Behind the Curtain at LEO: A Personal Reminiscence

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This reminiscence recalls the environment in which LEO came to be built, the personalities involved, the major problems that were encountered, and the circumstances that led to the disappearance of the brand at the time when it was achieving its greatest successes. From first to last, LEO's active life span was only 20 years.

The 50th anniversary of business computing, with special recognition for the Lyons Electronic Office (LEO) business computer, was celebrated in London in 2001. The anniversary occasion, coupled with the publication of three books,[1-3] and two articles in *Annals*,[4,5] meant that LEO was emerging from obscurity at last and achieving its rightful place in computer history.

The bare facts of how LEO came to be built by a London, England, catering firm are well known now. Figure 1 lists key dates[6] in the computer's history.

The story that follows is based on my personal recollections during the time I was the manager of Lyons' Systems Research Department and then of LEO's Systems Analysis and Applications Department, to which were later added Consultancy and Marketing.

1949—Decision made to design and build an electronic computer to serve the Lyons business.

1951—The world's first business computer job starts running regularly on the basic LEO.

1951—The world's first full-scale business computer job, the Lyons payroll, ran on the completed LEO I computer. LEO Computers set up as a subsidiary of J. Lyons and Co.

1962—The multiprogrammed, solid-state LEO III was delivered three years ahead of its IBM equivalent.

1963—Merger of LEO Computers and English Electric computer division.

1969—The final deliveries of LEO 326 computers (the fastest of the LEO III range) were made, completing 61 LEO III deliveries in all.

Figure 1. Key milestones in LEO development.

The environment

The catering company that built LEO, J. Lyons and Co., was an old established business with a management structure of a type that has since largely disappeared. Its founders were members of a family that had emigrated to England from Prussia in 1841. One of the Gluckstein brothers married a Salmon, and so the dynasty of Salmon and Gluckstein was founded. Their business began with tobacco products. Later, they branched out and established the Lyons catering business.[7]

After a time, so many family members were in the business that to avoid confusion they were all known by their first names prefixed by "Mr.," save for the wartime chairman, who was known as "Sir Isidore," and another of the older generation who was addressed as "Major Monte." Each division and subsidiary was the responsibility of a family member. Below them was generally a senior manager responsible for running the day-to-day affairs, but strategic decisions were always made by the family. When the computer subsidiary, LEO Computers Ltd., was set up, Lyons named Anthony Salmon to head it. Among his recent responsibilities had been control of the company's tea gardens in Malawi. The family had offices in the company headquarters in the west of London; consequently, decisions could be made rapidly. Such was the case when Lyons agreed to build a computer for the company's own use.

Over many decades, the company had developed a can-do culture. It had taken on enormous banquets calling for meticulous organization; accordingly, the company was confident that the seemingly impossible could be achieved as long as it was properly organized. Lyons was essentially a vertical company, prepared to take over any activity for which the required level of service could not be obtained elsewhere. So, it seemed less remarkable from inside Lyons than from outside that because the desired equipment was not commercially available, the company would naturally fill the gap.

Personalities

The LEO computer and its applications evolved from the vision and efforts of several different personalities.

Raymond Thompson

First and foremost was Raymond Thompson, the company's deputy chief comptroller sent to the US in 1947, leading a two-man party to investigate developments in the office management field that had occurred during World War II. It was that party's report that set everything in motion. The computer section of the report is reproduced in *LEO—The Incredible Story of The World's First Business Computer*.[2]

TRT, as he was generally known, was a Cambridge mathematician with first-class honors. He had joined Lyons in 1931. John Pinkerton, LEO's chief engineer, said of him:

> He had the quickest intellect of anyone I ever met. Sometimes when trying to persuade him of the value of some new approach, he would make a momentary resistance, but if you were right, then in a second or two his attitude would switch, your idea was seized on and elaborated in ways beyond anything that had occurred to you.[8]

