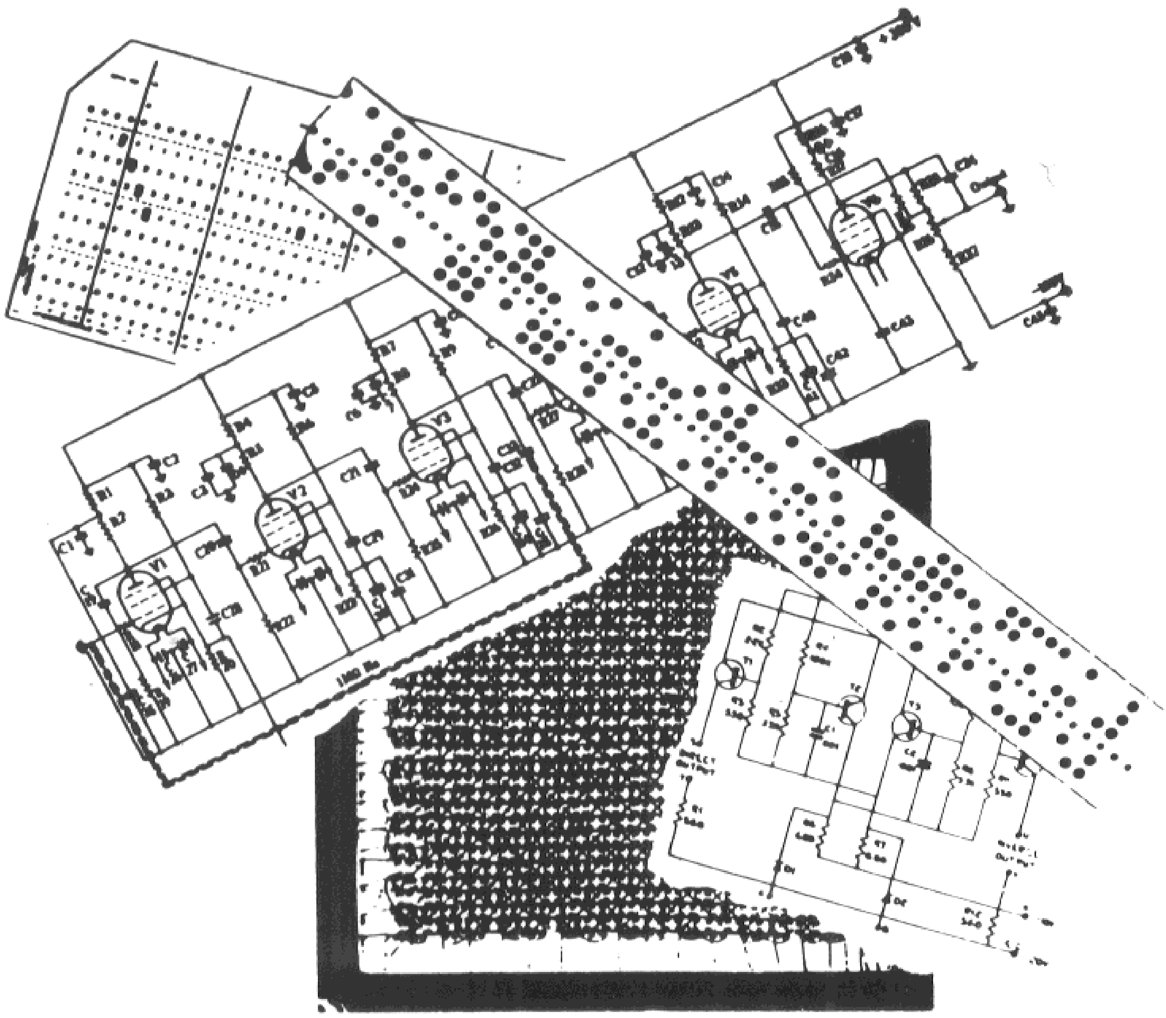
Issue Number 36 Autumn 2005

Computer

RESURRECTION

The Bulletin of the Computer Conservation Society



science museum

BCS THE BRITISH COMPUTER SOCIETY

THE MUSEUM OF SCIENCE & INDUSTRY IN MANCHESTER

Computer Conservation Society

Aims and objectives

The Computer Conservation Society (CCS) is a co-operative venture between the British Computer Society, the Science Museum of London and the Museum of Science and Industry in Manchester.

The CCS was constituted in September 1989 as a Specialist Group of the British Computer Society (BCS). It is thus covered by the Royal Charter and charitable status of the BCS.

The aims of the CCS are to

◊ Promote the conservation of historic computers and to identify existing computers which may need to be archived in the future

◊ Develop awareness of the importance of historic computers

◊ Encourage research on historic computers and their impact on society

Membership is open to anyone interested in computer conservation and the history of computing.

The CCS is funded and supported by voluntary subscriptions from members, a grant from the BCS, fees from corporate membership, donations, and by the free use of Science Museum facilities. Some charges may be made for publications and attendance at seminars and conferences.

There are a number of active Working Parties on specific computer restorations and early computer technologies and software. Younger people are especially encouraged to take part in order to achieve skills transfer.

Resurrection

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Software Conservation Working Party

David Holdsworth

ICL 1900 – George 3

Out of the blue I have received a mail message from a Russian who still has a George 3 system running on DME. He has tapes holding early George 3 incremental dumps, which were used to start a new system off. These enable the construction of a filestore without relics of a previous user community. This will enable the production of a George 3 emulation for general release. We have successfully transferred images of these dump tapes from his machine. Alexey Giordienko has done some sterling work in reading the tapes on an old IBM machine, and then creating the images, which have been transferred over the Net.

His original message looked rather like spam, with its Cyrillic sender's name looking like the sort of message that I usually delete unread, but the subject field contained the characters “G3”. Increment number 3 on Alexey's tape holds the Algol 68R compiler from RRE Malvern (as it was then named). This compiler was the first in the world, and was presented at a conference organised to discuss how one might go about compiling this new language, which at the time looked to be a challenging task. The paper from Woodward, Currie and Bond hit the conference out of the blue, rather like Alexey's mail message.

Unfortunately, attempts to use the compiler lead to execution error. It looks like our 1900 emulator might have an error in its emulation of some subtlety of the machine's instruction set.

BBC Micro – 1986 Domesday

In the earliest years of this century I was involved with a project exploring the use of emulation for accessing data held in machine-dependent obsolete form. The Camileon project (Creative Archiving at Michigan and Leeds, Emulating the Old on the New) used the 1986 BBC Domesday system as its exemplar. I am working to release an emulator that can be downloaded and will read over the Net to access the data originally held on two double-sided 12" laser discs. The original project involved collaboration with Michigan University, and recent progress has been helped by cooperation from Long-Life Data, which has a system offering modern-style access to the original data at *www.domesday1986.com*, as a result of work for the National Archives.

The emulator enables people to see how multimedia was thought of in 1986. There are several emulators available on the Web for the BBC micro, but this one has the addition of the Philip's Laser Vision player.

English Electric KDF9 – Eldon2 multi-access system

Another email from the blue (Grenoble to be more specific) came from a man who is trying to emulate KDF9 so as to run the Director from the Eldon2 system that was run at Leeds University and NPL. As the author of much of the code I am ashamed to admit that I did not keep it well enough to survive moving office, especially as one move was done while I was away from Leeds University.

However, Hans B Pufal has found a listing in an archive, and done an OCR job good enough that I recognise code with which I was familiar 35 years ago. He has then gone on to produce an assembler, and then emulate the machine well enough to get the initial system start-up message that came out on the operator's console. Anyone who can offer listings of KDF9 software please get in touch.

Contact David Holdsworth at ecldh@leeds.ac.uk.

Pegasus Working Party

Len Hewitt & Peter Holland

The working Pegasus has continued to be demonstrated to interested museum visitors, usually every two weeks.

After being lost for several months, the logic diagrams special to our machine have been found and copied to CD by the museum. From this we have been fortunate in finding outside help to make us working paper copies free of charge.

