



REVIEW OF THE YEAR 2007-08

Personnel

Dr Cecilia Mascolo was appointed to a University Lectureship in Computer Systems from 1 March 2008. She currently holds an EPSRC Advanced Research Fellowship entitled Coordination and Reliability Mechanisms for Adaptive Mobile Middleware and aims to better exploit time and space information to build more effective communication systems.

Dr Andrew Rice was appointed as an Assistant Director of Research in Applied Computing from 1 May 2008. His research is considering ways in which computing might have a positive impact such as the provision of an optimal digital infrastructure; sensing the planet and optimising use of physical resources; modelling the planet and making dependable predictions; digital alternatives to physical activities.

Dr Sam Staton and Dr Bartek Klin were appointed to EPSRC Research Fellowships in Theoretical Computer Science, using mathematical techniques such as categorical logic to investigate the structure of programming languages.

PhD student Mbou Eyole-Monono was elected to a Junior Research Fellowship at Trinity College researching sensor technology to provide real-time indoor location information on people and objects.

Three members of staff enjoyed personal promotions from October 2008: Dr Simon Moore to a Readership in Computer Architecture, Dr Peter Sewell to a Readership in Computer Science, Dr Tim Griffin to a University Senior Lectureship.

On 1 October 2008 the Computer Laboratory consisted of 104 members of staff:

Established posts	Academic staff	36
	Academic-related	10
	Assistant staff	12
Un-established posts	Academic-related	2
	Research Fellows	5
	Researchers	39

Honours and Awards

Professor Andrew Pitts was elected a Fellow of the British Computer Society in October 2008.

Computer Laboratory graduate Nicholas (Nicko) Van Someren was elected as a Fellow of the Royal Academy of Engineering in July 2008.

Alumni Ian Braid, Alan Grayer and Charles Lang were awarded the 2008 Pierre Bezier Award for their fundamental contributions to practical solid modelling and the profound influence their work had on commercial solid modelling systems.

Activities

Membership of the Industrial Supporters' Club reached an all-time high of 75. Fifty-one companies from software, animation and gaming, as well as many of the major names in finance, defence, communications and commerce attended the Club's Annual Recruitment Fair on 15 November 2007, making it the most successful Fair ever. Such was its success that the Club received membership enquiries from companies who had heard about it by word of mouth. Services to members increased with many coming to Cambridge throughout the year to give presentations or workshops. The Club also saw an increase in interest from students looking for both summer placements and graduate opportunities.

Membership of the Cambridge Ring grew to almost 500. Over 100 Lab graduates attended the 2007 annual dinner while there was also good attendance at the roundtable discussion events. The mentoring scheme developed and proved particularly popular with recent graduates.

A team from the Computer Laboratory, headed by Dr Rob Harle and sponsored by Google, ran a competition for sixth-form students to make the best YouTube video clip describing some aspect of computer science in an entertaining way. The first prize, a visit to Google Zurich, was awarded to a pupil from Pool Hayes Community School in Willenhall, with runners-up from Llanidloes High School, Powys and St Paul's School, Barnes.

Robin Milner, Emeritus Professor, has brought a decade of research to fruition with a book 'The Space and Motion of Communicating Agents', shortly to be published by CUP. With the advent of Ubiquitous Computing, which will dominate the 21st century, his new model aims to bridge between well-known process theories and the extraordinary challenge that Ubiquitous Computing presents for sound engineering and rigorous foundation. His vision was the subject of an invited lecture at the recent British Computer Conference 'Visions for Computer Science'.

Teaching

The first year of the Computer Science Tripos was thoroughly revised. Alongside the revision, it incorporated two new options (Mathematics and Social Psychology). The old "25%" option was transferred to the Natural Sciences Tripos, to which it logically belonged. The former change is seen as a factor in the dramatic increase in applications for October 2009 (up 53% on the previous year). The latter change caused an even more dramatic change in the number of first year Natural Scientists taking a Computer Science option in 2008-09 (up over 300% on the previous year), some of whom may decide to switch to Part IB of the Computer Science Tripos. Plans for the new course, the MPhil in Advanced Computer Science, were consolidated, and the course is advertised to start in October 2009.

The Diploma Course was withdrawn at the end of the academical year 2007-08, after 55 years of invaluable service. To mark its passing, the Diploma Course students, alumni, staff and those with past or present association with the Course attended a valedictory party at the Computer Laboratory in July.

Research

Research income amounted to about £3.9M.

The Computer Laboratory currently holds a portfolio of 94 research grants, covering a broad spectrum of topics:

- Worldwide deployment of the algorithms for automatic recognition of persons by their iris patterns continued to expand, primarily at border-crossings as a substitute for passport presentation, as well as for security and access controls. The one million passenger milestone was reached in the UK's passport-substituting programme IRIS. In India, 30 million persons were enrolled in their iris-based identity card system, and

Canada completed deployment of its iris-based CANPASS system at all eight international airports.

