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## Remembering LEO

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**Abstract:** It is now more than 60 years since the world's first business use of a computer, the valuation of bakery output, was rolled-out the LEO I computer at Cadby Hall in London, the headquarters of the food production and catering company J. Lyons and Company. LEO I had been designed and built as a computer to be used for business data processing by a team of engineers recruited by Lyons, with a basic design following the design of the Cambridge University EDSAC. The story of the Lyons initiative has been recorded and explanations of how a company in the food business came to build a computer has been told in books and articles in the last decades (- see Appendix 1 for a comprehensive bibliography of material relating to LEO). This chapter remembers the contribution made by LEO.

**Keywords:** Business computers, J. Lyons and Company, LEO

The late David Caminer passionately wanted the world to be reminded of the LEO heritage. He had been instrumental in setting up and managing the LEO programming and systems function (Aris 2000, Ferry 2012). He felt that J. Lyons and the LEO team had played an important role in what is now taken for granted – the use of computers in society for a wide range of activities other than mathematical calculations. And he was concerned because it seemed to him that the part played by LEO had been written out of the histories of computing then being published – the 1980s and later, and that as a result there was only a very limited memory of the LEO legacy. A good example is that the 875 page *Concise Encyclopaedia of Computer Science* (Reilly 2004), intended as a reference book for students, devotes half a sentence to LEO in Appendix III on page 832. The UK's Professor Martin Campbell-Kelly, one of the world's leading computer historians, in his *History of the Software Industry* (Campbell-Kelly, 2003) makes no mention of LEO and little of British software despite the pioneering achievements of LEO and other British companies, concentrating largely on American initiatives. He writes, (page 10), "... *I probably have a better knowledge of the British software industry than of the American. However, I felt unable to incorporate much material on the British software industry because it would have appeared disproportionate, would have appeared chauvinistic*". Such modesty can lead to the making of myths.

It was David Caminer who, supported by a small group of old enthusiastic LEO hands, was determined to ensure that the legacy of LEO would be written into computer history. Independently Peter Bird, the ex-head of Systems Development at J. Lyons & Company Limited, had long thought it was important for the LEO story to be part of computer history, and over a number of years, working very much on his own, had compiled a history of the LEO project, which apart from the historical

narrative included much technical and personal detail. To publish the book he even set up his own publishing company, and in 1994 published '*LEO: The First Business Computer*' (Bird 1994).

It was in his later years, retired from ICL and Fujitsu, that David Caminer gathered a small band of LEO pioneers and enthused and bullied them into turning the LEO story into a narrative of computing history. The first step was to write an account of the LEO history leavened by the personal reminiscences of many of those who had played a part in the story, including some who had worked for LEO customers. The book, first published by McGraw-Hill in the UK (Caminer *et al* 1996), was subsequently published in the USA (Caminer *et al* 1998), and in 2000 translated into Chinese for publication in China.

Between them these books provide an authoritative history of the LEO story, which helped to bring LEO back into the story of how computer use evolved and the special part played by J. Lyons and LEO.

The publication of the 1996 and 1998 books led to David Caminer proposing the establishment of the LEO Foundation as a charity devoted to promoting the memory of LEO and encouraging academic studies of LEO. The first task the Foundation set itself was to organize a major Conference in 2001 to celebrate the 50<sup>th</sup> anniversary – November 2001 – of the first time-critical regular job for J. Lyons & Company Limited. The Conference was held at the prestigious London Guildhall, sponsored by a number of organizations including the City of London, Fujitsu, the Wall Street Journal Europe, the IEE (now IET), KPMG and the London School of Economics. It attracted participants and speakers from around the world. A special edition of the Journal of Strategic Information Systems published the proceedings (Journal of Strategic Information Systems 2003).

It was clear that the story of a British catering and food manufacturing business launching the first business computer and setting up a Computer Manufacturing and Service Company as a subsidiary – LEO Computers Limited – was gaining traction at least in the UK and had become more widely known and intrigued parts of the media. The result was the publication of more books telling the LEO story. Science writer Georgina Ferry wrote an account (Ferry 2003) which received the accolade of being the book of the week for BBC Radio 4 in September 2003 being broadcast twice a day for five days on Radio 4.

In 2001 BBC Radio 4 broadcast four 15 minute programs each program devoted to one pioneering initiative in the history of computers. One episode was entitled 'LEO the Lyons Computer'. The series was written, produced and narrated by Mike Hally. Its success led Hally to publish an extended version of the program in a book which demonstrates that computer developments in the 1940 (and earlier) and 1950s took place in many places and were not confined to the USA and Britain (Hally 2003)

Remarkably Channel 5 television was planning a documentary 'Disappearing Britain' screened in 2006 which included the story of tea drinking in Britain with the well-known actor Wendy Craig as presenter.<sup>1</sup> In researching their story they came across J. Lyons of teashop and tea marketing fame, and discovered that Lyons was using its own computer LEO for both teashops replenishment and the weekly planning of tea production and blending. Intrigued they followed up the story and

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<sup>1</sup> "Disappearing Britain: The British Cuppa" with Wendy Craig (2006)

devoted a part of one of the programs to LEO and included an interview with the programmer (Frank Land) who had been responsible for the tea blending application.

To celebrate the 60<sup>th</sup> anniversary of the coronation of Queen Elizabeth II, BBC I television compiled a five episode program ‘The 1952 Show’ of notable events in Britain around the time of her coronation, and the editors selected the LEO story for episode 5 screened on 30<sup>th</sup> March 2012. It featured an interview of one of the original team of engineers responsible for the design and construction of LEO I – Ernest Kaye.

The spate of books and media exposure appeared to ensure that in the public sphere in Britain the LEO story had received recognition and admiration even gaining a Guinness Book of Records Certificate as *“The first ever business computer was LEO I (Lyons Electronic Office). It began operations in November 1951 at the Lyons headquarters, London, UK”*.