Our offline PC has recently been upgraded, thanks to the museum, and the diagrams can now be viewed on that also. The tracing of any failing logic will now be much easier.

We are hoping to have further work done on the Creed paper tape equipment as soon as the engineers can arrange to visit the museum. Unfortunately, the motor of the Trend 700 paper tape reader attached to the PC has burnt out, so at present we have no offline facilities for tape preparation. But we are grateful to have found a replacement motor from the spares held at Bletchley Park which we hope to fit to the tape reader shortly.

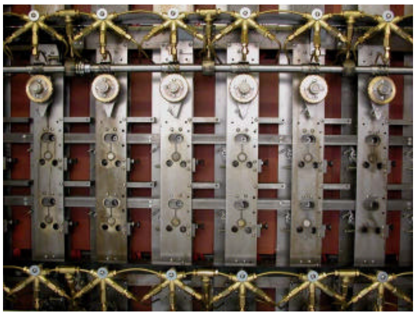
Contact Peter Holland at peterholland@care4free.net.

Bombe Rebuild Project

John Harper

Inserting photographs into *Resurrection* 35 was clearly successful so, as promised, I have included two more this time. One is relating to work finished some time ago and the other is of parts completed since our last report.

The photo below is of the central mechanism viewed from the rear with the gate open. It shows the drive to six Letchworth Enigmas. The horizontal worm shaft drives the fast drum shafts. The worm gears drive the worm wheels, which in turn drive pawls onto a ratchet wheel. In this manner drums can be set at the beginning of a run and will progress in step thereafter.



The medium and slow drums are advanced by a carry bar. Two of these can be seen right across the photograph. They are moved to the left (as seen in this rear view) by cam action activated when appropriate by a solenoid. The action is transmitted to a pawl that turns the drum shaft $1/26^{th}$ of a turn. A ‘catching’ pawl then holds the drum shaft in its new position and the carry bar returns to its ‘rest’ position.

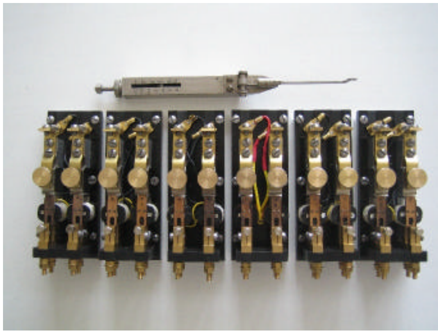
The lubrication pipes, completed only a few months ago, can clearly be seen. Three pipes from each five-way junction feed oil into each Letchworth Enigma through metering valves.

Good progress is being made with drum manufacture but as this is very labour intensive it will continue well into 2006. When we reach this point we will not only have enough for three banks but a full set that will allow every combination of the 60 Wheel Orders to be mounted. We shall run the machine ‘in anger’ later this year, albeit initially only on one bank.

All the Cross and Connect units are now complete. Menu plug moulding will recommence shortly but again this will not delay our main commissioning activity. We have around 60% of the total amount already to hand and wired.

The major item to announce in this report is that the last major manufacturing activity has been achieved. There are now no major items that have not been made in some quantity. There are a few minor problems to solve but these are almost insignificant compared to the problems that have been encountered and solved. There are many more parts to make identical to those already made. The majority of these are reported above but others have still to be completed. However all this is in hand and will be phased in as appropriate.

The last major manufacturing challenge was the Sense Relays. Armatures and contacts were recovered from other Siemens relays but we had to make everything else. Around 80% of the parts are remanufactured within the team.



Six new relays are complete as can be seen in the photo above. Each relay base is 4” long. The following 20 are now well on the way to being completed and parts for all the rest are mostly to hand.

Our Web site, although not very up to date, can be accessed at *www.jharper.demon.co.uk/bombe1.htm*.

Obituary: Harold Gearing

We regret to report that CCS Committee Member and former Society Archivist Harold Gearing died on 4 September at the age of 93.

Harold was one of a small group of industry executives in the 1950s who realised the potential of the computer straightaway and was instrumental in ensuring that his employer benefited from the new invention.

An accountant and statistician, he had joined the Metal Box Company in 1939, and he stayed with the company until his retirement in 1973. Harold was asked in 1956 to head up a new division at Metal Box to investigate the potential value of computers to the company. By then he was thoroughly familiar with unit record equipment and had already gained experience of computers including the Pilot Ace, and had attended some of the earliest computer courses run by Northampton Polytechnic (now the City University).

Throwing himself with enthusiasm into his new assignment, he taught himself computer programming and wrote successful programs for invoicing, stock cataloguing and cash settlement applications using Edsac, Pegasus and Orion machine code. He also developed system software and was particularly proud of his Orion multitasking system, claiming it was two years ahead of its American competitor. The department he set up steadily expanded and by 1971 was employing 94 people.

Harold was also one of the driving forces behind the formation of the British Computer Society, and it was in the conference room of his employer, Metal Box, that the Society was formally brought into being on 20 May 1957. He was one of the 14 elected to form the first Council of the Society. Later he became Chairman of the Publications Committee responsible for the *Computer Journal* and the *Computer Bulletin*. He was one of the first members of the BCS to be awarded honorary fellowship.

Harold was appointed Archivist of the CCS when just short of his 80^{th} birthday, in December 1991, and put in much dedicated work recording the existence and whereabouts of documentation and artefacts from early computer systems. He served in this capacity for a decade until advancing years began to tell. He remained a member of the CCS Committee until his death.

Finding the Necessity for Invention

Hugh McGregor Ross

The author argues that the computer was an unnecessary invention, because there was no work available for it to do that could not be done another way. As late as 1955 there were still virtually no real applications, and it took a whole decade before computer industry executives developed enough “ways to make these useless machines useful”.

There’s an old saying “Necessity is the mother of invention”. When computers were invented, though, there was no necessity for them. No application had been identified for which they were necessary. I have four pieces of evidence to support this somewhat startling assertion.

The first comes from Harry Johnson, who told me that in the early 1950s when he was working in the Ministry of Civil Aviation, he needed substantial computing facilities and had no difficulty at all in finding them. There was an adequate supply of people performing hand calculation using Brunsvigas and things like that.

Then, when Harry was seconded to the NPL in the early days of the pilot Ace, he found that at the NPL there was the idea that a single national computer should be established for Britain. One!

He also found that that Jim Wilkinson had great difficulty in finding suitable applications to test out the pilot Ace, although there was a substantial mathematics department at the NPL.

The fourth piece of evidence comes from Bernard Swann’s history of the Ferranti computer department. It has not been generally published, but a number of copies are in circulation. Swann records a conversation with Douglas Hartree, who certainly was fully aware of all the mathematical work going on at Cambridge University, in which Hartree gave the opinion that there would be no need for more than the three computers that had already been started – one at NPL, one at Cambridge, and one at Manchester (he threw in another one for Scotland for reasons of national pride).

The conclusion I draw is that in the early 1950s people had not established any necessity for the use of computers.

When the Manchester pioneers had made their large machine, they walked along the road to Ferranti, the electrical engineering firm, and asked them to make a well-engineered version of it. This became the first Ferranti machine – we called it the Mark 1 – installed at Manchester University.

Sir Ben Lockspeiser authorised that development. He gave Ferranti a blank cheque, thereby initiating the Government practice of starting all computer projects with a blank cheque. (There's one for the National Health Service now; a cheque has been made out for £6 billion but the cost has already risen to £30 billion; it's your money and mine that makes up the shortfall.)

That Ferranti project was a one-off development. But Sir Vincent de Ferranti was a remarkable man who had the vision to see the possibility of manufacturing electronic computers and of making a business out of them. He seems to have been the first – at least in Europe – to have had that insight. He engaged Vivian Bowden to implement his vision.

Vivian Bowden had a brilliant intellect. His thinking was what we nowadays call 'lateral thinking'. He would contemplate one particular objective and he would bring in other strands of thought laterally. He was highly creative, and outstandingly persuasive. Bowden soon realised the necessity to invent uses for computers. He was probably the first man to be aware that these uses had to be invented.

