

OTHER MEMOIRS, REMINISCENCES AND COMMENTS

Anonymous reminiscence

The visitor also told me that he and a nearby lady neighbour had also worked at the Vickers site in the early 1950's at a time when large numbers of the employees were contracted to undertake work on soldering electrical connectors and making wiring and cable looms to be used in the pioneering LEO computer developed by J. Lyons and company. Having originally been conceived to help with catering and bakery production for J. Lyons, in later years variants of the LEO design were also contracted to the Ministry of Defence to assist with missile and war head trajectories.

Anonymous note retrieved by John Daines

ICL set up the Scottish Development Centre at Dalkeith House in late 1970 and transferred all the System 4 software support from Kidsgrove. That would have included the System 4 Cleo compiler that, I suspect, compiled directly into native code; not via intercode. The aim was to free up resources at Kidsgrove so that the people could work on New Range and to provide a centre for software in Scotland that could attract Scots back home to work on software. DME / Leo was developed at Dalkeith.

LEO and its early attempt to use Magnetic Tape

The LEO design team attempted to use Magnetic Tape in its early design and worked with Standard Telephone and Cables to provide the required capability. Ernest Lenaerts reports in his diaries on the failure of the venture.

Below is the Standard Telephone and Cables own account of their collaboration with J. Lyons, the failure of the magnetic tape facility to meet LEO's reliability standards, and STC's own venture into building computers resulting in the launch of the STANTEC ZEBRA, an early stored program computer, which for a limited time was successfully exported. See: <http://www.stlqcc.org.uk/a-brief-history-of-stl/>

The Early Years

Shortly after the end of the second world war STC had decided to re-establish research facilities. Until the middle of 1931 a laboratory which could be considered the forerunner of STL had been established within ITT operating in premises formerly occupied by the Royal Air Force on Hendon Aerodrome. This laboratory suffered the fate of many similar institutions following the depression.

The new facilities were to be established in an existing plastics and cable factory in Progress Way, Enfield as a temporary measure. The company was to be known as Standard Telecommunication Laboratories and the date of formation was 1st. December 1945.

Further on there is reference to the Leo collaboration:

Fortunately about this time STC became involved with J. Lyons in the development of LEO, (Lyons Electronic Office), a computer system for payrolls, bread delivery forecasts and similar work to release office staff for other operations. STC approached STL to design the

preparation of data in a form suitable for computer operation, the input (decimal to binary conversion), the output (binary to decimal conversion) and the ultimate paper results. System design was by D.A.Weir and J.Rice backed up by E.P.G.Wright. Design of circuits, a high speed magnetic tape machine and the necessary equipment practice was dealt with by D.S.Ridler and his team. The equipment was installed for trials in Cadby Hall but, although the design proved entirely suitable, it was finally removed because the high speed gas filled counting device that was extensively used in the circuitry lacked the extremely high reliability required. The gas tube was the STL decatron.

Because of this computer experience the Transmission Division asked us to produce a system to reduce the work involved in filter design. A team consisting of J.Rice, P.W.S.Harrild and D.G.Hunter designed a computer called STEP 1 based on magnetic drum storage and the laboratory again developed the circuits and equipment. This was one of the first electronic stored programme computers to go into active service. Subsequently STC were approached by the Dutch PTT Research Laboratories (NSEM) for assistance in developing a new computer and asked STL to provide the expertise. In consequence J.Rice worked in conjunction with the PTT, who had the basic idea, to design the practical concept, later to be produced at Newport by STC, known as ZEBRA. STL also developed the required circuitry together with the magnetic drum storage system. For some years ZEBRA was the UK's largest export – over twenty systems.

John Aeberhard: Reminiscences around LEO

I was late on the scene as far as LEO was concerned. I joined EELM as press officer in August 1966. My joining just happened to coincide with the publication of the very first issue of Computer Weekly and my first engagement was lunch with Jim Bonnett, the paper's editor. A good start to a career in new computer industry PR.

I got the job after a series of interviews, but principally because I managed, in the last of them, to hit it off with David Caminer, having won a national award from the British Association of Industrial Editors for a newspaper with an 80,000 circulation that I'd edited for my first employer after a history degree at university, Michelin Tyre Company. After four years with Michelin I reckoned I knew pretty much all there was to know about tyres and there were these things called computers that were coming to the fore and were clearly offering a much wider horizon.

As a non-technologist who could string words together quite readily my role lay largely in explaining technology to a lay audience. The lowest common denominator applied: if I understood something, others would too!

So there I was in the EELM offices in Stag Place, Victoria, charged with publicising the new data processing machines that were rapidly spreading across industry and commerce, reporting to a PR manager, but also working directly with Caminer, an experience that was stimulating and unpredictable at the same time.

Caminer was a manager who commanded respect by being on top of his subject and passionately so. He inspired loyalty, but also left some enemies in his wake. That didn't always fit comfortably in the corporate world that was opening up beyond LEO.

I was a fan, albeit he was the only manager I worked for who came close to physically assaulting me by grabbing my pullover during a heated discussion about what should go into Computerview, the new newspaper I produced for the company as an external PR vehicle.

I didn't realise it at the time, but the LEO influence and, to some extent, its ethos was gradually giving way to the more corporate approach of English Electric. System 4, based on the IBM-compatible RCA Spectra designs, had been introduced to the market and was the focus of all marketing activity.

I would still be writing stories about the Post Office and its LEO 326 computers with the occasional KDF9 press release thrown in there, but System 4, rightly so, was taking all the attention.

At the same time English Electric brought in new management in the shape of Ken Barge whose impeccable credentials as a high-flying IBM salesman didn't, shall we say, naturally fit with Caminer's more direct hands-on management style.

A move of office from Victoria to a brand new building strung along a large part of the Euston Road – "Barge's Folly" as it later came to be known - signalled the shift in culture.

Not long after the move and the change of name to English Electric Computers came the shock of another merger. This time it was the big one – the consolidation of the two remaining representatives of the British computer industry, English Electric Computers and International Computers & Tabulators, into a single company, International Computers Limited, ICL.

The white heat of technology that had so impressed Harold Wilson had led to his Labour government, in the person of Tony Wedgwood Benn, brokering the marriage. Like most mergers, it was not a marriage of equals. At one point it had looked as though English Electric would emerge as the dominant partner. In the event, it was ICT that dominated.

From an English Electric viewpoint, the merger came at the wrong point in the product development cycle. The costs and the delays involved in the launch of System 4 and its acceptance by the market placed English Electric in the weaker position. In the event, the plum jobs in the new merged company went for the most part to the former ICT managers from Arthur Humphreys, managing director, downwards.

The two sides in the merger had pursued quite different strategies from a technology viewpoint, with English Electric opting for compatible alignment with IBM and ICT preferring a non-compatible IBM strategy.

This leads to one of those fascinating what-ifs of history. Who's to say what would have happened to the British computer industry had it been English Electric rather than ICT driving the technology forward.

From a personal standpoint, the merger was a bad one for me. I was suddenly not, as I had been with English Electric Computers, the company press officer and spokesman, which would have taken me to the Putney HQ. Instead, I was buried away in a basement office of Whiteley's department store in Queensway in charge of PR for the ICL subsidiary companies, namely the service bureau company, ICSL, and a new company to be formed out of the supplies operations of the merged parties. ICSL management accepted me under sufferance as they had their own man lined up for the PR role. And the supplies company didn't inspire me much as a must-do glamorous opportunity.

In actual fact, the supplies company turned out to be a good learning curve. The brief I got from Ralph Woolf, the managing director, impressed me at the time and still does. It was simplicity itself. "You do what you want to do," he said. "If it works out, fine. If it doesn't, I'll still be behind you, but you'll be out of a job."

So it was me who named the company Dataset, who developed its corporate identity and who launched it on the market. What happened to it, I never really knew as not long afterwards I was summoned to meet with Cedric Dickens, ICL's

communications director. A vacancy had occurred in ICLs Putney HQ and I was being offered the job of ICL corporate press officer. A weight had been lifted off my shoulders and my career was back on the track. I relished the opportunity and set to with gusto, though I have to say my ideas of PR did not always mesh with those of my corporate managers.

Cedric Dickens, a direct descendant of Charles, was one of the old school. There was a drinks cabinet in his rather spacious office, and though to my fairly certain knowledge he never indulged in working hours, his acclaimed mantra was, "A glass of champagne on the hour, every hour!"

My time as corporate press officer in Putney was busy and demanding. Computers generally and ICL, in particular, as the flagship for British technology, were always in the public eye and there was much to promote. From a PR viewpoint the job was comparatively straightforward. Interest from the media, if not exactly a given, was easy to stimulate and story lines abounded.

At the same time, however, some of the frustration I'd experienced in Whiteley's department store basement lingered and it was not long before, in late 1969, I got, and accepted, another job offer, this one to join Honeywell's computer operations as press officer for Northern Europe. I did feel some guilt at joining the enemy after waving the flag for the British computer industry for over three years. But I was career-minded, relatively young and the money. I stayed with Honeywell for 11 years, the last three of them running PR and advertising for Honeywell Information Systems Inc, the computer half of the Honeywell Corporation.

When I left Honeywell finally towards the end of 1980, it was to return to the UK to start up my own PR company which I subsequently built into a market-leading high tech PR specialist, A Plus Group, eventually selling the company to New-York stock exchange-listed marketing powerhouse, Omnicom, and a management group. At the time, A Plus had some 65 employees and a turnover approaching £5m.

I promptly retired at the relatively young age of 59, but, kept my interest in computers going as a voluntary trustee/director of a charity applying computer technology and its life-enhancing possibilities to the problems faced on a daily basis by people with disabilities. I changed the name of the charity to AbilityNet and helped it build from one centre in Warwick to an organisation of a dozen specialist centres operating nationally.

By this time the millennium was approaching and my career in PR turned full circle as I renewed contact with LEO through David Caminer and other former management from the old days who had joined forces, at Caminer's instigation, to establish a LEO Foundation.

Caminer had this strong wish to see LEO's pioneering role in business computing recognised by history. There was a danger, he thought, that others would usurp LEO's position as the world's first business computer and he determined to do everything in his power to see that this didn't happen.

Personal motives played a part in this. He, after all, had played the leading role in the development of LEO software. But it was broader than this. He was out to beat the Americans again and set the record books straight.

First off there was a book – the first of several - co-authored by Caminer, Frank Land, John Aris and Peter Hermon. Next up was a broader PR campaign.

It was at this stage that I was persuaded to join the Foundation at its regular meetings at Caminer's home close by Richmond Park in East Sheen. Caminer and his management team had decided that a key part of the PR programme was to be a major business computing conference centred around the 50th anniversary of the first

operational job to run on LEO, a bakeries' valuation job for Lyons in November 1951.

The Guildhall in London was to be the prestigious venue, the support of the Lord Mayor's office was secured and the dates were fixed as the 5th and 6th of November 2001.

It was to be my job to develop the PR materials for the conference and to get as much media visibility as possible leading into and through the conference. Others would work on getting a top line-up of big-name speakers for the conference programme. My first thought was to develop a theme for the conference, couched as widely as possible, and a special logo to promote it. Thus we arrived at "50 years of Business Computing" for use on all promotional materials.

These materials had then to be produced, including a press pack focusing on the LEO story. The programme itself, however, was not to dwell on the past, but rather to be forward looking. To underline this, a £5000 prize, sponsored by the National Computing Centre, was to be awarded for a paper speculating on where computing was headed over the next 50 years.

Beyond this I used my contacts to enlist the Wall Street Journal as a major sponsor of the conference – quite a coup to get America's major business daily to support the claim of a relatively unknown British company to have developed the world's first business computer! I took the paper's senior technology editor to East Sheen to meet with Caminer, resulting in a major feature on the LEO story, and the paper also ran a series of free ads promoting the conference.

I also recruited my former PR company, on a pro bono basis, to assist with the mechanics of information distribution and the lobbying of journalists.

In the event – and at a time when the conference business in general was in the doldrums - the conference attracted an audience of some 240 people and a great deal of media coverage.

There were many other initiatives undertaken by the LEO Foundation over the next decade to promote the LEO story – too many to cover in this summary paper – and my involvement continued.

One, in particular, however, does rate a mention, namely a 60th anniversary media event hosted by the Science Museum in November 2011. A small tweak to the 50th anniversary logo meant we could use it again. And the same applied to the press materials.

The press duly turned up to hear essentially the same story and to give it further widespread visibility. The Science Museum, moreover, was in the process of a major overhaul of its computer and communications gallery, resulting ultimately in LEO being featured in its new displays.

The 60th anniversary Science Museum event was notable for one other reason. It was co-sponsored by Google, another PR coup matching the earlier Wall Street Journal sponsorship.

Here again we had a market-leading US organisation – in fact, their foremost technology company – paying court to the LEO story.

The Google contribution was substantial, involving their whole London-based external communications team, and including the production of a very professional promotional film. Later on this led to a public lecture extolling LEO at the London School of Economics by Eric Schmidt, Google's worldwide boss no less

In many ways it was PR job done!


And shortly after this event, the LEO Foundation, was dissolved as a separate charity, and its remaining assets and its PR baton passed to its sister organisation, the LEO Computers Society, a membership group of former LEO employees.


I'm still involved, but now mainly in an advisory role. Occasionally, I get hands-on again, but sadly of late this has mostly involved contacts with obituary editors!

The LEO story, much like the Windmill theatre in London during the war years, never closes!!

A more extended version is archived in Dropbox at:

<https://www.dropbox.com/s/g7jaevjpfm34lg0/John%20Aeberhard%20reminiscences.docx?dl=0>

 **Peter Baker**, Operator, then Programmer Tote Investments. From 1962 to 1964 I worked as a Saturday job in the Lyons Tea Shop in Dalston. On getting my A Levels I joined Tote Investors Limited in New Bridge Street near Ludgate Circus London. I was interviewed by Alan Williams and was offered and accepted the job as one of the first 4 operators of their soon to be LEO III computer. After 8 months operating I took an aptitude test and became a programmer. I left to join Matthew Hall & Co Ltd on 21st November 1966 to work as a programmer on an ICL 1901. I stayed with them through various mergers and take-overs until my retirement in 2006 at which time I was an Information Manager working on large offshore OIL and Gas projects for Clients like Shell, BP, Elf, Total, Marathon Oil etc I have some memories of working at the Tote and some photographs of the machine and one of my fellow operators a Mr Andrews.

 **Brian Beagley** Brian Beagley doing a vacation job as a Schoolboy in the mid 1950's was offered an engineering job, mentored by John Pinkerton at the LEO manufacturing sites and contributed to the work being carried out. He carries a lifetime memory of those days. He went on to have a very full life in academia and research in Physics, Chemistry and Community Service



— Brian also tells his story in the first edition of LEO Remembered, page 36, which will be repeated in the second, coming, edition.

— **Claire Brent-Meek** Applied for a job as programmer in Johannesburg in 1965. She passed the QUIS aptitude test but decided to complete her education and declined a job offer. The letter below from the South African LEO company is of interest:



ENGLISH ELECTRIC-LEO COMPUTER SERVICES (PTY.) LIMITED

(Incorporated in the Republic of South Africa)

36 Anderson Street, Johannesburg Telephone 838-3581 Telegraphic Address "Leotronic"

Please reply to P.O. Box 4164, Johannesburg

12th October, 1965.

Miss C. Brent-Meek,
P.O. Box 7,
WARMBATHS.


Dear Miss Brent-Meek,

We thank you for attendancy at an interview on the
7th October, 1965.

The results of your primary "QUIZ" aptitude tests have shown that you possess the necessary qualities to become a good programmer. Although the tests are designed to assess applicants with commercial experience or academic qualification behind them, you scored a satisfactory rating. We would thus suggest you consider programming as a career, and request that you contact us when you have completed your matriculation examination with a view to giving you more exhaustive tests. Should we find after these tests you are suitable we will be pleased to discuss a possible position for you in the programming division of our company.

We wish you every success in your examination.

Yours sincerely,


p.p. R.L. KAYE
ACTING HEAD OF PROGRAMMING.

/SMV



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We wish you every success in your examination.

Yours sincerely,


p.p. R.L. KAYE
ACTING HEAD OF PROGRAMMING.

/SMV

DIRECTORS: C. DE G. WATERMEYER, (CHAIRMAN & MANAGING DIRECTOR), E. BURNHAM, T. REEKIE, T. R. THOMPSON, (BRITISH), A. J. WOOD, ALTERNATES: A. ROSEWELL, H. S. L. N. MAISEL & I. B. MELLOR S. C. NEWMAN D. C. BIRCH

Maurice Bonney:

DOB: 1932

Abstract: Maurice Bonney was a mathematician who had early experience of working with LEO as head of a group of programmers involved with aerodynamic

calculations for missile technology working in the British aircraft industry, and using LEO as a bureau facility. Later in his career he worked for Renold Chains on their LEO III as chief programmer. He subsequently joined academia in Operations Management finishing his academic career as Professor of Operations Management. He spent much of his academic career working on Computer Aided Design producing significant innovative research.

He has written a substantial memoir about his career including his LEO experiences. The memoir, still undergoing revisions, is stored in the LEO Dropbox archive,

https://www.dropbox.com/search/personal?path=%2F&preview=Maurice+Bonney+memoir.doc&qsid=53814489983096573199242543471538&query=maurice+bonney&search_token=maaZCi5EZfs9ghMHde3MaOmE5gIkeIs7mVIUbNhfSkQ%3D

Graham Briscoe LEO III , IBM 360 and Phoenix Insurance. - Recollections

My first computer experience was with Tube Investments in the Midlands working in the early 1960s on an IBM 1401 for their Steel Tube Division, then supporting as a Company Systems Analyst a conversion onto an IBM 360 system - initially a /20 then a /40.

In mid 1970s I moved to Phoenix Assurance who had had a LEO III working out of Norbury - and when the company moved its HQ to Bristol in 1974 I joined them and supported a conversion to an IBM 370 series.....it was reported at the time that this installation had the only ever paper tape input (ex LEO) into an IBM 370 series machine. (Editor: Mike Tyzack notes that Centrefiles 360/50 also had paper tape input). The LEO machine was number LEO III/33 - and the installation is currently with the National Computer Museum in Scotland - but without any of the connecting cables - all the various "boxes" are present. Between closing Norbury and the IBM 370 kicking in Bristol - Phoenix used the NDPS LEO machines in their Centre in north Bristol - but that is another story.....

In 1973 Phoenix Assurance (Bristol) (now integrated and " lost " in Royal Sun Alliance = RSA) was converting from a LEO III to an IBM 370 series - (at the time the only IBM 370 series which had paper tape input - ie ex LEO) and as part of the conversion from LEO (and a Data Processing Department relocation from Norbury to Bristol) - Phoenix were using the National Data Processing Service (NPDS) LEOs (ex Post Office) in Bristol for parallel running. When NPDS went on strike (OK the first time as they continued running external work) for the second time and NPDS " blacked " external work - we " raided " at night their data tape store to " rescue " our main data tape files - which were then taken to eastern Europe (probably Czech Republic) and Australia (??) to run our insurance renewals on an existing LEO III. Following which the conversion to the IBM 370 was a bit rapid for the renewal print suite.....!!! (Who remembers John K Norman (JKN) and Dick Cooling who organised the furniture removal van for our tape collection ?)

The Phoenix LEO III/33 to IBM 360 systems conversion took place in 1973 and this computer files conversion work was above my pay grade then...I was supporting Phoenix Corporate Services Department design the process and procedures (as an Organisation & Methods Analyst) for the relocation of their Administrative Head Office in King William Street across from the Bank of England (the original Phoenix Clock and a giant stone phoenix is still above the entrance hall / door of a Japanese bank (Daiwa ?) to Bristol.

During my own research on an Institute of Administrative Management 1960s computer training package I came across Peter Bird - who was, at that time,

researching his own Lyons history book. I met him in Reading and we swopped a few stories - particularly the Phoenix Assurance conversion from a tape input LEO III to an IBM 360 (I understand that the Phoenix 360 was the only 360 with paper tape input !), and the impact of the Bristol National Data Processing Service (NDPS) of the GPO to whom Phoenix had outsourced one of its two LEO machines work load during the conversion and whose staff then went on strike, and on the second strike staff blacked all external work as well. Phoenix Data Processing management hired a furniture van - and with the help of a set of keys supplied by NDPS management - stole back our complete set of master tapes. Some were then sent to an eastern Europe organisation (?) with a LEO to print off our monthly renewals - otherwise Phoenix could have lost the insurance renewal business !! I also recall talk of sending some tapes to Australia (?). Finally - some parts of the last planned six months of the LEO tape conversion project were squashed into two weeks - in order to get the Phoenix General and Life / Pensions renewal production and printing facility up and running in Bristol.

<https://www.dropbox.com/s/qrijnwhk39hglt/Graham%20Briscoe%20memoir.doc?dl=0>

See also obituary of John Denys Neale above.

- **Tom Brooks** Joined LEO as a programmer in 1963 as his first job after graduating. After learning Intercode and later CLEO became working with Renold Chains and subsequently on a number of Post Office applications. After his days working with LEO became involved with the Marconi Myriad. He reports on the first experimental use of braille on Leo III at the Post Office led to more frequent use of Braille and how one of the programmers involved, Norman Verrill, in 1969, set up the "British Computer Association of the Blind". They are the oldest computer association for blind and partially sighted people in the world. By the time that the British Computer Association of the Blind was set up, the first System 4 machines could also support braille. I have asked a friend for some details of the use of braille on those System 4s around the year 1970 to illustrate the continuity of development. John Paschoud adds: "I don't know if I can add much to the Blind Programmers story. I never actually met any (of the blind programmers), and I think it must actually have been when I was Ops SDPO at Barbican NDPS Computer Centre (which was trials and EE System4, rather than production and LEO326, with most of the programmer teams based at Docos House a short distance away). But they were very similar to the barrel line-printers on the 326s at Charles House, Kensington CC. The process involved fitting a rubber sheet about 0.5mm thick between the hammer array and paper, and removing the ink ribbon, so that printing dots in Braille code would leave raised dots on the paper. Then adjusting the hammer force carefully so they didn't actually puncture the paper.

- I used the same technique a few years later, on a much later timesharing mainframe (a DECSys-10) because a completely blind little boy joined the Cub Scout pack where my wife was a leader. So we found software to translate the text of some of the Cub Scout Handbook into Braille, and I made a Braille-print kit for our lineprinter and 'borrowed' it for a few evenings."

- His more extensive reminiscences are archived in LEO Computers Dropbox account at:

<https://www.dropbox.com/preview/LEO%20Oral%20History%20project/LEO%20Me>

[moirs%2C%20Reminiscences%20and%20Anecdotes/Tom%20Brooks%20memoir.docx?role=personal](https://www.dropbox.com/s/tnk5tm8uhxpg2p2/LEO%20Reminiscences%20and%20Anecdotes/Tom%20Brooks%20memoir.docx?role=personal) or can be obtained from Frank Land at f.land@lse.ac.uk

ter Byford: LEO entered a team for the Lyons Pennant sports day competition open to all Lyons groups. They won the competition in 1962 and again in 1964. A group photograph showing Peter Byford holding the Pennant is shown on page 98 of the first edition of LEO Remembered. A photograph of the 1964 Pennant is attached.

LEO Reunion 19th October 1984 – The Rugby Club, Hallam St., London

120 people, all ex-staff of Joe Lyons own computer company, met to renew old acquaintances and to celebrate old memories of the World's first commercial computer LEO I and its descendants LEO II and LEO III.

All five of the surviving LEO directors had been contacted. John Simmons, the man who proposed the original venture, is now in his eighties and was unable to attend, however he sent his best wishes.

Anthony Salmon and Tony Barnes also sent their good wishes but could not attend. Other apologies were received from as far afield as Canada, Germany and Hong Kong.

John Pinkerton and David Caminer were the two directors who did attend. They worked for ICL up until their respective retirements. It was interesting to find that one third of those present were current employees of LEO's successor, ICL. Amongst ICL "personalities" was Ninian Eadie who has survived the STC takeover as a director (*note: STC took over ICL in 1984 but this only lasted a few years until Fujitsu bought the company*).

The committee had gathered some memorabilia which was on show. Also showing was a short LEO promotional film borrowed from the ICL archives.

The BBC "chip shop" got wind of the event and were there to interview some of the old-stagers. The resulting programme was broadcast on Saturday, 27th October 1984. A copy of the programme will be provided for the LEO Reunion archives.

Dr. Pinkerton had been the electronics engineer recruited to build LEO I in 1949 and became Technical Director of LEO Computers Ltd. when it was formed in 1954. He retired from ICL earlier this year.

A presentation to mark his 35 years in the "Computer Industry" was made by the organising committee. This consisted of an engraved pen and a specially designed card signed by all present.

Bottles of wine (Chateau LEOville, Jean LEO Cabernet Sauvignon and Minervois (Minerva Road was the LEO factory) were given as prizes to:

Furthest traveller to the Reunion – Roger Thorpe (Newcastle)	
Earliest starter at Lyons or LEO – Ernest Lenaerts (1947)	
Longest server with LEO etc. – Fred Barnett (1954 – present time)	
Lucky number tickets – Jim Hamilton and Ralph Land	

Photos of the event were taken by ICL news, copies of these were available from the treasurer at the time.

To keep in touch for the next Reunion (April 1987) please write to the secretary. There are 275 names on the current mailing list.

<https://www.dropbox.com/s/tnk5tm8uhxpg2p2/LEO%20Reunion%2019th%20October%201984.docx?dl=0>

— **Tony Carrol** Operator at Wills Tobacco. My involvement with LEO started when I was a schoolboy. I had taken my "O" levels and was going into the 6th form but I wanted to mix Classics and Science and was told in no uncertain terms that this was not possible. I could not just do Science as the only chemistry exam I passed was by ignoring the H₂O s etc and just concentrated on the maths. I thought this was NOT chemistry. So I ended up doing Classics which did not suit me. Through a friend of my mother's I went for a job as a statistician but did not get it (thank goodness) and then I heard that there were vacancies for trainee computer operators in W. D. & H. O. Wills. This sounded interesting and I was fortunate to be taken on and started in September 1959 (on £265 per annum). I rapidly progressed up to Shift Leader and stayed doing that role until 1969/70 the boss of the department (Bob Brett, with whom I am still in touch today) wanted to move me to Systems and Programming. And so I moved, thoroughly enjoying that time, and stayed in IT until I retired for the second time in 2003(?).

One interesting occurrence happened on 10th July 1968, but cannot be part of my talk on LEO, was that our computer (a KDF9 by this time) was flooded to a depth of about two feet. As luck would have it, the workload on another KDF9 had just been transferred onto an IBM 360 (?) and this empty KDF9 was only about 7 or 8 miles from our site. We used it for one month, burning out the motor on a brand new printer in that month, and then returned to "our" KDF9 which had been successfully returned to life with, I believe, only two new boards. I also remember that we only lost a few mag tapes.

