

ALEXANDER PHILIP DAWID

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EDUCATION

1967–69 University of London (Imperial College; University College)
1963–67 Cambridge University (Trinity Hall; Darwin College)
1956–63 City of London School

QUALIFICATIONS

1982 ScD (Cantab.)
1970 MA (Cantab.)
1967 Diploma in Mathematical Statistics (Cantab.: Distinction)
1966 BA (Cantab.): Mathematics (Second Class Honours)
1963 A-levels: Mathematics and Advanced Mathematics (Double Distinction),
Physics (Distinction)
State Scholarship

HONOURS AND AWARDS

2018 Fellow of the Royal Society
2016 Fellow of the International Society for Bayesian Analysis
2015 Honorary Lifetime Member, International Society for Bayesian Analysis
2013 Network Scholar of The MacArthur Foundation Research Network on Law and Neuroscience
2002 DeGroot Prize for a Published Book in Statistical Science
2001 Royal Statistical Society: Guy Medal in Silver
1978 Royal Statistical Society: Guy Medal in Bronze
1977 G. W. Snedecor Award for Best Publication in Biometry

EMPLOYMENT ETC.

2013– Emeritus Professor of Statistics, Cambridge University
2013– Emeritus Fellow, Darwin College Cambridge
2007–13 Professor of Statistics and Director of the Cambridge Statistics Initiative, Cambridge University
2011–13 Director of Studies in Mathematics, Darwin College Cambridge
2007–13 Professorial Fellow, Darwin College Cambridge
1989–2007 Pearson Professor of Statistics, University College London
1983–93 Head, Department of Statistical Science, University College London
1982–89 Professor of Probability and Statistics, University College London
1981–82 Reader in Probability and Statistics, University College London
1978–81 Professor of Statistics, Head of Statistics Section, and Director of the Statistical Laboratory, Department of Mathematics, The City University, London
1969–78 Lecturer in Statistics, University College London

VISITING POSITIONS ETC.

2016 Visiting Scientist, University of Cagliari
2013–16 Visiting Fellow, Department of Mathematical Sciences, Durham University
2013–15 Visiting Fellow, Department of Criminology, Cambridge University
2010 Visiting Professor, University of Cagliari
2009–18 Honorary Professor, University of Hong Kong
2007–17 Honorary Professor, University College London
2001–02 Affiliate Professor, Gatsby Computational Neuroscience Unit, University College London
1982 Visiting Research Fellow, University of Wisconsin at Madison
1974–75 Visiting Lecturer in Statistics, University of British Columbia

RESEARCH GRANTS

UK Research Councils

2009–12	Genetic variation, disease prediction and causation	~£250,000
2007–12	Cambridge Statistics Initiative	~£2.6M
2006–09	Geometrical methods for statistical inference and decision	~£250,000
2006–09	World of uncertainty (co-investigator)	~£260,000
2006–09	Simplicity, complexity and modelling (co-investigator)	~£250,000
1992–94	An abstract approach to expert systems	~£100,000
1989–91	Bayesian analysis in expert systems	~£30,000
1988–90	Probabilistic modelling for expert systems	~£90,000

Visiting Fellowships

1985	M. J. Schervish	~£6,000
1984	M. H. DeGroot	~£2,000
1983–4	J. M. Dickey	~£6,000

EEC

1989–93 Probabilistic reasoning on graphical structures with applications to expert systems ~ECU20,000

Home Office Forensic Science Service

1994–6 Research on DNA Statistics ~£40,000

UK/Hong Kong Joint Research Scheme

1998–9 Conditional specification of multivariate probability distributions ~£5,000

European Science Foundation Scientific Programme on Highly Structured Stochastic Systems

2000 Short visit by Vanessa Didelez ~FF 7,000

2000 Short visit by Dr Peter Grünwald ~FF10,000

2000 Research kitchen, Probabilistic expert systems and genetics ~FF30,000

Leverhulme Trust

2014–17 Emeritus Fellowship £18,920

2003–08 Evidence, inference and enquiry: Towards an integrated science of evidence ~£970,000

