

Women's Stories from the Computer Room

Photographs of early computer laboratories, with their chunky consoles and steel cabinets, always feature smart young women seated at terminals or changing tape drives (see Figure 1). Yet the documented history of modern computing is overwhelmingly male, especially in academic environments. In a bid to restore the balance, I recently interviewed women, almost all mathematics graduates, who had worked in Oxford University's pioneering Computing Laboratory, either as staff, users or students. Their stories reveal the complex ecology that developed around the teaching, research and practice of academic computing between the 1950s and the 1990s, in which women played an essential but often unacknowledged role.



Figure 1: Communications programmer Esther White in the early days of the Computing Service (OUCS archives)

Oxford was one of the few British research institutions to establish a computing laboratory before 1960. Advised by a committee chaired by the X-ray crystallographer (and Nobel prizewinner-to-be) Dorothy Crowfoot Hodgkin, in 1959 the University took delivery of a Ferranti Mercury.

Hodgkin's group, working on the three-dimensional structure of insulin, was one of the heaviest users of computation in Oxford. From 1961 Eleanor Dodson, an Australian maths graduate, developed algorithms for crystallographic calculation (see Figure 2), which she ran on the Mercury. She says

The crystallographic groups had the right to two full nights a week to do our calculations. If you stayed up all night, you got your calculation done – something that now you'd do in seconds. By 1966 they'd got a new machine, a KDF9, which had much more memory, which made our lives easier.

Dodson moved to the University of York in 1977 with her crystallographer husband Guy, and though on part-time contracts almost until retirement, led the development of an international library of crystallographic software, CCP4, that continues to flourish today. She was elected a Fellow of the Royal Society in 2003.

Coinciding with the installation of the KDF9, Linda Hayes joined the Computing Laboratory in 1966 to work as research

assistant to its director, the numerical analyst Leslie Fox. She arrived with a postgraduate diploma in Numerical Analysis and Automatic Computing from the University of Cambridge. She says

Leslie Fox did not use a computer. The nearest to a computer he got was an adding machine and winding a handle, and I was the new thing to do his computing on.

The first of the DPhil students Fox had supervised was Joan Walsh, who went on to become reader and then professor of numerical analysis at the University of Manchester (sadly, she died before I began my interviews). In 1970 Hayes, Walsh, Shirley Lill (now Carter), lecturer in computing at the University of Leeds and Brian Ford, lecturer in computing at the University of Nottingham, founded the Numerical Algorithms Group (NAG). NAG brought together the resources of six research computing laboratories to develop a library of shared software for the new ICL 1906A computer that each had recently ordered. Originally located in Nottingham, Ford ran NAG from Oxford from 1973.

Hayes wrote algorithms for linear algebra, translating programs developed in ALGOL into FORTRAN. Carter did the same for minimisation. Carter says

Brian was looking for people in different disciplines to write the algorithms. So, it was a collaborative thing, to make available very important tools – it would have been a real waste if everybody had tried to develop everything themselves.

NAG, now a not-for-profit company, will shortly celebrate its 50th anniversary. Carter held lectureships at Leeds and then Liverpool universities before setting up two successful private consultancies with her husband, specialising in mail order databases.

Hayes, meanwhile, remained at Oxford until her retirement. From the start the Computing Laboratory had served both as a research centre for numerical analysis and a computing service to the whole university. In 1970 the two functions separated. Hayes says

I was gradually thinking that I really wasn't a mathematician and I liked helping people, and so when the split came, I chose to go with the Computing Service (OUCS).

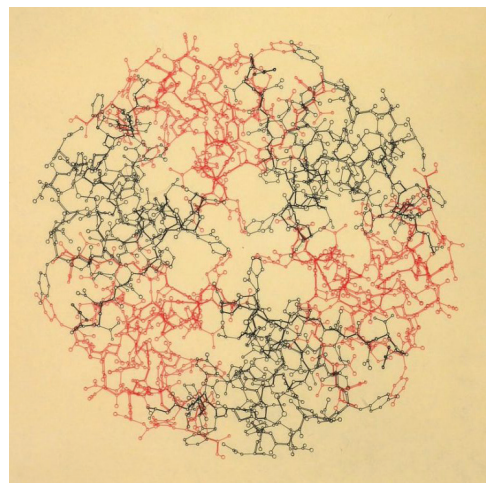


Figure 2: Pen-plotter diagram of insulin structure, programmed by Eleanor Dodson and printed in OUCS around 1971 (MS. Eng. b. 2056 (B. 281). The Bodleian Libraries, The University of Oxford)

She became head of user services: her database of users and password access formed the kernel of today's institution-wide university card system.