— **Linda M Chapman (nee Robertson)** I “I worked in Hartree House as a junior programmer between 1963 and 1965. I have memories of the excellent training and supervision which far exceeded anything else which I came across in my 30 years as a programmer.

— **Helen Clews (nee Garsed)** I joined Leo Computers on 24th September 1962, starting with the five-week basic course at Hartree House. From October 1962 to early 1963 I was in the mathematical programming section at Minerva Road, Acton. In early 1963 I was transferred to the Training and Technical Writing section at Hartree House where I worked on writing manuals and organising and lecturing on training courses – mainly on Intercode and CLEO; but later we developed a senior programming course covering software such as The Master Programme and Compilers. The regular courses were at Hartree, but a few were on customers' premises. I particularly remember giving a course at the GPO offices in the Barbican at the time when the Barbican Centre and flats were being built. I moved to Radley House in South Ealing when the Training Department was re-located there. I can't remember the date but guess it was in 1964. Whilst there I continued to organise and lecture on courses in a much-expanded department.

In June 1965 I married Richard Clews, a senior programmer and systems analyst with LEO, and we went on his three-year contract to Australian Computers in Melbourne, where a branch of English-Electric-LEO-Marconi was being established. I trained the staff of Australian Computers on programming the new System 4 machine, and was sent to New Zealand with two others from the Sydney office to give a ten-day course for the NZ Post Office, who had just bought a machine (I can't remember exactly, but I think they bought two LEO 111s) (Editor: Sale did not succeed). Soon afterwards, EELM merged with ICT to become ICL. I left the company in October 1966 to teach Maths. in a local secondary school for the remaining two years of our stay in Australia.

We returned to the UK in January 1969. Richard worked for ICL for most of the rest of his working life. I taught at a grammar school in Chesham, Bucks., mainly concentrating on Maths., but for a short time I taught AS level computer studies, which included a component on the history of computing. I was teaching LEO as history! My transfer back to Hartree House was the start of my happy time with LEO. It was a wonderful place to work and I very much enjoyed organising courses and doing technical writing. With so many recent graduates being recruited, it was like university, but with money. I started buying books and records from Whiteleys, we had picnics in Kensington Gardens and in the summer after work we could walk across the gardens to queue for tickets to the Proms several times a week. Magic!
<https://www.dropbox.com/s/rz9or0qq7xh3mgv/Helen%20Clews%20nee%20Garsed%20Recollections.docx?dl=0>

— **Alistair Cochrane** – LEO II I was an operator for several years on the Leo machine at Stewarts and Lloyds in Corby. Attached is a piece I wrote some years ago for the local heritage centre regarding the running of the weekly payroll for the steel works and tube works on the Corby site. See Dropbox
<https://www.dropbox.com/s/31snysnmb3qg08k/Alistair%20Cochrane%20Memoir.docx?dl=0>

- **Doug Comish**: Sporting Reminiscence
- Information about Lyons Sports Day activities: I did take part in one of them but having got changed into football kit the opposition failed to turn up!
- However I can recall one interesting cricket match we played at Sudbury.
- The Programming section challenged the rest of LEO and I was appointed Captain of the side. We batted first and I managed to contribute a few runs. When our opponents batted, they gradually approached our total and lost wickets on the way. They had one guy who could hit the ball very hard to deep midwicket and the situation was reached that their last pair were together and they needed about ten to win. I considered myself a safe pair of hands and so I moved myself to deep midwicket in case their batsman offered an opportunity for a catch.
- They ultimately got to within two runs of our total and their batsman went for his favourite shot and connected. I saw the ball all the way into
- my hands and to my dismay right out of them!!
- But it was a good match
- **Mike Cowlard**, Reminiscences of a LEO Operator
 Left School with two O levels (Maths and English. Joined GPO as Clerical Officer. Always good with figures quickly promoted. Advised that he might get faster promotion outside GPO noted adverts for computer jobs. Tried Heinz and Lyons doing well in aptitude tests. Offered job by Peter Bird, then operations manager of the Lyons LEO operation. Joined Lyons as Operator in May 1968. His 50 years in computing comprised Operator/Shift Leader/Shift Supervisor - Leo II/III, managing the crazy Autolector. Migrated to IBM - Operator/Shift Leader/Shift

Supervisor/Programmer/System Analyst. For full text of Mike's reminiscence see <https://www.dropbox.com/s/9qub4z79qs3l6wz/Mike%20Cowlard%2C%20Reminiscences%20of%20a%20LEO%20Operator.docx?dl=0>

- **Dick Cromwell** Leo memories – I went to LEO II at Elms House Hammersmith in February 1959. I left in April 1963 to start LEO III training. I started as an Assistant Engineer, then Shift Engineer and finally in July 1962 became Chief Engineer at the site. I moved on to LEO III/16 and took it to Kayser Bondor at Baldock Hertfordsire. Dick's full account can be found at <https://www.dropbox.com/s/fd5p9o24j8zh0rt/Dick%20Cromwell%27S%20LEO%20MEMORIES.docx?dl=0>
<https://www.dropbox.com/s/0s4nweb17m4zqwm/Anthony%20Robin%20Davies%20memoir.doc?dl=0>

- **John Daines:** Reminiscence

The Glyn Mills payroll paid people by Credit Transfer rather than by cheque**. It was at the start of each bank branch having a sort code as well as folk having account numbers. We produced a payslip and a credit transfer (Credit Advices on the pic). There was a tape that contained "the Bank File" and that started to be used for more payrolls – "the standard payroll" that became an early package, requiring only "minor" tailoring for each customer.

They paid military officers (all army, half RAF or half army, all RAF I think and the input data was referred to as "casualties", a term used in the pic. I seem to remember that the casualties were punched and verified twice and two tapes were input for comparison (Bob Stevenson may be able to confirm).

Glynn Mills had their offices at Osterley Park (wartime evacuation) and I remember that on one weekend I had to deliver the results to Osterley. It was when the Hammersmith flyover was being built so it involved a lot of in-and-out under the works on the A4.

I did some googling and discovered that they were also adopters of another technology used in an innovative way. <https://worldradiohistory.com/hd2/IDX-Site-Early-Radio/Archive-Wireless-World-IDX/50s/Wireless-World-1952-09-OCR-Page-0047.pdf>

Editors Note: Also see John Lewis, Chapter 19, 229-242 in Caminer et al, LEO: The incredible Story of the World's First Business Computer.

** we used to print cheques for Bermondsey Borough Council and each one of the supplied bank cheques printed on continuous stationery had to be accounted for.

- **Ray Dawson**, I started with LEO in Hartree House in 1961, working on the LEO II, with its thousands of valves, Decca Magnetic tape decks, and Powers Samastronic printers. If I remember correctly the store size was 64 tubes (mercury delay line cylinders about 2in diameter and 3 ft long) which each held 16 words of information. The later LEO IIs had core store, which was a big step forward at the time, and were much more reliable. In those days you never had to wait for a fault to occur, there always something needed fixing. We worked round the clock shifts, an engineer and mechanic on each shift. The system serviceability was good if it reached 80%. The takeover by English Electric to form EE LEO Marconi came in 1963. In 1964 I remember Mike Milgate buying a new Ford Cortina for £630. I thought that he was a millionaire. At the time I had a bike to get to the station. After retraining on LEO III I

moved to Lancashire in 1965, a strange move for a Yorkshireman! With the exception of racial abuse from Lancastrians and Liverpoolians, it is a very pleasant area of the country in which to live. After working on the LEO III at the Premium Bonds Office at Lytham, I was responsible for the LEO III at BICC Prescott. For a fuller account see:

Ray Dawson, *Reminiscences* published in *Bits and Bytes*, Newsletter for ICL Pensioners. Autumn 2000, pages 3-4, and

<https://www.dropbox.com/s/pvn23zfn0p6ylwf/Ray%20Dawson%20Reminiscences.docx?dl=0>

- JD also remembers the Master Routine: I have listings of the master routine and it was written in Intercode.
-
- Intercode itself was a level above machine code and, although a instruction looked to be an equivalent to a machine code instruction, it was often expanded by the translator into several machine code instructions.
- However, Intercode instructions 100/0/0 to 131/1/3 were one for one equivalents of machine code instructions 0/0/0 to 31/1/3. That meant that the master routine programmers could program at the lowest level and use specialist low level instructions that weren't in the Intercode set e.g. input output, interrupt handling, setting store protection tags .etc
-
- Interestingly, Cleo allowed for routines to be written in Intercode and, by implication from the above, that Intercode might include machine code.
-

- **John Daines** LEO III Programming and Operating Utilities

- An important utility managed program changes with the Version Control utility implemented in the Intercode Translator. A programme had a 5 digit version number that was incremented by 1 each time the program was amended. See Volume III, section 15 at <http://sw.ccs.bcs.org/leo/LeoIC6-17.htm#s15> 15.1, 15.2 and 15.3 last paragraph "New Issue Number" Each line of code was numbered by the Translation when the program was first created and, if it had been amended, the program version number of the amendment was printed next to it. All this was built in. There was a program trials facility built into the Translator see volume III section 16 at <http://sw.ccs.bcs.org/leo/LeoIC6-17.htm#s16>
-

- There were standard sort utilities 07003 (3 tape sort) and 07003 (4 tape sort). They were string sorts where the strings were created on two work tapes from the input tape in the first pass and subsequently merged, utilising the hardware merge instruction, until the final two strings were merged onto the output file.
-

- Printing could either be directly to a line printer, which would restrict its use by other programs, or by sending each print line to a magnetic tape file with a header, that said what type of report it was, together with any paper movement controls. Thus a program could effectively output to any number of "printers". The standard print program utility 06060 would subsequently read the magnetic tape, printing all lines of a report type on each pass. Lines of print were assembled by a table driven hardware instruction that selected data as required, changing formats and inserting £ signs as required. All this was cross checked by the Translator.

-
- There were also utilities to manage program libraries, copy and compare magnetic tape files and print the contents of magnetic tapes and main store. See volume V.
-
- More importantly, there is an extensive piece of work by Ken Kemp, who was in charge of Leo systems and programming at the English Electric-Leo Service Bureau in Bristol in the mid to late 1960's. At <http://sw.ccs.bcs.org/leo/Manuals.htm> , the main index to the manuals, there is a pointer to Recollections of a Leo III user, which is at <http://sw.ccs.bcs.org/leo/KenK.htm>
-
- John Daines November 2021
- I've always assumed that P1, P2 and P3 are constituent programs of the L3 suite – Bakery Valuations.
-
- From reading some of the files, these are very complicated programs and the machine was tiny.
-
- The following shows the amount of time involved.
-

CALCULATION OF SALES STATISTICS FOR CADBY HALL BAKERIES

By means of this job a statement is produced showing the value of sales, gross profit and distribution allowances for the different channels of sale, the standard costs of production, and the stocks and stock balances for the Cadby Hall Bakery goods.

The input tapes give:-

1. The total sales in quantity and value, the gross profit, and the distribution allowances for the different channels of sales as produced on a punched tape by a previous job, together with the standard factory cost rates.
2. The outputs for the bakeries, the despatch stocks, and the daily stock balances, all in kind.

A series of schedules is produced for each bakery and another series for C.H. Bakeries as a whole. Attached are specimens of each of the possible kinds of schedule, which is identifiable by the second code number printed; the first code number indicates the bakery or, if it is 100, that the schedule relates to Cadby Hall Bakeries as a whole.

	Hrs.
The time taken by the calculator in doing this job is	1½
The two preparatory jobs for it take	3
giving a total calculator time of	4½
The time taken in punching and checking the data on the tapes is	8
The time at present taken to do this job by normal clerical methods is	50

-
-
- From looking at Lenaerts Notebook No 8 page 39 written on Monday, Dec 3rd 1951, he refers to the P programme's successful run on Friday afternoon (November 30th) at 2:20. Note that Len then continues with his usual pre-occupation (faults!).
-

3 - 12-51

The P programme was completed without any hitches or holdups at 220 on Friday afternoon.

Everyone was duly impressed and pleased and even Shaw was happy as for the rest of the afternoon he was able to play with his annex.

I have still got a fault to trace on the Storage Junction Unit which will trouble earlier in the week but I must spend a good deal of time with Miss Hills today introducing her to the job in easy stages

-
-
- Note also that on the 28th, page 37, he notes the successful completion of P1, suggesting that perhaps P2 ran on the 29th.
-
- Three days therefore looks a reasonable view.
-

28-11-57

P1 completed today
without any hitches!

Much effort was put into
a investigation of the shortening
of the character generator this
morning and after doing
a few extended tests on last
week's P1 we started this
week's at 4 o'clock finishing
at 5.35. There were about
3 corrections and as all
the results had been calculated
before hand (just in case)
it was possible to say that
all the results were correct

Barbara Dickens. I was a LEO programmer in Intercode on the Leo 326 installed by the Dept of National Savings. I started in 1968 and was trained by the Post Office trainers before working for DNS at Lytham St Annes. I remember the days very well as I did mainly maintenance which meant finding old code to delete to make room for any amendments. After a few years I moved onto ICL System4 machines programming in Usercode and COBOL before joining SMBP and working in COBOL and machine code on Univac 1100 series. I eventually moved onward and upward into management and consultancy

but I still remember my Intercode days and the carol tunes made from holes in the printers format tapes.

• **George Drummond**, GPO (BT) –Reminiscence Born in Fife Scotland in Feb 1947. Attended Kirkcaldy High School, then Strathclyde University. Initially applied to the Post Office and was interviewed in Edinburgh for an Executive Officer post (as they were called in those days). During the interview I was asked if there were any specific areas in which I would like to work, and I said computing. I was then asked to go down to London to sit a computing aptitude test, and from there I was offered a job on the Telephone Billing programming team in Docos House, Aldgate London. I was the last BT in-house instructor to teach Intercode and CLEO programming. When the St Albans training school no longer had instructors in house, it was passed to the TB3 project team to take over that role, as we were the last operational user of those languages. We even had a few non-BT students on the later courses as , by that time, no-one else taught those languages. As a result of BT's decision to offer this externally I had to go through a six-week course at BT's training college to learn how to become an instructor and to become an accredited courses lecturer before BT could 'Sell' this training commercially. I started work originally with the Post Office in 1968 working on the Leo 326 Telephone Billing Suite of programmes known as MFC (Major File Change). These were a suite of programmes used when Telephone Exchange Ranges were being altered to support the STD dialling system. The suite was capable of carrying out complete, or partial, exchange re-numbering. I also worked as a senior programmer on the introduction of Post Codes, Decimalisation programme, and VAT introduction for Telephone Billing. From several years I took charge of the programmers who provided Software Support to all of the operational Leo326 telephone billing systems. When BT then moved to the 2900 systems, I relocated back to Edinburgh (my home town) as a System Software Support manager based in Craiglockhart. I subsequently moved into an IT sales technical and system consultancy role for the final four years of my 39 year career with BT. I retired in 2007 now live on the South Coast in West Sussex.

<https://www.dropbox.com/h?preview=George+Drummond+memoirs.doc>

• **John Edwards** Reminiscence after attending Neville Lyons Lecture I worked only briefly for Lyons doing Time and Motion Study at Cadby Hall. It was in fact an interim job as I resumed my degree work at London University. I was making the most of a grant to study after wartime service as a navigating officer in the Merchant Navy. I got to know most of the departments at Cadby Hall, including T&M on the swiss roll line that you mentioned. I also did some studies at the Coventry Street Corner House. This was to determine the average time spent in the Brasserie ; this was done by simply counting the numbers going in, and those coming out , over a period of time . I remember a somewhat hilarious moment in the ice cream factory when a stainless steel overhead pipe carrying the liquid ingredients became disconnected and poured a fair amount over the foreman.

The overall impression I had of operations at Cadby Hall was great efficiency. The main point of the T&M work was to get control , by knowing the man- hours required to produce the various items. I think that efficiency was the main driving force behind Leo , was it not ? I did not have any direct connection with Leo, I was told that there were some people from Birmingham University working on it. I have always tried to impress on people the remarkable achievement of the first commercial computer being developed by a food company, and by the lead that this should have given the UK in that science. I feel that Lyons should have persisted in being in the computer business and given

government support. I know from personal experience how little support was given to new technology. In 1971 I had a small electronics company, in that year Intel produced the first microprocessor (the 4004) we used this to produce the first desktop computer in the same year. Unfortunately in spite of getting orders from UK and abroad, and being used in commerce, lack of adequate finance killed it off.

<https://www.dropbox.com/s/tjlx15xtiyd8p0d/John%20Edwards%20Reminiscence.docx?dl=0>

- **Stan Evans**, Maintenance Engineer on LEO I and LEO II, joined LEO 1956

Date of Birth: Born 23/09/26

I never realised that my life was about to dramatically change when I went to Joe Lyons at Cadby Hall in 1956. for an interview for a job as maintenance engineer working on their first computer they had ever made. I was an experienced electronic technician but knew nothing about computer digital technology.

I was interviewed by the computer engineering manager Peter Mann. He asked me many questions but sadly I did not do very well with my answers. To my surprise and pleasure he offered me a job. It later emerged that all the other candidates had the same lack of knowledge that I had.

What was unique about this computer was that it was the first computer “worldwide” that was designed to do commercial type work. The other computers in use were basically scientific machines.

Lyons formed a company called LEO Computers so in fact I joined this company not Lyons.

There were two other chaps who joined me the same day. Les Rabitt and Stan Holwell. Now this is where I go for a wobble trying to remember names. However here goes.

The senior engineers already on site. Frank Walker, Jimmy Wheeler, George Manley and a much older chap Chas. These were the chaps who not only had to mend LEO I but had to teach us rookies.

Although there were detailed schematics of every specific unit in the machine there were no written notes on the logic. ie how the computer worked other than the hand written notes of our tutors. I pause a minute to reflect “You cannot get more basic than that.”

Our work shop was a 12 ft by 12 ft room located across the corridor from the Computer Room. In addition to us engineers there were three other people in this room.

To help fixing computer faults every unit type had a spare unit. I think they were called LCU xx If a fault was traced to specific unit and the fault cleared when replaced by the spare then Hey Ho back to the operators and the machine was up again. In the work shop the faulty unit was put into the Test Rack.

This Test Rack had simulated features to be able to test the unit and find the fault. There was a very clever engineer called Gibson. He maintained this test rack and also was involved in the thinking about the next step LEO II. Also in the workshop were two ladies.

One was a very experienced lady who did all the electric wiring in the units (modifications etc) The other lady was a thermionic valve tester. She had a check list of

units that had been operational for a certain time period and checked all the valves and if below the Makers specification replaced them with a new valve.

The huge irony was that a development engineer chap called Lenearts established that new valves were more likely to fail than the comfortable settled in old ones. So this testing of valves did not really do any good. So this procedure was stopped. We were learning all the time.

There were two people we often worked with on the computer. They were David Caminer and Mary Blood. They were in fact the first Business Computer Systems and Programmers in the country and David led a small team of programmers who had written all the LEO I operational jobs since 1952 which was quite impressive.

Programmes were written in machine code format and stored in the main memory. This consisted of a number of special long tubes filled with mercury. They were stored under the false floor together with a number of smaller tubes, registers that contained only one word of 17 binary bits. Note. I am struggling here and hope I have got it right. I would think the main memory had 32 tanks and each tank 32 words.

I seem to recall a D30 digit. Perhaps that was Leo II

Basically a line of machine code had 4 areas. Each area had a specific significant meaning. If the programmer wanted this action to be an ADD he would put a number in binary in the first area because he knew that number told the computer to ADD. The other three areas were locations of the two numbers in the action and where the answer was to go. Clearly this format would not be the same for other instructions.

How about that a programme lecture in one paragraph. The point of this paragraph was to illustrate how basic the programming was. Cobol, Fortran etc was not even a dream in these days.

Mr Caminers team had written several programmes which tested the performance of the machine. When it failed we were given the reason. If it did not fail we used the margins tester. We had over a 1000 wires from the engineers control panel going to the most crucial electronic sections in the machine. These wires sent electronic signals that increased or decreased digital pulse size. Use of variation of threshold often made the performance test programme fail. Using eliminating switches It was a simple matter to find what unit was causing the programme to fail.

In certain difficult faults Mr Caminer was a great help in typing in a simple programme which clearly showed what action was going wrong, the engineers were then able to get moving with the oscilloscopes and find the fault.

I have enclosed a picture of a young engineer all 30 years old Stan Evans himself working at the LEO I engineers control desk. It was here that the engineers and Mr Caminer did our fault diagnostic work. Very often the engineers would do the same for the same reason. A small loop of a failing instruction made oscilloscope work easier.

Interesting to note that the Operators rarely use the engineers panel because at that time operations control was done using Punch Cards. These cards had been successfully used for many years for basic business tasks. They were 3 inches by 7 inches, had numbered columns 1 to 80 with rows numbered 0 to 9. Rectangular holes were punched out in each column.

To start a programme the operator would push a button called BOOT which placed into the computer Order Tank an instruction to read a card into the computer. This card contained the necessary instructions to read the complete pack of cards into the computer. These cards contained sequence of computer instructions ie the programme, and the scheduled commercial programmes was then ready to run. The operators area was dominated by three big heavy card readers, equally heavy printers and a paper tape reader.

The inevitable happened of course the work load had got very heavy so we had to go to three shifts. I hated the night shifts and I think in hindsight we would have preferred One week of nights and two weeks day/evening. However we three new chaps were very rapidly promoted to Shift Leaders because the senior chaps were moved to Minerva Road factory where work on the next generation computer LEO II was moving very rapidly. Oddly enough I cannot remember anything about our junior engineers at that time. Doing nights did have one advantage and it's a story I was very fond of telling. The Lyons management who were very highly regarded and so were provided with an "Out of this world" restaurant. Two lady chefs looked after the restaurant at night. I used to chat these ladies up. Most of us, the engineers and operators enjoyed a very basic level of living so a full roast and three veg was a real treat. I was often offered if it was available a Dover Sole. I have never seen such a big Sole since then. A quarter of an inch fish each side of the bone and the fish overlapping the plate. This is how the rich or talented lived. I missed that!!!! when I eventually moved from LEO I So back to the real story.

Very soon the first prototype LEO II was completed and installed in a different but near by building to Cadby Hall. Both Les and Stan had moved to Minerva Road but in spite of my pleading I was still left in charge of LEO I. Something about good training in Management for me. Eventually LEO II / I was up and operational taking the commercial work off LEO I.

Transfer at last. No training course slot available so straight in as Shift Leader with new trained engineer Tony Talmadge to help me. (no the name is not right) I knew LEO I so well that the experience was invaluable when thrust onto LEO II and Tony was good. Hurrah.

The concept was almost the same but the electronic engineering had taken a massive jump forward. Not only was the machine considerably faster it now had magnetic tape which meant good bye to loading programmes and storing data on clumsy punch cards. Delay mercury tubes were still used for the memories. So given time and not too many nasty faults I soon settled in to my new job.

However even then it was "Stan they are in trouble on LEO. I can you go and help them"!! I suppose I took it as a compliment.

I was on LEO II / I for about 18 months when I was asked if I would be willing to move to East London and install a computer LEO.II/9. Consult with family and Yes. I was also able to help commission the machine at Minerva Road with a chap called Peter Ross before taking it out and installing it at Ilford (the photo people). In the following years we became good friends but that is a Honeywell story.

What was unique about LEO II/9 was that the main memory .was now stored in a new device called a Core Memory instead of bulky mercury tubes.

I was now living quite close to Ilford which made a marvellous change not having to travel a long distance to get to work. I soon settled down and with a good crew I had very low down time.

I should have realised with my past LEO career it would not last for long. My friend Stan Holwell had been made Area Manager and I was asked to take up the appointment of Area Supervisor to support him and in particular address myself to problems at LEO II / 5 the in-house LEO machine located in Hartree House London.

There was a piece of new peripheral equipment being installed called Magnetic Drum but with good support from Minerva Road that ceased to be major problem and it soon became fully operation.

This was a Random Access Device (RAD) that enabled a programme to zoom in very quickly for data instead of a long wait going along a magnetic tape. Disc Drives did not arrive on the LEO II's

Leo II's were all thermionic valve machines with the inevitable problem of long periods of down time There was still quite a few difficult faults on Leo II / 5 that required me motoring from Ilford to mend them(Always late evening)But it was always satisfying to fix the problem and get back home again.

Reading back my report its interesting to note that the our memories are very selective. I read the Leo Computer Society members list and see that there were many chaps who I worked with and many others who sadly may have gone now who I do not remember. One thing I do know Leo produced some of the most highly competent, dedicated engineers and regarded as the best in the country.

My career path with LEO finished quite abruptly for Honeywell Controls advertised for engineers to start up a Computer Division. These computers were the equivalent of the LEO III's No valves fully transistorised. My golly what a nice change.

So after five years very exciting time with LEO I left and installed the first computer Honeywell had sold Bournemouth Town Hall. But that is another story.

To finish my Saga there was a humorous story about LEO II/9.

Many years later all the LEO II were being replaced with LEO.III's Fully transistor techniques replacing the unreliable thermionic valves. The machines had little value to the Scrap Merchants except for all the mercury in the old memory tubes. One such dealer thought he had bought LEO II/9 for a song! When his gang arrived to remove the machine he found to his horror NO MERCURY it had a core memory. See also version with photos at

<https://docs.google.com/document/d/1EjtC3VTgqRgZ2HZGUwB4D9gbd2gcUNmm2aPHgMwmMME/edit> and at

<https://www.dropbox.com/s/im70jncidwe2jq/Stan%20Evans%20LEO%20Maintenance%20Engineer.docx?dl=0>

Stan Evans

Review of John Daines Zoom forum presentation on 14th July 2021 and reminiscence of TRT in action:

John Daines was brilliant . Not only the very professional way he gave the presentation but the many items of news I did not know. In particular those related to TRT in the war. Also Lyons running successfully a war effort factory.

One memory of TRT was in the middle of a nasty engineering fault on Leo I he came down

and quite rightly wanted to know our progress. We had been down 3 hours by then.

He suggested you go into the work shop , have a cup of tea,switch off for 5 mins then recap the problem

Needless to say it worked. we were up again in 20 mins. A lesson I used many many times later on in my career

So I repeat John gave a brilliant presentation.

Of course feeding my ego he points an arrow at your truly at the Leo I engineers control desk in the section Maintenance

• **Professor Stephen Evans** I was interviewed by John Pinkerton prior to my graduating from Keele University in 1966. I was offered by Dr Pinkerton, sponsorship to do a PhD in any subject in any University that I wished (it's possible I still have that letter but can't put my hand on it now). I didn't want to do a PhD then, as I had had 3 years in the sixth form at school (I did my A levels at age 16), followed by going to Keele for 4 years and having a scholarship to go to Swarthmore College, Pennsylvania for a year, so I had already had 6 years in academia post my A levels- I wanted a job. I started work the

week after graduating from Keele in the Research Division at Minerva Road. English Electric-Leo had just had “Marconi” added to the name and I worked for John Winterbottom on speech recognition and visual display design. With Ann Cropper I published a paper in 1968 on “Ergonomics of Computer Display Design This seems to have gone on being cited up to last year.