2001–04 Bayesian networks for forensic inference from genetic markers ~£100,000

Isaac Newton Trust

2012 Causal inference in genomic epidemiology ~£ 14,000

2007–12 Cambridge Statistics Initiative: Building bridges ~£125,000

PROFESSIONAL SOCIETIES

Royal Statistical Society

2015– Statistics and Law Section Committee

2013–15 Statistics and Law Working Group

1993 Chartered Statistician

1992 Joint Editor, *Journal, Series B*

1987–89 Chairman, Research Section

1981–82 Vice-President

1978–80 Honorary Secretary, Research Section

1975–78 Associate Editor, *Journal, Series B*

Read Papers

1990 Fisherian inference in likelihood and prequential frames of reference

1987 Symmetry models and hypotheses for structured data layouts

1978 Conditional independence in statistical theory

1973 Marginalization paradoxes in Bayesian and structural inference (with M. Stone and J. V. Zidek)

Institute of Mathematical Statistics

1979 Elected Fellow

1977–82 Associate Editor, *Annals of Statistics*

International Statistical Institute

1978 Elected Member

Biometrika Trust

1992–96 Editor, *Biometrika*

1984–92, 1996– Trustee

International Society for Bayesian Analysis

2005–9 Editor, *Bayesian Analysis*

2000 President

1998 Director

FURTHER PROFESSIONAL ACTIVITIES

2015–	Technical Advisory Committee, Center for Statistics and Applications in Forensic Evidence, Iowa State University
2012–	Group to Individual Committee, MacArthur Foundation Law and Neuroscience Network, USA
2012	ASA Committee on Establishment of an International Prize in Statistics
2011–	Editorial Board, <i>Journal of Causal Inference</i>
2010	External Assessor, APRC Review of the Department of Statistics, London School of Economics
2009	Institute for Mathematical Sciences Advisory Board, Imperial College
2008–12	Board of Managers, Kuwait Foundation Fund
2007	President’s Advisory Board, Carnegie Mellon University Machine Learning Department
2006–8	Academy of Medical Sciences Working Party on Non-Experimental Methods
1989	External Assessor, Appointment Committee for Chair of Statistics, University of Durham
1988–91	UK Medicines Commission
1987–	Trustee, Neuroendocrinology Charitable Trust
1987–89	Chairman, Board of Studies in Statistics, University of London
1983–91	Editorial Board, Oxford University Press Statistical Science Series
1982–85	SERC Statistics Panel
1978–91	Royal College of Physicians Computer Committee

External Examining

1998–2001	University of Kent
1995–97	Chief External Examiner for Combined Sciences, Hong Kong Baptist University
1992–94	University of Ulster
1986–90	Imperial College of Science, Technology and Medicine
1986–89	University College of Swansea
1982–85	University of Hong Kong
1980–83	University of Surrey