- A group from the Computer Laboratory took part in the ITA annual conference, a very large UK/US industry/university collaboration led by IBM research, on the fundamental limits of coalitions of wireless networks. The Computer Laboratory's contributions have been in three main areas: bio-inspired algorithms, policy controlled routing, and mobility models.
- The Intelligent Networked Airport project continued research on next generation radio-over-fibre unified networks, targeted at applications for intelligent gate management (getting passengers and bags reconciled on and off planes efficiently). Working prototypes of all the systems researched in the project were publicly demonstrated at an event attended by many relevant industry representatives.
- A team from the Computer Security group won the Best Practical Paper award at the eminent IEEE Symposium on Security and Privacy for a paper on the insecurity of PIN entry devices; their "Chip & PIN" vulnerability demonstrations received substantial media attention. Group members were also commissioned to write a report on security economics and the internal market which stimulated significant interest and will hopefully influence IT security policy in Europe.
- Work continued with the Crucible network on public policy for interdisciplinary approaches to technology research and innovation. The local collaboration included researchers from Social Anthropology, the Judge Business School, and leading innovation strategy consultants.
- Research on automated theorem proving had numerous applications in science and engineering. A related project delivered an automatic theorem prover called MetiTarski. Its architecture was unique, and many of the problems that it can solve are solved by no other software system.
- A member of staff was the principal organiser of a major workshop on Logic and Algorithms held at the International Centre for Mathematical Sciences, Edinburgh in July 2008 and attended by over 80 participants from around the world.
- The Natural Language and Information Processing Group focussed research around information extraction from scientific articles. A recent highlight was development of a classifier capable of distinguishing hedged or qualified sentences (pervasive in scientific writing) from ones making definite claims.
- Key research areas in the Rainbow group were extracting emotional cues from facial expression and body language, novel methods for designing three dimensional shapes, and interdisciplinary approaches to technology research and innovation.
- Research on precise models for the subtle memory orderings of real-world multiprocessors, (to support reasoning about low-level concurrent programs) began well, with preliminary results for x86, POWER, and ARM multiprocessors.
- Research in the Security Group sponsored by the European Union's Galileo Supervisory Agency is enabling work on trusted receivers for global satellite navigation systems. This work has many applications, from making smartcard payments more secure to preventing fraud and privacy invasions in future road charging systems.

- The Computer Architecture group is exploring communication optimisation for power efficient chip multiprocessors. Discussion about massively parallel simulation techniques led to a major project with the Universities of Manchester and Sheffield for architectural exploration using field programmable gate arrays.
- A computational model of stem cell behaviour, undertaken as part of a collaboration with EPFL (Lausanne) and the Cancer Research Institute in Heidelberg, has led to the discovery of a special subpopulation of stem cells which become activated in response to major injuries. The finding may explain cancer reappearance after radiotherapy which it seems does not affect the reservoir of stem cells and highlights the priority to target this subpopulation using chemotherapy.
- The DTG Wireless Team in collaboration with its partners in the CUED completed a large Wireless Sensor Network deployment near to Bond Street station on the London Underground (LU). The data from the network will be used by LU to assess the condition of the tunnel and to help detect long term trends in cross section deformation. This work was sponsored by the EPSRC as part of its WINES II call.

Administration

The IT support team made major contributions to improvements to administrative processes, one of the most important being the integration of the building security system with the main departmental database. The team was heavily involved in the migration of the department to the new VoIP telephone system during which the opportunity was taken to upgrade the network infrastructure to improve speed and resilience.

The job ticketing systems in both Systems Administration and Building Services, continue to expand; during the year the IT team resolved approximately 2000 tickets ranging from simple printer problems up to complex issues in research computing.

New directives on controlling power consumption were balanced with an increasing demand for resources. Changes to system management techniques are gradually removing the need for computers to be left switched on when not in use, and server virtualisation techniques are being used to provide central services as efficiently as possible.

Additional funding provided by the Computer Laboratory paid for access to the complete IEEE Digital Library for one year. Continuation of the subscription is conditional on matching funds being made from other sources, e.g. the School of Technology and/or cognate departments.

Visitors

Professor Richard Bornat, Middlesex University

Professor Fred Brooks, University of North Carolina at Chapel Hill

Professor Andrew Brown, University of Southampton

Professor Helene Collavizza, Ecole Polytechnique Universitaire de Nice Sophia Antipolis

Professor Warren Hunt, University of Texas at Austin

Dr Vito Latora, University of Catania

Professor Mayumi Masuko, Waseda University, Japan

The Future

The Laboratory's strategic plan continues to contribute to the School of Technology's five-year financial plan. Through implementation of the plan, the Department continues to excel in teaching, world-leading research and wealth creation. It envisages steady growth of the

academic staff by about one person per year, together with associated administrative and support staff, completing the expansion of the academic establishment by 2013-14.

The development of a sustainable planet is arguably one of the most important challenges facing the world this century, and computer-based tools form a crucial component of many solutions. The problem is that many of these tools do not yet exist. *Computing for the Future of the Planet* is a research perspective which has been created in recent years at the Computer Laboratory to address this issue and the next planned academic staff appointment will be in this topic.

The Laboratory's Teaching Committee continues to review the Laboratory's taught courses. The new MPhil in Advance Computer Science (ACS) will begin in October 2009. The MPhil in Computer Speech, Text & Internet Technology (CSTIT) will run for the last time in 2009-10; its content will then be merged with the new course. We also wish to explore ways in which some of the material in the MPhil in ACS can be taken as a Part III of the Computer Science Tripos.

An undergraduate exchange programme with MIT will be implemented in 2009-10. The first stage will enable third year students from MIT to study Part IB of the Computer Science Tripos, giving them credit roughly equal to five MIT modules. Changes to the Regulations for the Computer Science Tripos to enable Cambridge computer science students to spend a year at MIT will be considered by the Faculty Board next month.

Funding difficulties continue to inhibit the Laboratory's ability to recruit research students. Support for studentships is being sought as part of the University's 800 campaign; the fund stands at £1,679,826.00.

The development of the Hauser Forum at West Cambridge, and the subsequent move by Cambridge Enterprise to their new premises in the Forum, will enable the Computer Laboratory to expand into the remaining part of the William Gates Building by the start of 2010.

Margaret Levitt
November 2008