Now I shall focus on the timescale of early computer developments, as shown in Table 1.

I make no bones at all about asserting that the Manchester Baby represented the invention of computers. I'm talking about stored-program electronic digital computers: I'm not considering Eniac or Colossus or similar machines. A replica of the Baby has been constructed and is on display in one of the Manchester museums. We have the date of Baby recorded very accurately, and many readers will have been at the golden jubilee celebrations which were held in Manchester in 1998.

In 1949 we got to the stage where Edsac was operational in Cambridge. Also in that year the large Manchester machine became operational.

In 1950 the Pilot Ace was operational at the NPL. Apparently it was not until 1952 that this machine was able to provide a general computing service. It's interesting to note that gap between 1950 and 1952 while the machine was being worked up into practical operating condition.

1948 June	Stored-program computer invented Manchester 'Baby'	Williams, Kilburn, Tootill
1949 May	Edsac operational Large Manchester machine operational	Wilkes, Renwick
1950	Pilot Ace operational	Turing, Wilkinson, Newman, Haley
1951 July Nov	Ferranti Mark 1 operational Leo I operational	Pollard, Lonsdale Pinkerton
1952 Feb	Pilot Ace providing service	
1953 April Dec	Ferranti Mark 1★ operational Elliott 401 operational at Physical Society Exhibition Leo I completed and operational for service	Bennett Elliott, Owen, St Johnston
1954 March	Elliott 401 to Rothamsted Research Station	
1955	First Deuce to NPL	
1956 March	Ferranti Pegasus operational for service	Elliott, Strachey, Owen, Devonald, Merry
1957 Aug	Ferranti Mercury operational (in Norway) Leo II delivered Ace operational	

Table 1: Early British computer developments

By 1951 the first engineered version of the Ferranti machine was operational, as was Leo I.

By 1953 the improved Manchester Mark 1★ had become operational. In April the Elliott 401 operated at the Physical Society's Exhibition, and in December Leo 1 became operational for service.

Deuce apparently became operational in 1955. In 1956 the first Pegasus went into service. In 1957 we got the Ferranti Mercury computer operational in Norway. I believe Leo II was delivered in that year, and also the full size Ace at NPL.

That was the first decade of computers. That's the period I'm going to talk about, and it's crucial for this investigation.

I will look now at the documentation which is available for early applications. It is most remarkably sparse.

It was apparently not until 1951 that the first documents on applications were published. There were two papers in that year: one by John Bennett and one on X-ray crystallography processed on Edsac.

In the second half of 1952 Vivian Bowden wrote his book "Faster than Thought". About 15 people collaborated with him, but it was his concept. This book contains a very large section on applications, about a third of the book. If you read those chapters carefully, you will realise that they were not real applications. Vivian Bowden was very clever: he very seldom used the present tense, always the future tense. His sentences are qualified by 'might be', 'could be', 'thought to be possible'. So a third of the book is filled up with non-existent applications, and that was the best he could do in 1952.

Bowden also published a paper on 'The use of computers in aircraft design', and Bernard Swann published one on 'The use of computers for industrial and commercial applications'. I don't have exact dates, but I guess that they were written in 1953.

In 1955, I gave a lecture on the applications of computers, which was subsequently published. One odd thing about this paper is that when I wanted to show a photograph of Pegasus it had to be an artist's drawing. So in September 1955 we could not take a photograph of Pegasus. My recollection is that the doors had not been fitted to the cabinets, and we had to fall back on an artist's impression.

There are about a dozen types of application described in this article, and my recollection is that this was the second attempt, after Bowden's book, to publicise a range of computer applications. But the title of it is 'Future applications of computers'. I was copying Bowden's trick, and apart from the section on aircraft calculations everything else is in the future tense. So as late as 1955 there was still a remarkable paucity of real applications.

In 1956 I started in Ferranti a series of documents, the 'CS' series. They had text and diagrams, many being of punched cards. A third of these documents were to do with equipment, now called 'hardware'; a third of them were to do with programs, the program library and so on, now called 'software'; and a third were to do with applications. Over eight years we published 400 of them, so we were running at the rate of just about one a week. It was a very high rate of striking.

In 1956 also Peter Hunt wrote a paper on aircraft structural analysis, and at the end of the year Harry Cotton, a colleague in Manchester, wrote a paper on applications of Ferranti computers. It describes about 25 applications, and is beautifully produced and very authoritative. At the end of every one he says something like “this application was done on the Manchester University Mark 1 computer in 10 minutes, whereas it had taken three and a half weeks to do it by hand”. What he is inadvertently revealing there is that for all those applications, computers were unnecessary! All those applications had already been processed by hand.

In 1957 Conway Berners-Lee published an article on machine loading, a very unusual and interesting application of computers; in October Peter Young published a paper on electrical planning. Peter Young was my assistant; therefore I probably prompted him to do that one. Conway Berners-Lee was one of my colleagues; we worked closely in adjacent offices.

In December 1957 Cyril Gradwell from Ferranti in Manchester published an article in the *Overseas Engineer*. This was a very authoritative review of applications. But note that Gradwell’s article was published in the *Overseas Engineer*. By 1957, 10 years after computers had been invented, it was still impossible to get the editor of any British journal to accept any article on computers. They just weren’t interested. The editors were reflecting the attitudes of their readers, and readers were not interested in the application of computers.

Now I shall try to make a survey of early British computer applications (see Table 2), mostly summarised from this scanty data.

The early subjects – of stresses, stability, and the distribution of power – were very characteristic applied mathematics problems that a Cambridge mathematician would turn his hand to. I’m not certain that they were taken up by the CEGB, or indeed that the CEGB took any notice of this work.

It appears that in 1951 Bennett and Kendrew had established the use of computers in X-ray crystallography.

In 1952 Vivian Bowden persuaded the Society of British Aircraft Constructors to set up a panel to consider the application of computers to aircraft structural design. Bowden attended all the early meetings, and later I did so too, and that was where I first met our colleagues from NPL – Wilkinson and Woodger – because English Electric was working very closely with NPL. I became friends with all these people and we established a significant number of aircraft calculations.

In the guided weapons field there was work done on a guided weapon that steered itself onto a moving target. In 1952 George Felton and I were involved in making an analogue computer for guided weapons experiments, and I therefore assume that by 1953 the military were beginning to run real applications.

1950	Stresses in structural frameworks Stability of electrical networks after short circuits	Bennett Bennett
1951	X-ray crystallography - atomic structure Optical lens design - ray tracing	Bennett, Kendrew Black
1952	Distribution of electrical power in networks Electron trajectory problems Ballooning of thread during spinning Ballistics - shell trajectories Map surveying - minimisation of errors	Bennett Edsac Mack, Gradwell Glennie Wilkinson, Johnson
1953	X-ray crystallography - atomic structure Guided weapons - trials analysis, stability, homing on target Operational research - behaviour of queues	Ahmed, Cruickshank Johnson
1954	Simulation - scheduling of bus service Simulation - St Lawrence Seaway flows Aircraft flutter effect Analysis of experimental statistics Minimisation of waste in cutting sheet material	LPTB, M-L Berners-Lee Strachey Wilkinson, Woodger, Hunt Rothamstead
1955	Variety of aircraft stressing problems Stressing problems in frameworks and pipe systems Surveying - minimisation of error (FPC2) Optical lens design - auto-design Wages calculation with group bonus Torsional vibrations and critical whirling speeds of rotors Optimisation of tanker routes and cargos by linear programming	 Bennett, Cotton Bennett Black Ferranti Hollinwood Bennett, Gradwell, Kaye Shell
1956	Optical lens design - zoom lens Load flow in electrical networks Optimization of refinery products Planning production of items from a variety of components	Owen Bennett Shell, BP C Berners-Lee
1960	Text editing and hyphenation for metal typesetting	Samet, C Berners-Lee

Table 2: Early British computer applications

The next item is map surveying. In those days there were no satellites. The way you did surveying was with a theodolite and a chain of standard length. You took two known places on the map, and from those, using the theodolite and the chain, you took readings to other items that you were interested in, and you gradually made a series of measurements that were called a traverse. The whole skill and cunning was that you made this sequence of measurements round back to your starting point. When you got back to the starting point it didn't agree. There was always a mismatch. And it was a substantial mathematical task to juggle the figures, to eliminate the error, and to apportion corrections round all the measurements. It was a non-trivial task because, especially when the ground was not level, there were cosines involved.