Recognition in the wider world of academia was more limited, though many computer history texts, but as suggested above, not all, noted the Lyons initiative and the role played by LEO in the evolution of business computing. Good examples are the IEEE Journal Annals of the History of Computing in the US and the Computer Journal in the UK both of which have carried a number of papers related to LEO over the years (Anderson 2004, Aris 2000, Caminer 1958, Caminer 1997, Caminer 2003, Delve and Anderson 2001, Gosden 1960, Forbes 1965, Lewis 1963, Lewis 1964, Land 2000, Land 2006). Important papers reviewing the achievements of the LEO team and their importance in the history of computing were contributed by senior American Scholars (Baskerville 2003, Mason 2004).

In 1999 the Association for Information Systems (AIS), the organization representing the academic discipline of Information Systems world-wide with a membership of thousands, established an annual award and called it the LEO Award.

*“Named after one of the world’s first commercial applications of computing (The Lyons Electronic Office), the purpose of the LEO Award is to recognize truly outstanding individuals in the Information Systems community, both academics and practitioners, who have made exceptional contributions to research in and/or the practice of Information Systems. The LEO Award will be a singular honor to recognize seminal work by the Award winner.”*

It is clear that the story of LEO and its pioneering achievements are now much better known. But is it ‘mission accomplished’? David Caminer would have said *“no, it is work-in-progress, and you must try harder”*. Even as late as August 2011, Eric Schmidt, CEO of Google (Schmidt 2011), in his MacTaggart lecture, noted *“You (Britain) – my parenthesis - invented computers in both concept and practice”* and added *“it’s not widely known, but the world’s first office computer was built in 1951 by the Lyon’s chain of teashops”* (my underlining).

In 2011 the LEO Foundation was merged into the LEO Computers Society. The Society had been established primarily as a way of keeping ex-employees in touch with each other and to run regular reunions. It currently (2012) has a membership of over 300, including most of the surviving pioneers. But over time and with encouragement from LEO Foundation members it began to take an interest in ensuring that the LEO legacy was not lost and to take advantage of the knowledge and experience of its membership to retrieve lost elements of that legacy. To aid that process it has set up a LEO History Committee with the remit to take the various ad

hoc and opportunistic efforts already in place and put them on a more coherent footing and ensure that outcomes were properly disseminated and made available to scholars, students and the public at large.

There are a number of ways in which the history of computers can be constructed.

- **Via the dedication and enthusiasm of individuals and groups**, including ‘institutions’ such as the Computer Conservation Society<sup>2</sup> and the LEO Computer Society<sup>3</sup> who volunteer to sift through relics, collating classifying and editing material ranging from hand-written notes, including coding sheets, documents such as minutes of meetings, to artifacts, including technical diagrams and blue prints as well as circuit boards and in some cases complete computers. Others are more concerned with re-constructing computers long out of use or emulating old software.

One important strand of the LEO Computer Society’s activity is building up a group of volunteers drawn from all branches of LEO’s activities, but primarily ex-LEO engineers and ex-LEO programmers and systems analysts, to assess the material as it comes to light and determine what items should be saved and where they should be located to provide the best access for later use.

Perhaps the most important UK institution for remembering the UK computer heritage is the Computer Conservation Society, established jointly by the British Computer Society and the Science Museum. Apart from the outstanding work inspired by the late Tony Sale of reconstructing pioneering computers such as Colossus, the Ferranti Pegasus, ICT 1301 and now EDSAC, they set up a project, ‘Our Computer Heritage’, headed by Simon Lavington to provide detailed documentation of all the UK computer ranges, including, of course, the LEO range<sup>4</sup>. Though much material on the LEO range has been supplied a great deal of material, much to our regret, is still missing.

- **By locating publications** – newspaper articles, press releases, academic papers, books, and sadly, obituaries, as pioneers pass away. Much documentary material already exists in libraries, archives and museums. These include collections gifted to the archives by individual pioneers or their descendants. However, the collections are widely dispersed, and only rarely transcribed into digital formats required by future scholars and students. Indexing is at best limited. Providing scholars and others with a systematic account of what is available presents the historian with a problem. For example the extensive collection of LEO documents at the Manchester University Rylands library, though well catalogued, is all in its original form comprising manuscripts and typewritten papers as well as some computer print outs.

The bibliography in Appendix 1 should be regarded as a step in the direction of making known what is available and where it is located with respect to the history of LEO, but it is at best work-in progress as more

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<sup>2</sup> <http://www.computerconservationsociety.org/>

<sup>3</sup> <http://www.leo-computers.org.uk/>

<sup>4</sup> <http://www.ourcomputerheritage.org/>

material comes to light. Readers of this chapter are encouraged to help in adding to the bibliography by letting the author know of additional material. Internet searches engines have greatly facilitated the collection of relevant material. But large amounts of documentary material exists in private hoards, unclassified and not indexed, often only coming to light on the death of its collector. A good example is a cache of 100 or so manuscript notebooks found in a cardboard box and left by the original LEO engineer Ernest Lenaerts covering the years from 1949 and now donated to the LEO Computers Society by Lenaerts' sons. Their value cannot be assessed until they have been transcribed, but they have aroused the interest of a number of museums and archives. As noted above it is only the dedication of volunteers that can help rescue such material for posterity.