[https://scholar.google.co.uk/scholar?cluster=3718501728846242519&hl=en&as_sdt=2005&scioldt=0,5&as_ylo=2014]

I don’t know whether some reminisces of working at Minerva Road in the Research Division would be of interest- it was obviously post Leo, though I did learn CLEO and Intercode. I left EELM to go to CERN in 1968, and worked as a programmer there for Carlo Rubbia, subsequently a Nobel Laureate.

I changed the focus of my career several times and I am now semi-retired and paid to work 1 day per week at The London School of Hygiene & Tropical Medicine.

I recall various people from 1966-68 in addition to Pinkerton and Winterbottom. Ernest Lenaerts was around Minerva Road then; I did meet you very briefly and various other luminaries of the time but I’m sure you won’t remember me. Ann Cropper and I were involved in the start of the British Computer Society “Display group”, and our paper was based on a talk I gave in one of the early meetings of that group.

• **Mike Finlay** Memories of LEO I was born in on 18th April 1937 a true Londoner within the sounds of Bow Bell, did my National Service between 1955 and 1957 at the RAF Air Radar School as an RAF Radar Theory instructor, and then studied at Jesus College, Cambridge for the Natural Science Tripos Part 1, followed by the Economics Tripos Part2, graduating in 1960.

I joined LEO after Cambridge. The Careers Advice fellow at Cambridge said that my Natural Science and Economics degree together with my Electronics experience in the RAF suggested I should try for a job in the nascent Business Computer industry, so I had interviews with ICT, IBM, NCR, and LEO. LEO was the standout option, due to the recruitment process whereby we were given a lesson on some basic machine coding and then set a problem to solve by writing a program. This gave an insight into what the job would entail, unlike the others which were basically a simple form of IQ test.

I did receive offers from all four – though the non-LEO ones were for punch card processing rather than computing. It was an easy choice, and I joined LEO in September 1960, as a trainee sales consultant. My first task was to rewrite a payroll data vet program for Tate and Lyle on the LEO II/1 bureau at Cadby Hall, though I was based at Hartree House. The rewrite was necessary as the program’s many modifications had made it too big for II/1’s massive storage capacity of 2,000 words – ie 1K bytes!! Happily, the rewrite was a success, and I learned the value of constructing a comprehensive set of test data to ensure the program could cope with all eventualities.

I then moved into Frank Land’s Consultancy team, under Mike Jackson, to work on the Renold Chains project. I remember the concern of their management team about this new-fangled idea – “Will we still be able to make chain?” was a frequent query at progress meetings!

I learned how to write Job Plans the LEO way, with flow charts etc, and the value of studying what the client needed to be done, as opposed to a “One system fits all” approach to tendering and project implementation. I also enjoyed analysing the LEO III sort program, in order to produce a ready reckoner for calculating how long the sort would take for different input variables.

I worked on many interesting projects under Mike and, later, John Aris and Doug Comish. These included Post Office Premium Bonds, Stewart and Lloyds, Shell Mex BP,

Manchester Corporation, HM Dockyards and many other Government Departments. I remember our contacts at the Treasury were a Mr Alcock and a Mr Balls, which I hope did not represent the government's views on our efforts. There was also a memorable two weeks in Prague at the Communist bloc Computer Exhibition in 1966, on the EE-LEO stand under Ralph Land, and it is good to see both Frank and Ralph at the LEO reunions. My visits to Shell-Mex BP being driven by Mr Caminer, and to Renold Chains in Manchester in Mike Jackson's Austin Healey Sprite, were particularly memorable if rather hair-raising. It was always good to arrive!

I shared an office at Hartree House with Ninian Eadie and Mike Gifford, both of whom had stellar careers LEO, and I also met LEO II Chief Programmer Susan Finch, my wife now for 55 years and counting.

As LEO III activity increased, and later System 4, I became Defence Sales Manager under John, but I fear without much success, and my last post before the ICL merger was as Government Sales Dept Systems Manager. ICL then made me Regional Systems Manager South for Doug Comish's Local Government Sales Division, which meant working at an old ICT office in Beckenham. This was a two-hour commute, so when a Computer Systems Manager job came up in Cockfosters, 5 minutes from my house, I left ICL in autumn 1969 and began the second phase of my career, which ended as Director of Strategic Planning for TSB Retail Bank Division.

I retired in 1992, and my best memories are the early days at Hartree House, working alongside fellow graduates and professionals, doing a job both innovative and exciting, whilst also enjoying a vibrant social life with some colleague or other throwing a party nearly every weekend. LEO was truly a ground-breaking project, and I am very proud to have been involved. When people ask me "What did you do?" on the golf course, I always tell them about LEO and what it meant for the future of British business management.

<https://www.dropbox.com/s/ye54m4sfqwkh1fz/Mike%20Finlay%20Biography.docx?dl=0>

- **John Fletcher**, I was a maintenance engineer for approximately 20 months on the Leo 3 at British Steel site Ravenscraig Motherwell in the late 60's. I was employed by English Electric Computers at that time who also serviced the process control computers in the strip mill. Our Leo training took place at the Post Office Edinburgh site. Great training and experience as I remember. a good foundation for the rest of my computer industry career. I remember the Leo has been fairly reliable and therefore not needing much attention. Spent more time with the document reading/paper tape generating data processing data.. Christchurch Dorset is now home. .Tel. 01202 255870 mobile 0748 838 4414

- **John Simon Florentin**, Computer Operator I used to work on Leo III's at Shell Mex's computer centre in Hemel in about 1965-67. I thought I had better write something about this before I disappear for good.

They had two of these machines that were to us exactly the same. All this was on the lowest level of the building where it crossed the bottom end of Marlowes in the centre of Hemel-Hempstead. This building has since been replaced.

These machines were run 24 hours a day Monday to Fridays. There would be two teams of about 4 operators on each shift, one for each machine. The only other persons around on the night shift would be someone in charge of the whole shift, the cook to feed us and a person who was the magnetic tape librarian and the engineers. On the night shift the operators would be fed at about 12.00 at night and the computers would be handed over to the engineers who would do whatever maintenance was necessary. They frequently did not use there allocation of time and it was possible for anyone who wanted to, to run their own programs. I think one machine was handed over to the engineer for an hour then the other

for an hour. When the operators were not working or eating one popular pastime was playing cribbage. On the end of the week night shift there would be a very large sort that took most of the shift. But when it finished everyone went home early.

Each machine had eight tape drives (no discs) These would be four on two channels - so the source files would be read in from two drives on one channel and output to two other drives on the other channel. The source file would be on about 10 tapes.

This meant that one person would be working almost by himself juggling these tapes all night. On top of this, every now and then the tapes containing the current partially sorted file would be saved just in case a re-run was needed. During a large sort like this the machine could run up to two other programs

All programs had to be typed onto paper tape and then read in.

I think the words in the memory were 48 bits long. One or two of these were parity bits as operators would get SPF's on the console denoting a store parity failure.

It was said these machines had a floating point option fitted.

The control store was in a box about 1ft cube. Inside was a three dimensional array of fine wires with very small cores at what appeared to be random points.

The paper tape reader was made by Elliot but the paper tape punch was made by Teletype. The printer was made by Anelex. There was also a card punch and reader.

There might have been a reader for reading forms where boxes were selected by drawing a line through them (Editor: Lector or Autolector). The whole machine was made using transistors except in the tape drives, TM2's made by Ampex. Thyratrons were used to control the roller used to press the tape against the drive. The density of the bits on the mag tape was such that we had a gadget with a sort of fluid magnetic liquid in it such that individual bits could be seen.

<https://www.dropbox.com/s/qwhc24ztw05iyab/John%20Florentin%20memoir.docx?dl=0>

- **John Forbes**, Reminiscences. Joined Leo in early 1960. Did a few 'odd jobs' for Leo II. In summer was told that I was to lead a small team writing an Intercode Translator for Leo III. My immediate questions were, "What is Intercode?" "What is a Translator?" With a small team created Intercode translator
- Working closely with Master routine (MR) had Translator and its MR interface working in 1961.

Moved to CLEO compiler in 1962 with a larger team.

In 1963 on spent more time accompanying consultants to answer/explain to prospects how Leo software worked.

In 1964 IBM announced 360. Moved to team designing 'new range'. Abandonment of 'new range', after 'deal' with RCA for Spectra series. Worked on System 4 and software support until moving to Canada in 1969

Two points raised I think I can provide comments on.

1. Why CLEO rather than COBOL? This will go down in the annals of LEO history as one of the great internal debates. (I was not party to it). In the red corner we had the proponents of CLEO (Clear Language for Expressing Orders) It was a clearer language than COBOL. It sought to combine the facilities of COBOL AND FORTRAN in the requirements it addressed. And perhaps most importantly it was the brainchild of TRT. In the blue corner we had the proponents of COBOL led by DTC. It was an already accepted high level language. This meant that it would be easier for a company that had COBOL programs to convert from another machine to a LEO machine. (Far-sighted in

that uniform tape standards, programming languages had not yet emerged as a long-term goal).

Anyway the RED corner won by a KO and I was instructed to produce a CLEO compiler, for which I was given a somewhat larger team than had been the case with INTERCODE.

2. Why did the CLEO compiler produce output that was input for the Intercode translator?

In the initial design stage, the objective was to produce object code ready for handling by the Master Program in the same format as the Intercode Translator; and we had experience of doing this. Inside the team there had been little if any discussion about whether that was the right way to go. Then came the suggestion (from Mike Josephs, I think) that we should go the Intercode route. The argument for going this way was that the CLEO compiler would be ready sooner, both because it would cut down on some of the work that had to be done in earlier passes of the program and because some additional passes would not be required. The argument against was simply that each compile would take longer. I agreed with the Intercode route, on the understanding that we would later be able to amend the compiler to be expanded to incorporate the translator functions. (Of course, this never happened and many members of the team and I were long gone into other roles soon after the Intercode version was working.)

3. High level languages v low level languages and computer road blocks. The pros and cons of this debate have been well versed for many years. What, even now I believe as I swear at my laptop, is an understanding of what is the critical component that slows down the execution of a program. For many years it was the speed of the cpu. In one organisation I became familiar with a critical long running batch program ran every night. The solution was to get faster tape drives. Surprise! the run time of the critical update program did not decrease.

Now I look at my lap top and wonder why a program takes so long to load or a file to be found. The disc drive has (in my case) become the limiting factor. My experience is that very few installations take the time to analyse where their road blocks are. See <https://www.dropbox.com/s/qhekzhfa8jh4lwb/John%20Forbes%20memoir.doc?dl=0>

· **Bill Forfar** Reminiscences 2011

Text:<https://www.dropbox.com/history/LEO%20Oral%20History%20project/LEO%20Memoirs%2C%20Reminiscences%20and%20Anecdotes/Bill%20Forwar%20memoir.docx?subject=uid=47902250&preview=Bill+Forwar+memoir.docx>

It all started when Wendy Craig woke me up with "A Cup of Tea and Lyons Tea Shops"

I was dozing on the settee when I became aware of LEO on the screen and Wendy Craig uttering the words Lyons Electronic Office.

Acronyms, acronyms ... they are a part of everyday life and the acronym LEO reminded me that in 1963

I chanced into the world of computing when my first job was as a Computer Operator for Shell Mex and BP on their new LEO 326 machines in Hemel Hempstead. What an introduction, right at the cutting edge of the brave new world! 1024 words of 40 bit memory, made up of a matrix of magnetic rings each threaded on three wires which made it look rather like a thread-bare tapestry on a plastic frame about 12 inches square. You could SEE the bits in each WORD.

Sept 63..... Love, love me do

A wonderfully air-conditioned room with two LEO 326's: each with 8 tape decks, 2 paper tape readers, a paper tape punch, card reader, card punch, two printers, main console and Engineer's Control panel. The place was jammed by trolleys filled with the input for the jobs - mag tapes to read, some work tapes for the sorts, mag tapes for output into the next job and paper tape with daily sales tickets to be read by the Elliott Readers. This tape was punched from the handwritten dockets sent from the depots where the road tankers filled up with diesel or petrol.

I remember we had one operator on Mag Tapes, one on Peripherals, one on Buttons.

The cry rang out - "Allocate mag tape on Channel 2 Route 2: Printer on 6/1: Paper Tape output on 7/1" The job started and the P/T began to fly through the reader into a large metal bin. Mag tapes inched forward, reports printed out, reel after reel of P/T filled the bin. Don't lose the end - it's all got to be rewound in case the job fails or the tape needs to be dibbed.

The jobs failed sometimes due to mis-punches in the P/T so out with the dibber and the black-tape to re-punch a character or two. One day a reel stopped repeatedly just after a splice point, the data prep girls had joined two reels together. However the second tape had been turned over and joined upside down to the first one. The sprocket holes seemed to match but the 2-track side had been joined to the 3-track side and carefully trimmed to make a neat splice so it looked like the 5-track tape was supposed to look.

Another day came the words - "I bet you can't hit the big red EMERGENCY STOP on the Engineer's panel from here with that reel of black and sticky".... Zzoom.....Ooops..... Silence except for "You've won the prize, Jim!" Then the problem was how to doctor the console log to cover up the re-run time.

July 64.... Please, please me

The task now was to learn Assembler, then CLEO for writing programmes. Wow, a step up the employment ladder. The DSR - Dealer Site Record -with filling station information covering the number of pumps, A-road or B-road, car dealership, gallonage for the storage tanks, throughput per week, location and so on. Did you know there are even waterside filling stations for barges? Then began my introduction to a look-up table to check the map reference was correct for the site. It was planned to use this to work out the best road route for the tanker from the depot to each filling station and back to the depot - this was leading edge use of computers and might save money. The edge of the whole country was set up in map references so garage could be mistakenly put in the sea somewhere! In fact this routing idea was too heavy on computing calculation and, anyway, the tanker drivers were the experts on minimising the road miles. Development deferred!

Oh, the elapsed time it took to get a compilation and test of the programme back from the machine! One turn round every three days only to find there was a simple coding error. There were too many programmers, too many mistakes and too much operational work for the hours in the day. But the LEOs proved their worth and SMBP's profitability rose.

Sep 65 ... What's new Pussycat?

I bade farewell to Hemel and enrolled on the Computer Science degree at Hatfield, which had 2 periods of 6 months working in a business during the 4-year course. But now the computer (I hesitate to use the word) was an Elliott 803B, all paper tape and not a mag tape to be seen. However it did have long-life plasticised paper tape from which to load the operating system! Output had to be via paper tape and then printed via a Teletype. Still I learned a lot. At the start of year 2 it was back to Hemel for 6 months commercial experience working on another programme. All acronyms were related to the sales and

delivery world of the oil industry in the UK. Then other languages, FORTRAN, COBOL, Algol and more needed to be mastered.

Mar 1968 Come on baby light my fire.....

.....I spent time somewhere else.... NO, not at Her Majesty's Pleasure!

Aug 1969 Zebedee time

EELM had lost the sales battle to Univac at the Shell site. The machines had changed to become Univac 1100's with the FASTRAND storage device holding an infinite amount of information so you wouldn't need to store information on mag tapes anymore..... wait a moment, what was that saying about systems expanding to fill the available storage? We were soon back using mag tapes and there were too many programmers developing too many programmes and too many operational programmes to run in the available time.

What goes round comes around, things don't really change do they.....? Which brings me in a roundabout way to the time I witnessed Real Magic. The office block had a magnificent view of the junction where six roads met. A scaffold tower went up in the middle, six large white blobs appeared at the end of each road and many concentric circles were drawn. At five minutes to four o'clock the High Priest climbed the Tower holding a megaphone. Work stopped and our windows were crowded with baffled observers. His yellow-jacketed assistants hovered on the kerbs and at precisely 4pm they leapt into action to make a Magic Roundabout. Two lanes each way and six mini-roundabouts later it soon slowed the traffic to a crawl but after a few days the locals became accustomed to it and they zoomed round. In at road 1 go left to road 2 or 3, it's quicker to go right to 5 and 6, but which way to road 4? ... **end of my SMBP involvement....**

▪ **Wendy Forward** Memoir by her daughter Anna C Page

My mother, Wendy Elizabeth Forward, was a computer programmer during the early 1960s in London before embarking upon overseas travel. She read mathematics at Reading University, and graduated from there in July 1963 (her degree certificate says 'Pure Mathematics, Applied Mathematics and Geography, resulting in a BSc Honours 3rd class'). She was a programmer on the Leo III business computer from approximately September 1963 until about August 1966. The Leo was the first business computer in the world, invented during the early 1950s for the Lyons Teahouses (Leo stood for Lyons Electronic Office). See: <http://www.leo-computers.org.uk/newphotos.htm> for photos of Leo I, Leo II and Leo III. My mother worked in the Lyons main bureau computer at Hartree House, Queensway, London <http://www.leo-computers.org.uk/newphoto3.htm> and there are some wonderful photos of the installation of this machine – by crane through the window! This machine was in use from 1962 – 1972.

My mother lived near to the computer, in Leinster Square, and then later she moved to Fitzjohn's Avenue in Hampstead. I succeeded, via the Leo Computers Society, to get in touch with one of her former colleagues who confirmed that she had been a Leo programmer. Her colleague, Peter Byford, told me "We all had a great time at Leo although we worked long hours. We all got on well, your Mum was a nice lady, good programmer, sometimes worried more than most when things went wrong but an important part of our programming team. She would have worked on CLEO and intercede" (programming languages).

My mother's first dog in Cape Town was called Cleopatra was a Great Dane, the runt of the litter (Cleo for short). We had always thought that Mum had named her for the Egyptian Queen (though we didn't know why), however CLEO stands for 'Clear Language for Expressing Orders' and was the plain English programming language developed for Leo computers (but which ultimately lost out to other programming languages – see pages 164-165 'A Computer called Leo', by Georgina Ferry). To me this just shows Mum's quiet and ironical sense of humour that she named her dog after the programming language she used, especially as dogs are (hopefully) controlled by commands.

Leo Computers merged with English Electric in February 1963, in October 1964 EE bought out Lyon's holdings and the computer company was renamed English Electric LEO Marconi, in 1967 it merged with ICT to form International Computing Limited (ICL). These first two events would have taken place while my mother worked for the company. ICL later lost out to IBM and the USA market and then the Japanese has predominated the computing world ever since.

I remember my mother's reaction to the first Apple home computer that friends of ours acquired in the early 1980s. She so wanted a reason to justify the expense of acquiring one, but despite the fact that it could have helped with the household accounts, the accounts for her mathematics coaching and the weekly letters to her parents and sister, she resisted the urge to buy one as she saw it as a luxury and was very careful about saving money. I so wish that she had bought one, though she would not have had long to enjoy getting to grips with programming again because of her early death.

My mother was an inspiration to me in so many ways, although I only had her for 13 3/4 years. She would have been pleased with my achievements at the Open University (both as a student and member of staff), as I am proud of hers at Leo: what a great technology role model to have in my family.



Wendy and Cleo, 1968. See also

<https://www.dropbox.com/scl/fi/md6e105079om96rvzjaw7/Wendy-Forward-by-Anna-Page.docx?dl=0&rlkey=ykq9u1x4qen2f36p2l9st9ydz>

- **Nigel Furness**, I was involved in 1981 in decommissioning the Bristol machine, LEO III-70 which was a 326 model (editor: the last LEO). Prior to decommissioning I had been employed as a systems engineer to provide engineering support for this machine. I had been trained at Charles House which was a BT (formerly GPO) installation, as was Bristol and Cardiff. I was unaware that the guys who were training me had been at the forefront of computer science in the 1950s. Many of the concepts embodied in LEO are to be found in today's PCs - multi-channel DMA for example, though LEO's version of a DMA controller was called an "assembler" - a term guaranteed to cause confusion in conversation with programmers. LEO III had the world's first multitasking operating system, called rather quaintly "the master routine". It also had a microprogrammed CPU - a very advanced idea at the time. LEO was beautifully made and all those engineers who worked on LEO were very proud to have been connected with the machine and we were very sad when we switched it off for the last time. I and (I think) six other colleagues were the last generation of engineers recruited by ICL to work on LEO and I joined the company last of all, several weeks after the others in January 1980. I have to say that much of what I learned during this period has underpinned my entire understanding of computers and it was a marvellous opportunity for a young engineer to have experienced what some have called "the golden age of computing"

▪

- **John Godwin** : LEO Programmer Johannesburg:

Worked in the Johannesburg Bureau from 1964 until 1986 when I moved to the then holding company. Originally we were part of the Rand Mines Group of companies. The mining houses were our main customers for whom we ran payrolls, stores and share transfers. For full reminiscences see

<https://www.dropbox.com/preview/LEO%20Oral%20History%20project/LEO%20Memoirs%20%20Reminiscences%20and%20Anecdotes/John%20Godwin%20brief%20bio.doc?role=personal>

← **Jeff Goodenough**, LEO engineer. One of my main programming achievements in between mending LE-1 units, was to add the "om tiddly om pom - pom pom" tune to the end of a little program which verified (I think) magnetic tapes! (Much to the amusement of the operators.)

- **John Goodwin** I worked on LEO II/4 for the Ford Motor company, & I'm the sole entry in your list of addressees that did genuinely work on that machine; one of the two others worked on II/11, & the other worked for LEO on II/8?, & joined Ford after II/4 had been scrapped.

I notice that you have an error regarding the attribution of II/6. The Government Pensions activity never had their own machine, having used one of other of the LEO-owned machines that operated as a service bureau. (*Editors note: Goodwin's assertion cannot be sustained as a number of LEO Computers Society members including commissioning engineers tell of visiting the LEO II/6 at the Ministry of Pensions offices in Newcastle. Geoff Pye - see Oral History gives an account of working on MPNI LEO II/6 in Newcastle*)

When I went on my programming course at Whiteley's, we were presented with a list that detailed the owners & locations of the LEO computers; that list omitted II/6, & in response to our enquiries about that, an evasive reply advised us that the presenter was not able to disclose that (so of course we all knew where the machine had been deployed). That machine was actually purchased by another Government activity - the Foreign Office, for one of their activities whose existence was never disclosed; that machine was actually located at Cheltenham, & certain of our engineers were required to work on that machine as required. I never heard of the fate of that machine, but I expect

that it was simply scrapped - like all the others & no mention if it is included in any information published by Bletchley Park (it took over the work of the 11 Colossus machines). (Perhaps it's still there?)

It was quite amazing just how much work those machines could achieve, even using punched-card for input & output of master files (some using pure binary), supported by a room full of ancillary punched-card appliances (sorters, collators, punches & interpreters + an IBM 407 tabulating machine - that I programmed using huge re-wirable plug-boards! Modern machines seem to be no more efficient, due to the increased bit usage plus masses of bloatware, & general incompetence of system designers & programmers. Our programmes were coded to run using pure-binary code, but the compiler would accept decimal input & convert to binary for execution, but I had to decode the binary & perform modifications by 'patching' in binary.

I worked on our LEO until it was replaced by an IBM 1410 in November 1963, & I supported & worked on a series of other machines until 2000 C.E. when I accepted early retirement, but continued working as a consultant - even to the present day. Our replacement machine was eventually replaced by a Honeywell 2200 + a 120, in a dishonest attempt to gain the company's business by a bunch of fraudsters, since the machines were rip-off's of the IBM 1410/7010 &c., & the software merely stolen directly; compiling a programme in Cobol, resulted in a fatal error unless the computer used was declared to be an IBM 1410 or 7010; that machine got thrown-out prior to launch, when it was found that it was not up to the claimed performance, & would take 28 hours per day to run the existing workload then currently performed on the IBM 1410; we replaced the IBM 1410 with an IBM 360-50, running in IBM 7010 emulation mode; I wrote the Post Mortem programme for it!, & spent many week-ends running both new & old machines concurrently 24 hours per day, unassisted & unaccompanied, to develop new programmes for our entire Accounting systems; people would have a fit nowadays, if anyone attempted that! The above account is archived in Dropbox at <https://www.dropbox.com/preview/LEO%20Oral%20History%20project/LEO%20Memoirs%2C%20Reminiscences%20and%20Anecdotes/John%20Goodwin%20reminiscences.docx?role=personal>

Emil Gottwald. I joined LEO Computers in 1964 after graduating from Queen Mary College in London with a degree in physics. It was right in the middle of the boom in semiconductors, and even though I had specialised in solid state physics the prospect of working with semiconductors did not appeal to me, so I interviewed with LEO Computers and accepted their job offer.

I was part of a small group [I think there were 6 or 7 of us**] working on "special projects" for JW [whose nickname BTW was 'Fred']. We had a small lab which housed a "research" computer consisting of components mounted on pegboard hung on the wall, and fed by paper tape. We worked on a variety of projects ranging from voice recognition [prompted by IBM's 'Shoebox' voice recognition device], to thermal printing and performance analysis. This was during the time of the LEO III/F, and we built a prototype performance analyzer for it consisting of a bunch of photocells mounted on the control panel, driving a paper tape punch to record which cells had detected a control panel light. It was a Rube Goldberg affair using rubber doorstops for the photocell mounts [the screw holes were used to fit over the console display lights at one end, and to house the photocells at the other - cheap and effective]. Don't know how that turned out as I left for the States around then. I remember JW blowing his top when he found out I was leaving, calling me into his office and reaming me out for not giving more notice. A more pleasant memory of JW has to do with his mantra to keep things simple.

He once asked me to name a simple, reliable mechanism and I said "A car engine". His reply was "How about a matchbox?"

My time at Minerva Road is one of my fondest memories - I still have my CLEO and KDF9 Algol User Manuals and I seem to remember an AutoCoder manual lying around somewhere though I don't remember if that was from my LEO days or from college.