Conference Organisation

2013	Organiser, Special Topic Session on Probability Forecasting, 59th World Statistics Conference, Hong Kong
2011	Joint Organiser, Darwin College Lecture Series on “Beauty”, Cambridge
2010	Joint Organiser, Third Workshop on Game-Theoretic Probability and Related Topics, Royal Holloway University of London
2009	Joint Organiser, Machine Learning Summer School, Cambridge
2009–10	Co-Convenor, Mellon Sawyer Seminar on Modelling Futures: Understanding Risk and Uncertainty, Cambridge
2009	Joint Organiser, Molpage Training Programme on Causal Inference: State of the Art, Cambridge
2009	Joint Organiser, Communicating Complex Statistical Evidence, Cambridge
2008	Joint Organiser, LMS Symposium on Mathematical Aspects of Graphical Models, Durham
2008	Organiser, Cambridge Statistics Initiative 1-Day Meeting, Cambridge
2007	Programme Committee Chair, British Academy Conference on Enquiry, Evidence and Facts: An Interdisciplinary Conference
2005	Programme Committee, 10th International Workshop on Artificial Intelligence and Statistics, Barbados
2004	Scientific Programme Committee, 3rd Winter Workshop on Statistics and Computer Science, Ein-Gedi, Israel
2001	Organizer, DNA Workshop Meeting, Lewes
2001	Programme Committee, 8th International Workshop on Artificial Intelligence and Statistics, Key West, Florida
2000	Joint Organiser and Head of UK Delegation, International Conference on Foundations of Statistical Inference, Jerusalem
2000	Joint Conference President, 6th World Meeting of the International Society for Bayesian Analysis, Crete
2000	Joint Organiser, HSSS Research Kitchen on Probabilistic Expert Systems for Genetic Analysis, San Vigilio, Italy
1999	Scientific Programme Committee and Seminar Organiser, Research Programme on Causal Interpretation and Identification of Conditional Independence Structures, Fields Institute, Toronto
1998	Joint Organiser, HSSS Workshop on Structural Learning in Graphical Models, Tirano, Italy
1991, 1994, 1998, 2002, 2006, 2010	Organising Committee, Valencia International Meetings on Bayesian Statistics
1986	Joint Academic Organiser, RSS/SERC Research Workshop on Asymptotic Statistical Inference, Edinburgh
1982, 1986	Joint Technical Convenor: Institute of Statisticians Conferences on Practical Bayesian Statistics, Cambridge

In addition, I have served on numerous University and Professional committees.

INVITED PRESENTATIONS, ETC.

2018	de Finetti Lecture, International Society for Bayesian Analysis, Edinburgh
2017	Special Invited Paper, Computational and Methodological Statistics, London
2017	Data, Databases and Expert Knowledge in Forensic Inference, Carnegie-Mellon University
2017	UK Causal Inference Meeting, Colchester