- **Collecting material**, mainly artifacts, for exhibition in Museums. Many museums of science and technology arrange displays of computer hardware tracing the evolution of computers from their beginnings to the most recent technology available. But there are gaps in the story, exemplified by the story of Colossus the British pioneering code breaking computer during the Second World War that was destroyed, including all documentation relating to its design and construction, on orders from the Government who felt the need not to compromise the secrecy of its operation. The late Tony Sale, the original curator of the Bletchley Park Museum, who led the team which rebuilt the Colossus, wrote:

*“After VJ Day, suddenly it was all over. Eight of the ten Colossi were dismantled in Bletchley Park. Two went to Eastcote in North London and then to GCHQ at Cheltenham. These last two were dismantled in about 1960 and in 1960 all the drawings of Colossus were burnt. Of course its very existence was kept secret.”<sup>5</sup>*

Gaps in the collection of LEO (and other) computers are making it difficult for the museums to provide a complete or fully coherent story. Again, the LEO Computers Society is playing its part in plugging the gap. When items are located they frequently carry no identifying label. The society's engineer members try to identify and explain the function of particular computer circuit boards, computer units and blue prints or help museums with their collection of LEO artifacts. One problem is that relics are scattered across a wide range of museums. LEO artifacts are held at the National Museum of Computing at Bletchley Park, and the London Science Museum will be showing pieces of LEO in its new computer exhibits. Recently the Computer Museum in Silicon Valley acquired some LEO pieces and will be showing them as part of its new facilities. Other pieces, including a nearly complete LEO III, are held in the National Museum of Scotland in Edinburgh, and another LEO III in the Museum of London. The bibliography (appendix I) has made a start in showing the holdings in a number of museums and archives.

- **Noting the content of Conferences** and their proceedings, such as computer history conferences, and special events including ones to celebrate

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<sup>5</sup> <http://www.codesandciphers.org.uk/lorenz/colossus.htm>

anniversaries of notable past events. A good example is the Google sponsored event at the London Science Museum to celebrate the 69<sup>th</sup> anniversary of the roll-out of the first LEO application on behalf of J. Lyons & Co limited.<sup>6</sup> The IFIP Working Group 9.7<sup>7</sup> provides information about relevant conferences. Conferences provide opportunities for scholar to learn from each other and exchange ideas.

- **Taking Oral Histories.** Historians know that one of the prime resources for historical knowledge is stored in peoples' memories of past events. Unfortunately it is a wasting asset as individuals including those with vital clues about past happenings pass away. This has led to the oral history movement, the attempt to capture memories and knowledge by interviewing and recording the stories of selected individuals. Historians in general rely on documentary evidence culled from account books, tally rolls, legal documents, minutes of meetings and so on supplemented by contemporary accounts provided by commentators and newspapers dating from the time of the event recorded. Whilst such historical accounts can, as historians know, suffer from deliberate distortions and omissions, oral histories in relying on memory at a distance from the events reported can suffer from false memories. In the UK the Oral History Society provides advice and training for novice oral historians.<sup>8</sup> It also sets the standards for recordings to ensure the long lasting quality of the recordings. The taking of oral histories involves interviewing and recording a subject with the interviewer leading the subject through a loose framework of questions. The interview then has to be transcribed, the transcript agreed with the subject, edited and archived in digital format. Transcription represents a major item of cost.

The British Library has a major Oral History project (the Life Histories project) recording selected individuals from each sector of British society. Two members of the LEO Computer Society were selected from the technology sector, and their histories are now part of the British Library archive. These two were Mary Coombs who joined LEO in 1953, and who may well have been the world's first female commercial programmer, and the author of this chapter.<sup>9</sup> The late John Pinkerton, LEO's chief engineer and designer of LEO I recorded his own history and that is now stored at the Charles Babbage Institute, University of Minnesota, now part of the IT History Society.

The result of these initiatives led the LEO Computers Society to launch its own Oral History project. This required the need to purchase appropriate recording equipment and subsequently to have the recordings professionally transcribed. The society applied for funding from the Association of

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<sup>6</sup> <http://storify.com/lynetter/leo-60th-anniversary>

<sup>7</sup> <http://www.comphist.org/>

<sup>8</sup> <http://www.oralhistory.org.uk/>

<sup>9</sup> See <http://britishlibrary.typepad.co.uk/oralhistoryofscience/2011/08/new-interviews-online.html#tp> and <http://cadensa.bl.uk/uhtbin/cgisirsi/x/0/0/5?searchdata1=CKEY7328647&library=ALL> and <http://cadensa.bl.uk/uhtbin/cgisirsi/?ps=4vatGo3loS/WORKS-FILE/22600167/9>

Information Technology Trust and received a small grant to fund the project. The project was managed by a small team aided by volunteer interviewers who were given notes of guidance (Appendix 2). A schedule of individuals was drawn up giving priority to the oldest subjects. The team experimented with a variety of recording methods, but always retaining the recording standards established by the Oral History Society. These included using Skype and a smart phone to record interviews where the subject was remote from the interviewer, for example the ex-head of LEO in Australia, Neil Lamming. To date (May 2012) some dozen interviews have been conducted.

In addition to the oral histories members of the LEO Computers Society have written their own reminiscences, ranging from a few paragraphs to near monographs describing a particular application, ground-breaking at that time. These too after editing will form part of the LEO archive, to be ultimately placed in a public archive in order to make them as widely available as possible.

Let me finish by paying tribute to those who made the LEO story possible. First John Simmons, then Comptroller of J. Lyons, who saw his task as business process re-engineering to make Lyons a more effective business and who in 1947 sent Thompson and Standingford to the USA to discover if there had been any new ideas which Lyons could use. There they incidentally saw the first US computers, and recognized that they could be the future for business data processing and on their way home sketched how a computer might be used to complete a business process. They wrote the prescient report recommending Lyons to explore the possibility of Lyons using a computer; a report which Simmons thought was right and put it in front of the Lyons Board of Directors. The Board, to their credit, accepted the notion, and set in train the process which led to the Lyons Electronic Office (LEO). Then a tribute to John Pinkerton, the engineer of genius who brought the idea into reality and David Caminer who invented practical systems engineering and whose ideas led to a long sequence of innovative and ambitious applications.

And who are not mentioned? The many people who worked with those noted above and for those who have passed away the obituaries record at least some of their achievements in the LEO story.

In this chapter I am proud to pay tribute to all of them.