Pinkerton made this statement from a background—which included Cambridge University and government research—that led him to have met some of the leading brains of our time. Perhaps not surprisingly, TRT sometimes found others to be somewhat slow. TRT was notorious for standing up two sentences into a presentation and saying, "What you mean to say is this …" Generally, but not always, he was right. Picking up new ideas extraordinarily rapidly, he was sometimes in danger of adopting them as his own. Len Lenaerts, who among other duties was responsible for improving the LEO system reliability and for participating in design, suffered notably. TRT found it difficult to grasp that a pre-war clerk in his department could have engineering ideas of such originality. To some extent, this outcome resulted from the company's rigidly hierarchical nature. Leo Fantl, an early LEO programmer, commented bitterly, "He was able to be brutally frank and he unthinkingly made me suffer for my nonscientific background and do-it-yourself 'education.'"[2] Fantl had come over from Czechoslovakia on a Kindertransport and had done much of his study as a farm laborer before joining the Royal Air Force (RAF).

On the other hand, Thompson's enthusiasm was an essential motor of the whole project. He was an enthusiast not only in his work, but in whatever he was doing. He enjoyed teaching what he had learned himself and later took close interest in all areas of computer training.

John Simmons

John Simmons was Lyons' chief comptroller, to whom Thompson presented the report of the US trip and the recommendations stemming from it. Simmons was another Cambridge mathematician with a first-class honors degree. He had been recruited by Lyons in 1923 when, with expansion, the company found itself engulfed by paperwork. When he arrived, the atmosphere was Dickensian, with high mahogany desks and stools. Over the years, Simmons had mechanized the offices with calculating and accounting machines from Burroughs and NCR. However, it was always Simmons' intent that the purpose of the mechanization was not just to carry out the office tasks more rapidly and economically but, equally important, to provide management with better information as to why profits varied and how variations could be put right. To support him in this work, he created a Systems Research Office that focused on creative organization and methods.

Simmons was as reserved as Thompson was outgoing. He rarely visited the offices for which he was responsible, relying mainly on those immediately reporting to him to develop and execute his plans and to keep him informed. He was the son of two missionaries and was guided by a strong social conscience. In a recorded interview in the 1970s, he declared:

> The difference between a routine office job and a routine factory job is that in the factory job you are doing the same thing, literally the same thing, time and time and time again. In the office you are doing the same kind of thing, but you are feeding in different figures to the machine all the time. You have got to concentrate. You can't even daydream.[2]

His ambition was to get rid of this drudgery. He spoke of his reaction when the computer proposal was made: "They put a match to a bonfire that was already latent. The suggestion only had to be made to be one of those exciting things that are immediately obvious."[2] (Figure 2 shows Simmons at a company function.)

John Pinkerton

At the operational level the computer responsibilities were divided into two areas. John Pinkerton was responsible for building the system, and I was transferred from Lyons Systems Research to form a new unit, responsible for making the system operational. We both reported to Thompson. Pinkerton had been recruited from Cambridge. It had been agreed by the board of directors that the computer project would go ahead, provided that the EDSAC system under construction at Cambridge, based on the von Neumann architecture, had demonstrated that it could successfully run a stored program. Before Pinkerton was hired, Lyons had never employed an electronic engineer. There was a strong electrical department, but its work was largely devoted to providing and regulating the Lyons power supplies.

Pinkerton had spent the war years in Telecommunications Research Establishment, the prestigious UK government research organization of which the principal objective was to develop electronic aids to the war effort. After the war, he had returned to Cambridge for postgraduate studies.[8] When Maurice Wilkes, the director of the mathematical laboratory that was building EDSAC, was asked by Lyons to interview Pinkerton, he replied that Pinkerton was just the man for the job. Pinkerton, approaching 30 when he was appointed, had a calm temperament that enabled him to overcome many problems during the design and building of the LEO systems. He also had to withstand pressures from Thompson, who was prone to underestimate required project resources. One of my abiding memories is Pinkerton standing on the LEO I plinth and resisting pressure to bring forward the forecast completion date for LEO II. "What are the problems that make you need so much time?" demanded Thompson. Pinkerton paused, then replied quietly, "You are asking me to give you the list of the towns in China that I don't know the names of."