2016 Lecture course, University of Cagliari
 2016 Programme on Probability and Statistics in Forensic Science, Isaac Newton Institute, Cambridge
 2016 Paper Highlights from *Bayesian Analysis* Session, Joint Statistical Meetings, Chicago
 2016 Paper Highlights from *Statistics and Public Policy* Session, Joint Statistical Meetings, Chicago
 2016 International Society for Bayesian Analysis, Sardinia
 2016 Keynote Speaker, Société Française de Statistique, Montpellier
 2015 Center for Statistics and Applications in Forensic Evidence Kickoff Event, Ames, Iowa
 2015 RSS Statistics and the Law Section Meeting on Epidemiological Evidence and Tort Litigation, London
 2015 International Workshop on Causality, Counterfactuals, and Legal Responsibility, Sassari
 2015 Fifth Conference of the European Philosophy of Science Association, Düsseldorf
 2015 Lindley Memorial Session, Joint Statistical Meetings, Seattle
 2015 Greek Stochastics, Crete
 2015 Danish Society of Theoretical Statistics, Copenhagen
 2015 Keynote Speaker, UK Causal Inference Meeting, Bristol
 2015 Fifth Workshop on Game-Theoretic Probability and Related Topics, Guanajuato, Mexico
 2014 Keynote Speaker, 9th International Conference on Forensic Inference and Statistics, Leiden
 2014 47th Scientific Meeting of the Italian Statistical Society, Cagliari
 2014 Keynote Speaker, Korean Statistical Society Spring Meeting, Daejeon
 2014 KNAW Colloquium on Dependence Logic, Amsterdam
 2013 12th European Conference on Symbolic and Quantitative Approaches to Reasoning with Uncertainty, Utrecht
 2013 High-Dimensional Inference with Applications, Kent
 2013 RSS Bayes 250 Meeting, London
 2013 Methodological Issues in the Special Sciences, Bertinoro, Italy
 2013 Recent Advances in Statistical Inference, Padua
 2013 Seminar on Dependence Logic: Theory and Applications, Dagstuhl, Germany
 2013 Max Planck Intelligent Systems Colloquium, Tübingen, Germany
 2012 Probabilistic Expert Systems for Forensic Genetics, Rome
 2012 Symposium on Conditional and Direct Causal Effects, Jena
 2012 Lecture course, Università Roma Tre
 2012 The Hidden Side of DNA Profiles, Rome
 2012 Causal Inference and Dynamic Decisions in Longitudinal Studies, Bristol
 2011 30th Fisher Memorial Lecture, Cambridge
 2011 8th International Conference on Forensic Inference and Statistics, Seattle
 2011 Guest Lecturer, Vienna International Summer University
 2011 Hierarchical Models and Markov Chain Monte Carlo, Crete
 2011 Causal Inference in the Health Sciences, Bologna
 2011 Workshop on Geometric and Algebraic Statistics 3, Warwick
 2010 Information Geometry and its Applications III, Leipzig
 2010 Third Workshop on Game-Theoretic Probability and Related Topics, Royal Holloway University of London
 2010 Young Researchers in Mathematics 2010, Cambridge
 2010 Saw Swee Hock Lecture in Statistics, University of Hong Kong
 2009 Perspectives on Causation, School of Law, University of Aberdeen
 2009 Atlantic Causal Modeling Conference, University of Pennsylvania
 2009 Causal Inference: State-of-the-Art, Cambridge
 2009 Mixing Econometrics and Epidemiology, Imperial College London
 2009 Communicating Complex Statistical Evidence, Cambridge
 2008 Causality: Objectives and Assessment. Neural Information Processing Systems Workshop, Whistler
 2008 Tutorial, Neural Information Processing Systems Conference, Vancouver
 2008 Gruppo Ematologi Forensi Italiani, Padova
 2008 LMS Symposium on Mathematical Aspects of Graphical Models, Durham
 2008 The Role and Evaluation of Evidence in Economic Analysis, Bologna
 2008 Franklin Institute Awards Symposium, Philadelphia
 2008 Geometric Aspects of Conditional Independence and Information, Leipzig
 2007 British Academy Conference on Enquiry, Evidence and Facts: An Interdisciplinary Conference
 2007 Reassessing the Paradigms of Statistical Model Building, Oberwolfach, Germany
 2007 Academy of Experts, London
 2007 Evidence in the Human Sciences, Bologna
 2007 Confirmation, Induction and Science, London School of Economics
 2007 Seymour Geisser Memorial Lecture, University of Minnesota
 2007 Graphic and Visual Representations of Evidence and Inference in Legal Settings, Cardozo Law School, New York
 2006 de Finetti Centenary Meeting, Bologna
 2006 Pluralism and Causality in the Sciences, London School of Economics
 2006 Medical Thinking: What Do We Know? CRUK, London
 2006 40th Anniversary Celebrations, Department of Statistics, Glasgow
 2006 Causality and Probability in the Sciences, University of Kent
 2006 Teaching Evidence and Fact Analysis, Institute of Advanced Legal Studies, London
 2006 Causation, Probability and Decision, Sydney University
 2006 Bayesian Reasoning Workshop, Monash University