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# Appendix 1: Bibliography

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- **LEO, the First Business Computer**; P. Bird, Hasler Publishing, 1994.  
Peter Bird joined Lyons when, as he says, ‘the pioneering years of computing were no more than folk history.’ Nonetheless, through his ‘talking with old-timers’ and delving through the Lyons archives, he has made an important contribution to the LEO story. Of particular value are the appendices which, inter alia, give details of the instruction codes, speeds, capacities and deliveries of the different models.
- **User Driven Innovation: The world’s first business computer**, (eds.) D.T. Caminer, J.B.B. Aris, P.M.R. Hermon, F.F. Land, McGraw Hill, Maidenhead, 1996. A first-hand account written by thirteen of the early users who developed the disciplines of systems engineering and put LEO to work on economic, time-dependent business applications, starting in 1951. Included is an edited version of the seminal report of the two Lyons executives who, after a tour of the early computer activity in the United States in 1947, recommended that Lyons acquire a computer of their own. Also included is a Science Museum interview with John Simmons.
- **LEO, the Incredible Story of the World’s First Business Computer**, (eds.) D.T. Caminer, J.B.B. Aris, P.M.R. Hermon, F.F. Land, McGraw Hill, New York, 1998. The revised US edition of User-Driven Innovation, a Chinese edition was published in 2000.
- **A Computer Called LEO**; Georgina Ferry, Fourth Estate, London, 2003.  
‘LEO and its creators deserve their place in history not because of what it was, but because of what it did, for LEO was the first computer in the world to be harnessed to the task of running a business.’ A paperback edition was published in 2005, by Trafalgar Square.
- **An ICL anthology**, edited by Hamish Carmichael; Chapter 6, LEO, pp. 91-94, Laidlaw Hicks Publishers, Surbiton, 1996. Chapter 6 presents an anthology of quotations about LEO, mainly from LEO personnel.
- **Electronic Brains: stories from the dawn of the Computer age** by Mike Hally, Granta Publications, London, 2003. The book is based on 4 BBC radio programmes produced by Mike Hally. Despite its populist title, it is a very readable and informative account of some early computer ventures in the USA, UK, Soviet Union and Australia. Chapter 5 is an account of the LEO story.
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  - Baskerville, R. The LEO principle: perspectives on 50 years of business computing, pp 255-263
  - Caminer, D.T., LEO and the Computer Revolution, pp 265-284
  - Cox, G., Business computing 2001-the state of the art, pp 285-294
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  - Yapp, C. Conference sponsors' panel: what have we learnt in 50 years? pp 309-320
  - Shirley, S. Panel: social and economic consequences of business computing and public policy, pp 321-330
  - Ashworth, J.M., Knowledge and digital information, pp 331-337
  - Hudson, R. Panel: crystal ball, 2001-2051, pp 339-353
  - Ein-Dor, P. The world and business computing in 2051: from LEO to RUR? pp 357-371
  - Amaravadi, C.S. The world and business computing in 2051, pp 373-386
  - Schell, E.H. The world and business computing at mid-century, pp 387-395
- British Journal of Administrative Management (1991), 75<sup>th</sup> Anniversary Issue: <http://archives.li.man.ac.uk/ead/html/gb133nahc-leo-p1.shtml>. The contents include:
  - Simmons, the visionary, April 1991
  - O&M and Simmons, November 1991

## Archives – LEO documents and Artefacts

- **National Archive for the History of Computing**, Manchester, **LEO Computers**, <https://www.jiscmail.ac.uk/cgi-bin/webadmin?A2=history-of-computing-uk:ca4a4c3.0012> provides a listing of documents held by the library. <http://www.chstm.man.ac.uk/nahc/contents/leo.htm> <http://archives.li.man.ac.uk/ead/html/gb133nahc-leo-p1.shtml>  
As part of the library's special collections, the Archive is located in the main building of John Rylands University Library of Manchester, <http://rylibweb.man.ac.uk/> Burlington Street (building 18 in the campus map <http://www.man.ac.uk/about/campus.html>).
- **The Computer Conservation Society** has collected technical and other background Information about all early UK computers including LEO. See <http://www.ourcomputerheritage.org/CCSprop6.pdf> <http://www.ourcomputerheritage.org/> and <http://www.ourcomputerheritage.org/acknowledgements.pdf>  
The LEO record is incomplete and further technical information would be welcomed by the CCS. The CCS also maintains an index of documents relating to LEO including a complete listing of the **Pinkerton** papers held at the Science Museum <http://sw.ccs.bcs.org/iclarch/arch01.html> and 65 technical drawings including two patent applications <http://sw.ccs.bcs.org/iclarch/arch06.html>
- **The Computer History Society** has established an archive search facility of computing history websites. The link to the search facility is: <http://ithistory.org/archiveit/archiveit-search.php>. Searching LEO+computers brings up <http://ithistory.org/archiveit/search2-realttest-navtest.php?q=LEO%2BComputers&i=1827&p=0&submit=Search> with many LEO entries.

