Dr Andrew Whiter BSc(Eng) MSc PhD PGCE FHEA

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Andrew's career has spanned a wide range of research, consulting, business and education roles including being an artificial intelligence researcher at HP Laboratories, establishing HP's European Knowledge Systems consulting organisation, founding a software business in South Africa, being a technical director of Forté Software's operations in Australia, heading the Sun Java Centre in the UK, working as a technology due diligence advisor for EY, and teaching mathematics and computer science at a UK secondary school.

Andrew helped found the innovative and highly regarded BSc/MSci Management Science programme at UCL in 2014 and has been responsible for its ongoing delivery and evolution since then: first as deputy programme director, then as programme director.

Career Summary

1982-1984	Research Systems Engineer, Systems Designers Ltd
1985-1988	Member of Research Staff - HP Laboratories, Hewlett-Packard
1988-1992	Head - HP European Knowledge Systems Centre, Hewlett-Packard
1992-1998	Founder/Director - Objective Solutions, South Africa
1998-2000	Austrasia Technical Director - Forté Software, Australia
2000-2002	Head, UK Sun Java Centre, Sun Microsystems
2002-2003	Sloan Fellow, London Business School
2003-2004	Independent Strategy Consultant, Xivation Consulting
2004-2011	Assistant Director, EY (Transaction Advisory Services)
2011-2012	Founder/Director, Epispan.com
2012-2013	PGCE student, The Open University
2013-2014	Teacher of Mathematics and Computer Science, The Ashcombe School, Dorking
2014-Present	Associate Professor (Education) & Programme Director, UCL

Qualifications

1981	BSc(Eng), Engineering Mathematics, First Class Honours, University of Bristol
1987	PhD, 'Pi-Fuzzy Logic (and its application to open world reasoning)', University of Bristol
2003	MSc, Sloan Fellowship Masters[1] in Management, London Business School
2013	PGCE, Postgraduate Certificate in Education, The Open University
2015	FHEA, Fellow of the Higher Education Academy
2020	CertHE, Certificate in Higher Education in Astronomy (Distinction), UCL

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[1] The Sloan Masters is an MBA equivalent full-time degree, offered only by Stanford University, MIT and London Business School

Papers and Publications

PFL: Pi-Fuzzy Logic (A Practical Fuzzy Logic),
with J. Baldwin, IFAC Fuzzy Information Processing and Decision Analysis Conference, Marseilles, France, 1983

Towards a Possibility Inference Query Language (Pi-QL),
IKBS in Defense Conference, RSRE, Malvern, UK, 1984

Pi-QL (Possibility Inference Query Language): nearer to the ideals of logic programming?,
International Symposium on Fuzzy Information Processing in AI and OR, Cambridge, UK, 1984

Planning with multiple resource constraints and an application to a naval planning problem,
with A. Tate, IEEE/AAAI First Conference on AI Applications, Denver, USA, 1984

Application of Causal and Qualitative Reasoning to modeling short term haemodynamic regulation,
with S. Todd, Second Alvey Workshop on Deep Knowledge Based Systems, Cambridge, UK, 1986

An Airport Ground Crew Shift Scheduling System, South African Computing Society Expert Systems Conference, Pretoria, South Africa, 1994 (winner best paper at conference)

Academic, Technical and Teaching Experience

BSc(Eng): Engineering Mathematics	1978-1981	This degree included courses in a range of core engineering modules (including electronics, fluid dynamics, mechanics of machines, material science) and engineering maths modules (including mathematical modelling, calculus, linear algebra, continuum mechanics, finite element analysis, operations research, decision theory, control theory, probability, statistics, and machine intelligence). My final year project (25% of degree marks) concerned the development of a program, written in Lisp, to teach, perform and assess symbolic differentiation for A-level students.
PhD: Pi-Fuzzy Logic (and its application to open-world reasoning)	1981-1987 (1981-1982 full time)	PhD supervisor: Professor Jim Baldwin, Emeritus Professor of Artificial Intelligence, Faculty of Engineering, University of Bristol PhD sponsors: The Admiralty Research Establishment (Portland) sponsored my PhD as part of a CASE Award PhD studentship. Hewlett-Packard and Systems Designers additionally supported the completion of my PhD on a part-time basis, providing invaluable access to world-class computing resources and time to complete my PhD. My PhD research had three distinct components: 1. A self-contained mathematical treatise on the development of Pi-Fuzzy Logic. 2. The theoretical foundation of an open-world logic programming language, PI-QL, based on Pi-Fuzzy Logic. 3. The application of Pi-Fuzzy Logic to a Naval route selection problem.

