lyn Thomas with Sue Merchant (President of The OR Society)*

## Citation for Beale Medal 2007

Colin Eden, Professor of Management Science,  
University of Strathclyde

Colin Eden's work has had an impact on OR in academia and practice in the UK, and worldwide, which is in many ways unequalled. Following a PhD in mathematical programming applied to production control, experience as an OR analyst, OR manager, and consultant, he entered the academic world in the late 1970's. Working with colleagues there he developed the approach to problem structuring using

cognitive mapping.

His book *Messing about in Problems* (with Sue Jones and David Sims) published in 1983, together with journal articles in the same period, confronted the OR community with one view of what became known as 'soft-OR'. A view of OR that encompassed organization politics, negotiation, and qualitative modelling was controversial at that time. Colin's role in that debate was a central one and his arguments were always intellectually well founded, clearly articulated and convincing – his concern was for the implementation of traditional OR through problem ownership: solving the right problem.

Cognitive mapping, cause mapping, and group strategy maps were extended through his involvement in the development of a Group Decision Support System (GDSS) called *Group Explorer* alongside the well established *Decision Explorer* software (formerly COPE). These developments led to the JOURNEY making approach to strategy (*Making Strategy: the journey of strategic management*, Eden and Ackermann, 1998 and *The Practice of Making Strategy*, Ackermann and Eden 2005). The development of these methodologies has been, and continues to be informed by an extensive programme of Action Research with a range of public and private organisations on issues of local, national and international significance. Colin's contribution to the academic development and application of OR extends also to the development and substantive use of cause mapping and simulation for modelling disruption and delay experienced in complex projects. This work has redefined the understanding of the project management of large projects.

Colin is also well known nationally and internationally for his research on managerial and organisational cognition; for his writings on Action Research; and in the field of Group Decision Support for his pioneering work on the use of technology to facilitate group processes. His list of publications includes 8 books, over 100 peer reviewed papers and 50 book chapters.



Colin Eden with Jeff Griffiths (President of The OR Society)

## Citation for Beale Medal 2005

### Rolfe Tomlinson

This citation is in support of the nomination of Rolfe Tomlinson for the Beale Medal, an award which recognises a sustained contribution over many years to the theory, practice or philosophy of OR.

Rolfe Tomlinson has been involved with The OR Society since first joining in 1960. Throughout his working career, and into a very active retirement, he has given great service to the society, becoming President in 1974/75, and being made a Companion of the society in 1990.

He was head of OR at the National Coal Board for 11 years up to 1977, and was then appointed to the Royal Society's International Institute for Applied Systems Analysis for three years, as the Chairman of the Management and Technology area, and the senior UK representative. He then became Professor of Systems and OR at Warwick University and Director of the Institute of Management Research and Development.