- **University of Warwick, Modern Records Centre**, Contact Details: Location **John Simmons Papers (1924-1994)** Ref: GB 152 GB 152 MSS.363, <http://archiveshub.ac.uk/data/gb152363>
- **Frank Skinner's website**: <http://www.ampnecrucis.f9.co.uk/PARK/LEO.htm>
- **Andrew Wylie** – Mister Transistor – collects and records information about early transistor computers, including LEO III – see <http://homepages.nildram.co.uk/~wylie/trancomp/LEO3.htm>
- **Bill Forfar**: Reminiscences at [www.groveblue.co.uk/wf.pdf](http://www.groveblue.co.uk/wf.pdf)
- **London Metropolitan Archive** holds material relating to J. Lyons and Company, archived under: GB 0074 ACC/3527
- **Museums** A listing of which UK museums hold LEO Artefacts can be found at <https://docs.google.com/viewer?a=v&q=cache:PDjj3gRefxAJ:www.ourcomputerheritage.org/where%2520to%2520see%2520bits%2520rev.pdf+National+Museum+of+Computing,+Bletchley+LEO&hl=en&gl=uk&pid=bl&srcid=ADGEEShQHZUJK9fLszQDnyUPVCJHyggZYpZb17rxGSn0sTpHzT-N67c2U8mKwcbndQJCYwUFqjwsZiadPNLwnm9aP2qsDnH8Dyp-JNgYByD7TCatAti0ny37VO2xsBmiE97dQEWtB1N&sig=AHIEtbRt65LTg4sDLd2BvqImwO9oAxlUNA>
- **Computer History Museum, Silicon Valley**. The Museum holds and displays a number of LEO II relics and various LEO books and documents. Its record of holdings with photos is well organised and can be found on: [http://www.computerhistory.org/search/?q=LEO+Computers&site=chm\\_collection&client=chm\\_collection&output=xml\\_no\\_dtd&submit.x=2&submit.y=2](http://www.computerhistory.org/search/?q=LEO+Computers&site=chm_collection&client=chm_collection&output=xml_no_dtd&submit.x=2&submit.y=2)
- **Science Museum, London**. The Museum has a limited collection of LEO relics. A recent grant will enable it to greatly improve its display of computer history items including LEO relics and the LEO story. The curator responsible for the acquisition and display is Dr Tilly Blyth, [tilly.blyth@sciencemuseum.org.uk](mailto:tilly.blyth@sciencemuseum.org.uk). See also [http://objectwiki.sciencemuseum.org.uk/wiki/Leo\\_II.html](http://objectwiki.sciencemuseum.org.uk/wiki/Leo_II.html)
- **The National Museum of Computer History, Bletchley**. Information about LEO with photos on <http://www.tnmoc.org/40/section.aspx/24> . No LEO items are listed on the schedule of holdings at the Museums website <http://www.tnmoc.org/> . Trustee of Museum and Secretary of Computer Conservation Society is Kevin Murrell, [kevin.murrell@tnmoc.org](mailto:kevin.murrell@tnmoc.org)
- **National Museums Scotland, Edinburgh**. The Museum has LEO III/32 (Colvilles Ltd, Motherwell, as well as three LEO III circuit boards, one of which is on display, and three circuit boards from LEO IIs. The Senior Curator of Modern Science and Computing is Dr Tacye Phillipson, : [t.phillipson@nms.ac.uk](mailto:t.phillipson@nms.ac.uk) Website: <http://www.nms.ac.uk/>
- **Museum of London, London**. The Museum has parts of LEO III/45 ((Webb Durlacher Mordant) including the console on display <http://www.museumoflondon.org.uk/Collections-Research/Collections-online/object.aspx?objectID=object-49407&start=1&rows=1> Website: <http://www.museumoflondon.org.uk/> See also activity sheet for school children: [www.museumoflondon.org.uk/.../KS3\\_Communication\\_and\\_technology\\_world\\_city\\_activity\\_sheets.doc](http://www.museumoflondon.org.uk/.../KS3_Communication_and_technology_world_city_activity_sheets.doc)

## Private Holdings

Many individuals dead and alive, members of the LEO Computers Society or ex LEO employees have private collections of LEO artefacts, documents and photographs, some of which are of historical importance. They include:



**David Caminer:** private archive, collected by Ray Hennessey

**John Aris:** private archive, collected by Ray Hennessey

**Colin Tully:** private archive

**Frank Land:** private archive

**Ernest Lenaerts:** 100 notebooks, quarto, compiled in manuscript, dating from 1949 to the early 1950s. The notebooks have been donated to the LEO Computers Society by Paul and David Lenaerts, Ernest's sons, and are being transcribed into digital form by members of the Computer Conservation Society's team rebuilding EDSAC.

There are many other private hoards and the LEO Computers Society would welcome information about such holdings.

### Obituaries and Biographies

**Ernest Joseph Kaye** 1922-2012

Ben Rooney in Wall Street Journal <http://blogs.wsj.com/tech-europe/2012/05/07/u-k-computer-pioneer-dies/>

<http://www.youtube.com/watch?v=GE6TX70A3Rc>

<http://blogs.wsj.com/tech-europe/2011/11/14/worlds-first-business-computer-celebrates-60th-anniversary/>

<https://plus.google.com/106615548454096392167/posts/4v94i6vGPst#106615548454096392167/posts/4v94i6vGPst>

[http://www.bbc.co.uk/blogs/outriders/2011/11/leo\\_making\\_history.shtml](http://www.bbc.co.uk/blogs/outriders/2011/11/leo_making_history.shtml)

**George Manley** 1938-2011

[http://centaurs-rfc.org/html/web\\_news\\_29.html](http://centaurs-rfc.org/html/web_news_29.html)

**Gordon Foulger** 1942-2011

<http://www.gordonfoulger.co.uk/obituary.php>

**John Aris** 1934-2010

<http://www.guardian.co.uk/technology/2010/aug/26/john-aris-obituary>

<http://www.vukutu.com/blog/2010/08/a-computer-pioneer/>

<http://www.cs.man.ac.uk/CCS/res/res52.htm#i>

**Mavis Hinds** 1929-2009

Mavis Hinds working for the Meteorological Office used LEO I for weather forecasting – the earliest use of computers for modelling the weather in the early 1950s.

<http://onlinelibrary.wiley.com/doi/10.1002/wea.502/abstract>

**David Caminer** 1913-2008

<http://www.telegraph.co.uk/news/obituaries/2188963/David-Caminer.html>

[http://en.wikipedia.org/wiki/David\\_Caminer](http://en.wikipedia.org/wiki/David_Caminer)

[http://uk.fujitsu.com/pensioner/topics/obituaries/david\\_caminer/](http://uk.fujitsu.com/pensioner/topics/obituaries/david_caminer/)

<http://www.nytimes.com/2008/06/29/technology/29caminer.html>

<http://www.liverpooldailypost.co.uk/views/obituaries/2008/06/26/david-caminer-64375-21152334/>