My role

My responsibility of preparing productive applications to be ready for the equipment as soon as it reached completion was seen as a natural extension of my work as manager of Systems Research. As I've commented elsewhere, it was like going from checkers to three-dimensional chess.[3]

However, I was able to approach the new task with a detailed knowledge of the Lyons tasks that were to be converted. Before the war, I had worked at Lyons as a management trainee in Simmons' organization. The preparation could not have been better. During the war, I served with the Green Howards infantry regiment in North Africa. After being wounded, I was brought home and rejoined Lyons, where the work that I led in developing systems engineering is documented elsewhere.[4] Much of the success that LEO Computers achieved in producing a working system came from the close relationship that Pinkerton and I quickly established.

Figure 2. John Simmons and David Caminer at a LEO celebration in the 1950s. (Photo from David Caminer's personal collection.)

Len Lenaerts and Derek Hemy

This survey of the individuals involved in the LEO project's earliest days would not be complete without reference to two remarkable characters who emerged from Lyons' existing resources. One was Len Lenaerts, already mentioned, and the other was Derek Hemy, his counterpart on the programming side of the operation.

Lenaerts' involvement began with the bargain Lyons had struck with Wilkes that, in return for access to the resulting work, Lyons would provide a sum of money and the services of a technician for a year. Lenaerts was that technician. He had come straight to Lyons from school to work as a clerk. The job was not much to his taste, and he made unsuccessful efforts to escape over the years. The war provided him with an opportunity to follow his technical interests. He became a trainee wireless mechanic in the RAF and then obtained a job in radio countermeasures. On promotion to sergeant, he was responsible for three London RAF jamming sites.

Lenaerts returned to Lyons in an unspecified capacity after the war, and he was readily available when Lyons needed a technician to honor the commitment to Wilkes. His last job before leaving for Cambridge was said to have been to build an automatic coin-in-the-slot sausage-frying machine. At Cambridge he not only learned how EDSAC was constructed but was able to make a positive contribution to unit circuit design.

Hemy, too, had joined Lyons pre-war straight from school as another of Simmons' management trainees. Wartime service took him first to the Royal Engineers' chemical warfare branch and then to the Royal Signals, where he established and commanded a unit whose principal task was radio fingerprinting to identify the source of enemy transmissions through the analysis of their electronic characteristics and transmission styles. Back from the war, Hemy joined me in Systems Research, and he was a natural in learning about the programming techniques that were still in their infancy at Cambridge. With a young research student, David Wheeler, who later became a professor of computer science at Cambridge, he mapped out the first, embryo approach to the payroll application. The requirements for business programming varied considerably from those required for scientific programming. Both the nature of the problems and the composition of the user community were different. Hemy's work enabled us to develop techniques suitable for business programming, step by step. In the *Annals*' obituary about him, he was described as "invaluable."[9] Nothing could have been truer.

Problems

An important part of the work of the Lyons computer team lay in unmapped territory, particularly in regard to input and output (I/O). In scientific computing—chiefly the only kind of computing that existed up to that time—there tended to be little data, much computation, and few results. The type of ballistic table computation for which ENIAC was built was representative. Little data was needed for each ballistic trajectory, but many repetitive calculations were needed to track the projectile to its zenith and then more calculations as the shell came to Earth. Typically, the only results required were the definition in distance and direction of the landing point. The next set of data, giving perhaps a slightly raised elevation, could then be applied automatically by the program. Such was the character of a great deal of contemporary scientific work, and it differed little from the work that Charles Babbage had labored on in the previous century. For these needs, existing input and output mechanisms were adequate.