When Harry Johnson went to NPL one of the first jobs he was given was to put a whole lot of survey data into the Pilot Ace, and with Jim Wilkinson he found a way of doing this. It was not at all easy because the Pilot Ace only had 320 words of store, but because his matrices had a lot of zeros he was able to do it. He had a pack of cards and he ran them through the machine again and again and again. So by 1952 we seem to have got to a real application!

Also in that year Ferranti people were asked to help in the calculations involved in what's called the 'ballooning' of a thread when it's being spun. What happens is that in a spinning machine the threads are fed in at the top, the machine twists them round and round, and they come out as a twisted thread at the bottom. Between where the thread goes in and where it comes out, it doesn't come straight down but balloons out. It looks like a figure of eight. This is one of the applications in Bowden's book that is written in the present tense.

In 1952 Glennie was beginning to perform computer calculations for the trajectories of shells. This is quite difficult; it involves partial differential equations. Two of the early Ferranti computers went into the military, and we heard very little about what they were used for, but one can assume that by this date Glennie had done some work on the ballistics of a shell.

By 1953 Harry Johnson was beginning to do operational research on the behaviour of queues, and I remember him telling me that the problem in designing an airport is that all the people who walk about in it walk about in queues, so there's no steady flow. It's quite difficult to design an airport for that reason.

In 1954 Christopher Strachey went to America and developed a real application on the flow of water in the St Lawrence Seaway. They were making a canal for the St Lawrence River and they had to make sure that the flow of water past the islands was OK.

In 1954 also one of the first aircraft projects was tackled. This is called ‘flutter’, and I’ll explain it very briefly.

If you have a mass carried on a spring and you disturb it, it oscillates at a particular frequency. An aeroplane is made up of a large number of masses, all fixed together by springs. You may think of an aeroplane as rigid, but it most certainly isn’t.

Peter Hunt, who was working at de Havilland, came to Elliott Brothers at Borehamwood and asked if they could help him to do this sort of calculation for the Comet. The only computer that Elliott Brothers had then was Nicholas, which was very much a prototype; it preceded the 401. Ruth Felton wrote the input routine for this project, and George Felton had written a matrix manipulation program, so the two Feltons and Peter Hunt carried out the flutter calculations for the Comet.

Peter Hunt idealised the Comet aircraft into 10 masses, because it involved matrices of order ten, and Nicholas had only a thousand words of store for data. George Felton has told me that he flew in the Comet several times, and was very thankful to know as a result of his calculations that the plane would not fall to bits.

I should explain that the problem with flutter is that if due to the flexing the aerodynamic loads get modified, then you get a forced vibration which builds up. One of the dangers of being a test pilot before computers were invented was that every now and then the tail would fall off. Well, George knew that the tail would not fall off the Comet. What he did not know was that aluminium alloys exhibit a fatigue effect and luckily, for he is still with us, he was not flying in the two Comets which blew up in the air. Anyhow, they didn’t fail because of flutter.

A third application that was developed in 1954 was scheduling of bus services: this was written by Mary-Lee Berners-Lee. The route was the London number 11 service, which goes from Shepherd’s Bush along Bayswater Road (alongside Hyde Park) to Liverpool Street, and then turns round and comes back again. Scheduling was difficult to manage, because people come to bus stops in a random order. If the bus is a little late, the number of people getting on and off goes up, and the bus is delayed. So you have an unstable situation. London Passenger Transport wanted to simulate this effect on a computer.

Very soon after that we established a set of programs for doing stress calculations in frameworks. It’s quite easy to do stress calculations

(I mean I could do it when I was at college) when the members of the framework are pin-jointed. But when you've got solid joints, the stressing is much more complicated, and it was necessary to use computers for that. We extended it for the stressing of pipe systems where you've got temperature and pressure problems.

I must also say a little more on map surveying. When the design of Pegasus had been completed, and the technique of using logic packages devised by Bill Elliott and Charles Owen had been established, John Bennett got interested in the idea of designing special-purpose computers, and he chose this map-surveying problem as an example. When Pegasus was designed it was called FPC 1 – 'Ferranti Packaged Computer 1'. What John designed was FPC 2.

This was done specifically for the Ordnance Survey and specifically for this map job. John has recorded how, when he had designed it, he got a member of top brass from the Ordnance Survey and took him up to Manchester to impress him with how wonderful computers were. All John had got was the Manchester machine, and on that day it didn't work at all. So the big brass went back to Southampton, and they never bought a computer. The FPC 2 project died.

Harry Johnson got the idea that computers could be used to help air traffic controllers and designed on paper a special purpose computer that would do this. The job dragged on for years and years and years, and in the end it was implemented in a transistorised machine which we called Apollo. After trials it went into service at Prestwick airport, and it ran for over 21 years, which was a very remarkable achievement for a very early transistorised computer.

The subject of optical lens design seems to have gone through three phases. There was a very early calculation performed on the Pilot Ace and other machines, in the form of ray-tracing; that seems to have been in 1951. By 1955 Gordon Black was suggesting, and perhaps even using, a computer to do automatic design of lenses. I was very interested in this subject and I took it up for Ferranti. By 1956 my pocket diary shows that another man, CE Owen, had done the first ray-tracing through a zoom lens. Ordinary ray tracing could be done by hand, but for the later phases of automatic optimisation and zoom lenses computers were a necessity.

I think it was in 1955 that the Shell people were beginning to do the optimisation of tankers and their loads. With a large fleet they wanted to know which tanker to put on which route, and what quantity and type of oil it should have in it.

Some other early Ferranti applications included:

- Experimental statistics
- Wages calculations (we did a trial in 1955)
- Load flow in electrical networks (Bennett, 1956)
- Torsional vibrations and critical whirling speed of rotors (Bennett, Gradwell, Kaye, 1956)
- Optimisation of tanker routes and cargos by linear programming (Shell, probably 1955)
- Optimisation of refinery products (BP asked us to provide them with a computer "like the one at Shell, but don't for goodness sake tell them that we're asking for it". In fact they did get one, in 1956, and by successfully optimising the output of their refinery they saved as much money in a year as it cost them to buy the computer)
- Conway Berners-Lee did another interesting early application in 1956, planning production of items from a variety of components, for example an animal feed product.
- Conway Berners-Lee evolved in 1960 a technique for text editing and automatic hyphenation for metal typesetting.

I established two important metrics at the time. The first was that by 1958 an estimated 400 new programs were being written each year. The second was that by December 1960 'Pegasus is the familiar tool of over 1000 programmers'. I remember being very careful to make sure that both these statements were true.

So 50 years ago there was a necessity to invent uses for these useless machines, and a necessity to find ways to make these useless machines useful. Some of *us* did that invention.

Editor's note: This is an edited transcript of the talk given by the author to the Society at the Early Applications seminar at the Science Museum on 24 February 2005. The Editor acknowledges with gratitude the work of Hamish Carmichael in creating the transcript.

Leo II and the Model T Ford

Frank Land

The author describes an order processing and stock control application implemented at the Ford Motor Company's spare parts depot at Aveley in the late 1950s. A major feature was the effective combination of computer and punched card technology, which was the key to success.

I'm going to discuss one specific application, covering the background, the requirements that had to be met, the particular Leo II computer configuration, and something about the job organisation. To refresh my memory I have drawn upon a paper I wrote in 1960 and a contemporary report by Cliff Dilloway of Ford Dagenham.

The first strange thing to consider is that in the 1950s the Ford Motor Company bought a computer from a teashop company. Why should a major automotive company go to Lyons to buy a computer?