Hayes was joined in 1974 by Carol Bateman. With a postgraduate diploma in cartography from Glasgow, Bateman's early work digitising Admiralty charts had led to a post teaching computing at Oxford Polytechnic, following her husband's career move. Within a few years of joining OUCS, she was running its training courses – an area that exploded with the advent of personal computers in the 1980s. She says

It didn't matter whether you were a porter or a head of college. They were all in the same predicament: they needed to learn how to use a computer.

Like Hayes, Bateman remained with the rapidly-expanding OUCS until she retired.

OUCS also pioneered what is now known as digital humanities after it hired Susan Hockey in 1975 to teach 'computing in the arts'. Alone among my interviewees, she arrived at computing via languages, having studied Ancient Egyptian for her Oxford degree. She had worked for five years at the Atlas Computer Laboratory at Chilton near Didcot, developing concordance programs for Arabic and Turkish (see Figure 3). She says of her time at OUCS,

I decided I was going to try and concentrate on research applications and get more people interested in doing those.

She co-authored the Oxford Concordance Program, and worked with international colleagues on the Text Encoding Initiative (TEI), a set of standards now very widely used in digital humanities. After leaving Oxford in 1991, she headed a new Center for Electronic Texts in the Humanities, based at Rutgers University in New Jersey. Her final post before retirement was head of the School of Library, Archive and Information Studies at University College London.

The Computing Laboratory continued to pursue research in numerical analysis. After Joan Walsh, approximately 10 women completed DPhils between 1960 and 1987, when Fox retired, out of a total of 80 research students.

Jennifer Scott FIMA was one of the later cohort of students, graduating in 1984. She began with a 'crash course in FORTRAN', but went on to do a theoretical project on discretisation methods for Volterra integral equations. She now heads the Computational Mathematics Group at the Rutherford Appleton Laboratory (RAL) in Oxfordshire, and, as Professor of Mathematics, runs the Mathematics of Planet Earth doctoral training centre at the University of Reading. She says

They [Reading University] offered me a full-time job but I decided, having invested so much here [at RAL], that I wasn't ready to leave. They knew that if they wanted to get me, they had to accommodate me.

Fox was not personally interested in the semantic aspects of programming, but he helped to bring Christopher Strachey to Oxford in 1966 as head of the Programming Research Group (PRG). Joining that group in 1969 as a research assistant was Julia Dain, who had just graduated from Oxford in mathematics. As a teenager she had a gap year job with Marconi – which employed many women as programmers – and learned several programming languages, working with a DEUCE, a LEO and a KDF9. She says



Figure 3: Susan Hockey defining fonts on the PDP15 at Atlas Computer Centre (© Science and Technology Facilities Council, available from www.chilton-computing.org.uk)

I had the impression then that people thought programming was to do with languages, and girls had language skills, and that was why they would be suitable for coding.

There was a constant stream of DPhil students through the PRG – all men – but Dain did not think of applying for a doctorate herself. She says

I don't regret it. There was research going on, of course, that was the point of PRG: the computer was there to support the research.

Her job involved 'cleaning up' the compiler and operating system for the PRG's Modular One, written in the language BCPL that Strachey had co-created (a forerunner of C). Dain made various moves after marriage, becoming a lecturer in computing at the University of Warwick in 1982. In 1995 she left to join a software consultancy:

I learnt tons because I'd only worked in university departments up until then – I was in a commercial environment and I really enjoyed it.

Often making career choices to fit around family commitments, these adaptable women moved between teaching and research, computing support services, and private industry. In so doing, they carried with them the innovative mindset that characterised the early computer centres. It would be fascinating to compare their experience with women at other pioneering centres such as Manchester, Leeds and Cambridge, whose names may otherwise be forgotten and whose voices have gone unheard.

Acknowledgements

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