Pi-Fuzzy Logic is based on truth values, called pi-pairs, formed from a dyadic coupling of two possibility measures: the possibility of a proposition being true, and the possibility of the same proposition being false.

Pi-Fuzzy Logic supports open-world reasoning as pi-pairs support the state of unknown truth (or absolute vagueness), where propositions may have the possibility of both being true and false. PI-QL (Possibility Inference Query Language) was developed to exploit this characteristic of Pi-Fuzzy Logic. Unlike closed-world logic programming languages like Prolog, PI-QL employed symmetrical verify and refute strategies, with well-behaved negation and non-directed rules. PI-QL was developed in POP-11[2].

The research papers relating to my PhD research are:
PFL: Pi-Fuzzy Logic (A Practical Fuzzy Logic), J. Baldwin and A. Whiter, IFAC Fuzzy Information Processing and Decision Analysis Conference, Marseilles, France, 1983
Towards a Possibility Inference Query Language (Pi-QL), A. Whiter, IKBS in Defense Conference, RSRE, Malvern, UK, 1984
Pi-QL (Possibility Inference Query Language): nearer to the ideals of logic programming?, A.Whiter, International Symposium on Fuzzy Information Processing in AI and OR, Cambridge, UK, 1984

AI Planning Systems	1982-1983	Whilst employed by Systems Designers Ltd, I worked with Professor Austin Tate of the University of Edinburgh's Dept of AI to further develop and enhance the Nonlin AI planning system, first created by Austin in 1975-1976 during the first year of the UK Science Research Council project entitled "Planning: a joint AI/OP Approach" (Principal Investigator was Professor Bernard Meltzer). Nonlin was developed using POP-11.

This work led to the following publication:
Planning with multiple resource constraints and an application to a naval planning problem, A. Tate and A.Whiter, IEEE/AAAI First Conference on AI Applications, Denver, USA, 1984.

During this time, and later when a researcher at HP Laboratories, I was heavy involved in the Alvey[3] AI Planning Special Interest Group. I regularly presented at this forum and organized meetings.

Symbolics[4] Lisp Machine	1983-1984	I was contracted by Systems Designed to undertake research for the Admiralty Research Establishment for over a year on the, then revolutionary, Symbolics Lisp Machine. I was the sole operator of this unique machine in the UK at the time. I developed a flight rostering system for aircraft carriers, using the core language, ZetaLisp, a precursor to Common Lisp that supported a true object-orientated programming.

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[2] POP-11 is a stack and list based symbolic programming language similar to Forth and Lisp, first developed by the University of Edinburgh in 1970.
[3] The Alvey Programme was a British government sponsored research program in information technology that ran from 1983 to 1987. The program was a reaction to the Japanese Fifth generation computer project. Focus areas for the Alvey Programme included Intelligent Knowledge Based Systems.
[4] Symbolics was a 1981 spinoff from the MIT AI Lab for the purpose of manufacturing Lisp machines.

Real-time Medical AI Systems	1985-1989	I joined HP Laboratories as one of its first researchers in its newly founded Knowledge Systems Lab in Bristol. I worked on a research project aiming to develop new AI techniques applied to real-time interpretation of complex multi-channel signals, bringing together existing techniques such as model-based reasoning, qualitative reasoning, naïve physics, Bayesian rule processing and blackboard systems. As a test bed for this research we considered the development of next generation medical monitoring equipment for use in operating theaters and intensive care. I started a long-term collaboration with the Medical Schools at the University of Bristol and with Imperial College. I developed a new technique called Interpretation-based reasoning, based on the idea of navigating between different rule sets and models that defined a current context and interpretation.
Expert Systems	1990-1995	When working at HP Laboratories, I realised that the research in expert systems technologies undertaken there could be leveraged into a specialised business unit. HP's senior management enthusiastically embraced my business plan and I established and led the HP European Knowledge Systems Centre, which developed a wide range of advanced expert systems for HP's customers.

My next move was to establish my own business, Objective Solutions. This business initially focused on developing expert systems and AI applications (including an airport staff rostering system and an intelligent business planning tool) using the object-oriented AI development environments sold by Intellicorp[5].

I won a 'best in conference' prize for the following paper, which highlighted an algorithm I had developed for the efficient processing of rules, dramatically reducing the time to produce optimal shift rosters: **An Airport Ground Crew Shift Scheduling System**, A. Whiter, South African Computing Society Expert Systems Conference, Pretoria, South Africa, 1994 |
| Java and large-scale object-oriented distributed systems | 1996-2002 | Both with my own company Objective Solutions, and later as Technical Director of Forté Software[6] in Australia and as Head of Sun Microsystems' UK Java Centre, I developed an expertise in designing and developing widely-distributed and high-performance object oriented systems. Forté Software initially sold development tools based on its own proprietary object oriented technologies but later migrated to Java, after which the company was acquired by Sun Microsystems.