First of all, there was mutual respect and esteem. John Simmons of Lyons was at that time the president of the Office Managers' Association. Ford had a thriving O&M department under a man called Bradley, who was a member of the same association. So they knew each other well, and there was a recognition that Lyons was, as far as organisation and methods was concerned, something special.

Ford had asked Lyons to do the company payroll as a service job. This was one of the first examples of outsourcing by a major corporation in the world: it involved running the Ford payroll on the Lyons computer at Cadby Hall. That program was successfully initiated in 1955. So Ford had some experience of Leo Computers' capability, which was most important.

Ford had a spare parts depot at Aveley, which in the 1950s was a state-of-the-art warehouse. It held something like 45,000 distinct stock items. Many belonged to vehicles which were long out of date; indeed, they included some Model T parts: the Model T first came on the market in 1908!

You might wonder how many people were driving Model Ts in 1956, and the answer is: not very many. But the engines were still used in pumping equipment, and it was for those that the stock was being held. Ford claimed that it could supply parts for any Ford product, of whatever age.

The scale of business was very large by the standards of the time, involving 30,000 stock movements per day. Of the whole range of 45,000 parts, about 12,000 were active on any one day. So by any kind of scale this was a fairly massive operation.

Up to the time that Ford ordered the computer, it would be fair to say that it didn't need one. The data processing ran efficiently on unit record equipment. The manager, Stan Woods, could make things work on punched cards, and that was a special skill. Nevertheless the management realised that for competitive advantage, or to maintain their position in the marketplace, they required improved service and lower costs. Bradley and the O&M team worked out that a computer would be able to do that. This wasn't quite a computer looking for an application; it was a case of an application for which a computer would perhaps serve.

After the successful experience of the payroll application and a visit to Leo by Ford UK's Managing Director, an order was placed in 1956 for what was the fourth Leo II. (The first had gone to Leo Computers itself; the second had gone to Wills; and the third went to Stewart and Lloyds.) Later Leo IIs had core stores, but this one was still a mercury-delay line machine – quite a small machine. It was purchased in 1956 for £125,000.

Planning work started immediately and by the time the computer was delivered in December 1958 much of the programming had been carried out. Ford, and Leo Computers which was contributing to this, were ready. Ford had built up its own programming team, but a great deal of the initial work was done by John Gosden (a major figure in Leo Computers), and at a subsequent stage I took over from him.

The most important step taken by the Ford Motor Company was to hire Peter Gyngell. He is a figure who is perhaps a little larger than life. He had read philosophy at university, and thought of becoming a priest. I'm quite sure that if he had become a priest he would by now be an archbishop.

Peter was the one who, with Stan Woods' expertise in punched card processing, managed to blend those two techniques to produce the way the job was run, and to manage the actual implementation. Gosden had played a major part in how to build the job in the first instance, and Gyngell made it work. The project's success owes an enormous amount to his skill and enthusiasm. Later Peter joined Leo Computers and headed the company's operation in Australia, where he is now a private consultant.

Let's look at the requirements. The spare parts were divided into two main categories: Tractor parts and Auto parts. Some parts were reserved for export orders, some for domestic use. Each stock item could be Tractors or Autos or both, and domestic or export or both, and there were different rules for the way orders were supplied according to these various categories.

Ford had a tight-knit dealership network. Dealers were divided into two kinds. There were the retail dealers, ordinary garages, many hundreds or thousands of them; and the relatively few main dealers, three to four hundred of them. The main dealers supplied the retail dealers. So Aveley traded with a miscellaneous set of exporters and the tightly-controlled dealership network.

Orders were controlled in such a way that the highest discounts were available for orders placed on a regular basis. Each main dealer was expected to place a main stock order, covering perhaps several hundreds or even thousands of items, on a monthly basis, on a specified day of the month. If a dealer met the deadline, then he got a relatively high discount.

There was a series of order categories below the level of the main stock order with differing degrees of urgency. The highest urgency was applied to an Immobilised Vehicle Order (or in the case of exports an Air Freight Order). Every order had to be serviced on the day, provided the parts were available in stock (which was not always the case).

Main dealers were franchised as either Tractor or Auto dealers, though some dealers, especially in country districts, held both franchises. Tractor parts could only be ordered by dealers with a Tractor franchise, and Motor parts by dealers with a Motor franchise. But these franchises did not apply to export orders, where a different set of rules applied.

Orders which could not be met because stock was not available had to be back ordered, and so we had to maintain a notion of what was back ordered, and then as stock arrived it had to be allocated according to the priority of the various back orders. So there was a fairly complicated set of rules which defined when a dealer actually got the goods he had ordered.

Orders were supplied from Ford's own factories and from outside suppliers ranging from large companies such as Lucas and CAV to small companies supplying a variety of specialised items.

Stock control and order allocation were based on a series of rules framed in a variety of different ways. For each stock item a reserve stock was calculated based on past requirements. Fast moving items, some 9000 of the 45,000 total items, had a different set of rules.

Stock was allocated according to the type of order. A stock order had the lowest priority and could not take the stock below its reserve level. On the other hand, an Immobilised Vehicle Order could take whatever stock was available.

Items were known by their part number, but there were three different numbering systems in use. The first number was the number in the catalogue, the old Ford part number, a large alphanumerical number which dated back to historical times, and was based on the part of the particular factory where they were built.

There was a second number which defined the location of the item in the store. The store was a large rectangular space with gangways and corridors at right angles, and the bins were allocated a bin number according to the gangway they were in. Big ***A*** was a lateral gangway; small ***a*** was in a gangway going the other way, and this number therefore defined exactly where the item was to be found ... in theory, that was as long as the items were where they were supposed to be.

These two numbers meant that a matching process was necessary: is this item that we've called by location the same as the one described in the catalogue?

Finally a new serial number was allocated for data processing. So there were three numbers in all: the location number, the original number or catalogue number, and the computer number.

What were the requirements?

- To update the stock record with details of stock received.
- As soon as stock was received it had to be allocated against previous back orders. Then each item that was freshly ordered had to be checked for entitlement, to make sure that the dealer had the appropriate franchise and so on.
- To check that stock was available to meet the order, and to create a back order if not.
- To check on stock levels, and to report on any action needed, such as re-orders.
- To prepare picking, packing, despatch and invoicing documentation. These were in different sequences. Picking documents had to be in bin number sequence; invoices had to be in part number order, within dealers; despatch information had to be in a different order again.

- To maintain the dealer's personal account.
- To provide a comprehensive sales analysis.
- To calculate monthly sales forecasts and to schedule stock replenishments.

So it was a fairly integrated total job that was required. Now let's have a look at the computer which had to deal with all that. It was a Leo II with 2000 words of storage, each of 19 bits, including the sign.

The input comprised three independently buffered channels linked to card readers, each card reader operating at 200 cards per minute, giving a total input rate of 600 cards per minute. One of the more novel features of Leo II at this time, compared with machines used for more technical purposes, was the provision of multiple channels, which allowed simultaneous input and output on a fairly large scale.

Output consisted of three independent buffered channels. There were two card punches, providing 200 cards per minute, because the punching rate per machine was only 100 cards per minute, as against the reading rate of 200 cards per minute. That marvel, the Powers Samas Samastronic printer, operated at 300 lines per minute.

So by modern standards, what I have in my ear now, a digital hearing aid, contains more computing power than that entire Leo II.

Limitations in the computer configuration made it impossible to satisfy all the requirements in one run. We had no random access, no magnetic tape. So we had to do the job, and this I think was the clever thing, by using punched card equipment – card punches, collators, and so on – for parts of the job, and blend them in with what the computer could do best. The skill of John Gosden, Peter Gyngell, Stan Woods, and I have to include myself to a certain extent, lay in making that blend work.

Of course, there were other people all over the world who may have been doing similar things, but we weren't copying anybody. Everything we did, we did *de novo*. That is perhaps to our credit.

Without random access, it was sequence that determined job organisation, such as bin number sequence for picking documentation, and part number within dealer number sequence for dealer document production. The small size of store meant that export processing was done separately from domestic processing; we couldn't do it all at once.