2006 Distinguished Lecture in Computer Science, Queen Mary, University of London
 2005 Second International Conference on Information Geometry, Tokyo
 2005 21st Congress of the International Society for Forensic Genetics, Azores
 2005 Second Workshop on Combining Probability and Logic, London School of Economics
 2005 British Society for Philosophy of Science Annual Conference, Manchester
 2005 International Conference on Statistics, Hong Kong
 2005 Human Identification E-Symposium 2005
 2005 Sixth International Conference on Forensic Statistics, Tempe, Arizona
 2004 Royal Statistical Society Conference, Manchester
 2004 International Summer School on 'Causality, Uncertainty and Ignorance', Konstanz, Germany
 2004 PASCAL Workshop on Learning-Theoretic and Bayesian Inductive Principles, London
 2004 Information Processing and Management of Uncertainty, Perugia
 2004 19th Annual Darwin College Lecture Series, Cambridge
 2003 GSS Assistant Statistician & Statistical Officer Annual Conference, Reading
 2003 Workshop on Paradigms of Model Building, Dortmund
 2003 MIR@C Workshop on Bayesian Networks and Micro-Array Analysis, Warwick
 2003 CISHE Colloquium on Transitions, University College London
 2003 54th Session of the International Statistical Institute, Berlin
 (Invited Paper Meeting Organiser)
 2003 Workshop on Complexity and Inference, Rutgers University
 2003 Workshop on Statistical Learning in Classification and Model Selection, Eindhoven
 2002 Fifth International Conference on Forensic Statistics, Venice
 2002 AMS Summer Research Conference on Emerging Issues in Longitudinal Data Analysis, Mount
 Holyoke College, Massachusetts
 2002 Conference on Causality: Metaphysics and Methods, London School of Economics
 2001 Workshop on Recent Developments and Applications in the Statistical Analysis of Discrete
 Structures, Munich
 2001 Conference on Statistical Models and Computationally Intensive Methods for Estimation and
 Prediction, Bressanone, Italy
 2001 Conference on Causality and Statistics, Snowbird, Utah
 2001 Rietz Lecturer, IMS Annual Meeting, Atlanta, Georgia
 2001 Seminar on Inference Principles and Model Selection, Dagstuhl, Germany
 2001 ISBA Regional Meeting, Laguna Beach
 2001 Symposium on Bayes's Theorem, The British Academy, London
 2001 HSSS Workshop on Structural Stochastic Systems for Individual Behaviours, Louvain-la-
 Neuve, Belgium (Discussant)
 2001 Eighth International Workshop on Artificial Intelligence and Statistics, Key West, Florida
 2000 International Conference on Foundations of Statistical Inference, Jerusalem
 2000 Seminar in Honour of Abner Shimony, Bologna
 2000 DINA Research Kitchen on Probabilistic Expert Systems for Genetic Analysis, Skagen, Den-
 mark
 2000 HSSS Final Workshop, Luminy, France
 2000 21st Meeting of the International Society for Clinical Biostatistics, Trento, Italy (Discussant)
 2000 AMS Summer Research Conference on Bayes, Frequentist and Likelihood Inference: A Syn-
 thesis, Mount Holyoke College, Massachusetts
 2000 Fourth Conference on Logic and the Foundations of the Theory of Games and Decisions, Turin
 2000 Sixth World Meeting of the International Society for Bayesian Analysis, Crete
 2000 International Conference on Philosophical Aspects of Bayesianism, King's College London
 2000 Workshop on Forecast Validation and Risk Assessment, Humboldt University, Berlin
 2000 HSSS Research Kitchen on Probabilistic Expert Systems for Genetic Analysis, San Vigilio,
 Italy
 1999 Fourth International Conference on Forensic Statistics, North Carolina State University
 1999 Research Seminars on 'Conditional Independence Structures and Graphical Models' and
 'Causal Interpretation of Graphical Models', Research Programme on Causal Interpretation
 and Identification of Conditional Independence Structures, Fields Institute, Toronto
 1999 Second European Conference on Highly Structured Stochastic Systems, Pavia
 1999 52nd Session of the International Statistical Institute, Helsinki (Invited Paper Meeting Or-
 ganiser)
 1999 Workshop on On-Line Decision Making, Rutgers University
 1999 International Workshop on Objective Bayesian Methodology, Valencia
 1999 Uncertainty 99 (Seventh International Workshop on Artificial Intelligence and Statistics), Fort
 Lauderdale, Florida
 1998 HSSS Workshop on Structural Learning in Graphical Models, Tirano, Italy
 1998 Special Invited Speaker, Joint UAI/ICML/COLT Meetings, Madison, Wisconsin
 1998 Conference on Automated Learning and Discovery, Pittsburgh
 1998 Sixth Valencia International Meeting on Bayesian Statistics
 1997 Programme on Neural Networks and Machine Learning, Isaac Newton Institute, Cambridge
 1997 AMS-IMS-SIAM Summer Research Conference on Graphical Markov Models, Influence Dia-
 grams, and Bayesian Belief Networks, Seattle
 1997 Joint Statistical Meetings (ASA), Anaheim (Session organiser)
 1997 International Society for Bayesian Analysis, Istanbul
 1997 International Symposium on Contemporary Multivariate Analysis and its Applications, Hong
 Kong (Session organiser and speaker)
 1997 Tutorial, Sixth International Workshop on Artificial Intelligence and Statistics, Fort Laud-
 erdale, Florida
 1996 NATO Advanced Study Institute on Learning in Graphical Models, Erice, Sicily