For business needs, it seemed evident that unless some way could be devised to feed in data and record the results more rapidly, the speed of the electronic computer would be squandered. From the outset in the Thompson-Standingford report[2] in 1947, it was accepted that this medium must be magnetic wire, or, more likely, magnetic tape, which was then still under development. In their report they wrote: "As an alternative to the magnetic wire, a paper tape, coated with a magnetic layer, has been developed. It is less expensive than the wire and can be run at one tenth the speed to give the same output."[2]

It was assumed—although no classical Systems Office Research study was carried out—that magnetic wire or tape would be the I/O medium and, for that matter, the medium of secondary storage. The LEO team's assumption, untested in any way, was that electronic computing required magnetic services.

Pinkerton began work on magnetic storage soon after he joined Lyons. Magnetic tape expertise was not readily available, but, as it happened, a leading electrical firm, Standard Telephones and Cables (STC), was then installing a new telephone exchange at Lyons headquarters facility, and their subsidiary, Standard Telephone Laboratories (STL), was experimenting with magnetic tape in conjunction with teleprinters.

In May 1949, the same month as EDSAC produced its first results, STC was given an outline of what LEO Computers envisioned. Soon afterward, a study contract was negotiated and a contract to build the required equipment followed. The plan was to record the data onto the magnetic tape using a special device incorporating a check function, and then feed the data into what was called a *converter*, where the data would be translated from its decimal notation on tape to the binary notation used by the computer. Then, when the arithmetic unit was ready for each set of data, it would be automatically flashed over to the main computer memory. Output would be handled similarly. Thus there would be something like a three-ring circus, with results for one unit being output while calculations for the next unit were being carried out, and the input for a third unit being read in (see Figure 3).

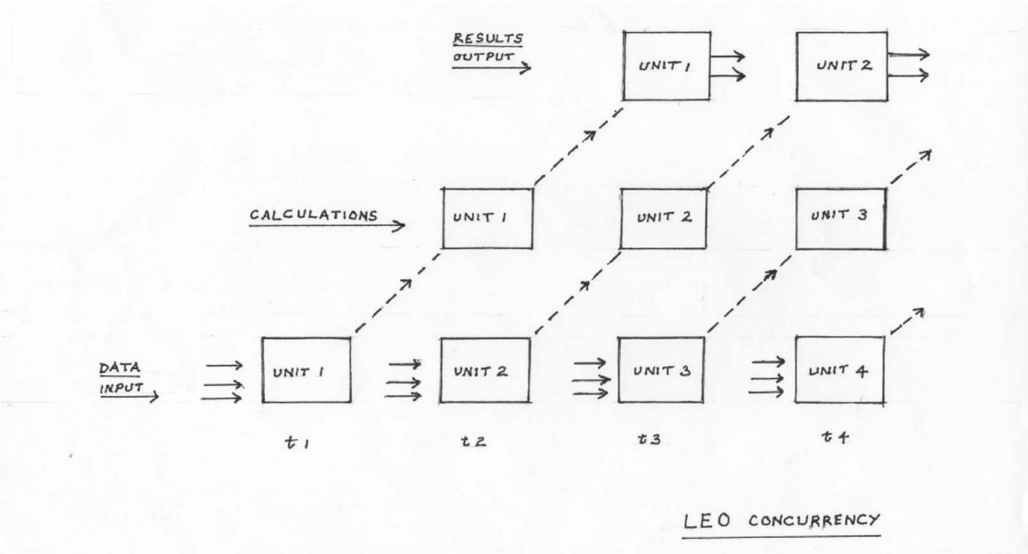

Figure 3. LEO concurrency. Data is input for item 3 at the same time as the computations are taking place for item 2 and results are being output for item 1. (Sketch by David Caminer.)