Forté Software elicited considerable interest for its state-of-the-art software development technologies and I, as the local 'technical executive', was frequently involved in giving key-note lectures and in writing articles to satisfy this interest. |

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[5] Founded in 1980, Intellicorp marketed an expert system environment (Knowledge Engineering Environment - KEE) for development and deployment of knowledge systems on the Lisp machines that had several advanced features, such as truth maintenance. Intellicorp moved the KEE functionality to the PC creating Kappa, one of the earliest object-oriented development environments for commercial programming. Intellicorp was also part of the consortium that helped develop the standards for UML, the Unified Modeling Language.
[6] Forté Software was a US company founded in 1991 that developed and sold proprietary and Java-based object oriented development tools for building large-scale distributed systems. Sun Microsystems acquired the company in 1999.

Technology Strategy and Technology Due Diligence	2003-2011	Following a year at London Business School in 2002-2003, where I specialized in technology strategy, I first became an independent strategy consultant and then joined Ernst & Young as a technology specialist particularly working in mergers and acquisitions. This work continued to expose me to the latest technologies and their exploitation in a commercial context.
Project Management	career wide	Each of my positions has exposed me to project management. I have significant project management experience – both in managing software development projects and in managing more general business projects. For example, in 1996 my business in South Africa was contracted to manage, design and develop the core case management system supporting South Africa's new Commission for Conciliation, Arbitration and Mediations[7]. I personally managed this complex time-critical project, which was recognised as a considerable success and is one of the achievements of which I am most proud.
Pre-UCL Teaching Experience	pre-2014	Though most of my career has been outside education, I have always enjoyed working with, developing and training younger people and it was always my intention to teach one day. I had first planned to become a teacher after my undergraduate degree and had been offered a place at University of Bristol teacher training college. It was only after I was asked to consider a PhD that my career took a different direction. When I was a PhD student, I was a postgraduate teaching assistant helping supervise undergraduate tutorials in engineering mathematics. Throughout much of my career, I have been involved in developing and delivering specialised training courses; all effectively at postgraduate level. These have included courses in technology due diligence, business requirements analysis, project management, software development methodologies, distributed software development and on a range of software development tools. The business I founded in South Africa particularly offered a range of advanced software design and development training courses. In 2011 I made the decision to move into education, undertaking a year of teacher training in secondary school mathematics. From this, I gained a Postgraduate Certificate in Education (PGCE) and UK Qualified Teacher Status (QTS). After qualifying, I spent a year teaching mathematics and computer science at The Ashcombe School in Dorking, Surrey. I particularly taught A-level Mathematics and was a Sixth Form Tutor.

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[7] The CCMA was one of the first major institutions to be established by South Africa's first democratically elected government.

UCL Teaching Experience	2014-present	At the end of my first year as a teacher, I was approached by a UCL Professor I knew who encouraged me to apply to UCL to help launch the new BSc/MSci Management Science programme, starting with designing and leading the first-year mathematics and data analytics modules.

In 2015 I became the Deputy Programme Director, with responsibility for all the mathematical, data science and computing aspects of this programme.

In 2022, I was promoted to overall Programme Director.

I designed and taught many of the core modules on the Management Science programme, including:
- MSIN0011: Mathematics I (Calculus)
- MSIN0015: Mathematics II (Linear Algebra)
- MSIN0010: Data Analytics I (Statistics and Data Mining)
- MSIN0025: Data Analytics II (Machine Learning and Forecasting)
- MSIN0023: Computational Thinking

I also recently re-designed and taught the elective module MSIN0180 Quantitative Methods in Business.

A key innovation I introduced to the teaching of all the mathematics, data analytics and computing modules of the Management Science programme is the deeply embedded and consistent use of a range of software tools and programming environments across all these modules. We believe that teaching students how to use such tools is a key part of readying students for the workplace, future research and postgraduate study.

Other teaching responsibilities have included supervising undergraduate (BSc/MSci Management Science) and postgraduate (MSc Business Analytics) dissertations, and designing and leading many scenario weeks, a core innovation of the BSc/MSci Management Science programme.

From 2019 to 2023 I was the BEAMS (Built Environment, Engineering Sciences, and Mathematical & Physical Sciences) academic representative on the UCL Access and Participation Steering Group (APSG) following nomination by the Director of the School of Management and the Engineering Sciences Faculty Tutor.