1996 Fourth World Congress of the Bernoulli Society, Vienna
1996 Third International Conference on Forensic Statistics, Edinburgh
1995 Third Brazilian Bayesian Statistics Meeting, Ouro Preto
1995 Closing Address, Sixth Latin American Congress on Probability and Statistics, Viña del Mar, Chile
1995 Algebraic and Combinatorial Methods in Multivariate Analysis, Oberwolfach, Germany
1995 Research Seminar on Probability and Causality, Aalborg, Denmark
1995 Second International Workshop on Bayesian Robustness, Rimini, Italy
1995 Mahalanobis Memorial Lectures, Indian Statistical Institute: Delhi, Bangalore, Calcutta
1994 Second European Science Foundation Workshop on Highly Structured Stochastic Systems, Wiesbaden, Germany
1994 First European Science Foundation Workshop on Highly Structured Stochastic Systems, Cortona, Italy
1994 Drug Information Association 5th European Workshop on Statistical Methodology in Clinical Research, Edinburgh
1993 International Workshop on Hierarchical Modelling, Rio de Janeiro
1993 Computer Vision Programme, Isaac Newton Institute, Cambridge
1993 Second DeGroot Memorial Lecture, Carnegie-Mellon University
1993 49th Session of the International Statistical Institute, Florence
1993 First Multinational Riverboat Conference on Bayesian Econometrics and Statistics, Basel-Amsterdam
1992 International Symposium on Social Gerontology, Jaen, Spain
1992 Royal Statistical Society Conference, Sheffield
1992 Institute of Statisticians Conference on Practical Bayesian Statistics, Nottingham
1992 Fifth Purdue International Symposium on Statistical Decision Theory and Related Topics
1992 International Symposium on Multivariate Analysis and its Applications, Hong Kong
1991 Conference on Recent Developments of Exchangeable Random Processes and their Statistical Applications, Cortona, Italy
1991 Fourth Valencia International Meeting on Bayesian Statistics
1990 Lecture course, University of Perugia, Italy
1990 Royal Statistical Society Fisher Centenary Meeting, London
1989 18th National Statistics Meeting, Santiago de Compostela, Spain
1989 RSS/SERC Research Workshop on Expert Systems and Statistics, Edinburgh
1989 Lecture Course, Bocconi University, Milan
1988 Joint Statistical Meetings, New Orleans
1988 14th George Zyskind Memorial Lecture, Iowa State University
1987 Third Valencia International Meeting on Bayesian Statistics
1986 Second Catalan International Symposium on Statistics, Barcelona
1986 Institute of Statisticians Conference on Practical Bayesian Statistics, Cambridge
1986 RSS/SERC Research Workshop on Asymptotic Statistical Inference, Edinburgh
1985 Lecture course, Department of Biostatistics, University of Valencia
1984 20th Gregynog Statistical Conference
1984 Royal Statistical Society 150th Anniversary Conference, London
1984 Israel Statistical Association Conference on Foundations of Statistical Inference, Tel Aviv
1983 British Society for the Philosophy of Science Annual Conference, Brighton
1983 Special Invited Paper, Institute of Mathematical Statistics Meeting, Nashville
1982 European Meeting of Statisticians, Palermo
1982 Royal Statistical Society Conference, York
1982 Lecture Course, University of London Postgraduate Statistics Series
1981 Conference on Exchangeability in Probability and Statistics, Rome
1980 Conference on Medical Statistics, Rome
1979 International Meeting on Bayesian Statistics, Valencia
1978 Dutch Statistical Meeting, Lunteren
1978 Institute of Mathematical Statistics Conference, San Diego
1977 Lecture course, Department of Statistics, Carnegie-Mellon University
1977 Lecture Course, Istituto per le Applicazione del Calcolo, Rome
1976 European Meeting of Statisticians, Grenoble
1976 First European Conference on the Foundations and Applications of Bayesian Methods, Fontainebleau
1974 Research Conference, Department of Theoretical Statistics, Aarhus University

Additionally I have given numerous invited research seminars at Universities in the UK and abroad, and have proposed or seconded the vote of thanks on nine Royal Statistical Society read papers.