• **Brian Grimshaw** I started work on LEOs in September of 1967 for Shell-Mex and BP based in Wythenshawe, Manchester. I was 19 at the time but still have fond memories of this time and would be happy to be interviewed or put them in writing. I also have my original training manual entitled 'English Electric Leo Marconi Training Manual- Leo III Basic Operating No 53'. This is a fairly weighty tome with several hundred A4 pages (hand typed/hand drawn I suspect) plus a couple of sample logs headed 'Mock Control Desk Exercise No. 1' and 'No. 2'. Whilst the manual purports to be 'basic', the first page is headed 'The Co-Ordinator' which describes the anatomy of an instruction! I worked on LEO's for about a year helping to run the SMBP group accounts which covered Shell, BP, Scottish Power and National Benzole. I then became interested in programming having seen examples of CLEO and Intercode (akin to COBOL and Assembler on other systems). I subsequently transferred to operating an ICT 1004 (plugboard based) which I did get to program until it was replaced with a Univac 9400, whence I became a 'proper' programmer using DOS assembler and COBOL. I still have the printout from my first Assembler program but that belongs in a different 'museum'

• **Valerie Grose** I had the somewhat dubious distinction of being the first girl in London to complete the Gold level of the Duke of Edinburgh's Scheme (only because I was in the first intake of girls to start when it was introduced). On the photograph I am showing Mr & Mrs Simmons the work two younger girls are engrossed in leading to the Bronze stage. It was divided into four sections: Service to the community, Adventure, Hobbies and practical skills. Under hobbies I spotted driving a car and asked my manager what that entailed as few had a car at the time. Please laugh (or not) but a man was paid to take me out on Saturday mornings, in a company car, to teach me. No matter how long it took: the objective being for me to pass the test. I made my way to Cadby Hall to meet George, plus car, and then I drove to my home in Ealing where my mother had coffee and buns ready for us. George had a cigarette and after chatter together I drove back to CH. We spun it out for about six months and I then passed. Although I went to work everyday with only two weeks holiday, that company was pretty good to me. What a privilege to have had my office (when eventually promoted to senior secretary) opposite that of Mr Simmons with TRT's alongside. Mr Pinkerton and Mr Caminer had offices elsewhere but were frequently seen heading to Mr Simmons' office. One day Diane (a colleague) and I were called upon to serve tea in his oak panelled office to a group of a dozen or so gentlemen. I was going on holiday next day (he must have been told that by someone). He stopped the meeting, excuse me gentlemen, Valerie I understand you are going on holiday tomorrow. May I ask where to if you are going away. The Isle of Wight with my parents. He then wished me a pleasant time. My completion of the Award took me to the office of Sir Samuel Salmon who presented me with "The Ascent of Everest". I still have it on my bookshelf. I met Sir John Hunt and when four more girls completed the Gold level we were invited for lunch at the House of Commons with the MP for Hammersmith, Mr Compton Carr. So....I never was a "LEO" but had that close association with the key players. I have spoken to one or two people at the reunions who were LEOs but who never met the "gentlemen". I feel very fortunate. KR Valerie I know so many widows, I feel I am now a member of "that" Society. Had Tony have lived, his onward journey would not have been pleasant (wheelchair and incontinent) so I

have to come to terms with the outcome being, for him, the kindest thing.

My file was on the table with lots of other items/memorabilia. I removed a couple items that I can always return. I must say, in all honesty, at the time I had no idea of the role of Mr Simmons. Like several other "pinstripe-suited" gentleman he was just a very senior manager to whom we younger employees showed great respect. He was the Comptroller but what exactly that was we knew not: just the head of the clerical workings of J Lyons, in the same way that schools have a headmaster (or mistress). I'm not entirely sure I had awareness of his LEO importance/connection. When Messrs Caminer, Pinkerton and Thompson dashed along the corridor heading to room 23 (Mr Simmons office) I suppose we thought it was the weekly audience, such as the Prime Minister has with Her Majesty the Queen. I was once, with another staff member, called upon to serve tea to various managers in his office. Whilst we poured then delivered to each person, they carried on talking but Mr Simmons said, "excuse me a moment, gentlemen": Valerie I believe you are going on holiday tomorrow, are you going away? With my parents we were heading to the Isle of Wight. He wished me a very nice time. His secretary, Miss Margery Slack went to Tangier. We lesser mortals thought she was on some other planet: way out of our reach. Tony was with British Airways and we returned from Washington on Concorde. Never as a young girl could I have imagined such arrangements. Neither could I have imagined being part of these LEO gatherings in such a grandiose building as Middle Temple Hall. I don't have photos that Mr Simmons took: just one with me explaining the Duke of Edinburgh's award to he and Mrs Simmons. Another manager, Mavis Leopold was the wife of Michael, nephew of Reginald Leopold who conducted the Sunday evening Palm Court orchestra programme. A Mrs Greenall, personnel manager and Miss Buzzey, secretary to the Chief Accountant, together with Mrs Simmons all had manicures, regular hair appointments, bags and shoes like Footballers' wives have nowadays (Several thousand per item: equivalent in those days). Something we younger ones could only admire and dream of. It all seems like another world but of course is the memory of the early days of my life. The Lyons whole operation was very labour-extensive. Would Mr Simmons nowadays have no need of his secretary and just communicate on his mobile and iPad? Maybe the wages and salaries to so many thousands of staff (9000 at Cadby Hall, I recall) perhaps be part of the downfall of the company? Thankfully the organisation of the time enabled me to have an interesting and fulfilling career. I feel very fortunate.

• **Valerie Grose Reminiscences**

I have read the fascinating article (that mentions Nigella). Actually her grandfather Mr Felix Salmon was our "in-line direct director" with secretary, Miss Patterson. One of my colleague's father was Mr Felix's chauffeur and when a child she played with Vanessa, Nigella's mother. As previously stated, other than Mr Frank Land I knew most of the other 'names' (Messrs Simmons, Pinkerton, Thompson, Caminer). I believe Mr Oliver Standingford had just left the company prior to my joining but I knew Mr Geoffrey Mills with whom he co-wrote "Office Practice" I certainly cannot claim to have known them well (being considerably younger) but my office was in the same corridor so saw them all frequently. To measure their success is difficult: obviously, as things eventually panned out I suppose wrong decisions were made but they were surely the "brains" of the time. By way of comparison, "medical" knowledge extended to patients having leeches set upon them to draw out blood but as time passed with newer developments this soon become consigned to history. Mobile phones were the size of bricks, became very small but curiously are now larger (albeit slim and lightweight) but have the capacity to offer many more functions. Life has changed beyond all recognition over the past half century with so many new

inventions, and all new technology in the future will surely pale into insignificance with yet more inventions. Fax machines and music cassettes for instance, (good inventions that were relatively short-lived). LEO though was of great significance and I feel very privileged to have been an employee at J Lyons during those early years. Even the style of dress of those gentlemen would not suit modern times: grey suits, short back and sides hair, most smoked. Most certainly Miss Margery Slack, secretary to Mr Simmons did, and Mrs Maureen Henley, secretary to TRT. When entering their offices you could barely see them through the smoke! I recall walking through the bakery department once with trolleys of bread rolls open to the elements; people walking past coughing. Swiss rolls, as I recall were all rolled by hand as no machine had been put together that could roll them without cracking. Imagine what Health and Safety would say about that nowadays. The internal telephone exchange was fascinating, headed by Mr Calder. Each call had to be individually connected. The two dozen or so telephonists sat at terminals with thick flex to insert into the connecting plug. When lifting the receiver to make a call, the telephonists were trained to ask by name "Which number, Mr Simmons" but 'ordinary staff' were greeted with 'number please' to which you replied 'extension 645'. Daily office life was very labour intensive with reports and minutes of meetings having to be typed using carbon paper to produce extra copies. I was a very light typist, only being able to produce about four readable reports so, if ten were required I would have to type each set three times which was very time-consuming. How different my life would have been with a modern computer/keyboard, email facility and the holiday entitlement of today. Ten days only, plus Bank Holidays and New Year's Day was a working one at the time. Mr Samuel Salmon gave a New Year address over the tannoy, "Hello and good morning, Cadby" and thanking all for their contribution to this great company. It was just that at the time and I am pleased that aspects will have historical significance. I rather suspect those in LEO had their heads down busily engaged in developing the new machinery and knew rather less of what happened on a day to day basis, as described above. Mr John Andrews has a file of LEO memorabilia that, being somewhat of a hoarder, I have kept from my early days at JL. Unfortunately I could not download this (<http://leo.settle.dtdns.net/LeoCode/LeoIIIdemo2.zip>) Please forward this on and feel free to ask any further questions you feel I may be able to assist with. Best rgds
Valerie

Dear Frank,

Having heard your name for several years (I have attended quite a few reunions (sadly seeing Mr Caminer in a wheelchair at one) it surprises me that our paths never seem to have crossed. Mr Simmons, to me, was the epitome of the perfect gentleman and always addressed me as Valerie (no others did so)*. Geoffrey Mills smoked a pipe, as you may recall, and somewhat amazingly lived less than five minutes from where my son and daughter in law now reside. His address sounded so romantic (Beechcroft was the name of his house) and to me it sounded so far away (Claygate, Surrey). * my own boss of course used my Christian name and, to my total amazement, announced one day that as he used mine, then I should use his. I found that extremely difficult. It just was "not done". Mr Simmons' address. Hyde Park Gate. A quick Google now shows today's asking price, £13,000,000 but perhaps modest against the £40m of the Beckhams! Holidays: one year my boss went to a Butlins Holiday camp (!) as felt suitable for his two young children. Upon return he reported the children had loved it

whilst he and his wife grinned and bore it. My colleagues and I - Torquay, Isle of Wight, Camber Sands. Miss Slack, secretary to Mr Simmons went to Tangier. We considered either she, or the rest of us, were on another planet. I have no recollection of the destinations of the LEO gentlemen. Not LEO but might amuse. Mr Mark Bogod (non-family director?) due a new company car, invited his chauffeur, Geoffrey to choose. "How about a Rover 90, sir?", and he chose the colour: grey. Very insightful psychology. Clearly, Mr Bogod was not overly-bothered and presumably felt if Geoffrey was happy he'd give good service, often being required to work anti-social hours driving to functions and returning at midnight. Looking back over the years, at the time everything, everyday was so normal but now seems.....yes, like life on some other planet. Oh yes, just thought of this. We girls wore gloves to work, even in summer! In winter, obviously for warmth but in summer, lacy decorative items and as for being bare-legged: never. Nylon stockings with nice straight seams and I never saw the gentlemen wearing casual clothes as on "dress down Fridays" in offices nowadays. Grey suits, black shoes, shirt and tie was their 'uniform'. I can clearly picture the vast LEO and wish I had paid rather more attention. Opening my Daily Telegraph one day, on the Obituaries page sadly was Mr Pinkerton. I recognised him straightaway before even seeing his name. Then Mr Caminer. May they all rest in peace after giving valuable service to that once great company but more particularly that wonderful invention, the Lyons Electronic Office.

■ **Peter Guest** b.1934, died 1995 aged 61, LEO Maintenance Engineer

Margaret Guest, his widow writes: Peter's education badly disrupted during Wartime, leaving Wm. Penn School, Peckham, London aged 16 in 1951. Attended Woolwich Polytechnic 1951-55 for part time day release, obtained ONC in civil engineering while working for Sir Murdock MacDonald & Partners as a trainee draughtsman. Further HND studies but National Service in RAF intervened including training in communication hardware preparing to be a wireless operator and then posted to Aden where he worked for the Commonwealth Air Forces Communications Network with the rank of Corporal. Came back and worked for Vickers Armstrong at a factory in Crayford, Kent. At the time he joined they were building a valve computer for Powers Samas, the PCC, which had an immense number of problems and not many people capable of solving them! He left when the PCC was going to be superseded by a future design done by ICT.

Early 1960 (the year we were planning to marry) Peter was employed by LEO in London (for a very small wage for the first 6 months) while getting a good grounding in all aspects of this new invention; engineering, testing, commissioning, etc. He was sent out to maintain computers at Ford Dagenham (LEOII/4) and Ilford Films (LEO II/9)

while we lived in a caravan on the outskirts of Romford. He was also training on LEO 111. At the time the head office of LEO Computers was in Bayswater.

Then, about 1964, after LEO amalgamated with English Electric, we moved to the South Coast where he was sent to commission a new English Electric computer for Lloyds Bank at Durrington, Worthing, while also troubleshooting other installations in London and the South Coast.

After the merger with English Electric he spent a lot of time up in Kidsgrove on the KDF9 commissioning and troubleshooting.

Our next move was to Long Ashton, on the outskirts of Bristol where he was Assistant Service Manager. Later becoming Area Manager working on computers for Wills Tobacco and an important (I think Government) installation in Dworset. Later appointed Area Manager for West London and the Western Home Counties.

In 1967, when Marconi split its computer interests from English Electric, another move to Widford, Chelmsford, to work for Marconi who were embarking on a programme to produce the Myriad 1 and design the Myriad 11.

He was also involved in the System 430 for English Electric-LEO (the first integrated circuit design) which caused many problems because of the high reliability requirements necessary for the Military and Traffic Control for which it was intended. He was then Manager overseeing design, production, quality control, budgets, planning and responsible for 45 employees. It was a very stressful time for him.

Then there was a period of uncertainty, with a merger of Marconi with GEC looming..

This made up his mind to move again, to MDS Data Processing, Teeside, Durham.

Peter first joined MDS as Quality Control Manager. MDS was an international company, main Plant being in Utica, north of New York State and another in Germany and he made regular visits to both locations. After all this travelling he decided to stay more local, so worked for local companies; Redifon, Comark and MBM near Brighton, before finally freelancing as a Business Consultant working from home.

He sadly died of Cancer aged 61.

 **Gloria Guy**, LEO Computer Society Committee member

My very first employment was in 1952 with Jo Lyons at Elms House and have a loose connection with Coventry Street Corner House. Sadly, I wasn't a Nippy but once Lyons had trained me to use a calculator in their own training school, my job consisted of adding up all the bills from Coventry Street Corner House - all day long! I found it fascinating and got quite cross with Lyons when they decided to promote me after 16 months to a job which I didn't like and with people that I didn't get on with!

After several moves - Bakery Sales office using comptometers, then LEO doing data entry in 1954 I had no idea I was working on a piece of history. During this time I was studying shorthand and typing at night school and eventually worked in their Works & Engineering department at Spike House before leaving for a secretarial career, which stood me in very good stead for the rest of my working life.

My mother also worked at Cadby Hall and my grandfather worked at Henry Telfer (the meat pie company owned by Lyons). See:
<https://www.dropbox.com/s/8km6dav1cr5wlq9/Gloria%20Guy%20brief%20bio.docx?dl=0>

- **Michael Guy LEO Master Routine – The Birth of Software Engineering?**

Michael Guy joined LEO straight from Wadham College, Oxford in 1962 with a mathematics degree. After two years working on the Master Routine he left to do a PhD at Newcastle University in integer programming. After two years working for Wiggins Teape in their systems development department he rejoined what was then ICL. He worked on VME for many years, progressing from programmer to designer, project manager and OSTECH. When a team was created to pursue the UK Alvey projects, launched as a response to the Japanese 5th Generation project, he seized the opportunity, working mainly on persistent programming with the universities of Glasgow and St Andrews. He ended his career with Teamware in what had become Fujitsu. On retirement he went back to university, taking degrees in theology and biblical studies at Birmingham University. After gaining an acquaintance with at least a dozen programming languages he had no desire to program any more until twenty years later, when he found himself helping to debug his grandson's Python programs on a Raspberry Pi.

I worked on the LEO III Master Routine from 1962 to 1964, going straight from university with a maths degree. It was nearly sixty years ago and my memories of that time have been paged out and archived, and have probably been corrupted on the way. Also I do not have a wide knowledge of the wider world of computing at the time. But I have been encouraged to write this article in the hope of generating discussion of a very important subject – the development of the discipline of software engineering.

John Daines writes “I have listings of the master routine and it was written in Intercode.

Intercode itself was a level above machine code and, although a instruction looked to be an equivalent to a machine code instruction, it was often expanded by the translator into several machine code instructions.

However, Intercode instructions 100/0/0 to 131/1/3 were one for one equivalents of machine code instructions 0/0/0 to 31/1/3. That meant that the master routine programmers could program at the lowest level and use specialist low level instructions that weren't in the Intercode set e.g. input output, interrupt handling, setting store protection tags .etc

Interestingly, Cleo allowed for routines to be written in Intercode and, by implication from the above, that Intercode might include machine code.”

LEO was the first computer to be used for business purposes. This meant a change in the priorities of computer design. The first change was that it was used for data processing. It spent relatively little time actually calculating and a lot of time reading paper tape, printing and reading and writing magnetic tape. The role of the Master Routine was to manage the computer efficiently and attempt to keep everything going full time. This is what multi-programming is about.

The second priority was for reliability. Lyons would receive telephone orders every evening and these orders had to be on the lorries by the following morning. The business came to depend on a working computer. Computers did break down, and every installation had on site engineers so that the moment a breakdown occurred the engineers were in the machine room within minutes. Spares were kept on site, ready in case of need.

Software, especially the Master Routine, also had to be reliable. Releases were strictly controlled. A new release would incorporate many changes. It had to be tested by the team in dedicated slots of machine time. It was beta tested by using it on the service machine in Hartree House and then released to customers. The customer would run his own tests before installing it. If a bug occurred the customer would revert to a previous version. Upwards and backwards compatibility was essential. A bug would cause a paper dump to be sent to the team by courier and a patch would be issued. A new version of the Master Routine was not allowed. If a patch did not work it could be removed. The danger of a patch was that while curing one bug it might inadvertently create a new one.

Reliability required strict discipline in the creation of the Master Routine. Machine time was expensive, requiring dedicated use of the machine. Testing took place overnight so one was only allowed one test a day. I have a feeling that several changes were assembled into one Master Routine, so a trivial mistake in the code in the heart of the operating system could mean that no one in the team got a test that night. Accordingly, code had to be checked by the programmer and rechecked by another member of the team. The emphasis was on getting the code to work first time, with testing being quality control. Of course, this was not always achieved.

Code had to be intelligible to other members of the team. Being written in machine code, it had to be commented and written in such a way that other members of the team could understand it. At the same time, we were under pressure to write economic code and were told that every word saved would save the customer £5 of RAM. Virtual store was not even dreamed of. Understandable code therefore meant that it had to be understood by another member of the team. As the members of the Master team were probably selected from those who performed best in the aptitude test it might have been difficult for someone from outside the team to understand it.

Some programming practices would be frowned on today. The manual specified the effect of an instruction for straightforward use and we would sometimes wonder what would happen if we went outside the specification. One example would be what would happen if one used a decimal add on a hexadecimal number. In such a case a member of the team would ring the designer of the microcode. He would get out the flowcharts of the instruction and tell us, so we were programming to the microcode rather than the specification. Another quirk was that a switch might be implemented by overwriting the next instruction by an unconditional jump, something that would be prevented by modern hardware. It worked because LEO III had no instruction cache.

There was no written manual. Programming standards were passed on by word of mouth to each new entrant to the team. Disagreements were resolved by the team leader. We worked as a close knit team with about a dozen members. It included men and women and the only thing that mattered was technical competence. We were all in the same room and could talk to anyone at any time. Each person in the team could work on any part of the Master routine and, importantly, maintain it.

There were good things about the way we did things and questionable things, but it taught me the discipline needed of a systems programmer. This stayed with me all my working

life: take care when writing the code and do your best to get it right before testing. I took the same ethos with me when I later worked on 2900 VME. Good programming is about discipline.

I had some fun working on LEO. I remember being given the boring task of writing a test program for the printer. In response I created a program to print out the value of π to as many decimal places as I wanted. After evaluation of the next ten digits it would print out the value so far. π is evaluated through an infinite series so the task is not as difficult as it may seem.

One thing I am particularly proud of is a creating new version of the bootstrap. The bootstrap consisted of reading in a sequence of code and obeying it and this code would load the Master Routine. Unfortunately the paper tape reader read 7-bit characters because it was intended for reading ASCII, and so the only instructions available were those which those in which the top bit was zero. These would culminate in an unpack instruction which converted the rest of the paper tape to binary. The bootstrap was in existence when I joined, but then a customer – Dunlop, LEO III/3 - bought a computer which used cards and had no paper tape reader. The bootstrap was over 80 characters long and would not fit on a card. The customer would not have been happy to buy a tape reader simply for loading the Master Routine! I was given the task of compressing the bootstrap into 80 characters. This I achieved, probably using an obscure instruction sequence.

One day a consultant expressed dissatisfaction with the handling of magnetic tapes. A tape would be loaded on to the tape deck and an operator would inform the computer of the label on the tape. Any direct operator interaction is by its nature error prone and the consultant was prepared to pay for an experiment in hide and seek, whereby the computer would read the label. I was given the task of extending the tape handling of the Master Routine to do this. As there was no machine time available for it in Hartree House, I spent a few weeks in Birmingham making the modification, using machine time provided by the consultant. At the end of the exercise I produced a 17 page typewritten specification of the 'Controlling Master Routine'. It states how it would identify each tape, assign it to the correct program and unload it when it was finished with.

My memories of LEO are interspersed with other memories from that time. Working hours were from 9 to 5 five days a week with no overtime. We always had lunch in an Indian restaurant just round the corner and could wander around Whiteleys department store in the time remaining. The winter of 1962-3 was cold and the snow lay on the ground for six weeks. I was there for the last London smog when, standing at the traffic lights, I could not see the light on the other side of the road and the foul air meant that I went straight home after work and never went out until the next morning. The Cuban missile crisis took place in 1962 during the introductory programming course. At first I lived in London in Fulham Palace Road and I would spend Saturdays wandering the streets of the City exploring the many beautiful Wren churches. We could buy excellent seats at Covent Garden for £2 courtesy of the Lyons social club. I was sent a credit card through the post unrequested and without a credit check. After six months I moved back to my parents in Camberley and commuted in my first car: a Ford Anglia with the raked back rear window in which I could career downhill at sixty-five miles per hour on the Staines bypass and park on a side street near Hartree House.

The world was changing. It was an exciting time to be young, independent and at the forefront of technological innovation, but I do not think I realised it at the time. See also


Dropbox <https://www.dropbox.com/scl/fi/fnfst16lp6s67uj9veo21/Michael-Guy-memoir.docx?dl=0&rlkey=2l0rzgycww8mufci24l6xmjg5>

Michael Hancock I was Shell Mex and BP's chief programmer when we acquired our first Leo III in 1963 (no 6) and was involved in the studies and decisions which led to its acquisition. We later acquired another Leo III and 2 Leo 326's which were considerably faster. Our computer centres were in Hemel Hempstead and Wythenshawe. Leo were in competition with ICL and IBM and succeeded first because they had the most suitable machine and second because of their skill in persuading our management that they were right for the job. ICL had a grand machine on the stocks then but typically, it never saw the light of day. I designed a massive sales accounting system with help from John Aris. Such a pity that Leo did not have the resources to create the next generation. I was lucky enough to be in another area while a traumatic transition to Univac took place. The Leo users group brought me into contact with such as Dunlop and Imperial Tobacco. The latter was worth a visit to Bristol as they gave away a box of cigarettes to their visitors. An extended version of the career and memoirs is available in Dropbox at <https://www.dropbox.com/s/22dwf6tv7cid0ui/Mike%20Hancock%20Memors.docx?dl=0>

Douglas Hartree and LEO (from Wikipedia
https://en.wikipedia.org/wiki/Douglas_Hartree)

Hartree's fourth and final major contribution to British computing started in early 1947 when the catering firm of [J. Lyons & Co.](#) in London heard of the ENIAC and sent a small team in the summer of that year to study what was happening in the USA, because they felt that these new computers might be of assistance in the huge amount of administrative and accounting work which the firm had to do. The team met with Col. [Herman Goldstine](#) at the [Institute for Advanced Study](#) in Princeton who wrote to Hartree telling him of their search. As soon as he received this letter, Hartree wrote and invited representatives of Lyons to come to Cambridge for a meeting with him and Wilkes. This led to the development of a commercial version of EDSAC developed by Lyons, called [LEO](#), the first computer used for commercial business applications. After Hartree's death, the headquarters of LEO Computers was renamed Hartree House. This illustrates the extent to which Lyons felt that Hartree had contributed to their new venture.

Hartree's last famous contribution to computing was an estimate in 1950 of the potential demand for computers, which was much lower than turned out to be the case: "We have a computer here in Cambridge, one in Manchester and one at the [NPL]. I suppose there ought to be one in Scotland, but that's about all." Such underestimates of the number of computers that would be required were common at the time!

 **Denis Hitchens.** Operator on LEO III/15 at Shell Australia

Neil Lamming interviewed me and conducted the aptitude test. But the person I was really trying to dredge from my memory was Bill Cheek who along with Jack Dankert encouraged me to return to full-time study. I was 19 and 20 at the time, turning 21 about a fortnight before I went to RMIT -- imagine a 20 year old shift leader with the fate of SCO in his hands!! So for me as a whippersnapper training 35+ year olds was a life defining experience and one which a bit later in life when I was President of the Students' Representative Council (elected leader of some 12,000 students) I was able to refer to when addressing Melbourne Rotary (yes, all the big wigs). A fuller version of the reminiscences are available in the LEO Dropbox archive at

<https://www.dropbox.com/s/bqgrbhhxh9cp4s4k/Denis%20Hitchens%20Reminiscences.docx?dl=0>

Brian Hobson: I am glad that you, (Hilary Caminer), were able to attend our recent “LEO do” as chaotic as it was! You asked if I would explain the origins of our group and also to help you understand our Lyons/LEO relationship as it seemed rather confusing. I will do my best. The meeting started when Norman Beasley retired from Lyons in/around 1982. Norman had been a member of Lyons/Leo from the early days and was Operations manager on LEO 1, LEO II/1, and LEO III/7 before becoming Computer Consultant to the Lyons group of companies.

Norman lived in Chalfont St Giles (I think this is correct) and Peter Bird (Lyons Programming Manager) and Alex Tepper (Lyons Operations manager) would go to visit him fairly frequently. Carol Hurst, who was at our meeting, also lived nearby and had also left Lyons would join the others making a foursome. In my Lyons career I started in Operations as an operator (employed by Norman) and later became a consultant working with Norman. When Alex Tepper was promoted to Head of Computing for Lyons I became Operations manager and joined the gathering.

All Lyons computer staff are quite a close knit group and various members moved into senior positions within other companies within the group as Accountants or Head of Computing, etc. Tony Thompson, who you met, became Chief Accountant for various companies, Alan King (now passed away) became head of Lyons Maid computing. They joined in our meetings and gradually as time went on our group has continued but with varying members, as old ones passed away others came to know of us and joined. Peter Bird was the mainstay organiser as he had the most contacts. Cyril Lanch is a fairly newcomer to our group but did not step back quick enough when volunteers were sought to carry on Peter’s organising! Hopefully that explains our group, now for the LEO/Lyons feelings – difficult!

History of Lyons and computers. Lyons built a computer to do work for Lyons Electronic Office (LEO), staff working on the computers were Lyons staff. With the success of computers Lyons formed a computer company LEO Computers Ltd but the staff although working for LEO were still Lyons staff at heart. When the company LEO was sold the computers remained at Lyons and were operated by Leo staff until they chose to remain at Lyons or were replaced by new Lyons staff.

Lyons computer history goes from LEO I through Leo II/1, LEO III/7, LEO 326/46 and eventually to IBM computers. Our attachment to LEO may be explained by the fact that the original computers were still in use at Lyons long after LEO had been sold and in many instances the staff working them were the original staff. When LEO was sold the computer department became LEO and METHODS, then Lyons Computer Services Ltd (LCS My best analogy would be: If you had a daughter and she got married she would still be your daughter and a member of your family although she would have joined another family, you would continue to be proud of her. The same is how our computer department feel.

When LEO was sold the computer department became LEO and METHODS, then Lyons Computer Services Ltd (LCS), and finally Lyons Information Systems Ltd (LIS).