<http://boingboing.net/2008/06/29/computer-pioneer-and.html>

<http://www.guardian.co.uk/technology/2008/jul/11/1>

**Colin Tully** 1936-2007

<http://www.bcs.org/content/conWebDoc/16757>

<http://comjnl.oxfordjournals.org/content/52/3/388.short>

<http://www.leo-computers.org.uk/images/colintullytribute.pdf>

**John Gosden** 1930-2003

<http://www.leo-computers.org.uk/gosdenobit.html>



[http://www.cs.manchester.ac.uk/other/CCS/res/res33.htm#f\\staff2\l\\_users\LANDF\Leo\Gosden obit in Independent.htm](http://www.cs.manchester.ac.uk/other/CCS/res/res33.htm#f\\staff2\l_users\LANDF\Leo\Gosden%20obit%20in%20Independent.htm)  
<http://ithistory.org/memoriain/memoriain-detail.php?recordID=80>

**Leo Fantl** 1924-2000

[http://www.thocp.net/biographies/fantl\\_leo.html](http://www.thocp.net/biographies/fantl_leo.html)  
<http://www.smartcomputing.com/editorial/dictionary/detail.asp?guid=&searchtype=1&DicID=18016&RefType=Encyclopedia>

**Anthony Salmon** 1916-2000

<http://www.kzwp.com/lyons.pensioners/obituary2S.htm> (page 1)

**John Pinkerton** 1919-1997

<http://www.independent.co.uk/news/obituaries/obituary-john-pinkerton-1144708.html?pageToolsFontSize=200%25>  
<http://www.cs.man.ac.uk/CCS/res/res19.htm#g>  
[http://ieeexplore.ieee.org/xpl/freeabs\\_all.jsp?arnumber=707576](http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=707576)

**Ernest Lenearts** 1910-1997

<http://www.cs.man.ac.uk/CCS/res/res17.htm#f>

**Dan Broido** 1903-1990

<http://www.kzwp.com/lyons.pensioners/obituary2B.htm> (page 1)

**John Simmons** 1902-1985

<http://www.oldbrightonians.com/notable-obs/business/john-simmons-bc.-1916.html>  
<http://www.oxforddnb.com/view/printable/57059>

**Oliver Standingford** 1912-1980

<http://www.kzwp.com/lyons.pensioners/obituary2S2.htm>

**Thomas Raymond Thompson – TRT** 1907-1976

<http://www.kzwp.com/lyons.pensioners/obituary2T.htm>  
<http://www.oxforddnb.com/view/article/101160>

Brief biographical sketches of a number of Lyons and LEO people can be found in **LEO, the First Business Computer**; P. Bird, Hasler Publishing, 1994, pages 200-212. The following people – in alphabetical order - are noted: John Barnes, Daniel Broido, David Caminer, Mary Coombs, Leo Fantl, Isidore Gluckstein, Montague Gluckstein, Samuel Gluckstein, John Gosden, John Grover, Derek Hemy, Ernest Kaye, Frank Land, Ernest Lenearts, Joseph Lyons, John Pinkerton, Anthony Salmon, Ray Shaw, John Simmons, Oliver Standingford, Thomas Raymond Thompson, David Wheeler, Maurice Wilkes, Peter Wood.

## Oral and Narrative Histories

- **Title:** Oral history interview with John M. M. Pinkerton  
**Call Number:** OH 149  
**Interviewee:** Pinkerton, John M. M., (John Maurice McLean), 1919-  
**Repository:** Charles Babbage Institute, University of Minnesota, Minneapolis  
**Description:** Transcript, 54 pp.

URL: <http://special.lib.umn.edu/cbi/oh/display.phtml?id=121>

**Abstract:** Pinkerton begins by discussing his education and wartime work in radar technology in England. He then describes his movement into the computer industry after World War II and his work on the LEO I and LEO II computers. In this context he discusses the British computer firms J. Lyons and Company, Leo Computers, English Electric Co., and International Computers Ltd.

- **Title:** Life Stories, British Library, An Oral History of British Science

**Interviewee:** Mary Coombs (nee Blood), LEO Programmer 1953

**Interviewer:** Thomas Lean

**Link:** <http://cadensa.bl.uk/uhtbin/cgiirsi/Af8OziBrN6/WORKS-FILE/245260056/9>

**Abstract:** This is a full oral history of the life of Mary Coombs as part of the British Libraries Oral History series on the life of selected British Computer scientists.

- **Title:** Life Stories, British Library, An Oral History of British Science

**Interviewee:** Frank Land

**Interviewer:** Thomas Lean

**Link:** <http://cadensa.bl.uk/uhtbin/cgiirsi/Af8OziBrN6/WORKS-FILE/245260056/9>

**Abstract:** This is a full oral history of the life of Frank Land as part of the British Libraries Oral History series on the life of selected British Computer scientists

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Alan King

**Interviewer:** Tony Morgan

**Link:** [https://exchange.lse.ac.uk/exchange/LANDF/Inbox/Re:%20Oral%20Histories-9.EML/1\\_multipart\\_xF8FF\\_4\\_LEO001.html/C58EA28C-18C0-4a97-9AF2-036E93DDAFB3/LEO001.html?attach=1](https://exchange.lse.ac.uk/exchange/LANDF/Inbox/Re:%20Oral%20Histories-9.EML/1_multipart_xF8FF_4_LEO001.html/C58EA28C-18C0-4a97-9AF2-036E93DDAFB3/LEO001.html?attach=1)

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Tony Morgan

**Interviewer:** Ray Hennessey

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Ralph Land

**Interviewer:** Martin Garthwaite

**Link:** <https://www.dropbox.com/home/Leo%20Interviews#:::76715808>

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Bob Gibson

**Interviewer:** Martin Garthwaite

**Link:** <https://www.dropbox.com/home/Leo%20Interviews#:::76715808>

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Neill Lamming

**Interviewer:** Martin Garthwaite

**Link:** <https://www.dropbox.com/home/Leo%20Interviews#:::76715808>

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Roger Coleman

**Interviewer:** Tim-Greening Jackson

**Link:** [tim@greening-jackson.com](mailto:tim@greening-jackson.com)

- **Title:** LEO Computer Society Oral Histories

**Interviewee:** Doug Comish

**Interviewer:** Martin Garthwaite

**Link:** <https://www.dropbox.com/home/Leo%20Interviews#:::76715808>

- **Title:** Computer History Museum, Silicon Valley, Oral Histories

**Interviewee:** Chris Date

**Interviewer:** Thomas Haigh

**Link:** <http://www.computerhistory.org/collections/accession/102658166>

Chris Date, well known for his work on Data Base theory and practice started his career with LEO, and provides a description of his experience on pages 7 and 8 of the transcript of the interview.