The job was organised into daily, weekly, and monthly runs, with year-end extras. To do all that on the Leo II took 24 hours, so the computer ran three shifts. It was on all the time.

Files were kept on 80-column cards, and there were several types. The major one was the Stock Balance Card – you could say the database, the main record of the system. This card was punched in two ways. It had the part serial number punched in alpha/decimal, which was used for sorting; and it had the rest of the information punched in binary in rows. So that card exhibited some ingenuity! The information provided was:

- Part serial number
- Stock available
- Quantity on back order
- Export orders deferred
- Forecast demand for one month
- Actual demand this month – domestic
- Actual demand this month – export
- Goods received this month
- Stock control indicator, to say what kind of part it was
- Procurement source code, to say where the part had come from.

The second important record was the Movement Card: again fiendishly clever stuff! One wouldn't dream of doing things this way any more. The Movement Card contained the following data:

- Part serial number
- Bin number
- Part number
- Domestic Price
- Export Price
- Selling Units
- Cost Price
- Sales Analysis Code

This was all punched in alpha/decimal and interpreted. It provided the basis of all the input and the actual processing.

The cards were held in a large pulling file, and girls went round with each dealer's order, which could have several thousand items, and pulled cards from the stack for each part. The cards then went to punching and verifying to add on the quantities ordered, the dealer number and so on.

Then items that had moved were outsorted from the main pack. We collated the Movement cards against the Stock cards to pull out the ones that had moved, to ensure that we processed only the 12,000 or so that had moved out of the 45,000 total. We created out of this run a Variations card, which showed any stock adjustments that had to be made, so that we could then feed those back in next time round. The cards were then re-sorted and used for producing the documentation.

Orders were received during the morning. The cards were pulled and processed during the day. The main run was during the night. By the morning the picking lists were ready for the factories. So it was a pretty smart turn-round, on what was less than what I've got in my ear.

Between 1500 and 2000 invoices were produced each day, each covering several hundred items.

The system represented a sensible mix of computer and unit record operations, using each to the best of its capability, and it's that blending which I think made possible the running of this system on a daily basis in a regular fashion.

The level of ambition, given the limitations of the computer by today's standards, was commendably high.

The implementation went more or less to plan, and the bulk of the requirements was met as first stated. Inevitably there were some compromises, but they were remarkably few, and there were things that had to be added later in order to meet the full set of requirements. As a planning operation that worked this was a credit to the Ford team.

Nevertheless, it was felt by 1960 that Leo was running out of capacity, and that it would be incapable of handling increased volumes or stretched requirements. By then, too, computer equipment had advanced.

As a result Cliff Dilloway was commissioned to write a report on the job, to review procedures, and to recommend what future steps were taken. In the end the suggestion that the computer was to be replaced relatively quickly was not taken, and the situation was saved for Leo II by replacing the old unit record equipment with the most modern IBM unit record equipment, which could do the unit record part of the processing that much quicker. The bottleneck had surprisingly been not in the computer, but in the way the total operation was handled by the unit record equipment.

Editor's note: This is an edited transcript of the talk given by the author to the Society at the Early Applications seminar at the Science Museum on 24 February 2005. The Editor acknowledges with gratitude the work of Hamish Carmichael in creating the transcript.

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Problem Solving with George 3 Today

Brian Spoor

The author describes how he used the George 3 Executive Emulator to decipher some puzzling ICL 1900 data recorded on magnetic tape.

I received a request for help from the Population Studies Centre at the University of Pennsylvania on data formats used on ICL 1900 systems for the African Census Analysis Project[1].

The problem was a set of data from the 1977 Malawi census recorded on 14 reels of half inch magnetic tape. This data did not match the known census results, and appeared to have binary or some form of compressed data embedded in it.

The first step was to examine some sample files, using a 1900 tape print utility on a PC, to determine what they consisted of and to ensure that they did resemble 1900 data. I found that the files, which were in 'bitstream' format, contained a standard 1900 series tape header label; a standard 1900 series start of subfile followed by variable length data records; and a standard 1900 series end of subfile.

I then re-assembled the files into a 'tape' that could be read on the George 3 emulator, and wrote some Plan programs under George 3 to look at the data. It consisted of variable length records ranging from three to 19 words in length. I was lucky that there was one 19-word record which corresponded with the original Census Form.

By extracting the records according to the record length, starting with the longest, I was able to make sense of them. The data at the end of the records consisted of codes that described how the record had been compressed, with the last word of the record containing a count of the number of compressions for that record.

The 'funny' data comprised counter/modifier words that described how many words were duplicate with the preceding record and where they were in the record. The compression turned out to be extremely simple (just dropping duplicate words from the record), and not specifically related to the data, but it did reduce the data volume to about

[1] See www.acap.upenn.edu.

two thirds of the uncompressed volume. I wrote various programs, modifying them as my understanding of the data evolved.

In addition to decompressing the records into card images that could be output and then transferred to a Unix (or variant) system for future use, I wrote programs to recreate a Census Tape, to process it and to produce a Census Report.

Having proved these programs on the sample data, I was asked to complete the processing of the full set of data tapes. A Perl program was needed to convert the bitstream files that had been created from the original tapes to the format required by George 3.

As a side note, the Perl programs had to be run under Unix. When run under Windows they appeared to work, but the file sizes were larger than the amount of data converted and random rubbish was interspersed within the valid data, leading me to waste an afternoon looking for a program error that wasn't there.

After conversion, I found that there were three separate multi-reel files, with all of the reels available. Running the decompression program on the first set of tapes and then running a census report produced roughly a 50% population increase.

Decompressing all the tape sets produced 96 sets of data, when we were looking for 24 sets of data (one per district). Manual analysis of the extracted files showed that we had partial and duplicate sets of data for the 24 districts. In most cases, a single file was an exact match on numbers with the published data for a district. In a couple of cases, a group of partial files had to be used.

Once the required files had been identified, I was able to create a new Census Tape and run a Census report from it. The numbers matched expectation, apart from one district where 520 people had been lost, from a total population of 5.5 million.

There was no requirement to create a new tape, as the relevant files were transferred to a Unix system for future use, but I did this as in my view it rounded off the work, leaving a new complete ‘tape’ for posterity.

For more on the programs, see *www/fcs.eu.com/fcssys/mal77.html*.

Was it necessary to use George 3? No, all of the work could have been done in Perl or C, but it was more fun, and to my way of thinking easier, to work in a 1900 environment. After all, I did this work for enjoyment, not for financial reward.

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How the BCS Was Born

Peter Barnes

The British Computer Society was not the blueprint of a single brain. Peter Barnes describes how the BCS emerged as a compromise between the conflicting ideas and interests of many different organisations, bodies and individuals.

Stafford Cripps is a name many readers will remember[2]. His main claim to fame was that he set supertax at one pound and sixpence (£1.025) in the pound. He was also the creator of the NRDC (National Research and Development Corporation), which he set up in 1950 to support the manufacturers and promote the development of computer techniques.

At about the same time the two major universities, Cambridge and Manchester, were starting computing schools, and at least two other professional institutes, the Actuaries and the Accountants, were beginning informal computer study groups.

On the professional side, the Accountants and the Actuaries got moving quite quickly. After 1953 they started going to school again at the Northampton Poly (now City University). They ran some successful courses, and brought in people like Dudley Hooper of the National Coal Board and Mac Bridger from the Northampton Poly itself.

In July 1954 they ran a very successful school "Computers with Cost Accounting and Management Control" which attracted what in those days was a large attendance. Two of them, Tony Bray and John Hough, who worked for the accountants Turquand Young, set up and agreed to run study groups. They did very well, and gradually began to formalise their activities. Soon they established the London Computer Group, with a subscription of 10/- (50p) to make it formal.

The London Computer Group held an important meeting in April 1956 at the Caxton Hall, with Dudley Hooper as Chairman. A man named EM Reynolds from Ford read a paper on "The computer possibilities in my company", which must have been very interesting. The late Harold Gearing was an LCG member: he was in the picture right at the beginning. LCG set up about 15 study groups.