As you may now gather we were very proud of our heritage but so was the computer industry. We as a Computer Bureau (which we had been from day 1 of computers) strived to continue to be at the forefront of computer usage and computer and peripheral manufacturers were very keen to be associated with us offering us very competitive deals to use their equipment. Our computer department was frequently put under the microscope by the main Lyons Board as the newer family Board members felt that

computing was expensive but on every occasion the auditing companies, including IBM, were in awe as to how we are able to do so much with so little and still lead the world. An example of this was back when Lyons had a fire on the Xeronic Printer in the LEO III/7 computer room. We made an arrangement with the Post Office (as it was then) to use their LEO III (overnight) in Charles House which was just across the road from us. Our shift of 6 operators replaced a shift of 20+ operators.

I cannot remember the trade magazine that did a piece on us as we were the first company to wire an entire building with various departments on different floors to use Local Area Networks linked into the mainframe. Also, one of our external customers was a large American personal tax company which had a large computer centre in the States but wanted a worldwide centre based in London. We installed a duplicate of their system onto our computer, they provided no computing staff as all maintenance etc. would be done from the States we only had two user/managers with us. Their system was difficult for their users to manage and I spent a lot of time supporting them because of the complexity of their system.

Eventually I volunteered to improve it for them and wrote a few simple programs and restructured their system making it much more efficient (saving hours a day of machine and their input time). The computer staff in America were interested in what I had done and came over to see for themselves, they were amazed and the CEO asked permission to adopt our version of their system to replace their own!

My own involvement with Lyons started while I was at school. My brother, Colin, whom you met was an operator at Lyons on LEO II/1 (but employed by LEO Computers) and I used to go with him to work some evenings or when I was not at school. I was able to help operate the LEO II computer (unofficially of course) and met the engineers on the LEO III/7. When Colin moved to Hartree House I also used to go there as well and helped out on the LEO III installed there. I loved the job and it really appealed to me so when I left school (in 1966) I went for interviews at Lyons and ICT (as it was then). Norman interviewed me and offered me the job (it helped that I knew several of the staff by name which impressed him!). I worked my way up from trainee operator to Ops Manager until the closure of the company in 1991. I won't bore you with my life history of the roles I held and of the changes in company structure that I made over the years as most of this was during our IBM period.

I hope that this gives you some insight into our little group and our attachment to LEO and why we feel a little side-lined when at the LEO Computer Society gatherings Lyons seems to be irrelevant. Maybe that is changing now but at the few meetings I went to over the years that is how it seemed which is why I have never bothered joining

▪ **Colin Hobson:** Weather, Wildlife and LEO Computers

Both LEO 1 and the LEO 2s were not installed in cosy, air-conditioned palaces. They went into normal office accommodation and the heat, generated by the hundreds of thermionic valves was conducted away by fans and overhead ducting. The operators were kept cool only if they could open the office windows! This could cause a number of unexpected problems:

On LEO 1 rain could be a problem. It was necessary to look outside before turning anything on. If it was raining, or snowing, the heaters in the valves needed to be turned on before the cooling fans. This built up enough heat to ensure that the water droplets sucked in were vaporised before they hit a hot glass valve cover. Failure to do it this way round would result in a series of high pitched squeaks as the glass, of the valves cracked. This would be followed by the sound of engineers swearing! If there was no rain, it was better to get the cooling up and running first.

On LEO 2 this was not a problem. The ventilation system didn't cause the computer much in the way of problems. The computer did provide a lot of heat, most of which was conducted away by the ventilation system. However, there was still a lot of peripheral equipment and human bodies churning out heat. The only option, certainly on LEO 2/1 was to open the windows to the outside world. Mostly this worked well. However, there were times when the outside world made its way into the operating area to cause chaos. Wildlife was one such problem. The occasional visiting bird could provide some distracting entertainment but the worst problem I can remember was a swarm of small insects which came in through the open windows and settled on the paper tapes and punched cards. They got squished into the holes in the cards and tapes changing the data.

Many years later I was working at a Post Office (now BT) site where a snake made its way through one of the doors from the outside world, down a short corridor and then got stuck between the automatic airlock doors into the air-conditioned computer hall.

Colin Hobson adds I was worked on LEO 1 and subsequent machines but am not sure about recordings. LEO 1 certainly did make a noise but I have a vague recollection that the speaker was not in the original hardware but in the dexion operators console, which was a later addition.

LEO 1 was on a platform at one end of the room (hall). There was an engineer's console up there which the operators did not use. The dexion operators console was down on the parquet flooring along with all the peripherals. The peripherals were aligned in two rows with shallow metal cable runs going back to the main frame platform. The room was not air conditioned and at times it was necessary to open several windows to allow the operators to breathe! A warm wet day was a real problem as we had to make sure the heat in the room was enough to evaporate the rain before we could open the windows! Another side effect, on the operators, was the smell of cooking which often wafted up from below!

Note: Colin Hobson was interviewed by Marie Hicks for her book Programmed Inequality (see above) and provides one of her case studies noting the story of LEO.

· **David Holdsworth** - I went to state schools in the then West Riding of Yorkshire, where the Director of Education was Alec Clegg, well-known for his left-wing views. As a result, I left a co-ed comprehensive school in 1961 and went on to read Physics at Oxford University following a few months working in the works laboratory of English Electric. I began my computing career as a physics research student writing Algol60 programs modelling quarks on a KDF9. After discovering that I might be better at computing than physics, I got a job at Leeds University in 1967 where we implemented the Eldon2 multi-access operating system on KDF9, which was still running at NPL in 1980. Leeds University's KDF9 was succeeded by an ICL 1906A where I was involved with George3 and George4. At Leeds I was an early champion of Amdahl and of UNIX.

I was often helping others with their computing issues. After completing the doctorate, I went to a job in the Electronic Computing Laboratory at Leeds University, where I worked in a variety of roles until 2004. Actually the thesis was written up while at Leeds. My developments on their KDF9 are [documented in Resurrection](#), the journal of the [Computer Conservation Society](#). Suffice to say that I was a key figure in implementing the Eldon2 multi-access system, which enabled us to offer interactive computing from March 1968, with 32 tele-types connected via a PDP-8.

I started resurrecting/preserving software in the late 1990s. By *resurrecting/preserving* I mean getting the software into a modern digital state and providing the ability to execute it. George3 was the first such rebirth, using the official

George3 issue magnetic tapes, followed by the BBC micro's Domesday Project. The first software rescued from printer listings was KDF9's Whetstone Algol. I was also involved in the preservation of digital material that is not computer software. An important principle of my work has been that emulation should work on a wide range of current hardware, with a view to working on future systems.

Sometime around new year 2013, John Daines asked if I could use my skills in software resurrection on the pile of listings of Leo III Intercode that had been collected by Colin Tully. After resurrecting software for 1900, BBC micro and KDF9, I was keen to try rescuing software from a machine of which I had no prior knowledge, so as better to appreciate what we need to preserve if future generations can comprehend early machines. I was delighted when John Daines asked me if I could resurrect the Intercode system that he had obtained from Colin Tully's widow. I immediately put my work on the Edinburgh IMP system on the back burner, where it resides to this day.

I came to Leo III expecting to find an assembly language and set about implementing Intercode treating the printout as the source text of an assembly language. It soon dawned on me that there were no labels, and that really I was dealing with a machine code for a fictitious machine, a sort of Leo IV.

The raw machine code also came as something of a surprise, devoting all sorts of complexities to computing with a variable radix, and using sign-and-modulus for information in the store but converting to 2's complement in the A register (but not the B register). A step-by-step account of my voyage of discovery which led to a working Leo III emulation is [here](#).

I am fascinated by Intercode, as I think it may offer a window onto the time when assembly languages were emerging, a time before my own entry into computing, perhaps via a privileged side entrance. See

<https://www.dropbox.com/s/g2ullpu7ooxwvya/David%20Holdsworth%20Memoir.docx?dl=0>

· **Stan Holwill:** My LEO Involvement & Memories January 2018 Date of birth 1932.

Abstract: Stan started his working life in 1947, with an interest in engineering, at an electrical engineering firm Clifford & Snell in Sutton Surrey.

I served a five years engineering apprenticeship. During this time I spent one day a week at Wimbledon Technical College studying for ONC & HNC, followed by National Service in the Royal Corp of Signals working as a radio mechanic. On return to civilian life spotted an advertisement in Wireless World from J. Lyons for an engineer to work on digital computers. Applied, interviewed by Ernest Lenaerts and Peter Mann, accepted and joined LEO as junior computer engineer in January 1956, working at Cadby Hall on LEO I. Rapidly promoted to prototype commissioning engineer on LEO II/I and then chief maintenance engineer for the Elms House LEO II. From November 1956 acted as managing commissioning engineer for LEO IIs until 1961 responsible for a series of LEO II customers starting with Stewarts and Lloyds (LEO II/3) and going on to LEO II/11. In 1963 appointed Manager of the Maintenance Development Department (London). Remained in post until end 1970 when Minerva Road was closed. Subsequently worked with other ICL machines until retirement in 1991. Enjoyed his 15 year career with LEO, with working with LEO II the highlight.

Text: <https://www.dropbox.com/h>

- Alan **Hooker** memoir.

Alan Hooker's reminiscences: here is what I remember of my time at LEO. Some of the dates are a bit vague and might be suspect but then that describes me now!

I've also included notes on my visit to New Zealand which you might find interesting. In 1963 it was like pre-war Britain and that scenario has gone forever now.

I joined LEO in June 1958 at Elms House from the BBC and went through a six week LEO II training course, at the end of which I was thoroughly confused and questioning whether I had made another bad career choice. I was given a number of small maintenance jobs and utilities to work on then assigned to some major changes to LEO I programs. As I remember they were full of formed orders (Editor: orders created by the programmer by treating an instruction as if it was data held in store) as there was no B-line modification and my program errors frequently caused me to try to obey data. It was here that the penny dropped—the computer can try to obey data or do arithmetic on instructions, in memory they are both the same. Even so the Lyons bakeries were not brought a grinding halt and I emerged with the beginnings of programming ability. I returned to LEO II work under Betty Cooper (Newman) to write the Lyons Ice Cream suite. For Betty I had to code in ink and she checked off code. Any sheet of code she disapproved of was returned to me for rewriting (in ink). By the time the code got to Data Prep it was fit for testing. Another thing I remember about this suite was the correction to sales commission due to fluctuations in ambient temperature between this year and the corresponding temperature last year. I therefore was required to code a routine which, *inter alia* calculated corrected sales as actual sales times a constant raised to the none integral power of the difference between the temperatures calculated to one position of decimals. This could be positive or negative. Whilst I was sitting there with furrowed brow John Lewis helpfully told me to increase the temperatures by ten and divide the answer by 100. And so the calculations were done and so the commission was calculated and the salesmen found it incomprehensible! About this time Lector was introduced and the Xeronic printer installed in Elms House, so I worked on modifying the Teashops system to accommodate them, In 1960 I was assigned to help The Standard Triumph Motor Company (LESO II/8) in Coventry develop their stock control system under the management of Arthur Payman. Arthur had a Messerschmitt two seat/three wheeled bubble car in which we trundled up the M1 every Monday morning, and I returned by train at the end of the week. I think I worked on this project for about a year.

I then moved to Hartree House to work for Doug Comish on the Persian Lamb Sales System for the Hudson's Bay Company (Editor: a LEO II bureau job). This was the first time that I had acted as the front man doing requirements, design, coding, testing and delivery. Added to that the Powers Samas Samastronic printer was LEO's first Alpha numeric printer and was a bit whimsical in behaviour. It struck me as a bit odd that Persian Lambskins grown in South West Africa should be auctioned in London by a company with a Canadian name. Very little went according to plan. The sale was originally going to be small with plenty of time between receipt of skins and the auction to sort out problems, and the manual system would be the backup. In the event, because of the African weather, lambing was late, the closing date for the sale was late and a quarter of a million skins had to be and processed. On the day of the sale, David Caminer, and the engineer (who brought his French Horn and played Till Eulenspiegel for us) and sundry volunteers worked through the night, sometimes with fingers in the dyke, and delivered the results in the morning. What is more, despite the complexities of the accounting, we balanced to the penny!

Shortly after this we did stock control and sales forecasting for Lightning Fasteners, a subsidiary of ICI and the major source of zip fasteners in the UK. This was interesting because it was an early commercial use of exponential smoothing of averages. Another stock control system we did was for the H.J. Heinz company, a just-in-time raw commodity scheduling system for their

factory in Hayes. I don't remember when LEO 3/1 was installed at Hartree House (Editor: 1967) but I was then put in charge of a number of programmers working in Intercode and I also lectured on the LEO 3 Programming Course. My manager was Helen Jackson (Clark). People in the room I remember were Alan G Hooker, Jim Feeny, Tomas Maria Leonard Wizniewski, Rosemary Oakeshott, Diana Myra Loy Cooper (Didy); others whose names I don't today recall but will probably remember tomorrow whilst forgetting these. I was then tasked with setting up a unit to write standard commercial programs. We managed to design a flow chart for updating serial files and a prototype data vet program, but the availability of random access discs and IBM's initiative with CICS took the wind out of those sails and efforts were diverted to standard commercial routines.

I moved on to work for Ralph Land as a consultant, basically a Sales Support analyst. One Monday he said to me "How would you like to do a project in New Zealand for a couple of months?". "When?" I asked. "Next Friday" replied Ralph. So four days later with a suitcase, passport and a round the world ticket I set off for Wellington, via Hong Kong and Sydney. I arrived in Wellington late Monday afternoon, was met by David Howard, the local General Manager and was driven straight to the office of English Electric Leo Computers to start work! A good job I had broken the journey in Sydney. The computer bureau was based on an EE KDF6, and offices were housed in a small square perhaps about half a mile from the harbour. I had been booked into a small hotel a few minutes' walk from the offices, on the face of it very convenient, but in the event it turned out to be little different from a dingy boarding house with nowhere to work in the evening. When I complained about this the next day, the excuse was that there was large business convention in town and nothing better was available. I therefore went to the best hotel in town, the Grand, and booked a room for a month. After that I returned to the office to start preparing my Tender. The Company was hopelessly under resourced to bid for a distributed banking system, or to support such a system if the bid was successful, but I was there to have a go. At the end of a week I had overwhelmed the typing resources (no word processors in those days). Then there was a break of a week while the commercial and other local aspects of the proposal were prepared, during which I was sent down to Christchurch in South Island to investigate the potential market for computer bureau business. I made a few appointments, but I felt the time was not ripe for a start-up bureau centre.

Returning to Wellington to submit the proposal to the Bank of New Zealand, I was offered the post of General Manager of South Island with a view to taking over from David Howard as Country Manager when his contract expired in a year's time. Although tempted, I asked to consider my answer after returning to the UK and assessing the future there. I also took the opportunity to call in at the local office of Atlantic and Pacific Travel whose Managing Director was the brother of Ian Crawford, a LEO consultant and one of my Kingston flatmates. They kindly rerouted my return trip via Fiji, Tahiti, Los Angeles, San Francisco and New York, returning to Wellington.

From Wellington I flew to Auckland to touch base with the local office of English Electric. I had a great time in New Zealand but it was a technological backwater; looking back, I probably made the right decision from a career point of view. Once back in the UK I found it difficult to find a career niche so I left EELM to become the General Manager of Tyndall computers in Bristol in (I think) April 1965. Apart from acting as Director of the ICL Computer Users Conference, I had very little contact with ICL for the next few years. I joined Dataskil in 1979 as a Project Manager in PMS Reading under Ollie Smith and John Benbo, largely in a support role for other Project Managers and doing project Audits. One project I managed was to act as the General Sales Manager for Dataskil under George McLeman. Acting as line management of wheeler dealer salesmen and their was beyond my experience, and I was regarded with

suspicion by the unit. However with a £30 million sales target and a year to achieve it we had to get on with it and we made the numbers. I Then returned to PMS. Several company reorganisations later I was the manager of the unit but the culture had changed and I resigned from the unit to manage the transition of the BAA data processing systems from Honeywell to ICL computers. It was a five year project, the largest project I had managed and when I took it over it was exactly two years behind schedule. Three years later we finished it on time and budget! I then took early retirement.

A fuller account including recollections of travelling and holidays is included in:

<https://www.dropbox.com/scl/fi/qjywskwpxwzrnyn1t0lb2n/Alan-Hooker-memoir.doc?dl=0&rlkey=eecb3e0e5zydk5k4gkoyf29>

- **Barry Hooper**, Programmer Shell Australia

I remember my LEO programming days. Such fun and so stimulating to see what you have programmed do its job. That LEO was remarkable and its origins amazing. I was so sorry at Shell to see the LEO go and an inferior computer put in its place. Its only asset was direct access to disks all else was quite lousy and so hard to work. Fancy needing System Programmers just to keep it workable!

- **Barry Hooper**, Shell Australia

Thanks for your information and particularly the "LEO Matters" documentation. Brings back interesting memories. What a great computer LEO was. That Master Routine was brilliant. And printing in the background too, IBM could not do that! Actually I always felt we went backwards when Shell moved to IBM. But then it did have direct access with its disks. The Operating System and file management facilities were unnecessarily complicated and left a lot to be desired.

There were so many facilities in PL/1 that programmers were essentially each writing in different languages. Bye Bye to decent maintenance and flexibility.

- **Carole Hynam:** **Working for Wills as a 15 year old in the late 1950s**

I came to be working for W.D. and H. O. Wills in Bristol because although I had always wanted to go to Art School, I came from a family that had never gone into further



education (because in our section of society you had to be very well off or gain a scholarship.) Even though I was always in the top three in an A stream, as it was called, my careers officer told me there was no chance I would pass the entrance exam for WD and HO and would probably get a job in a factory or a shop. Luckily I had already taken the exam otherwise I may have pulled out at that point. Things were pretty grim in 1957 as it was only 12 years after the war had ended and money was very thin on the ground and so instead of taking the job offered to me

in an advertising workshop sending me to art school one day a week I took the position offered by WD and HO because it was offering £3 per week. I had heard my parents struggling with money and felt it would help them too.

I was chosen to work on 'Leo' as I had scored well in Maths in my Wills entrance exam. I really didn't appreciate at the time how honoured I was to be selected to work on Leo as WD and HO had a huge number of employees and I had come from an ordinary Secondary Modern school to work alongside of grammar school girls and public school boys. There were four of us chosen to work - two of us 15 year olds putting in data and two 16 year olds who were scrutinisers to check our work with a manager in charge of us called Irene. She seemed very old to us 15 year olds but was probably in her forties. The year was 1957/8 and the computer took up half of the general office. There was a great deal of suspicion from the other workers in the offices as I think they thought they may lose their jobs. We had an engineer called Reg who used to start the computer each morning and one programmer. As time went by more programmers were employed. The work was very spasmodic and we spent many hours just sitting waiting for our work to come in. The computer was very sensitive to damp conditions and if it rained it didn't work at all well. I remember Reg telling us it had the same valves as an electronic organ and that's why it seemed to play a tune on being started up. When fully trained our agility was important as we had to work at great speeds.

I stayed with WD and HO for just two years and then moved on to work for the NHS as a records officer. In hindsight I was probably silly to leave but at 16 I didn't find the work satisfying enough. After a long and varied career, I started painting again and luckily for me it took off. I still paint and do the odd commission and have sold over two hundred paintings during my life.

I feel very honoured to have been part of the story of this wonderful invention, Leo. I regard it as a very important part of my working life and at 77 years of age am able to relate this fascinating experience to some of my son's friends who are in the IT industry. How things have moved on.

<https://www.dropbox.com/s/axbsdfv68jf0q53/Carole%20Hynam%20reminiscences%202.docx?dl=0>

Roy Irons, one of Ilford Ltd LEO 2/9 computer operator:

The British Oxygen LEO 2/8 was in Edmonton, North London where they had a factory, distribution and offices. There was also a LEO 2 in the Slough area, I remember going over there once, at night!

← Another thought occurred to me, modern day 'computer experts' would not realise that in the 'old days' the programmes were kept on punched cards, not preloaded as now. Each time you ran a programme you fed the programme in front of the data. As the programmes were regularly updated, sometimes daily for new programmes, it was the operator's worst fear that a card jam would happen while feeding the programme in. You always hoped that the programmer had updated the spare programme pack! I and my shift colleague spent many a time reconstituting ripped punch cards after piecing the bits of the jigsaw together. Problems always occurred at night, rarely when the programmer was about with his or her notes! Computer operators had to know how to take the various bits of equipment apart to retrieve ripped cards, etc. The knowledge of card readers, punches and sorters became a vital part of our job. We also had to help the engineers locate faults on the main frame. It was a tough life, it was another world! See <http://www.glias.org.uk/news/256news.html>

Bill Jack, English Electric Engineer (team leader) Ravenscraig LEO III, recollection. The Leo III was acquired by the Colvilles Group Engineering Department on behalf of the Ravenscraig Works. They had already installed the KDN2 on the Slab Mill. I was a young

engineer in the department and was sent to Kids Grove to learn about the KDN2. When the Leo III arrived I was put in charge of the implementation team because I knew about computers! The LEO III was applied to production control/tracking throughout the steelworks complex and also to the production of the weekly payroll for 4,000 employees. The LEO III continued in both roles from 1965 till around 1972 when it was replaced by an IBM 360.

The most interesting feature of the installation was the extensive use made of Lector documents to record information directly from the operatives at the various processing points throughout the plant. These documents were collected at the end of each shift and processed in time for the production meetings at 9.00am the following morning.

You do correctly identify the tussle between the Finance and Engineering Directorates but this was resolved by the Finance Director purchasing an ICL 1900, installing it in another of Colvilles steelworks at Clydebridge and proceeding independently. This did not impinge upon the installation at Ravenscraig.

As a result of our conversations I have been in contact with members of the original LEO III 32 team and will put together a short record of the installation and the applications. This I can forward to you if of interest.

Bill Jack

Helen Jackson (nee Clark)

Born June 1936 in Wigan, I was the youngest of 3 daughters to a manager at the local coal mine.

At the age of five I was sent to a private preparatory school, to which even at that age I went by myself on two buses each way. From this school I passed the 11 plus and went to Wigan High School for Girls.

That same year my father died from heart attack; my mother never re-married.

In my penultimate school year, on a school trip to France I had to make a speech in French to the Mayor of Paris, thanking them for their hospitality, which I can recite to this day. In my final year I was appointed Head Girl

After my A levels in 1954, I went to Manchester University, and graduated in Maths in 1957. I went for job interviews to English Electric, Vickers Aircraft and LEO. I liked LEO best, particularly the job Appreciation Course, which in those days was a one day elementary programming course and tests on it, with the interview coming after the test results were known. I thought 'I can do this', and joined Leo in September 1957.

My sisters were by then living near London, and my mother had decided to move South anyway, and did this soon after I joined LEO.

After my programming course I was put into the programming section managed by Jim Smith, which had about 15 programmers working mainly in technical and insurance applications. I worked on several of these, on both LEO I and LEO II, and was rapidly promoted to be a Senior Programmer.

In 1959 LEO moved from Elms House, adjacent to Lyons head office at Cadby Hall, to Hartree House in Bayswater. LEO needed much more space for growth, for both programming work and computer operations for service bureau and computer customers.

In 1961 I was given responsibility for all service bureau application programming, and raised to management level. At 24, I was told that I was both the youngest person and the first woman ever to achieve this in the whole Lyons organisation.

Also in 1961 I married Mike Jackson. We had first met when Mike, also one of Jim Smith's programmers, was giving some of the lectures on my initial programming course on joining LEO. After that, we had had very little contact until the autumn of 1958 when all London Transport bus drivers went on strike, which lasted a few weeks. One lunch time a group of us were chatting about the effects of this on them, and I told them that I had to walk over 3 miles each way to and from the station to get to work, unless I could thumb a lift from a passing motorist. Mike offered to take me home that day on his motorbike, and this led to him taking me regularly to and from work for the duration of the strike. A strong relationship soon formed, which has lasted ever since. We will be celebrating our Diamond Wedding this year.

Mike was a keen racing dinghy sailor, and from early 1959 I crewed him regularly, in boats he had designed and built himself. We won many races, including regatta trophies, and were 3 times National Champions in the Class.

Following my promotion in 1961, the work for service bureau programming steadily increased. Initially, Hartree House had LEO II/5, with a drum, magnetic tape, and very fast printers. These latter items made it much more capable than LEO II/1 at Elms House, and much more service bureau work could be taken on. Later, LEO III/1 was installed there, many times more powerful than the LEO II, and my department was steadily expanded to meet the customer workload that the greatly extra computing power enabled. Eventually I had 53 programmers working for me.

Service bureau programming was where most new trainee programmers were placed, some proving to be of high calibre, and I was delighted that they came through my department on their way to better things. Noteworthy were Mike Daniels, Jim Feeney, Dick Peters.

However, all good things come to an end. In this case, it was with the arrival of our first child in 1965, after over 4 years as Service Bureau Programming Manager. I did not return to LEO, although after the birth, Mike asked me to write the programme for the largest and most complex job he was planning for the LEO 326 installation he was managing. This was written in CLEO for the handling of the accounts for a very large mail order company, which came to be handling over 300,00 agents and individual accounts of over a million credit customers. (Editor: that was the London Mail Order Company which Mike later joined. See Mike Jackson's own oral history). It was very successful. We had two more children, in 1967 and 1969.

By 1978, I decided that I would like a part time job, and started as bookkeeper for a small nearby firm in the building industry. When there, having told the boss about my time at LEO, he got me to use Atkins Computing, a service bureau in Epsom, to do structural

calculations for some design work. This was followed with his purchase of an Apple II in 1980, my first introduction to personal computers. I was pleasantly surprised at how powerful it was, and after machine code on LEO II, what a flexible language Basic is. I stopped working for him in 1981, when I started teaching.

We had sent our daughters to an independent grammar school. At a parents evening, in a chat with the headmistress I told her of my time at LEO. This resulted in being asked to introduce computer studies into the curriculum, and I taught it for 5 years. Some parents came for word processing lessons. During this time I put the staff payroll on to a PC, paying them direct into their banks, using a BACS file sent over a normal phone line. This was very early days for using a PC for that kind of work. But when the school accountant was due to retire, I was asked to take on that job, where I put the school accounts on to a PC, including parent billing. I was in this position for several years, only retiring in 1995.

After that, I did various stints of unpaid voluntary work, including for a local Citizens Advice Bureau, a toy library, and as a classroom assistant at a local primary school.

<https://www.dropbox.com/scl/fi/7wxh6koaq45ankayv3b4g/Helen-Jackson-history.docx?dl=0&rlkey=289bn2bg4bsqw2jd0czs2ydrh>

- **Alan Kay**

From Professor Alan Kay distinguished American Computer Scientist known for his work on Object oriented coding and winner of the Turing Award in 2003.

I knew Maurice Wilkes slightly many years ago, Roger Needham years ago, and most recently have met Andrew Herbert. The latter two had spent some time at Xerox Parc, and it was Andrew who told me about your society after I mentioned LEO as a good follow-on exhibit/story to TNMOC's recreation of EDSAC. He also explained about the society's museum presence in Cambridge.

and

Still, I think having at least "a wall" at TNMOC about LEO would greatly add important context to the larger story of computing, and especially British computing.