## Media Coverage

- **BBC 1 TV** in March 2012 ran a 5 episode series fronted by Len Goodman, reminiscing about the 1950s entitled *The 1952 Show* in honour of the Queen's Jubilee. Episode 5 screened on March 30<sup>th</sup> at 9.15am. It featured the LEO story with an excellent interview of Ernest Kaye. See also <http://www.bbc.co.uk/programmes/b01f9qw3/broadcasts/2012/03> The section featuring LEO and Ernest Kaye can be seen on YouTube at <http://www.youtube.com/watch?v=GE6TX70A3Rc>
- **60<sup>th</sup> Anniversary event at Science Museum 11<sup>th</sup> November 2011**  
The event received wide coverage including interviews on the BBC Today programme, BBC World Service, and BBC5 Live Outriders programme. It was also covered by the Daily Telegraph and the Daily Mail website The links below include reports in media, video recordings, radio recordings, photographs:  
<http://storify.com/lynetter/leo-60th-anniversary>  
<http://www.pcauthority.com.au/Tools/Print.aspx?CIID=280510>
- **Eric Schmidt in the 2011 MacTaggart Lecture** noted:  
"You (UK) invented computers in both concept and practice. (It is not widely known, but the world's first office computer was built in 1951 by Lyons' chain of teashops!). Yet today none of the world's leading exponents in these fields are from the UK"  
<http://s3.documentcloud.org/documents/238974/mactaggart-lecture-2011.pdf>
  - The Guardian on 2011 McTaggart Lecture Bridging the arts and sciences divide  
<http://www.guardian.co.uk/technology/2011/aug/29/bridging-arts-science-divide>
  - **TV Channel 5** ran a series of programmes on *Disappearing Britain*. The third episode in December 2006, entitled *The BRITISH CUPPA WITH WENDY CRAIG*, and included a section on J. Lyons with its Corner Houses and Teashops. This included the story of LEO including an interview with Frank Land. See also <http://ftvdb.bfi.org.uk/sift/title/824846?view=synopsis> and watch on [http://www.ovguide.com/tv\\_episode/disappearing-britain-season-1-episode-3-the-british-cuppa-with-wendy-craig-536421](http://www.ovguide.com/tv_episode/disappearing-britain-season-1-episode-3-the-british-cuppa-with-wendy-craig-536421)
  - **BBC Radio 4** commissioned a programme from Pennine Productions called **Electronic Brains** which was broadcast on 30 October 2001. The programme was compiled by and fronted by Mike Hally and one of the four episodes featured the story of LEO. See <http://www.bbc.co.uk/radio4/science/electronicbrains.shtml>

## Films

- *LEO The Automatic Office*, 1957 promotional film highlighting the way LEOs were constructed and their many varied business uses, ranging from teashop inventories to Ford's payroll. Copyright LEO Computer Society. <http://www.youtube.com/watch?v=-8K-xbx7jBM> Also held by Computer History Museum Silicon Valley <http://www.computerhistory.org/collections/accession/102705993>
- *Taking the Punch Out of Input*, 1970s era film by Lyons Computer Services focusing on input devices for LEO III range developed in 1960s. <http://www.youtube.com/watch?v=6IPVdHHRc2Q>

- *Electronic Data Processing. A series of film strips produced by the Institute of Office Management by its EDP Committee covering LEO I, Elliott 405 and Ferranti Pegasus. Available from Kevin Murrell at the National Museum of Computer History, Bletchley.*

## Appendix 2 – LEO Oral History Guidelines

### 1. Introduction

The LEO Oral Histories are an attempt to capture the knowledge and memories of employees of LEO Computers and its customers for posterity. It is the intention to keep the voice recordings and the digitised transcripts in an archive, possibly at The National Museum of Computing (TNMOC) at Bletchley Park and/or elsewhere. Links to the archive will be provided by a range of museum and specialist websites, including that of the LEO Computers Society, to permit as free access to the material as possible.

The archive will form part of the historical record of the development and evolution of computing in the UK. Its users are expected to be international scholars studying the history of computers and computing, the development of business computing and administrative computing, the impact of computing on society, innovation and innovation diffusion.

Other users will be undergraduate and graduate students in computing and business disciplines engaged in projects related to the history of their discipline, as well as journalists and writers preparing scripts and texts for articles, books, radio and television programs, and films which have computer related themes as well as biographical material involving some of the subjects of the oral histories.

Oral Histories require an interviewer using special audio recording equipment supplied by the Society to record the subject's spoken history. The guidelines below provide a framework for an interviewer to work to. Once an interview has been recorded it has to be transcribed into printed text and the printed text checked by the subject and corrected. Corrections and explanations would only be added to the transcript in the form of indexed Endnotes. A standard comment about the corrections and explanations should be recorded by the Interviewer at the end of the oral recording.

The copyright for the text is vested in the LEO Computers Society with the full agreement of the subject. The standard copyright claim and year of claim will be recorded at the end of the oral recording by the Interviewer as follows:

*"This interview of <interviewee> has been recorded by The LEO Computers Society as part of an Oral History Project to document the earliest use of electronic computers in business applications. Any opinions expressed are those of the interviewee and not of the Society. Copyright of this interview in recorded form and in transcript remains with The LEO Computers Society, 201x."*

Interviewers are volunteers primarily drawn from the Society membership though other volunteers, such as students studying or researching computer history, may with the approval of the Society carry out appropriate interviews

The LEO Oral History project is supported by funding from the Association for Information Technology Trust (AITT).