[2] Editor's note: Cripps was Chancellor of the Exchequer in the first post-war Government.

LCG progressed by holding a Convention, at which they decided to support a National body, should one be set up (the Group actually agreed in April of that year to become part of the BCS "if and when it was formed"). They had 400 members by then, with 13% of them from outside London, and the subscription had gone up from 10/- to one guinea (£1.05). In the first year, being good accountants, they had an income of £825 and a profit of £43. So LCG was a success, at least in accounting terms.

Now I turn to the scientific community. The NRDC, Cambridge and Manchester Universities, the aircraft industry (through the Society of British Aircraft Constructors), the National Physical Laboratory, the IEE, the BIM, the Office Management Association and others had been gelling around and meeting at the same time as the LCG was getting under way.

In May 1956 the NRDC took the initiative, and sent out something like 500 invitations to people to consider the formation of a new professional society to look at these things called computers and their usage, or in its own words, "to bridge the gap between the engineering design and use of electronic computers". At that meeting various other ideas hit stormy water.

The first BCS President, Maurice Wilkes, was involved, and I think he was concerned that the meeting had been called too quickly, as the existing professional bodies were all running around doing their own things, and were suspicious of new people getting involved, and suspicious of computers. Was there really a profession? Was there really a need for another society? There were concerns like that.

The NRDC then cancelled the planned public meeting, and instead a closed meeting took place, I think at the Royal Society of Arts. A Working Party was then set up, in the summer of 1956. From the beginning there was a confused brief: what was the Working Party actually to do? To look at the formation of a new body? Or to be a co-ordinating body – a body which just brought together other professional bodies such as the BIM and the IEE? Andrew Booth chaired various meetings which discussed such issues.

There was then a pause, attributed in the records to 'holidays', so from the summer of 1956 right the way through to January 1957 not very much happened. But I think a bit of lobbying went on. I've only had verbal information about this; I could find nothing in writing.

The next move was a meeting between NRDC and the other bodies in January 1957. This was an important meeting, because just about everybody who had been in the playing field seems to have attended. They considered two ideas.

One, put forward by the NRDC, was to form the National Computer and Data Processing Society (by that time data processing had come into being and the term was used instead of ‘computers’). The other, which came from the aircraft industry, particularly De Havillands where I was working at the time, was for a British Automation Association. That was based on the fact that, as far as the aircraft industry was concerned, they viewed computers highly technically, moving beyond mere calculations into process control, stock control and machine tool control. So from their point of view they wanted the term ‘automation’ in the title, and further they wanted to involve the social implications of automation in some kind of body.

The outcome of these two divergent views was the establishment of yet another Drafting Committee.

The next step forward came in March 1957, when the IEE set up what became the British Conference on Automation and Computation (BCAC). This was explicitly a co-ordinating body, which brought together the engineering organisations, using the term ‘Convener’. The Institute of Mechanical Engineers was the Convener for engineering, IEE was the Convener for computers, and social and economic matters were to be handled by the British Institute of Management. Such a body effectively superseded what De Havillands had proposed, and also another idea that Booth had come up with, for a Computational Association (I don’t think it ever existed, but he did write some terms and conditions for it).

So by April 1957 there were three ideas, not necessarily existing bodies, but certainly concepts. The first was BCAC; the second was the revised proposal for a National Computer and Data Processing Society; and the third was the body that had been there all the time, and was now nearly a year old – the London Computer Group, which was beavering away organising study groups and meetings very successfully.

The London Computer Group and the proposed National Computer and Data Processing Society rapidly joined forces. Together they set up a Committee, and that became the British Computer Society on 29 April 1957.

The BCS had its first Council meeting in the meetings room of the Metal Box Company, courtesy of Harold Gearing. The participants comprised seven individuals from the London Computer Group and seven individuals who had originally come through from the NRDC on the scientific side, and they formed the first Council of the Society.

The initial Council members comprised, on the scientific side, Eric Mutch from Cambridge; Frank Yeats, a statistician; Holland-Martin, a scientist; Ellis, Secretary of the NRDC; Ernest Clear Hill from De Havillands; Sandy Douglas, a mathematician; and Andrew Booth from NRDC and Birkbeck. On the LCG side were Boyles, an actuary; Bray, an accountant; Dowse, a Company Secretary; Harold Gearing, another Company Secretary; Geary, head of mathematics at Northampton Poly; Dudley Hooper, secretary of the National Coal Board; and Stephens, another accountant.

They rapidly formed two specialist groups – the Business Group and the Scientific Group. They were the rumps of the two previous groups – the London Computer Group, and Andrew Booth's NRDC committee which eventually called itself the Scientific Committee. The Council then set up Admin, Finance, Public Relations, and Meetings committees and, perhaps its most important initial act, established publications called the *Computer Bulletin* and the *Computer Journal*. It's interesting to note that in all the proposals for whatever body was eventually to be set up there was a call for two publications, a bulletin-type chatty newsletter, and a quality publication devoted to the highest level of papers in computing.

It took about six months to get the organisation going. The first meeting for members was held in October 1957. Professor Hartree gave a paper "The Machine's Eye View", in which he took the path of speaking on behalf of those ignorant things called computers. He effectively told people that they had to be very careful how they set their problems, and they had to know what they were doing before they came to use us. Perhaps we should apply the same principles today.

Membership was then about 1000, and because of the Articles of Association (the BCS was set up as a company), members had to be over 25 to vote. Associate members were aged 21 to 25, and anybody younger was classed as a student. We made a profit; I don't know how.

Over the next four years or so, from 1958 to 1963, the Society expanded, somewhat slowly, on fairly conventional terms. The study groups and meetings were very successful, and caused enormous problems with administration, finance and simply getting things done. I know that, because I became Honorary Secretary in 1962, at which time the professional staff comprised one elderly gentleman, who was well into his sixties, his secretary and typist, who was even older, and one sweet little 17-year-old who made the coffee and managed to get all the copy-typing incorrectly done. That was our entire staff, based in two very grotty offices in Finsbury.

We also hit some financial problems. The Assistant Secretary and I had to go to the bank to beg for a £4000 overdraft. Surprisingly we got it, heaven only knows how. We had a membership of 4000. I explained to the Bank Manager that each member's liability was limited to £1, so in an extreme case we could get the membership to pay up. He gave us the money on a Friday afternoon, and we had to find a way of paying it back.

Alex d'Agapayeff, who was the Treasurer, and myself, and one other (I think it was the Meetings Secretary) went out and organised seminars. I remember that I did one on systems analysis. We made £1500 each, and so we made a profit for the Society, but we were living very near the financial bottom.

When Eddie Playfair, Chairman of ICT at the time, was our President, he made Bradenham, the ICT conference centre, available for a working party to be set up to start looking at how the BCS might become a qualified body. We weren't expanding that fast; we had a lot of admin problems; we had a lot of interest to pay off. There was much debate about the subject. I'm not sure what triggered us off to actually start the process. I guess it was in order to make ourselves respectable: I can think of no other real motive.

Anyway, we set up a working party, which took a little time to report. By the time it did, in October 1966, our membership had gone up to about 6000. The working party said: "Yes, what a good idea! Let's become a professional body. Let's have some Fellows, Members and Associates and so on. We'll have a cut-off date of 31 January 1968."

They wrote some very interesting remarks on grading, which could be summarised in one word, experience, and some other interesting things including how to select the first Fellows (a problem because in order to become a Fellow you had to be proposed by a Fellow).

I still have my handwritten notes of the people we proposed as the first 50 Fellows of the BCS, together with notes as to why some people were deemed not quite suitable and so didn't appear on the final list. This proposal had to go, of course, to an EGM, which was held in March 1968.

We panicked at the last minute. We then had 18,000 or so members. We knew that there was a lot of opposition, but we'd no idea who it was. We'd introduced proxy voting, and we had enough votes, we reckoned, to get the motion carried. But we had threats that if people turned up and couldn't get into the meeting in Imperial College where it was to be held, they would use barrack room lawyer tactics to wreck the whole meeting.