To me, there is more of an interesting parallel to Whirlwind development than to the IAS machine (especially with regard to scope and software). I think the LEO software schemes for the Lyons' businesses were both landmarks early, and deserve to be more told in some kind of museum exhibit.

The ARPA and then PARC computer work was very inspired by both the big ideas of the past and especially the amazing amount of work under difficult and primitive conditions to not just think about software uses, but to include both the design and making of software and hardware part of an integrated working practical whole system.

Still, it's hard to beat the LEO story in this regard (I love it!)

I do know Dag Spicer, and others at CHM, and have donated various artifacts to CHM, including a couple of Altos, and a copy of the original Dynabook cardboard model. In addition, CHM is planning a "50th Anniversary of Smalltalk" for this Fall, which will probably partially feature the "Smalltalk Zoo" (working versions/recreations of all the Smalltalks going back to 1972).

A huge challenge (for a computer museum especially) is to provide actual explanations and context beyond just exhibiting artifacts as static objects. Visitors are supposed to "keep moving", and there is little time or place to learn more (a partial exception used to be the Met in New York, which had a great store next to a large cafeteria, so a visitor could buy more context and spend an hour in the cafeteria learning more).

Still, for computers, what's really important to understand about them is not actually shown in a learnable way, especially with regard to software. And the shops are often very lacking in this regard also. For example, a terrific little project at TNMOC is a valve flip-flop kit, which requires one to put together and solder, etc. But there is no explanation of flip flops, their history, and especially no explanation about how the kit itself actually works, or how flip flops are an essential part of computers, etc.

I started to talk to Andrew Herbert because I found that I had one Alto left in storage, and that the TNMOC had some interest in doing an Alto related exhibit. This got me to revisit "context" in general, and to think about "more" in general. And this led back to thoughts about earlier heroic computer projects, like Whirlwind, and especially LEO.

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: https://en.wikipedia.org/wiki/Alan_Kay

April 2021

· **Paul Kelley**

I worked in the Engineering Training Department July 64-August 68 - first at Minerva Road and then at Radley House in South Ealing. I began on LEO III (never worked on the 326 or 360) until switching to System 4 in early 65.

I have in my possession a complete set of LEO III logic diagrams and microprograms. In 2013 I began documenting, in extreme detail, how the various subsystems within LEO III operated. I had available to me the original text of my 1964 notes (and those of others) to assist me. I was intrigued as to whether or not, after 39 years, I could still do it. By way of illustration, attached is a Word doc of my efforts on the Coordinator which I ran by Tony Morgan in December 2013. It won't be too meaningful as there are extensive hyperlinked references to the logic diagrams and other documents.

Also attached is an image of my folder structure. I include this in order to point out that **EVERYTHING** I have has been scanned (1.5gb total) and to draw attention to the **Orig Text folder** which contains all my notes of 1964 vintage for all the LEO III subsystems. In sum, I think it would be appropriate to have a discussion with someone as to how best to dispose of all the above so as to ensure that it is not lost. Some of it may be redundant as it may already exist in the 'archive'. Given that I am now 80 and the sole carer for my wife, time to indulge oneself in this project is at something of a premium and whether I will be able to finish the project problematical at best. In light of these circumstances I would be happy to send a memory stick with everything on it and take advice on how best to proceed with the hard copy versions.

· **Ken Kemp:**

I joined English Electric Leo in September 1964 in Bristol as a trainee computer programmer following graduation. The Bristol office had been in existence about a year as a hardware sales office and a potential computer bureau for the SW of England and South Wales, and had a small staff of about a dozen, the seniors of whom had transferred from Hartree House, London. The computer bureau was to be run on LEOIII/35 which had been sold to the SW Gas Board based in Bath and had not yet been installed. The bureau used the computer overnight and the Gas Board used it during the day.

The bureau business was more successful than the hardware sales side and we soon had customers throughout the SW but not in Wales, dealing with a variety of commercial activities with payroll having the biggest share. The bureau staff expanded quickly, especially in data preparation, and operators who worked permanent night shifts. Following the merger with ICT, the few sales staff moved to the local ICT office, leaving the rest of us to continue with the bureau operation. At this stage, I was now the head of systems and programming. We continued using LEOIII/35 until the Gas Board replaced it with a System 4/50 which was also shared with the bureau operation. I stayed with the bureau operation through a number of subsequent owners, and I stayed in Bristol working as a project manager or software manager with several national companies until retirement.

My LEO activities were re-activated when a printed copy of the Intercode Translator was discovered and David Holdsworth decided to resurrect it. I was one of a number of

people who keyed in a copy of the Intercode from the listing. When David had a workable version of the translator which ran on a PC, I then wrote quite a number of small Intercode test programs to check the translator and LEO emulator were performing correctly. During this time I also contributed to the digitising of the LEO Manuals, the last of which (volume 5), I am just about to start on.

Report on Use of Software to Write and Run Intercode Programs on a PC

Introduction

My colleague, Ray Smith, and I were both involved in the project led by David Holdsworth, to successfully resurrect the Intercode translator and be able to write and run intercode programs on a PC. We could see the benefits for future researchers of early computers, of being able to write and run archaic software. We decided to package up the software which would do this. As a test of the package, we thought we would recruit ex LEO programmers to try the package. If an experienced Intercode programmer could not make the package work, then our package would have little use in 100 years time, and Ray and I would have to revise our ideas.

Forthcoming

Overview of Package

Analysis of Feedback

Conclusions

Possible Future Activities

<https://www.dropbox.com/s/n54quaijemznbq0/Ken%20Kemp%20memo.doc?l=0>

• Mike Josephs: Beginnings

This is in the nature of a bit of self – indulgence. I want to talk about my early days in the fledgling computer industry back in 1957 and thereabouts. Before doing so I want to welcome a new recruit to our circulation list: David Caminer, who must surely be the most senior of us all, as he was a warrior in the Desert Rats back in 1942. His name, you can be sure, will appear in what follows.

While the rest of you will probably have been doing something conventional, like medicine accountancy or ordinary business, I joined a new subsidiary of J Lyons & co which had gone into the trade of making and selling business computers. I will now admit that with my freshly minted maths degree, I had hoped to join IBM but they quickly spotted that I lacked the necessary skills in dissimulation to suit their style of operation.

To me the whole thing was like a job and a hobby and a high pressure trade school all wrapped into one intriguing parcel, made all the more so by David Caminer's role as king of the systems and marketing areas. The business was so young, but he and his managers seemed to know so much about everything. They were an incredible gang of people, full of unexpected talents.

I never really understood how the whole thing had come about. We were given some briefs on the company's short history, and various names were mentioned in tones of awe, but we were too busy worrying about where we were going, to concern ourselves with what was already long past. Anyway I left LEO Computers after 8 years, during which it had been merged with English Electric and Marconi, and effective control had passed out of the hands of the original senior team.

So why am I suddenly rambling on like some old codger reflecting on the errors of his youth, when as everyone knows I am supposed to be writing a deconstruction of the Financial Ombudsman Service to submit to the Commons Treasury Committee? The fault lies entirely with an authoress, Georgina Ferry, whose field is the history of various significant enterprises. She recently published her latest entitled "A Computer Called LEO", and to my surprise it is very good indeed.

It is not just a picture of the exciting days of a new technology which in the space of 50 years we have all come to take for granted, but simultaneously it charts the decline of a massively successful family owned food business which could not adapt itself to the demands of that new era. Although I encountered some of Lyons' strange ways, I knew too little about business elsewhere to put them into an overall context, but the book makes clear just how feudal and paternalistic the whole operation was. When push came to shove, the youngest family spriglet ranked above the most senior 'employee' director. And those senior employees wanted it that way. They saw themselves as squires to the family knights, not ambitious for themselves and devoted entirely to the family interest.

As a result, a degree of real humility percolated down through the ranks of the management and was imbibed by the fractious juniors like myself. If John Simmons, hyper-competent administrator and famed initiator of the whole Lyons computing enterprise, saw himself as no more than a capable family servant, who was anyone else to put on airs and arrogance? The contrast with executive culture and self promotion at the start of the 21st century could not be greater. I suspect that many of those old Lyons managers (though not us LEO people) would have fitted into Ancient Egypt without a ripple.

The Lyons company's self-image was of an immensely competent enterprise which had forgotten more about running food businesses than anyone else had ever learned. At its heart was an administrative machine that kept rigorous track of every bit of raw material and every hour of labour, and reported profit margins on a weekly basis. They, like the Marks and Spencer of the same era, were always looking for better, cheaper, more effective ways of doing things, so they found room for men of imagination and energy who would challenge established practices and propose better ones.

Unfortunately, marketing, finance and business strategy were not subject to the same types of intellectual discipline, but they were the fiefs of family members who reigned like Dukes over major parts of the whole empire and whose word could not be gainsaid.

As I read the book, I came to understand the strange conjunction of circumstances that led this food company into pioneering the application of digital computers to the operation of

major businesses, both their own and other businesses with forward looking management. Simmons (also a Cambridge maths graduate) had come to realise that the process of administrative improvement was blocked by the lack of suitable office equipment: everything available up to 1950 was just too damned dumb, and needed the work broken up into excruciatingly small stages. He realised that the new-fangled computers, just emerging from the labs of leading universities, could offer the solution to his problems.

His solution was simplicity itself: offer some funding to the Cambridge computer wizards, and in return get their advice and co-operation in designing and building Lyons own machine which would be tuned to business work the way the academic machines were tuned to scientific computations. Lyons and Simmons were even more 'can-do' than the American Marines.

As I think about this unlikely set-up into which I so innocently plunged, I realise that even today, after all the vicissitudes, some of my good friends date from that era: Frank and Ralph Land, Alan Jacobs, and perhaps one or two more whose origins I have forgotten. I might even include Robin Fairlie who made a huge success at Remington Rand/ Univac after David Caminer refused to be persuaded by my recommendation that Robin be taken onboard.

Now the engine of this unlikely subsidiary was not Research or Production, but was indeed the Systems Department run by David Caminer, who had learned his trade under Simmons in Lyons own Systems Department. That is where I started as a humble programmer, learning at the feet of people like Frank and Alan. These strange but clever people cared about only one thing: 'Did it work?', by which they meant 'Did it do the job we had promised the customer?' This was a very strange idea in the computing world of the day, where it was taken for granted that nothing would ever work first time, and certainly nowhere near the original budget.

But this was the philosophy of the Lyons people and we imbibed it from them like mother's milk. Neither intricate requirements nor unreliable equipment could be allowed to stand in the way of doing the job properly. They were just obstacles to be surmounted. If you didn't know how, then ask. If no one knew how, then work it out for yourself. The product of all this was a remarkable type of person, not so different from what you might find in a university engineering department. LEO people were unassuming but intimidating in their confidence that they could solve any problem that was capable of solution. And they proved again and again that the confidence was justified.

Looking back, it is easy to see that what was really special about LEO was the systems know-how, and that 'attitude'. It today's parlance we would say that they were without equal as systems and project engineers, and however good the youngsters were David Caminer was even better. Of course, he had the advantage of the right sort of basic training, which we all skipped because there wasn't time for that old fashioned 'organisation & methods' stuff.

That was the business that LEO should really have tried to be, but the directors had got the computer building bug and could never throw off the habit. Other people picked up the idea of systems consultancy and made fortunes doing badly what LEO could do well, but LEO wanted to be in the production business as well, which is something that burns real capital. Of course the mergers went badly, because the paternalist Lyons Board had cut their losses and cut their ties with LEO with the ruthlessness that would make a 21st century capitalist quite proud. None of the LEO directors even knew what was going down – they were sold out without warning!

I always seemed to be dragged into the strategic errors that senior management insisted on making, like setting up an operation in Johannesburg when we didn't have enough of 'the right stuff' to cope with the UK market. It was only when I read the book that I realised that DC and I thought the same about that little jaunt, even if it did give me a year in the RSA.

Reverting back, to when I returned from South Africa, I had to serve a two year stint as Caminer's technical fixer, which was sometimes a non-job because he was his own best fixer as all the rest will gladly testify. It also meant that I was under his feet a bit too often, which was widely regarded as something to be avoided if at all possible. Anyway, as a reward for sticking it out, and helping to get some advanced computers into production (something which Georgina talks about while neglecting to mention me by name for some reason) I was promoted into product planning in the Research Division, which I now learn from Georgina was a bit of merger politics that was not expected to produce anything.

There I turned myself into a pale copy of David C. and ran around like a demented bluebottle making enemies in all directions, but coming up with a credible scheme that unfortunately was just a bit before its time. Meanwhile the real version saw which way the corporate politics were going and espoused the proposal that the English Electric brigade wanted to hear. Our work in Research wasn't entirely wasted, because ten years later after yet more mergers, it was incorporated into a line of machines under the ICL label.

That was about as close as I got to corporate glory, but as they say, it was a great learning experience and helped prepare me for the rough and tumble of management consultancy. But what I didn't realise was how much of British industrial history in the 20th century was encapsulated in the strange case of Lyons and its LEO computers. Do read Georgina Ferry's book if these things interest you at all.

Professor Alan Kay XXX019

From Professor Alan Kay distinguished American Computer Scientist known for his work on Object oriented coding and winner of the Turing Award in 2003.

I knew Maurice Wilkes slightly many years ago, Roger Needham years ago, and most recently have met Andrew Herbert. The latter two had spent some time at Xerox Parc, and it was Andrew who told me about your society after I mentioned LEO as a good follow-on exhibit/story to TNMOC's recreation of EDSAC. He also explained about the society's museum presence in Cambridge.

Still, I think having at least "a wall" at TNMOC about LEO would greatly add important context to the larger story of computing, and especially British computing.

To me, there is more of an interesting parallel to Whirlwind development than to the IAS machine (especially with regard to scope and software). I think the LEO software schemes for the Lyons' businesses were both landmarks and early, and deserve to be more told in some kind of museum exhibit.

The ARPA and then PARC computer work was very inspired by both the big ideas of the past and especially the amazing amount of work under difficult and primitive conditions to not just think about software uses, but to include both the design and making of software and hardware part of an integrated working practical whole system.

Still, it's hard to beat the LEO story in this regard (I love it!)

I do know Dag Spicer, and others at CHM, and have donated various artifacts to CHM, including a couple of Altos, and a copy of the original Dynabook cardboard model. In addition, CHM is planning a "50th Anniversary of Smalltalk" for this Fall, which will probably partially feature the "Smalltalk Zoo" (working versions/recreations of all the Smalltalks going back to 1972).

A huge challenge (for a computer museum especially) is to provide actual explanations and context beyond just exhibiting artifacts as static objects. Visitors are supposed to "keep moving", and there is little time or place to learn more (a partial exception used to be the Met in New York, which had a great store next to a large cafeteria, so a visitor could buy more context and spend an hour in the cafeteria learning more).

Still, for computers, what's really important to understand about them is not actually shown in a learnable way, especially with regard to software. And the shops are often very lacking in this regard also. For example, a terrific little project at TNMOC is a valve flip-flop kit, which requires one to put together and solder, etc. But there is no explanation of flip flops, their history, and especially no explanation about how the kit itself actually works, or how flip flops are an essential part of computers, etc.

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One of the nice and important properties of LEO is the wealth of documentation and detail -- although I gather that this doesn't extend to the actual software that otherwise could be resurrected via emulation. However, the wealth of early system planning and ambition is priceless. Parc was almost the opposite in that, though the planning was pretty crisp, there were not a lot of planning documents, but there are readable tapes of large parts of the SW, and working Altos (also very detailed emulations including the microcode etc), with the result that quite a bit of what actually got done can be demoed today. Very useful partial exceptions are CSL's minutes of the weekly "Dealer" meetings in which progress and discussion were shared, and also the 6 month and 2 year reports (I wonder if these got preserved somewhere, I didn't take mine from Parc, and now wish I had). (LEOPEDIA

editor's correction: All the manuals (except volume 2 CLEO) are digitised at <http://settle.ddns.net/LeoMan/Manuals.htm> and there is a working emulation of the Master Routine and Intercode Translator. Intercode programs may be written, translated and run either freestanding or under the Master Routine. In addition we have listings of several customer programs, mainly from London Boroughs, as well as a few CLEO programs.}

In any case, though I am mostly thinking about how more context could be shown about the Alto, I can't help thinking about what could be done with LEO's history to make it more understandable by the public (and I'm sure the LEO Society has thought about this much more than I have). I'm certainly willing to donate funds to help make the LEO story more widely known. https://en.wikipedia.org/wiki/Alan_Kay

- **Ron Kirby**, after leaving the RAF in late 1962 early 1963 I joined LEO at Cadby Hall where I was working on LEO II/I. Following a relatively long career in various companies related to the computer industry I retired and by various routes got involved in local history as part of which I give talks to local clubs and societies. I also belong to a Probus club and a few years ago was asked to talk about an interesting part of my career. I chose to talk about the first computer to run a commercial application and have since turned that into a talk about the rise and fall of J. Lyons and how the British Computer Industry also rose and fell and along the way I cover the story of 'A Computer Called Leo'.
- **Stephen B. Knowles**, was an Operator who became a programmer in Tea Division, His memorabilia include a number of photos of LEO I – see <https://www.dropbox.com/sh/31e20it50u1lkm9/AABdJQ5oWNfEd5yQoH2x6XsGa?dl=0>
- **Frank Land (with Hilary Caminer)** – Reminder of a celebration. On the 30th November 2021 The partnership between the Centre for Computer History (CCH) and the LEO Computers Society (LCS) with funding from the National Lottery Heritage Fund celebrated the 70th anniversary of the world's first live business application – Bakery Valuations – by J Lyons & Co on their LEO computer at their HQ at Cadby Hall. The celebration included the launch of the LEO Film made by Boffin Media with lottery funding and available for viewing at ..., , presentations by Peter Byford, Dame Steve Shirley and Frank Land

The Film is intended for younger view to get an appreciation of the early days of business computing and the pioneering work of the LEO team. To view the Film and respond to a feedback survey please click on the followingand send your own comments to Frank Land for posting to LEOPEDIA.
- **Ernest Lenaerts**: Extract from his diaries on the occasion of Princess Elizabeth's visit to Cadby Hall on 15 February 1951, including a demonstration of LEO I performing test calculations.
 - HRH was no more and no less impressed than I had expected. The information "printed at the bottom which provided some light relief. Fortunately LEO made few mistakes – obviously not subject to stage fright and the Demo went off smoothly. A little more interest was shown I think in the interior of the machine when she saw the complexity of

the circuits – how many of this machines like these in existence?

Only one other in working condition – No others on commercial clerical problems. This auspicious occasion called for an enormous improve in general tidyness of the lab and I must make an effort to preserve this. My own desk was clear for the occasion – the first time in months. Work on the machine can go ahead again and I have been given a more or less free hand to proceed on which problem I deem the best tackled first. The object will be to bring the machine to full operating condition as soon as possible so that Caminer & Co can get [[weaving]] on some of the programmes that they have kept up their sleeves for so long. The first and most obvious fault to be cleared is the corruption in the Teleprinter which I Think are due to breakthro in the output Unit. Other troubles to be cleared are occasional “1”s being added into the store. These have the effect of spoiling all of the test programmes received from Cambridge ” View [the post here.](#)

Stewart Logan, LEO III at Ravenscraig

Colvilles Ltd., Ravenscraig Steelworks

A Short Description of the Leo3/32 Production Planning & Control System

Introduction

Colvilles Ltd. Steelmakers installed a Leo 3 (No.32) in their Ravenscraig Works in Motherwell in 1963. In 2021, Dr. William (Bill) Jack, leader of the systems development team described in a paper to the Leo Computers Society the systems developed and run on this computer. I was the lead analyst on the Production Planning and Control system and was asked by the Society if I could provide further detail on how Lector OMR techniques were used. I was not involved in the concurrent development of the payroll system so my recollections are only of the PPC system. This request was made nearly 60 years after we had acquired the Leo and all documentation had long since been destroyed. We clearly did not have the foresight to realise that what we were developing could be regarded as pioneering.

Locating some lost information

Perhaps a word is in order as to how I managed to get a little more detail. In 1967 I had just got married and was working on draft drawings of a house I planned to build. By pure chance, I recently found that one of these drawings had, on the back of it, most of a flow chart of the Production Planning & Control system that we had implemented. I think it is probably just missing 1 or 2 operations down one edge so it gives a very good picture of the scope of the system. It is unfortunately very faded and not really suitable for adding to the Leo archives. I was able to pick up much detail of the use of Lector documents from it but, regrettably, have not managed to trace any of the actual documents. This flow-chart, however, enabled me to extract further information about the system.

Why optical mark reading?

The primary requirement of the system was to provide information as at 6am for day staff who started work at 8.30am and for production meetings at 9am. This was not possible to achieve using conventional data preparation.

Collection of order details

Lector documents were used to collect data on new orders, order amendments, order cancellations and order completions. These documents were completed by sales personnel in an office environment. This information was input to the system run at 6am daily thus providing an updated order file.

Collection of steel movements and change of status

As Dr. Jack explained in his paper, for process scheduling reasons, it was not possible, unless an order was very small, to move all of the material for it through the plant together. However, by tracking the movement of every piece of material, whether or not allocated to an order, the system could provide the requirements of every order and the present progress towards order completion including whether there was a shortfall of material for it.

Lector documents collected information on the creation of steel slabs, their dimensions and allocation to orders and the coil of steel produced from each slab. Thereafter, Lector documents were used to record every movement and change of status of a coil. In later processing, a coil could be cut along its length into 2 or more narrower ones. Coils could also be cut into bundles of sheets and further processed. Lector documents were also used to track material through these processes. Where a coil was despatched to Gartcosh Works finishing processes the tracking continued until despatch from there as either coils or bundles of sheets. The data recorded on each coil or bundle as it passed through the processes included a code for the process, any change to dimensions, any change to weight and any change to grade (which resulted in it being removed from its allocated order). A lector document was also used to collect information on surplus stock being allocated to suitable orders. The tracking of coil and sheet bundles movement thus covered all processes until the material was despatched.

The Lector documents were completed by recorders on the shop floor (see appendix 1). The data was collected through a 24 hour period and input to the Lector machines at Ravenscraig and Gartcosh. Trials showed that time was probably insufficient to get the Gartcosh Lector paper-tape output driven over to Ravenscraig after 6am. add it to the Ravenscraig data, complete the system run and get the Gartcosh print-outs delivered all before 8.30am. A paper-tape reader to paper-tape punch link was thus commissioned between Gartcosh and Ravenscraig.

The system produced production reports for morning progress and planning meetings at 9am. Additionally, order file reports were produced showing the present status of each order so that remedial action could be taken if it was running late or short of material. Lists were produced of the stock ahead of each production unit to assist schedulers with their work and to greatly simplify periodic stock checks. Subsequent stock-checks showed the system to be highly accurate.

Analysis of the recovered flow chart indicates that there were 52 Cleo routines providing vetting and files updating together with about 50 printed reports. There were upwards of 30 sort routines. I do not have actual figures but there must have been many hundreds of order and stock changes every 24 hours.

Development team

Initially, the team comprised about 9 personnel who worked on systems analysis and the early stages of systems design. As work progressed, 6 of the team then programmed the analytical work. It seems remarkable that the system design and implementation was done by only about 3 systems analysts and 6 analyst-programmers using Cleo, which speaks highly of that language. The basic tracking and reporting system was implemented in late 1965 by the team that had only been trained early that year. However, continuous enhancements followed in the use of all the data that was being collected.

Further development

Round about 1970, under a British Steel reorganisation, the Leo 3 was to be replaced by an IBM 360/40. It indicates how highly the Leo system was regarded that the suite of programs was rewritten almost unchanged in PL1 to run on the IBM machine. This rewritten system which was implemented in 1973 still used Lector documents for several years until replaced by on-line terminals.

Stewart Logan
November 2021

Appendix 1 – Design of Lector forms

Trial OMR documents were printed and tested out on shop-floor production recorders. Most of the data to be collected was numeric; items such as material identity, any changes to dimensions, weight, grade or anything else that could change at any specific production unit. Alpha data was very limited and normally restricted to one of several characters. The test documents had the particular processing unit identity pre-printed on them. As most of the data to be collected was numeric, each character of a particular parameter to be input was represented by four, what we called, soup-bowls labelled 1, 2, 3 and 6. Thus, by filling in no more than 2 of these soup-bowls by pencil, any digit from 0 to 9 could be

represented. Thus recording a material identity of 5 numeric characters would be represented on the pre-printed form by 5 groups of these 4 soup-bowls. The choices of the limited acceptable alpha characters were all represented by individual soup-bowls. We were advised that shop-floor personnel would not understand this. We argued that anyone who knew how to fill in a pools coupon would soon master it. Trials showed that we were right. Subsequently, once the system was implemented, we only had one failure – a person who was dyslexic.

• **Ron Marshall**

I worked on Leo II at Cadby Hall and Leo III/1 at Hartree House as a technician. I had become disillusioned with the Banking and Insurance industries which formed the basis of my first work experience.

I joined Leo Computers in early 1960 - I had previously been working on teleprinters at the GPO and Leo were looking for technicians to service the paper tape data entry equipment. I was at Cadby Hall for some training prior to this. I worked - among others - with Robin Stanley Jones and I think Maurice Blackburn was there as an Engineer at that time.

I worked shifts maintaining the peripherals and received training on the mainframe. It was an exciting time. I remember a visit by the Duke of Edinburgh and the programmers had arranged for the mainframe to play 'The Sailor's Hornpipe' for him! There was a later visit by the Queen Mother who asked to see a computer.

I left Leo in 1963 - I had just got married and my new wife's father invited me to join him in his car retail business - big mistake! I re-joined what was now English Electric Leo Marconi (I think) in 1967 and once again worked at Hartree House. I became Technical Support for London and also trained on the VM operating system.

My manager was John Francis and I seem to remember working with Dave Hewer another Technician. I left what was now ICL in 1975 to emigrate to Canada - I had been trained on the then new Cougar Solid State Memory Systems so my skills were in demand in Canada. I worked first for ITTEL where I trained on IBM 360 systems and peripherals and then Storage Technology (STC later STK) where I became VP Customer Service until 1990.

I retired in 2005.

<https://www.dropbox.com/s/c96r3t2tj4r83ci/Ron%20Marshall%20memoir.doc?dl=0>

■ **Joe McNulty**

DOB: 1940

Joined LEO: 1966

Role in LEO: Site Maintenance Engineer LEO III; System 4

Abstract: Born in Northern Ireland, father miner, mother textile worker, moved with large family to village in Northumberland, failed 11+, educated in local elementary school till age of 15 without any qualifications or certificates. One brother was an apprentice electrician at a local pit and attended Carlisle Technical College one day a week. Joe taking a peek at his brother's books became interested and he too became an apprentice electrician at a local coal mine and attending Carlisle Technical College where he gained his ONC in mathematics and Electronics at the highest level. In 1961 opted to join RAF as a Radar technician serving part of his time in Malta. On completing his service, having acquired a love for electronics, looked for a job with computers and in 1966 was taken on by EELM to train as maintenance engineer on LEO IIIs at Radley House. Notes the quality of training he received. "I loved every minute of the course". Moved to Scotland as site engineer on a LEO IIIs and System 4

machines. After a successful career left ICL in 1972 to work in a number of electronic companies, before setting up his own consultancy and completing an honours degree in mathematics at the Open University. Joe retired in 2009. Final words from a fascinating memoir: “For me, I think, LEO provided an environment and situation in which I could succeed in my own terms. I was doing work that I could understand, that I liked and that made sense to me. In a sense, that gave me an attitude of if I can understand and use a computer, I can learn to do anything. That’s a big thing to say about a company but I believe that, even then, it was a special sort of company with special people in it”.