### 2. Guidelines for Interviewers

Because the recordings will be used by a great variety of researchers not all of whom will be familiar with mid-20<sup>th</sup> century technology or the role played by Lyons, it is essential that

interviewers ensure that where a respondent uses technical terms or assumes familiarity with, for example, the names of people or historical events, he or she is asked to explain and clarify the points at issue. A good example would be a respondent noting Kimball Tags or mentioning TRT by the use of those very familiar initials. The recording should explain what Kimball Tags are and how they were used, and spell out TRT's proper name and briefly who he was.

It is essential that interviewers master the recording equipment before embarking on an interview. It is very easy to make a mistake such as forgetting to change tapes, or keeping the recording going even when the formal interview has been concluded and the interviewer and subject gossip about some of their experiences.

Interviewing and responding can be very tiring and place a strain on voice and concentration. It may be best to divide the whole interview into a number of sessions each lasting an hour or so. The important thing is that both interviewer and subject feel comfortable, and that will vary with different people. A very full life history may take quite a few sessions and because it is easy to lose concentration and hence the thread, it may be best conducted over more than one day.

It is the responsibility of the interviewer to 'guide' the respondent by asking questions which lead to the unfolding of the narrative. But at the same time the interviewer must not dominate and should intervene only to get the respondent to clarify and explain where that is felt to be necessary. Above all the respondent must feel that it is his or her story which is the subject of the interview. That means that the interviewee should be encouraged to voice opinions and make value judgements where this will enhance the story.

Some remembered items may on reflection be regarded as being potentially damaging to living persons or slander them. Interviewers and respondents need to be alive to the possibility and be prepared to redact such items or place an embargo on their publication.

## **2.1 Introduction to the Interview**

The oral introduction to the interview recording is indicated above. The following is an example, recorded for the interview of Tony Morgan. The text should be on the lines of:

It's the 8<sup>th</sup> of November 2011 and I'm Ray Hennessy. I'm interviewing Tony Morgan to give us the story of his involvement with LEO Computers from the earliest days.

Good morning, Tony. We are recording this interview as a part of The LEO Computers Society Oral History Project. The audio version and the transcript will be lodged at a central archive and made available for researchers and members of the public.

Perhaps you'd like to introduce yourself ...

On the transcript, which starts with the above introduction the following should be inserted:

This transcript of the voice recording has been edited with the agreement of the respondent, Tony Morgan. Mistakes have been corrected and some clarification added within the text in italics; terms which may not be familiar to readers are explained in end notes.

## **2.2 Conclusion of the Interview**

The interviewer should end the formal interview with something along these lines:

This interview with Tony Morgan has been recorded by The LEO Computers Society and the Society would like to thank Tony very much for his time and reminiscences. The interview and the transcript form part of an Oral History project to document the early use of electronic computers in business and other applications, but particularly in business. Any opinions expressed are those of the interviewee, that is Tony, and not of the Society. The copyright of this interview in recorded form and in transcript remains the property of The LEO Computers Society, 2011.

The following may be added at the end of the transcript, if appropriate:

As indicated in the introduction, changes and clarifications have been included in the transcript.

### 3. Guidelines for the Interviewee

It is a very good idea to make comprehensive notes of your career in respect of LEO Computers but also note how your life led you, eventually, to working with LEO, and what happened afterwards. Note the names of anyone you can remember working with at LEO, not necessarily LEO staff, but any other people who were also devising LEO-based systems.

**Suggested CV and Interview Framework:** The framework is not intended as pro-forma script. Oral histories will vary in the detail provided, ranging from anecdotes about specific events to full life histories including details of domestic and family life. These guidelines are to be regarded as a menu. As far as possible the interviewee should dictate the flow. The role of the interviewer is to provide prompts when needed and to ensure that the interviewee's narrative is as clear and complete as possible without excessive intrusion.

- **Family:** Born, where and when. Occupation of father, mother. Any early memories?
- **Education:** Schools, further education, university. What subjects interested you, fired your imagination. What subjects did you take? Any special events or incidents having a bearing on what you studied? Did you do National Service? If so what did you do and where did you serve?
- **Finding a Career:** Career advice at School or University. What career did you envisage and why. What were your ambitions? Influence of parents on career. How did your career start? Had you heard of computers before you started your career. If so, how had you heard and what did you know? Had you heard of LEO or Lyons? What did you know about those companies or any other computer companies? Did you have friends or family who had gone into computers?
- **Client Companies:** If you worked for a client company, how did you come to work with LEO. [*Pick out relevant elements from the following paragraphs.*]
- **Joining Lyons or LEO:** When did you join? How did that happen? Who interviewed you? Did the interview make any special impression on you? Did you go direct to LEO or another part of Lyons? If so what did you do and when did you transfer to LEO? What was your first job when you joined LEO
- **Career with LEO:** Take us through your LEO career. Which computers and your role as the years passed? What do you remember of these years? Impressions of your colleagues and managers? Memorable incidents, including funny ones. Any feelings that you were at the forefront of business or computer innovation? Was the job exciting or boring? Did you work with LEO customers? Bureau or purchasers? Who were they? Review the experience of working with customers. When did you leave LEO? What made you leave?
- **Home life:** Where you married before joining LEO or later or not at all. Children? Home/work balance? How did that affect relationships?
- **Career after LEO:** What did you do in your subsequent career? How did it compare to working with LEO? Did your LEO career influence your subsequent career and if so in what way?
- **Professional activities:** Are you a member of the British Computer Society or other body such as IEE (now IET)? If so where you an active member? How? Did you maintain this in your retirement? Have you read learned papers or articles on computers, attended conferences, or read any of the LEO books?
- **Retirement:** When did you retire? What did you do in your retirement? Did you maintain contact with your ex LEO colleagues? Did you attend any LEO or computer history functions after your retirement?
- **Finally:** Reflect on your life experience with LEO. What remains with you of that experience?

*NB* The above is laid out as a sequence. In practice the interviewee will recollect events and feelings out of order and may want to add elements recalled during the interview. This has to be permitted with the interviewer providing explanations in the recording as this occurs.