TEACHING

Postgraduate Courses

Advanced Statistics and Inference	Advanced Statistics
Practical Statistics	Comparative Statistical Methods
Probabilistic Expert Systems and Image Analysis	Applied Bayesian Methods
Time Series	Communication Workshop
	Monte Carlo Inference

Undergraduate Courses

Elementary Statistics	Stochastic Processes
Statistical Prediction Analysis	Probability
Frequency Data	Multivariate Analysis
Bayesian Probability and Inference	Decision Analysis
Linear Methods and Analysis of Variance	Computational Techniques for Statistics
Stochastic Systems	Statistical Inference
Stochastic Methods in Finance	Principles of Statistics

Ancillary Courses

Probability for Mathematicians	Statistics for Medical Students
Statistics for Systems and Management	Evidence and Proof (Ll.M. Students)
Graduate School Foundation Course	

External Courses

Industrial Statistics	Lucas Institute for Engineering Production
Bayesian Statistics for Science, Engineering, Medicine and Management	George Washington University
Statistical Methods in Reliability	George Washington University
Fundamentals of Statistical Causality	RSS/EPSRC Graduate Training Programme;
Causality	Dipartimento di Economia, Università Roma Tre
	Machine Learning Summer School, Cambridge

MAJOR CONSULTING ACTIVITIES

Auto-Roulette

Performance Analysis of Electronic Gaming Machines
Department of Health/British Dental Association
 Measurement of Dentists' Workload (Report deposited in House of Commons Library)
W. S. Atkins Management Consultants/Anglian Water/South-West Water
 Verification of Statistical Methodology and Software for Water Company Asset Management Plans
Glaxo Group Research Limited/Fastmalt Limited
 An Expert System for Assessing Adverse Drug Reactions
Various Solicitors
 Adviser/expert witness on the interpretation of statistical evidence — especially DNA profile evidence
Railtrack PLC
 Expert Knowledge Elicitation

RESEARCH INTERESTS

My research has been largely motivated by the desire to understand and explore the connexions between logical and philosophical principles of inference, mathematical structures, and data-analysis. Much of my work is a critical examination of the logical **Foundations of Statistics**, both from a general standpoint and in respect of particular schools of thought — especially Bayesian, but also Likelihood, Structural and Fiducial. Early work on the **Marginalization Paradox** in improper Bayesian inference continues to stimulate debate. I have a particular interest in **Bayesian Decision Theory**, and have developed and applied general decision-theoretic ideas to clarify the theory of **Optimal Experimental Design**. Other Bayesian research interests include: **Coherent Combination of Expert Opinions**; **Matrix Distribution Theory and Bayesian Multivariate Analysis** (where work with BiQi Fang has drawn attention to undesirable properties of conjugate prior distributions in problems with many variables, and suggested some better-behaved alternatives); **Model Uncertainty**; and **Maximum Entropy and Robust Bayes Analysis** (which, in work with Peter Grünwald, have been shown to be two sides of the same coin).

Over 30 years ago I made contributions to a novel approach to statistical inference from the viewpoint of abstract **Differential Geometry**, which has proved significant in the later detailed development of that topic by Amari and others. I have once more become engaged in this area, and am extending it to statistical decision theory. With Steffen Lauritzen and Matthew Parry I have developed a complete characterisation of **local proper scoring rules**, which encourage honesty when assessing probability distributions, while depending only on the assessment made in the neighborhood of the realised outcome.

I introduced and developed the general axiomatic theory of, and associated notation for, **Conditional Independence**. As well as being a valuable tool for formulating and solving a great variety of conceptual and technical problems, this supplies a unifying thread drawing together many seemingly unrelated concepts of statistical inference. More recently I developed a novel abstract mathematical framework, the *Separoid*, which supports the application of these ideas to a wide range of other 'irrelevance' concepts, of independent interest. This work has been widely applied and extended by workers in Artificial Intelligence.