Repository: Dropbox

https://www.dropbox.com/search/personal?path=%2F&preview=Joe+McNulty+Memoir.doc&qsid=46282171009852707120531243657035&query=joe+mcnulty&search_token=maaZCi5EZfs9ghMHde3MaOmE5gIkeIs7mVIUbNhfSkQ%3D

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Restrictions: None Known

Chris Metcalfe

I fell out of secondary school at 16 in the late 1960s after failing most of my GCEs and joined the Civil Service in central London filing bits of paper as a temporary clerical officer. After failing to join ICL my father thankfully suggested I get a transfer (without interview!) to the Census Office computer section at Eastcote London. On arrival I was told I was a week early but as soon as I was introduced to the work I knew I was in the right work area which lasted 25 years! As a computer operator on the LEO 3/10 I started as peripheral loader (magnetic tapes, paper tape, printers) and when I got my Executive Officer grade I was in charge of running the computer. We had very sociable evening overtime sessions playing bridge whilst long computer programs ran. Typically four hour magnetic tape sorts with no restarts! I recall the water cooling system barely coped in the hot weather. I made my mark during a payroll run when a printer cheque number sequence problem occurred, by altering the tape block count in binary using the oscilloscope.

I later moved to the ICL 1904? computer on the same site and then transferred to the new Fujitsu? 1905E and George 3 at Newport South Wales. On promotion to Higher Executive Officer (only 1 in 5 applicants were successful I recall!) I headed the Operations Systems Support section. I wrote a world first macro to allow files to be deleted from an on screen list. 24 levels of nested IFs! Later moved on program system support and programming and EU & UK project work. Not too bad a career for someone who had few recognisable qualifications or had ever passed an aptitude test! I did get my AMBCS and still working!

Ross Milbourne Memoir and Tribute to Lyons, LEO and its people.

I have lived and worked with computers in industry all of my life, and have now retired. It has also been a lifelong hobby, as well as helping pay to bring up my family. The career I followed, from COBOL Computer Programmer in the 1970s, to I.T. Director in large organisations over the past 30 years, was founded by your father, David Caminer, and his colleagues at Lyons. For that, I will always be grateful to him and the team, as well as deeply interested in what people like David did in their lives, from which so much later sprang.

To make your mark in history, you normally have to be in the right place at the right time, with the right equipment, education and ideas. However, you also have to be a very talented person in your own right, or part of a talented team, to make the most of that opportunity and turn it into a success. To make your mark in history, you normally have to be in the right place at the right time, with the right equipment, education and ideas. However, you also have to be a very

talented person in your own right, or part of a talented team, to make the most of that opportunity and turn it into a success.

I hold a Master's Degree, with Distinction, in Computing - that was an absolute pleasure to study for. In my retirement, I have had the opportunity to build a good vintage computer collection, as well as a library of early publications about activity in the field. I volunteer for museums like the CCH at Cambridge, and have restored some of their early 'home' computers, such as the Altair 8800s and IMSAI 8080, for public display and demonstration. I understand that they have also carried out a good deal of work related to LEO in the past few years.

For my part, I have gradually accumulated more material about LEO during this period, including collecting a few of the 'standard' books on the subject, and I have loved reading about it. As I have delved deeper, I have come across other articles and material to add to my understanding and, finally, tripped across 'LEOPEDIA' on the Internet. What an amazing resource!

I quickly recognised that 'LEO Remembered - by the people who worked on the world's first business computers' was a 'must have' that was missing from my collection on the subject: hence my request to obtain a copy from you.

On a private note, I have a couple of letters in my collection from John Simmons to Richard Sharpe, the editor of 'Computing' Magazine, back in 1979. These were contained in Richard's personal copy of: 'LEO and the Managers', published by John Simmons, that came onto the open market recently.

They mention David Caminer, when he was living in Luxembourg, apparently. 'Computing' were clearly wanting to talk to David about his experiences for articles they were writing at that time, given it was the 'Silver Jubilee' of LEO. John Simmons had offered to get in touch with David for them, to gauge to what degree he might like to participate.

Ten days later, came the reply, which John quotes as follows:

"Of course, pleased to give what help I can to the project you mention. Unhappily, most of the earlier papers of LEO programming seem to have perished in one of those necessary but sometimes destructive clearances of the filing areas. It wasn't easy to know thirty years ago that they should have been given the retention classification of 'infinity' as historic documents!". How prophetic those words sound now, another 40 years later.

Archived in Dropbox at

<https://www.dropbox.com/s/ylqayspiuic8437/Ross%20Milbourne%20memoir.htm?dl=0>

- **Peter Mills**, Memoirs

After National Service, where he was first involved and trained in electronic engineering, and being demobbed in 1954, Peter responded to an advertisement placed by Lyons for a job as an electronic/mechanical engineer. Following an aptitude test Peter was offered a job to join LEO. He spent the next few years helping to keep first LEO I and then LEO II machines operating. Though leaving LEO Computers he returned to the LEO fold by joining the LEO team at the Ilford LEO II. In his memoir he tells of his pride of having worked with LEO.

Repository: Dropbox.

<https://www.dropbox.com/s/q0sdhjgrh3e05m6/Peter%20Mills%20Memoirs.docx?dl=0>

- **Andrew Murison**, Northwich. I have just read your article in the February issue of Third Age Matters – I am a member of the Winsford, Cheshire, U3A. In the 1950s and 1960s I worked at Stewarts and Lloyds Ltd. Corby steelworks, who installed a Leo computer in 1958. A school friend of mine, having graduated in mathematics also worked at the steelworks as a programmer on this computer and although I was an engineer and had no official connection with the computer I was shown round by my friend – who was called John Lamb. I remember the “air conditioning” system quite well as my father (now deceased) worked in the S&L new development electrical dept. The “solar gain”(sunlight) on the large picture windows plus the heat produced by the electrical equipment in the computer building caused all the thermal overloads to trip out – stopping the computer. The quickest installation to cool the building was then installed!

Over the years I have lost touch with him so can-not help you as to his whereabouts. In the 1980s the Corby steelworks was demolished and no longer exists but the tube works section was retained in working order (and still is) The tube works is now owned by Tata. Tata have an archive section based at their Shotton works and may have information. The other possible source of information is the Corby Heritage Centre. I have a booklet about Stewarts and Lloyds steelworks which has a picture of the computer and have enclosed a copy.

Robert Murphy. was the computer programmer on the LEO 326 computer in use for the National Savings Bank in Glasgow. I used Intercode and CLEO. The computer was decommissioned in 1974 with the data and systems transferred to an ICL 4/72.

My final task was to print off computer programs and documentation, label them up and package them for sending to the National Savings Archives. If I recall correctly there was a similar exercise going on with the hardware but I was not involved with that.

So there was lots of material kept but I do not know what became of it. It might be worthwhile contacting NS&I to find out what happened to the material and whether you can have it for your project

- **John Oates**, I was involved in Systems Design on the Ford Motors Leo 2/11 between 1960 to its decommissioning on the instructions of FORD US to go IBM. In this time I was mainly responsible for a system to control and monitor the introduction of new models which resulted in a massive elapsed time reduction to launch. If you have any interest, feel free to eMail or call - 01242 239647
- **John Panter** LEO Engineers responding to Request to identify computer depicted in MGM 1968 film “Hot Million” starring Peter Ustinov as criminal computer operator, see entry in Film section below.

This brought back a few memories! I can make a few comments.

1. I didn't know Fred Whittaker. I moved from Minerva Rd to Kidsgrove in summer 1965, so left before he joined.
2. The decks shown in the first picture are definitely Potter M120 drives. This is a link to the 1964 Potter catalogue I discovered:-
https://archive.org/details/TNM_EDP_Equipment_catalog_1964_-_Potter_Instrumen_20180223_0047/mode/2up See page 4. These were used on later

LEO III machines. Previously we used Ampex decks. The Potter decks were never used on System 4; we developed our own 4452 and 4453 decks.

3. A far as I am aware, there was never an ICL machine M505. I think this was MGM using a non-attributable name. This link gives a bit more information about the use of our equipment in the film.

<http://www.starringthecomputer.com/appearance.html?f=543&c=288>

4. The photo on Page 3 is definitely of the System 4 4453 high speed tape drive. (150 "/sec). I was transferred to Kidsgrove as the Project Manager for the design and development of this product. I have attached a copy of the marketing photo from which this was copied. The guy is a young (then) electronics engineer, Les Oliver, who worked for me on the project. You can see his hand on the logic rack.

5. I can't definitively confirm any other details, but I would guess that this was a later LEO 326, one that was built specifically for the Post Office. But MGM have done quite a lot to disguise it. I do not recognise it as a System 4!

- **Chris Parker**, I worked at J Lyons from February 1971 to 1976. My first job was working on the LEO 3/7 and LEO 4/6. I was an operator during the conversion to an IBM365/65 over my first 6 months and, when all the systems had been copied (via a System 4 deck), the LEOs were deconstructed. I have, somewhere in the loft, a circuit board from the LEO 4/6. I read your article in the U3A magazine with interest. I'm not sure what memories I have that have not already come to your attention, but I would be happy to discuss them with you - if you are interested?

- **W.E.J. (John) Parry.**

Abstract: Employed by Stewarts and Lloyds originally as engineer on their LEOII/3 computer and subsequently as programmer. Had received training as electrical engineer while doing extended National Service in RAF and in that capacity witnesses UK H bomb tests in Pacific Islands. Joined Stewarts and Lloyds at Corby after National Service and was transferred to help run the LEOII. Two mathematical jobs, Anchor problem and Best Mix ("mineral job") were totally self-contained jobs that I had little or nothing to do with. Also if I remember correctly neither jobs were significantly modified to take advantage of the later addition of the Ferranti drum, which if my memory is correct had a significant impact on the performance and running of the payroll suite. Because these two jobs were considered as "extra demanding" the operations staff used to advise us engineers when they were going to run these two jobs and when I was the duty engineer I used to go and listen to these two jobs running because they generated a totally different "music" to that we heard when running payroll. We engineers learnt a lot from the "music" during 30 mins or so of morning tests and this gave us a clue to how the system was behaving! For S&L Corby the payroll was the major financial justification so why am I emphasizing these two jobs when I knew so little of what were their commercial value to the overall LEO justification I believe S&L in Corby in the early 1950s were an advanced and forward thinking company. So bearing in mind the open mindedness of the Lyons management I suppose no surprise or justification to the S&L LEO II purchase but just showed how forward thinking a company Stewarts and Lloyds was. Subsequently joined ICL. Has recently contributed to the Corby Heritage events commemorating, *inter alia*, to their story of LEO at Stewart & Lloyds. Provided two articles for the May 2018 "Legends" event, including **John's Story**.

- **John Paschoud** on printing Braille programmes. See also Tom Brooks above. I don't know if I can add much to the Blind Programmers story. I never actually met any (of the

blind programmers), and I think it must actually have been when I was Ops SDPO at Barbican NDPS Computer Centre (which was trials and EE System4, rather than production and LEO326, with most of the programmer teams based at Docos House a short distance away). But they were very similar to the barrel line-printers on the 326s at Charles House, Kensington CC. The process involved fitting a rubber sheet about 0.5mm thick between the hammer array and paper, and removing the ink ribbon, so that printing dots in Braille code would leave raised dots on the paper. Then adjusting the hammer force carefully so they didn't actually puncture the paper.

I used the same technique a few years later, on a much later timesharing mainframe (a DECSys-10) because a completely blind little boy joined the Cub Scout pack where my wife was a leader. So we found software to translate the text of some of the Cub Scout Handbook into Braille, and I made a Braille-print kit for our lineprinter and 'borrowed' it for a few evenings.

- **Tony Priest**, visited Cambridge Centre for Computer History, May 2018 and was really happy to hear about partnership with LEO Computers Society and LEO heritage plans. He worked at Hartree House. He was employed as LEO II was being decommissioned and worked on LEO III there. He left a comment on our Facebook page over the weekend: "What a nostalgic visit! The Centre is doing great work to preserve so much that is important, especially the vital importance of the pioneering British computer industry. From the LEO displays - my first job was programming for LEO III - to the development of home computers and games consoles. The incredible computer power now available at such low cost. Keep it up please. And all the best for your Lottery funding bid for the LEO archive material project.
- **Geoff Pye**: Sporting Reminiscences
- Tennis.
- LEO had a team of 6 made up of 3 pairs, organised by John Gosden, to play other Lyons Departments on the courts at Lyons sports club. On each occasion each pair played one set against each one of the other department's 3 pairs thus totalling 9 sets. The tournament was spread over several weeks, one department opponent at a time. My partner was usually Earnest Roberts. Other team members included Alan Jacobs, Joe Crouch, a New Zealander whose name escapes me - all programmers - and Charlie O'Brien, an operator. Leo's performances were "average"!
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- Cricket.
- I remember playing a couple of matches, but do not recollect LEO matches being a regular feature, so probably not a league competition. TRT was an enthusiastic, agitated and critical spectator! Doug Comish was in the team and he may recall more details.
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- **Cynthia Reid**, I was born in Headingley, Leeds in 1935 and from an early age had an interest in science which was encouraged by my parents. I attended Brudenell Primary School, Bennett Road Junior School and Leeds Girls' High School. In 1954 I was offered

Exhibitions to both Oxford and Cambridge Universities and I elected to read Mathematics at Newnham College, Cambridge. At the end of my first year I switched to Mechanical Sciences and graduated in 1957 at which time I was recruited by John Pinkerton to work in LEO's engineering design department at Minerva Road in Park Royal, Northwest London. I had little knowledge of electronics or computers but it seemed an interesting challenge and I was there for four years until moving on to IBM. There were no other women engineers at Minerva Road, but this was a situation I was entirely accustomed to and never really thought about. I had been the only female undergraduate in the 2000-strong Engineering Faculty at Cambridge, the first and only woman member of the Cambridge University Air Squadron (I believe there were no more until the 1980s), the only female pilot at Yeadon (now Leeds and Bradford) Flying Club where I got a scholarship to attain my PPL whilst still at school and the only woman in the LEO motor cycling group where I rode a scarlet Norton 600cc Dominator. I guess being 'the only one' was just a fact of life that I accepted without question - and I am happy to say that I have never experienced prejudice on this account (although I did have to ceaselessly pester the Air Ministry for 2 years before I was finally accepted into the Air Squadron - even with my pilot licence). At Minerva Road I worked on the very early attempts at OCR (optical character recognition) where we were trying to design an input device which retail departments could use to order stock from a wholesale or central distributor. I think we just about managed to detect a very thick black pencil stroke across a precisely circumscribed quarter-inch square! It was an exciting time in that we were moving from thermionic valves and mercury delay line storage to transistors, printed circuit boards and solid state memory. I think I still have somewhere the soldering iron I was issued on my first day at Minerva Road! The only names I recall of my days there were my immediate manager John Bruce, our lab assistant Ernie Aylott and a couple of fellow design engineers Ivan Boskov and Yoram Azar. V

Cynthia Reid, a member of the Cambridge University Air Squadron, at the controls of a De Havilland Chipmunk in 1956, shortly before she joined LEO



<https://www.dropbox.com/s/7laoprvaell0b1a/Cynthia%20Reed%20Memoir.docx?dl=0>

• **Chris Reynolds** Born 23 March 1938 in Hertfordshire. Brought up in Somerset & Devon; Six schools attended before age of 13. Dartington Hall School, Totnes, Devon 1952-56 (very progressive and unconventional). University College London 1956-1959 – BSc in Chemistry. Exeter University 1959-1962 - PhD in Theoretical Organic Chemistry. After starting a career as an Information Officer at a public institution decided on a career move – for a higher salary – with Shell-Mex & PB in 1965 as a programmer working on their LEO III computer, but joined EELM as a Systems analyst/ sales consultant in 1967.. Worked on a number of projects but became dissatisfied with the way

applications were described. He proposed the development of a language (first named DORIS later extended and renamed CODIL) designed for users being able to define their own systems and interested the LEO management in its development. Joined Pinkerton's team in Minerva Road for further work on his notions. Despite progress EELM did not take the ideas further and in 1970 Chris left, first for a job with Plessey as a systems analyst and then in 1971 joined Brunel University to start an academic career, finishing in 1988 with the title Reader. Much of his research was focused on the development of CODIL resulting in a spate of Conference presentations and Journal articles. Ill health and poor relations with new head of department led to early retirement followed by some lecturing at De Montford University and much local history work in Hertfordshire, but also some further work on CODIL. Active member of LEO Computers Society. See <https://www.dropbox.com/s/jt6vmfovwmamm/Chris%20Reynolds%20Career%20History.docx?dl=0>

- **Mike Smith, Trivial Reminiscences of a LEO Man.** Mike had two separate careers with Lyons. From 1952 to 1959 working in the Bakery Division, leaving Lyons for what proved a bad choice, selling insurance, and returning in 1960 as an Operator on LEO, first in Elms House on LEO II and later transferred to Hartree House to work on LEO II/5 and LEO III. Appointed shift-leader after 10 months and later promoted to Chief Operator under Bob Woodward. Subsequently asked to lead a team in the new role of acting as operating consultants to LEO clients. The interesting reminiscence are filed in Dropbox at: <https://www.dropbox.com/preview/LEO%20Oral%20History%20project/LEO%20Memoirs%20C%20Reminiscences%20and%20Anecdotes/Mike%20Smith%20reminiscences.doc?role=personal>

or can be obtained on request from Frank Land – f.land@lse.ac.uk – or Mike Tyzack.

- **Ray Smith,** Reminiscences of a LEO III Operator and Intercode Programmer
Ray started as a trainee operator on the LEO III/4 in Greenwich for the London Boroughs' Joint Computer Committee (LBJCC) in 1966. He progressed to a senior operator before joining the London Boroughs' Management Services Unit (LBMSU) in 1968 as a trainee Intercode programmer. The LBMSU provided the programmers for the LBJCC. After his training course, he was posted to the North London satellite unit which looked after three, later four, North London boroughs with LEO III/94. He was not very happy about being posted to the sticks as he regarded it at the time. However, not long afterward the North London boroughs severed their relationship and his unit became independent. This put him into a fairly senior position overnight. Now he was happy. A couple of years later this unit became the London On-Line Local Authorities, moved to Enfield and installed an IBM machine. Ray was then sent on an IBM PL/1 course. In due course, he rose to the Principal Programmer position. Around 1977 he moved to work for Lloyd's of London where he stayed until 1998 becoming the General Manager of the Systems Development group and finally in charge of development, operations, networking and telecommunications. He retired in 2002 after spending a few years as a consultant mainly for JP Morgan.

My view is that for its time the LEO architecture was brilliant and Intercode was a very significant step forward over its rather elegant (in my opinion) Machine code. It also stood the test of time lasting into the late 70s.

As an operator, I found the machine itself a very rewarding challenge to get the best out of it, but get the best out of it we did (well some of us). For instance: understanding how the Master allocated valuable core storage. If the operator loaded programs in a non-optimum way that would limit the number of programs that could be running concurrently at any

time; forward planning to have tapes ready from the tape store ahead of time that they were needed to be loaded; having the correct stationery loaded in the printer ahead of time if possible; many etceteras.

My chief operator (who didn't operate) would go through the computer log daily to check how efficiently the console operator had performed the day/night before. Indeed, he worked out roughly how much every minute of machine time cost. In pound note terms, it did bring to life how much say, a twenty-minute rerun cost due to an operator error or a five-minute delay finding and loading a correct tape cost. Those that did the least well would find themselves more often than not, decollating 2- or 3-part stationary, chopping and packing payslips and other non-standard items. Those were jobs to be detested and a useful sanction. It certainly spurred me on to become a good operator (sorry to boast, but it is true).

Also, it was also remarkably reliable for its time (LEO III). You couldn't always say that about the quality of some of the programs though. Here I mean user programs

As a programmer, Intercode, which at first seemed difficult, soon became easy once you managed to come to grips with its structures and operators. Like operating the LEO, the real challenge was efficiency, but here it was in terms of how to write programs as small and reliably as possible so as to utilize best the limited resources of the machine and to minimize run times whilst leaving intelligible code behind for some future programmer to understand and amend. Oh, and I nearly forgot, accurately to perform the functions from the users' specifications. This was fun!

I had little experience of CLEO, but it seemed bloated compared with Intercode at a time when computer storage and machine cycles were at a premium and verbose to work with. I bet there were some heated discussions at the time about whether to go via the Intercode route or directly into computer code. I expect expediency won. Anyone know out there?

It did lead to having to have twelve overlays to compile; six for CLEO and six for the Intercode. Fascinating to watch as an operator the tapes doing merry dances going forward, rewinding, searching, running back etc. Had there been disk storage available though ...

My view (not original) is that high-level languages could not have their time until main storage, disk storage and machine cycles were virtually unlimited compared to the time of the LEOs. What a shame they could not have been developed further once those things became available. The CLEO would have been more in its element.

<https://www.dropbox.com/s/6jdj47pzt3pbtb8/Ray%20Smith%20Reminiscences.docx?dl=0>

Eileen Smith Role in Lyons included filling out Lector Forms. I read your article in the magazine with great interest having worked for J Lyons and Strand Hotels. November 1962 I joined the company as a trainee supervisor in the Corner Houses under the direction of Miss Clancy and Mrs Silverlock. It was a 9 month programme followed by a posting to one of the units. I went to The Grill and Cheese and The trolley Restaurants at the Tottenham Court Branch. Miss Brett was the House Manager. As part of my training I had to learn how to complete the Leo time sheets. I don't remember too much other than we had to use a particular strength of graphite pencil and only fill in the brackets[sausages] very carefully. If you went over the bracket then wrong payments were made. I enjoyed my time with the company but moved on to manage a restaurant having completed a 3 year full time programme on Hotel Management before coming to London for work. I did a further 5 years with Strand Hotels before the takeover by THF as a Personnel and Training Manager with the Albany Group. I still have contacts with former Strand Hotel Colleagues and when the

Regent Palace closed its doors I attended the Grand Finale . We all came away with a DVD of the history of the company which I think I still have tucked away somewhere.

Hope this info. may be of some interest although I am not a computer boffin.

Tony Carrol Operator at Wills Tobacco

My involvement with LEO started when I was a schoolboy. I had taken my "O" levels and was going into the 6th form but I wanted to mix Classics and Science and was told in no uncertain terms that this was not possible. I could not just do Science as the only chemistry exam I passed was by ignoring the H₂O s etc and just concentrated on the maths. I thought this was NOT chemistry. So I ended up doing Classics which did not suit me.

Through a friend of my mother's I went for a job as a statistician but did not get it (thank goodness) and then I heard that there were vacancies for trainee computer operators in W. D. & H. O. Wills. This sounded interesting and I was fortunate to be taken on and started in September 1959 (on £265 per annum). I rapidly progressed up to Shift Leader and stayed doing that role until 1969/70 the boss of the department (Bob Brett, with whom I am still in touch today) wanted to move me to Systems and Programming. And so I moved , thoroughly enjoying that time, and stayed in IT until I retired for the second time in 2003(?).

One interesting occurrence happened on 10th July 1968, but cannot be part of my talk on LEO, was that our computer (a KDF9 by this time) was flooded to a depth of about two feet. As luck would have it, the workload on another KDF9 had just been transferred onto an IBM 360 (?) and this empty KDF9 was only about 7 or 8 miles from our site. We used it for one month, burning out the motor on a brand new printer in that month, and then returned to "our" KDF9 which had been successfully returned to life with, I believe, only two new boards. I also remember that we only lost a few mag tapes.

— **Judy Smythson (nee Worrall)**, Leo career began in 1959 when I was interviewed by the man I was to marry, John Smythson. Little did he realize what a momentous interview that would turn out to be! I worked as a programmer at Hartree House under Helen Clark, (later Helen Jackson) for about 4 years until I had my first baby. I spent the next 15 years bringing up the children followed by a PGCE course to enable me to become a Maths teacher. I taught at various local schools when I retired to look after John for the last 25 years.

Dag Spicer On Friday 18th February 2022 Dag Spicer, senior curator of the American Computer Museum and American correspondent of the LEO Computers Society presented the history of the Museum, its holdings and in particular its affection and holdings of material related to LEO. Dag defined the Lyons/LEO story as a promontory in the evolution of computer use – a very apt definition. The presentation was via Zoom and finished with a question-and-answer session with many members of LCS and CCH joining in.

— A recording of Dag Spicer's presentation on **the Computer History Museum, Mountain View, California** on the Society Website can be viewed [Here](#) and the Museum's website on : <https://computerhistory.org>

- **David Stroll** Joined LEO Computers Society in July 1919. Currently a PhD student at Birkbeck College engaged in researching the history of Works Study and O&M and their relationship to Systems Analysis, and with the aim of designing a productivity measurement dashboard. His studies followed after a long career in management starting as a Management Trainee with ICL in 1968, a stint as regional sales manager, followed by management with DEC and acting as an independent consultant. For a fuller account of his career see <https://www.dropbox.com/s/viw9d5pjf1f18i8/David%20Stroll%20Innovation%20Projects%201981-2019.docx?dl=0>
- **Sumner, J. (2015),** See also in extract from the paper in Articles section.
 - History and Technology, an International Open Access Journal, Volume 30, 2014, Issue 4, pages 309-333 | Published online: 24 Feb 2015.
 - <https://www.escholar.manchester.ac.uk/api/datastream?publicationPid=uk-ac-man-scw:261886&datastreamId=POST-PEER-REVIEW-PUBLISHERS.PDF>
- In 1947, J. Lyons and Company, Britain's leading catering firm, sent two senior managers to the USA to investigate American systems of office management. Their bald conclusion was that established practice could teach them nothing: 'We did not find any firm which has developed on so broad a front as Lyons, most offices only having tackled a limited number of office problems without having surveyed the whole field'. Physical layouts – notably including that of the Pentagon – were poor, and development plans conservative, tending blindly to ignore the potential of rapid electronic processing. Far more exciting was the extensive American work on digital computing, but this was still largely uncommercialised.¹¹ Learning that there were British efforts in the same direction, the Lyons managers fostered a partnership with researchers at the University of Cambridge to develop the Lyons Electronic Office (LEO), which automated the bulk of the firm's payroll, stock control and valuation tasks across 1951–54, placing it at the forefront of international developments in this field. Lyons then formed a subsidiary to market LEO equipment to other businesses, stressing its business context as a unique guarantee of user-focused design.¹²
- A similar story played out in parallel at Ferranti, the commercial electrical and defence contracting group, which in 1948 sent a representative, Dietrich Prinz, to the USA to assess the state of the art in digital computing. Prinz's American hosts, according to company legend, wondered 'why he had come there, since the most advanced work was being done on Ferranti's doorstep at Manchester University', where the

cathode ray tube storage system had become the basis for a prototype computer.