So the afternoon before I telephoned the Albert Hall and said: "We have a problem. Can you help?" To our surprise the answer came: "We're quite used to people doing this sort of thing. The rate is £100. The Hall is available; you can have it between 2 o'clock and 5 o'clock tomorrow. There's no problem. We'll set it up for you. It holds 6000, if necessary." We took it. We didn't need it, because only 800 people came. The proposal was carried, and we had become a professional body.

After that the Society had to settle down, and build up its study groups, the training and education facilities, and all the paraphernalia that goes with a professionally qualified body. It took a few years before we could get a code of practice and a code of conduct. The code of conduct took until 1970, when it had to go to an AGM, and I was really disappointed by how few people actually voted for what is, for me, one of the symbols of a professional body. Anyway, we had achieved it by 1970, and that's a good point to stop.

Editor's note: This is an edited transcript of the talk given by the author to the Society at the Building the Profession seminar at the Science Museum on 24 March 2005. The Editor acknowledges with gratitude the work of Hamish Carmichael in creating the transcript.

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CCS Web Site Information

The Society has its own Web site, located at *www.bcs.org.uk/sg/ccs*. It contains electronic copies of all past issues of *Resurrection*, in both HTML and PDF formats, which can be downloaded for printing. We also have an FTP site at *ftp.cs.man.ac.uk/pub/CCS-Archive*, where there is other material for downloading including simulators for historic machines. Please note that this latter URL is case-sensitive.

Book Review

Nicholas Enticknap

Electronic Brains – Stories from the Dawn of the Computer Age, by Mike Hally, published by Granta Books at £15.99. ISBN 1 86207 663 4.

This book is not what you might think from the title. It has been written using an anecdotal approach, based on original interviews with survivors from the pioneering teams, but is essentially a narrative history of the origins and early development of the computer, covering the period from Babbage to 1960.

It is aimed at the non-technical reader, emphasising the personalities rather than the technology, but is nonetheless a serious piece of research which never sacrifices historical accuracy in the interests of a good story.

It differs from most other histories in being international in scope, without emphasis on developments in any one country. The USA and Britain naturally feature strongly, but there are also chapters on pioneering efforts in the Soviet Union and Australia. The emphasis given to Australia is unusual: the author classes Csirac along with the Manchester Baby, Edsac and Binac as the first four genuine stored program electronic computers to run.

As a result of this approach the reader can see clearly that the computer was in 1939 an invention waiting to happen: the solutions arrived at independently or semi-independently in many different places were remarkably similar, as were the problems the designers solved or failed to solve in the process.

The author does indulge himself by devoting a chapter to one machine that was different, the Phillips Hydraulic Economic Computer.

The author has drawn some conclusions which contradict conventional wisdom. Fans of Manchester University will be appalled to find that developments there are referred to only in passing. The author argues that the two outstanding figures in the British development environment were Alan Turing and Maurice Wilkes. He does give due recognition to the enterprise of Lyons, with Leo getting a chapter to itself.

In the US he accepts the influential role played by Eniac, but devotes rather more space than most to the predecessor Atanasoff-Berry Computer, or ABC. He also devotes a whole chapter to the Rand 409, which hardly features in most histories.

Letters to the Editor

Dear Editor,

In issues 34 and 35 of *Resurrection* you published a series of most interesting articles on British perspectives of the European computer industries' attempts at pan-European cooperation.

In the issue 34 article "Trojan Horses and National Champions" the author makes a small error on page 25 when talking of the CII Iris 50 and 80. In fact the Iris 80 was a joint development, with SDS, of a dual processor version of the SDS Sigma 7. It was the Iris 50 which was an independent development based on the newly introduced TTL chip technology of Texas Instruments.

More importantly, in the same article, the description of the creation of the French company Bull is misrepresented, probably due to its rather complicated nature.

The company Bull is named after the Norwegian engineer and inventor Fredrik Rosen Bull. Working in Norway in the 1920s he developed and patented punched card tabulating machines which were better integrated than, and free of the patent restrictions of, the American Hollerith machines. The death, in 1925, from cancer, of FR Bull left the continued development of his work in doubt, but his close collaborator Knut-Andreas Knutsen was determined that his legacy would continue. The patent rights were vested in a Norwegian consortium headed by the Knutsen family, and plans were made for their future development.

Negotiations in 1927 with the Powers company were unfruitful, but European sales and manufacturing were continued by independent Belgian and Swiss companies. In 1930 a company called Bull AG was founded in Switzerland to promote international sales.

In 1931 Knutsen brought together Belgian, Swiss and French investors and created the HW Egli Bull company in Paris, where the business and financial climate was considered to be most favourable. The new company had manufacturing in Oslo and Zurich in addition to Paris, and customers in Norway, Denmark, Finland and Switzerland. Bull was perhaps the first (and arguably the only) pan-European information technology company.

It was a stock issue in 1932 which brought investment from the old French paper-making company Aussedat. Active participation in Bull of the members of the Aussedat family continues to the present day.

Further details of the fascinating early history of the Bull company can be found on the Web site of the Federation des Equipes Bull at *febcm.club.fr/english/groupe__bull_chronology.html*. The FEB is an association of ex-Bull employees very active in the preservation of the rich and interesting history of the company. A Web page on the life of FR Bull at *www.iu.hio.no/%7Eulfu/historie/bull/index/html* is unfortunately only available in Norwegian (we would be interested in hearing from anyone who could provide a translation of the text).

Sincerely yours,

Philippe Denoyelle,
Vice President Aconit
Grenoble, France
and
Hans B Pufal
Grenoble, France

by email from *hans@pufal.net*

27 August 2005

Dear Editor,

Lily Hill House in Bracknell was the location of significant early computer system and software development. Specifically the Perseus (a big valve machine), and then the Orion 2 and Atlas 2 systems, were developed and built there. The southern part of the Ferranti Computer department was based there from the late 50s – and in the late 60s it was the home of the ICT Programming Languages Division.

The 67 acres of surrounding park and woodland are being restored (with £2m of Lottery Heritage funding). Phase 1 is complete and has restored pathways and views of magnificent specimen trees, which were part of an original arboretum dating from around 1850. The park is worth a visit to walk around – and it is free. There is a new car park accessed from Lily Hill Road.

Yours sincerely,

Alan Thomson

by email from *alan.thomson@iclway.co.uk*

2 September 2005

Forthcoming Events

Every Tuesday at 1200 and 1400 Demonstrations of the replica Small-Scale Experimental Machine at Manchester Museum of Science and Industry.

Weekday afternoons and every weekend Guided tours and exhibitions at Bletchley Park, price £10.00, or £8.00 for children and concessions (prices are raised on some weekends when there are additional attractions). Exhibition of wartime code-breaking equipment and procedures, including the replica Colossus, plus 60 minute tours of the wartime buildings.

6 October 2005 London seminar on VDU Development. Speaker: Ian McArthur.

3 November 2005 London seminar on History of Artificial Intelligence (joint session with BCS Specialist Group). Speaker: Professor Max Bramer.

8 December 2005 London seminar on the French Computer History Scene. Speakers: Hans Pufal and Philippe Denoyelle.

Details are subject to change. Members wishing to attend any meeting are advised to check in the Diary section of the BCS Web site, or in the Events Diary columns of *Computing* and *Computer Weekly*, where accurate final details will be published nearer the time. London meetings take place in the Director's Suite of the Science Museum, starting at 1430. North West Group meetings take place in the Conference room at the Manchester Museum of Science and Industry, starting usually at 1730; tea is served from 1700 (please note that the NWG's October meeting starts an hour later than usual).

Queries about London meetings should be addressed to David Anderson, and about Manchester meetings to William Gunn on 01663 764997 or at *william.gunn@ntlworld.com*.

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Readers who have general queries to put to the Society should address them to the Secretary: contact details are given on the page opposite.

Members who move house should notify Kevin Murrell of their new address to ensure that they continue to receive copies of *Resurrection*. Those who are also members of the BCS should note that the CCS membership list is different from the BCS list and so needs to be maintained separately.

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