A major research effort over many years was devoted to **Probabilistic Expert Systems**, now more popularly known as **Bayesian Networks**: a multi-faceted topic which applies graph-theoretic representations to analyse, structure and manipulate complex multivariate distributions. My theory of Conditional Independence played a crucial rôle in this. The book *Probabilistic Networks and Expert Systems*, written with Robert Cowell, Steffen Lauritzen & David Spiegelhalter and published by Springer in 1999, was awarded the first DeGroot Prize for a Published Book in Statistical Science.

An important philosophical attitude underpinning almost all my work is a 'positivist' emphasis on observables, and on the falsifiability of inferences. In particular this has guided my approach to the interpretation, assessment and validation of probability statements. I introduced the **Calibration Criterion** of validity for probability

forecasts, and developed this into a novel philosophical theory of **Objective Probability**. The same attitude provided the impetus for my introduction of **Prequential Analysis**, a general approach to problems of statistical inference and data analysis which takes seriously the problem of making and criticising statistical forecasts. Theoretically, it allows for very broad extension of classical ideas such as estimation efficiency, or consistent model selection, and has many pleasing properties. Practically, it provides a more generally applicable and interpretable alternative to cross-validation. Prequential Analysis has been successfully applied to the monitoring and improvement of the predictive performance of Bayesian Networks. It has close and interesting links with Bayesian Inference, with the theory of Stochastic Complexity, with Algorithmic Complexity Theory, and with Computational Learning Theory (COLT). With Vladimir Vovk I developed a new general mathematical theory of **Prequential Probability**, based on game-theoretic rather than measure-theoretic foundations.

Another long-term research theme was **Symmetry Modelling**, which, extending de Finetti's ideas of exchangeability, uses symmetry judgements and group representation theory to guide the construction, interpretation and analysis of statistical models. It has some purely technical connexions with the randomization theory of experimental design. A complete algebraic theory was developed for the general 'poset block structure'. Even for familiar simple balanced experimental layouts the symmetry viewpoint has provided new insights and methods of data analysis, and it also leads to new forms, analyses and understandings of the 'mixed model' of the Analysis of Variance. Because of competing priorities much of this work remained unpublished, but, stimulated by an invitation to deliver a 'Fisher Memorial Lecture', I am reviving my attention to it.

I have been developing new formulations and techniques for the conduct of **Causal Inference**, a topic of great current interest; this has links with both Symmetry Modelling and Bayesian Networks. My general world view being antipathetic to currently popular explications of statistical causality based on counterfactual variables, I have been investigating the extent to which sensible causal inferences can be justified without recourse to counterfactuals. In particular, I have shown that a natural decision-theoretic approach, using influence diagrams, can clarify and simplify many problems of causal inference, including confounding, direct and indirect causal effects, and effects of dynamic interventions. This work has been presented widely to philosophical as well as statistical audiences and outlets, and is currently being applied to address important practical problems such as medical decision-making and policy analysis.

I have been interested in the application of Probability and Statistics to a variety of subject areas, in particular to Medicine (especially medical diagnosis and decision-making), Crystallography, Reliability (especially Software Reliability) and, currently, **Legal Reasoning**. I have acted as expert advisor or witness in a number of legal cases, including notably that of Sally Clark who was accused of murdering her two baby sons, and others involving DNA profiling and fibre transfer. This has led me to a thorough theoretical examination of the use of Probability and Statistics for **Forensic Identification**, as well as to some study of genetic population structure. I led an international research group that developed probabilistic expert systems to analyse complex criminal and paternity DNA cases. This has also produced new methodology for estimating DNA mutation rates.

I have an interest in a range of logical and intellectual issues relating to the general concept of **Evidence**. I developed and directed a large-scale interdisciplinary programme involving 11 Departments across 7 Faculties at University College London, which led to publication of the book 'Evidence, Inference and Enquiry'.

May 9, 2018