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• **John Sutherland** responding to John Aeberhard: I have just finished belatedly reading your interesting article about the story of LEO and thought you might be interested in a further development of the story. I started to work for ICL in Dalkeith in 1972. As I understand it, at some stage between then and 1975 when I left, some of my colleagues were working on a project to put LEO onto the 2960 (I think) for the Post Office. Apparently, the Post Office unions insisted on retaining their existing LEO system, so my colleagues were microprogramming the machine, which was also capable of running VME systems to run DME/LEO

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- **Alison Taylor and Chris Tyson**, I am a 77 year old graduate of Aberdeen University, now living in Jersey. In the 1950's we lived in Hastings and my parents would take us up to London to a show, we often used to go to Lyons Corner House for a meal. So I always loved Jo Lyons. I met my first husband, **Christopher Ian Grigor Tyson**, at university. When I graduated in 1963, we came down to London to look for jobs. Chris had failed his degree, but was delighted to be given a job by Leo Computers Ltd, while I joined English Electric in their domestic appliance division to do market research. My brother was working for ICL (the English Electric Computer Co, in Staffordshire). We had another friend who was working for another computer company, but the name escapes me, and another for IBM, so when we had parties everyone had to define their terms before they could start talking about their jobs as each company used different words the the same thing. Chris Tyson stayed with Leo Computers until his death in 1970, but the company name changed half a dozen times. Leo was bought out by English Electric and became "English Electric Leo Marconi", then it joined with ICL, and was taken over finally by ICT. As far as I can remember Chris Tyson worked in the same office in Bayswater(?) despite the changes in company name. I think it was LEO III that Chris worked on. I have no momentos of Chris' time at Leo, but I do have a Pelican book "Electronic Computers" by S.H. Hollingdale and G.C. Tootill first published in 1965. It mentions the beginnings of the British computer industry, which confirms my memories of the companies above. I would be very happy to send you this book if you do not have it already. Myself working for English Electric, I remember using punch cards and paper tape to analyse the results of my surveys. For many years afterwards we used paper tape to hang Christmas cards from the picture rail as it was so much tougher than anything else. I hope this snippet of information is of interest to you and long may the society prosper.

- **David Tebbs** Date of Birth: October 1938, joined LEO 1964 left 1969 **Memoir:**

I joined the company earlier enough to qualify for the society, starting work at Hartree House. However, I was assigned mainly onto a KDF 9 client project and then and System 4 Sales. My only LEO computer work was self- study of the LEO coding manual (to fill in 3 weeks awaiting my first programming course - which turned out to be KDF9) and taking on, as area manager, responsibility for the Lyons' account shortly after their computer room fire. Even the latter was short lived as I was then promoted to set up and run the new Real Time department.

<https://www.dropbox.com/s/x1060y7bk8djvf7/David%20Tebbs%20memoir.doc?dl=0> For

a listing of David's current activities (October 2018) see

<https://uk.linkedin.com/in/davidtebbs###>

- **John Thompson**, born 4th January, 1935, joined LEO with no knowledge of computers But got some very good training and education at the training centre. I worked on the LEO I II and III as maintenance engineer and later at Minerva Road building and installing systems I do recall some funny things One year we selected the wrong cow as the winner at the dairy show, and we did payroll for the RAF officers and once made an error that made every officer donate half his pay to RAF Benevolent Society but the problems were always fixed very quickly and considering the amount of work being done it was good for the early time in that industry.
I installed a number of systems in the UK and we had very few delays in the scheduled handover to the customer thanks to fast response to any calls for help
I was just one of a great team that worked hard and had FUN. Later I moved to Canada and completed my career
there. <https://www.dropbox.com/s/wgeg807wthgqsa5/John%20Thompson%20memoir.doc?dl=0>

- **John Tomlinson**, LEO Operator. Bob Stevenson notes: "The John Tomlinson that I knew was an operator and shift leader on III/1 in Hartree House. I knew him well and I can't remember him mentioning that he worked on Leo1. The picture is dated in John Bird's book as 1953, which would make John T., pretty young at the time I would guess. I remember that it was John who went to Moscow to work on a demonstration Leo III at a Computer Show there. I wanted to go but the Bureau management wouldn't let me, so I nominated John."

- **Mike Tyzack's** story with Leo computers

MINISTRY OF PENSIONS & NATIONAL INSURANCE

In 1960 I was working at MPNI in Coventry. Our payroll was put onto a Leo II in January 1961 but I never saw the machine. I do remember that the printer had a limited character set because instead of using the figure 8 it used capital S and instead of zero it used O.

DUNLOP RUBBER CO LTD

My first programming job was at Fort Dunlop in Birmingham on Leo III/3. I started there in 1963. My first program was part of the payroll suite. I remember there was a complaint from one of the rubber workers that he'd worked a lot of overtime but only been paid just over £2:00:00. It turned out that he should have received £102:00:00 but the program only allowed for £99:19:11. There was another occasion when the payroll system crashed overnight and the Coventry factory workers were going to get their wages late. Our manager arranged that all those programming staff who lived in Coventry should go straight to the factory and help fill the pay packets. When we arrived we were not asked to show any identity but were given a case containing £2,000 in used notes and pointed in the direction of a room where we could work. The next suite I worked on was the Production Control System for aircraft parts at the Coventry factory still written in INTERCODE. We had our programs punched onto 80 column cards. When we needed to do amendments we punched those ourselves using a hand punch. We rarely added comments as these involved multi-punches (pressing 2 or 3 keys together to get a character). In 1964 we started using CLEO for a suite of programs we wrote for Dunlop Footwear in Winsford. So then our programs were perforated onto paper tape. When we had to perforate our amendments we got to use a decent Creed machine with a QWERTY keyboard. By this time Leo III/3 was filling up with production work so

Dunlop ordered another machine. I know one of our managers wanted an IBM 360 but we got the first Leo 360. By now we were getting just one amend & trial per day even though III/3 was running 24 hours a day. While we were waiting for delivery of LEO III/23 some of us had to do our trials at BOC in Swinton Manchester on LEO III/13. Each Monday we went up there and took a few mag tapes in a car. On the last week we realised we had 57 mag tapes to bring back but we did manage to fit them all in the Mini around the passengers.

TOTE INVESTORS LTD

In 1966 I got a job as Senior Programmer at LEO III/21. We were just maintaining an accounting system that had been written in INTERCODE. We wrote later programs in CLEO. A major incident while I was there was an infestation of iron filings. The air conditioning system had managed to spread these liberally around the computer room. The Leo III was out of action for a week while engineers wearing protective clothing vacuum-cleaned every piece of hardware. While they were doing that we used one of the GPO machines at Charles House in Kensington. Just before I left Tote I was invited to the Minerva Road factory to see the new System 4.

<https://www.dropbox.com/s/cndh08h4iy95lsy/Mike%20Tyzack%20Memoir.doc?dl=0>

- **Faith Van Rooyen** I am eighty years old and not in very good health at the moment.

I started my career in computers by learning to program in basic machine code and Intercode, on a Leo II at Whitely house in London in 1959/60.

In fact I wrote, in machine code, the 'Boot strap' program to load up and start the operating system running for Leo III.

The company I was working for, a subsidiary of the South African mining house Rand Mines, took delivery on one LEO III.

Leo Fantl pays tribute to her contribution, as the first programmer recruited by him in South Africa in chapter 25 of the Incredible Story Of the First Business Computer.

Alan Wakefield: On 21 Jun 2019, at 19:56, Alan Wakefield <wakefieldalan@aol.com> wrote:

Dear Hilary,

Your note below has prompted me to offer a personal reminiscence of LEO-related activity, or more specifically LEO personnel - related events, and relating in particular to your father, David Caminer. (If you will permit this!).

I was not an original LEO person, but, originally as an early 60's ICT recruit, I had the good fortune, in the late 1960's/70's, to work in a group led by David in the newly - formed ICL New Range Planning Group in ICL House, Putney, shortly after the formation of the ICL merger of the former ICT and EELM (and other subsids.) British computer companies.

David's role and contribution to this phase of ICL's development is well documented and applauded. I have an amusing (I hope) small episode during my time in that group, which I hope may be of interest to you, and some others. For reasons undisclosed to me at that time, part of our NR planning activities

required ICL to partake in some discussions with the French computer industry, in connection with their Plan Calcul, and their CII computer company, based near Versailles, west of Paris, as I recall. (There was a lot of political activity in Europe at that time with the proposals to form a "European" computer organisation involving the French, German and Italian computer companies ; but not initially the British!)

A small group of four(?) of us from ICL, led by David (I can't recall the other two participants) were delegated to go to CII (Paris) and have some exploratory discussions; I'm not sure about what, but it was probably about whether ICL could participate in the joint European plans, and whether any of their products or technology had relevance for ICL's New Range plans.

We set off from Putney, in David's company car (as I recall a Ford Zephyr 6 of the period; very angular and dark green? (actually yellow: Editor) The vehicle was an adapted automatic to facilitate David's driving), with David driving us " in spirited style" (we were late!) to Heathrow airport for a flight to Paris.

The next stages are a bit hazy, but we arrived and were accommodated near Versailles (which was close to the Bull/ CII works complex.) The following day we were taken to the CII complex for a series of meetings and viewings of the facility, and tour of the site.

Whilst walking around the facilities, David was in full flow animated conversation with their senior executives (we were following in the rear!). Passing through one of the areas, he tripped slightly, and then keeled over gracefully, but immediately bounced back up on the rebound, rather like a rubber ball, and without any break in the flow of conversation! (We from ICL were, of course, not unfamiliar with David's occasional "tumbles" with his prosthetic leg). The French were gobsmacked and bewildered at this; after that episode, they could not do enough to accommodate whatever requirements our delegation had on CII and David was celebrated as the war hero he was.

I don't think the talks finally led to anything for ICL, but the episode certainly gave us in ICL more fine anecdotal material about a fine gentlemen, on which to reminisce!

<https://www.dropbox.com/s/fqzvpc5fyle00w/Alan%20Wakefield%20reminiscence.docx?dl=0>

• **Harry Warner:** I worked as an operator on the CAV - Lucas, Leo III at Acton (High Street ?) from October 1963 to April 1964.

One of my clearest (and dearest) memories is of a blond haired engineer (from Somerset?) who would get the printer to "play" God Save the Queen.

I later programmed on the IBM 360 at Castrol, became Manager of Computer Services at Lever Bros. Canada and later was a Professor of Business Computing at Ryerson University in Toronto.

I retired at age 47 and live on a small commune in BC.

← **Tony Weber:** LEO Australia. "I was in the founding management group (Accountant/finance director) of the Australian subsidiary in the early 1960's under the management of Peter Gyngell. I had 25 years service with the Leo/ICL group of Companies, which then lead to another 30 years in the industry including service in Hong Kong then Boston USA. I spent the last 18 years up to 2015 on the Board of the public Company Prophecy International Limited; an Australian listed software Company. I have great memories of Leo, and the service it provided to the Australian business community in the early computer days, and enriched employment to 100's of staff in the IT industry."

← **Geoff Weston,** I read your piece in U3A Matters with great interest as I believe that I was involved with the first use of computing in the civil engineering industry. I worked for John Laing Ltd. (now Laing O'Rourke) under John Mason who was Project Surveyor. In '58/'59 I was a very junior surveyor on the London to Yorkshire motorway (M1) when a capable body was needed for a boring but important task. I drew, on specially printed pro-forma sheets, cross sectional profiles of the construction at 100 foot

intervals (chainages) of our "B" section from Ampthill to North of Newport Pagnell, about 650 in total. I added all the data points numerically and passed these sheets to the boss who combined them with other three sections and sent them to Cadby Hall where this enormous piece of kit called Leo worked out the total volumes of soil cut out, placed in cuttings, spread as topsoil etc.etc. This was to check the Ministry of Transport's figures and I understand that there was a significant difference therefore value. I never heard anything more about this and it seems to have escaped into the mists of time. By coincidence, my grandfather, uncle and other relatives worked at Cadby Hall.

Fred Whittaker I was a low person in the scheme of things at Minerva Road 1966-68. I had a sort of admin role to perform which meant strolling around the various engineering offices weekly and asking questions about timeliness of process. This was logged and forwarded to a higher office in Kidsgrove. I guess it helped the chief engineers to plan the end products. I had other duties to do. One was to receive engineering changes to the display mainframe together with the parts to be installed...usually minor. My dilemma was that I was not qualified to do any installation and the engineers had their work to do. I had to ask any engineer available on the floor to do it for me. It always worked. A bit off the cuff you might say.

That probably summarizes my work life there...lots of odd duties without a particular job description.

When the end came and we all lost our jobs I got hurt, injured my spine, and was hospitalized and off sick for months. The company continued to pay my salary until I was well and found another job. My hat off to them.

One time I was phoned by MGM films who were enquiring about renting a main frame for the film Hot Millions, starring Peter Ustinov and Maggie Smith. It was about a main frame being compromised by some freak occurrence and millions being siphoned away. Ustinov being the happy operator. The MGM producers came to Minerva Road to look around and saw the Spectra 70...I think it was.....which was all glossy and new but only there for testing and showing to potential buyers. I had to tell them that it wasn't available for hire and they had to settle for a second generation main frame which looked dowdy and was full of external cables etc. The post office had bought a few I believe? (Editor, actually a LEO 326, 3d generation computer) They agreed to rent that plus an engineer to maintain it and so it went forward. I saw the film later and it wasn't very good.

I had a very good time there at Minerva rd, and by meeting so many gifted engineers had an education nearly every day.

A few of our colleagues were installing a main frame in Ostrava Czechoslovakia when the Soviet army invaded and took over the country. I believe it was a coal mine or coal industry that had bought the machine. Our colleagues were eventually brought home after some delay. No harm done...although I never heard anything more about the main frame or if it was paid for.

I have no photos of my time there except for some photos of a cricket match between the ladies and gentlemen. Plus a couple of photos of the Joe Lyons rugby team playing at the Greenford ground. Nice memories.

After I left Minerva Road I worked at Ultra electronics until they also laid off about 300 people. I then thought I would go to another country and get laid off there. I applied to Canada and arrived there in July 1970. I have been in Canada ever since. I now live in Sooke on Vancouver island BC.

My main employment was for the Ontario government in the Ministry of Community and Social something in Toronto. After eight years they made it clear that I

had no further use to them. I got the message and quit. I had saved up enough money to buy a franchise in the printing industry and so I travelled to Long Island NY for a two week intensive course. Back in Toronto I opened up for business hired a pressman and hit the businesses around for work. This was successful for twenty years until at 61 I sold the business and the unit I had bought earlier and retired.

I got married in 1990 and lived in suburban Toronto until retirement when we sold up and drove west to BC in 1999.

<https://www.dropbox.com/s/cxntixmcw30spej/Fred%20Whittaker%20memoir.doc?dl=0>

More from Fred Whittaker

Here are some images of yesteryear. Bottom right is myself in my office in Minerva rd pulling the strings on Mon General. The others are three images of Robin Stanley Jones and Linda on their wedding day on the Thames somewhere. Also pictured is Nigel something by Robin's Borzoi. His wife is the central figure standing. Nigel was on the commissioning of Leo Three in Czechoslovakia when the Russkies invaded.

Nigel and his wife coincidentally met me again in Toronto where he was playing Rugby by Lake Ontario. They later moved west to Kitchener..I think..and then lost touch.

The others pictured maybe other employees or friends...can't say. The lettering on the wall is letraset by me.

I hope you find these interesting and if you want better images I can do that.

→ **Pat Whitaker** Joined Cerebos Foods Limited – a LEO III customer – in 1964 – after graduating with an honours degree in mathematics. Pat had taken the LEO aptitude test before the job offer and taken the LEO programming course at Hartree House. Pat worked on the Cerebos sales invoicing suite using Intercode. In 1967 Cerebos replaced its LEO III with a System 4 computer.

- **Michael Wilson** Currently lives in Canada. I joined Leo in 1961 at Minerva Road. I had just graduated from Teachers College and in those days a teacher was at the bottom of any salary scale. So I applied for and was hired as an Instructor for the LEO III Field Engineering Training School. Soon I was Manager of Leo 3 and KDP 10 training. I had gone to Kildgrove to learn the KDP 10 and then taught the first class in London. I worked for Reg Allen and then John Wheeler, who I think are still members of our alumni, as I am still in touch with Reg who lives in Dawlish. Until recently I still had Marketing Brochures for Leo 3 and Leo 326 and the Lector and an organisation chart of the School! I took them two years ago to San Jose when I was to meet Dag Spicer at the Museum of Computing. Unfortunately, due to some health problem, we did not meet. However, now cannot find them!!! *After over 55 years!!!* I will keep searching for them

- **John Winterbottom:** **DOB:** 1928
Reminiscences in 2 parts. Part 1 Life with LEO, part 2 pre and post LEO career
Joined LEO: 1960
Role in LEO: Design Engineer working with John Pinkerton
Abstract: John had a long career as a design engineer in the electronics industry, starting as electrician in the RAF after leaving School having specialised in Science and Maths. Followed up with Degree at Durham University. Later took MSc at Birmingham specialising in solid state physics and digital computing. Employed first by Lucas/CAV and then MIRA was head hunted to join the Data Recording and Instrument Company as Chief Engineer, a company associated with ICT. Left after contract dispute in 1960 to join LEO to work with John Pinkerton. Associated with a number of high level projects including a Government sponsored project on data transmission for the coming network age. Also heavily involved with the establishment of standards working with ECMA.

Left LEO in 1969 as he felt the creation of ICL had emasculated the innovative LEO research team. Joined Farrington – another specialist in data recording, working partly in the USA. Finished career working in management department of Portsmouth Polytechnic. John provides a fascinating account of life as an enthusiastic design engineer as well as his appraisal of the people he worked with at LEO.

Repository: Dropbox Part 1

<https://www.dropbox.com/s/pj9tnpi5dt36tqh/John%20Winterbottom%20Memoir.doc?dl=0>

https://www.dropbox.com/search/personal?path=%2F&preview=John+Winterbottom+Memoirs.doc&qsid=73188041692784938776139646353975&query=winterbottom&search_token=maaZCi5EZfs9ghMHde3MaOmE5gIkeIs7mVIUbNhfSkQ%3D

Part 2

https://www.dropbox.com/search/personal?path=%2F&preview=John+Winterbottom+Memoirs+2.doc&qsid=73188041692784938776139646353975&query=winterbottom&search_token=maaZCi5EZfs9ghMHde3MaOmE5gIkeIs7mVIUbNhfSkQ%3D

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- **Norman Witkin,** Memoir of working with LEO in South Africa

Norman had programmed an ICT HEC computer in South Africa, but seeking wider experience applied for a programming job with LEO Computers in London. Passing the aptitude test he joined the LEO team in Hartree House in 1959 aged just 19, working under John Aris. When LEO reached an agreement with Rand Mines for a LEO III to be managed by Leo Fantl, he was invited to join the LEO team in Johannesburg as a programmer working on the Rand Mines applications, both traditional and more ground-breaking. In 1967 Norman and his family emigrated to US in Cherry Hill, working in a variety of IT jobs including the establishment of an IT start-up. Of his LEO and Rand Mines experience he writes “...for its enlightened management, I tip my hat to LEO’s leadership. The management and operation of LEO Computers in South Africa from inception in the early 1960s and throughout that decade, was efficient, effective, courteous — and principled and fair. I am proud to have been part of its history and lucky to have enjoyed it.” Norman’s full memoir is held in Dropbox at:

<https://www.dropbox.com/s/isb623nkoy0ouho/Norman%20Witkin%20Memoirs.doc?dl=0>



Greg Wojtan MY DAYS WITH LEO

Me aged 70 →

At the beginning of October 1963, aged 25, I went to the Milk Marketing Board to do an aptitude test for a job as a LEO computer programmer, thinking that it might be more interesting than selling brushes for Kleen-E-Ze, which had been my job since leaving Edinburgh University that year without a degree but with lots of flower power.

There were some 120 of us programmer aspirants who, like me responded to the Times job ad placed by the Milk Marketing Board, but only 2 of us would be hired that day to programme their LEO III (Editor: MMB not on list of LEO III owners). I came in 3rd in terms of the aptitude test, so the lady running the show suggested I nip down to Earl’s Court where there was an Office Efficiency

exhibition and where the LEO computer was being shown. Maybe, with my good results LEO would hire me, she said.

So I did that and a nice LEO lady at the exhibition fixed me up for an appointment the following Monday, in Hartree House with the then LEO Programming Manager, at the time; one Bernard Pierce.

When I sat down with Bernard he didn't say anything for about 7 minutes until I asked whether one of us should say something, and asked if it should be me.

He stopped doodling and asked me; *"if you have a cup of tea and a cup of milk of the same volume as the tea, and you take a spoon of milk and mix it into the tea, then take a spoon of the tea & milk mixture and mix it into the cup holding only milk, will the tea cup have more milk in it than the milk cup have tea? Or what? Justify your answer"*.

Hang on, I thought – I've already done and passed my aptitude test! But there was no messing with Bernard. So I thought a bit more, gave him the correct answer and was hired to start at LEO the following Monday.

A couple of weeks later English Electric appeared and 'fused' with us, but I stayed on working on LEO for several years.

So, after learning Intercode and CLEO, I was a sort of acolyte to real programmers for several months before I was sent out to my first solo job at Shell (Editor: Shell Mex & BP) in Hemel Hempstead. My task was to use the Shell LEO to find out whether there was any sense in Shell running their Green Shield stamp schemes. In hindsight, the job wasn't all that difficult, but I did have several panic attacks, especially as it was my first project – when the word project in the world of computers had not yet been invented. Anyway I delivered on time, rushing the results on the final day on my scooter to Shell Mex & BP's headquarters in the Strand. The results incidentally were that Green Shield stamps did boost Shell sales, but only for some 6 or 7 weeks after the scheme was introduced.

In 1965 I worked at Hartree House again, on stuff that really stretched my brain axons to breaking point. This was because I was working with a bright wire called Gordon Scarrot from the Ferranti stable. He taught me Zipf's law, which I used for years after to detect monopolistic practices, and masses of other esoteric stuff. E.g how to debug radix problems using machine code directly on the machine: Sort of open brain surgery on the poor LEO. Gordon was surely one of the geniuses that got attracted to LEO like a magnet. I did

odd jobs for him - him Mentor, me Apprentice. One worthwhile one I remember was to produce a ready reckoner to estimate the duration of sort programmes run on different Mag.Tape configurations. (I think our first 6.5MB LEO discs only appeared a year or two later, essentially solving the data sorting problem. Meanwhile we used painful and unpredictable tape sorting).

As I was finishing the reckoner I got to know Ralph Land. Ralph it was who thought it would be a good idea to give me something useful to do. This turned out to be a payroll system for the several thousand employees of the NHKG, Steelworks in Ostrava, Czechoslovakia (Editor: LEO III/41). At the same Mike Carrington (died in the UK in 1967) had to volunteer to do a stock control system for NHKG. We had a year for each job and both managed our assignments OK. (One problem I had that sticks in my mind to this day, was that the payroll programme had to deal with a lady employee of NHKG who was paying for an elephant in installments to an Indian Maharajah that she had been married to, but had run away from).

How I got to that first East European LEO job in December 1965 is written up in Hilary's compendium of Leo reminiscences (Editor: Remembering LEO).

After Czecho, I got moved to Poland to do a monstrous stock control system for all the steelworks in Silesia, for an outfit called HPMOA on a Leo 360. At the time I and my fledgling new family lived just down the road from Katowice in Chorzow – the dirtiest town in Europe!. On an average day 80 tons of dust were deposited on Chorzow from the skies and my daughter spent her early childhood in dark grey nappies.

The office was in Katowice, but I and the 4 Polish computer specialists assigned to me to produce this system had to fit into a room measuring 15 sq.m.

To enable me to work with them we rearranged the desks so that we could take off the room door every morning and place it between 2 desks, thus creating 5 workplaces in the room. It is amazing what you can do if you are a pioneer, and determined to finish your job and get back home.

Well, I finished each successive job, but I never got home, not till around 1971

Meanwhile, I really did have a great time, learned a lot and made lots of LEO friends which I remember vividly to this day. Ralph of course, Fred Lamond and his cat, Braz Lovegrove, Tony Zak, Frank Skinner, Zvi Herzenstein to name but a few, and many others from English Electric/ LEO/ Marconi as well.

When there was no more work on LEO, and back in the UK I worked from Queen's House, Euston where I switched to the 2900 Series but more and more as Project Manager. From there I did a system study for Morgan Grenfell and what I thought was a brilliant proposal for the British Library books' catalogue system using CAFS (Editor: Invented by the aforementioned Gordon Scarrott). I never understood why we didn't win that business.

Shortly after I joined the PMI group of Project Managers and helped to write several procedures for the 5 volume ICL Black Book which eventually became the Prompt methodology and then the Prince PM methodology and its derivatives. The Prince methodology was adopted by HM. Civil Service as the standard for the UK Government IT Projects

PM is what I have done for the rest of my life, including some interesting projects for IBM where I worked for 8 years in Warsaw.

My last project I finished some 5 years ago. Now I do self-study of ancient history, which is as fascinating as the history of Leo.

<https://www.dropbox.com/scl/fi/5xjtt16j8pphyu8hjc48a/Greg-Wojtan-bio.docx?dl=0&rlkey=en2be7qcmb95df16pypidphlu>

- **Penny Woodward**, Operator Coventry City LEO !!!/28. I experienced the Leo 111 computer whilst employed by Coventry City Council between 1970-1973. I was a computer operator working three shifts, four persons to a shift, to keep council's finances running smoothly. Although initially engaged as a trainee computer programmer, part of the training and experience was to work in operations, and I enjoyed the work so much I preferred to stay in that field and asked to remain in my current post. I worked on that machine until it was replaced, and subsequently scrapped. I left that council and took up other work but eventually went back into operations for Rugby Borough Council on a different machine, quite different but almost as antique. Regrettably I took no physical pieces of the old machine but attach some pictures just before it was scrapped, unfortunately not of a good quality.



- **Marie Hicks** Twitter message:

THE TIMES FRIDAY JUNE 26 1964

FREELANCE PROGRAMMERS LTD.
 Ley Hill, Chesham, Bucks

1 IBM and 1 Leo programmer wanted for full-time assignments based at home, mobile London. Wonderful chance, but hopeless for anti-feminists. Also many opportunities for retired programmers (female) to work part-time at home, London and Midlands. Telephone and impeccable references essential.

In 1964 the inimitable [Dame Stephanie](#) ran this job ad in [The Times](#), seeking programmers for her startup. "Anti-feminists" need not apply--plus opportunities for women who'd "retired"