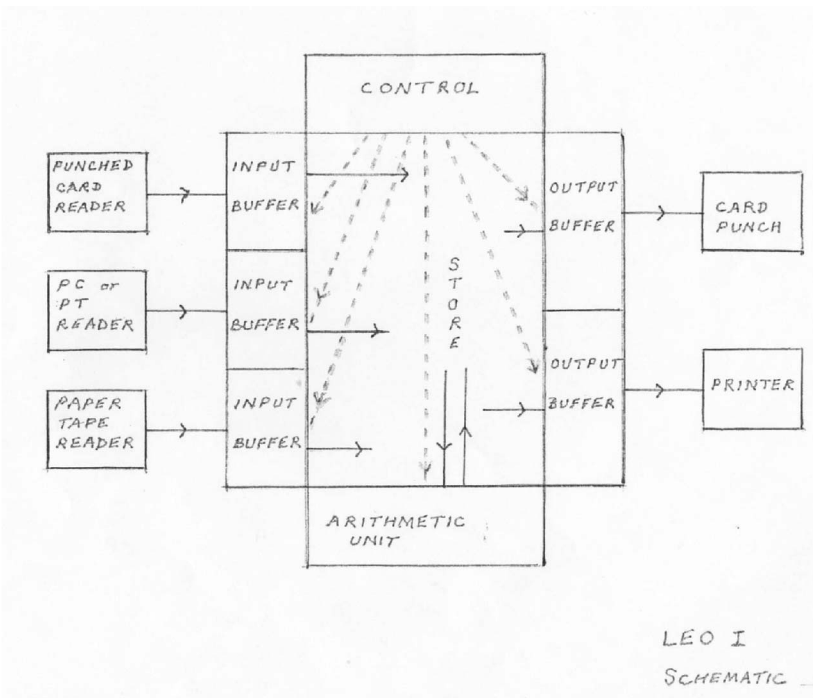

Figure 4. LEO I schematic. The three data channels feed data into electronic buffers where they are ready for use by the arithmetic units. Output was handled similarly. (Sketch by David Caminer.)

The plan failed to materialize. The magnetic tape encountered stop/start problems, but the major mistake was our relying on system logic in a technologically new device, the multicathode tube. These vacuum tubes had speed advantages, but continually disrupted trials by their proneness to faults, including the appearance of charges on more than one cathode at a time, which was theoretically impossible.

After a frustrating period, it was clear to the Lyons team that the STC equipment would not be ready in a sufficiently reliable state at anything like the date in 1951 of Pinkerton's completion of the mainframe. At a meeting, Simmons, Thompson, Pinkerton, Pinkerton's deputy, Ernest Kaye, and I in October 1951[6] decided to design and build an alternative system as a fallback to the STC system on which we would continue to cooperate. After a time, though, the STC project was abandoned, and all LEO resources were concentrated on the in-house system.

In 1953 the in-house system was complete. It was based on the same architecture as the system worked out with STL but accomplished its ends using conventional equipment—paper tape for recording and checking data, paper tape transports and punched cards for feeding data, and a line printer and card punches for output (see Figure 4). Equally important, the logical circuits were controlled by established vacuum tubes.

Although the new configuration was not as fast as the magnetic tape equipment on the STL system had promised to be, it was still capable of running the benchmark Lyons payroll job in 1953–1954 twice as fast as originally hoped for. This was due to extremely fine-tuned systems analysis and programming.

Simmons commented afterward about the choice of magnetic tape:

> It was a decision that was to produce more headaches than the whole of the rest of the project put together. If we had been content to use already existing systems for providing input and output we would have saved at least a couple of years and a great many headaches.[2]

The mistake meant that LEO I would not be complete until the autumn of 1953. However, work had proceeded on the Lyons payroll application in parallel, and trials were carried out as each aspect of the configuration was completed.

The specification[10] of the resultant application—the world's first fully integrated business job—reveals the detail to which the systems analysis was taken. The timing of the job, however, depended on all three channels of data, the computations, and the two output channels operating concurrently. This required a great deal of thought. For example, only one print cycle could be afforded for the employee pay slip, but this would have resulted in a long thin strip that would have been difficult to handle. Instead it was decided to give each employee two print cycles but to have two successive pay slips printed side by side. This meant storing one of the sets of pay slip details, but it was judged that in this case the additional use of precious memory was justified. Counting in all preparatory runs, the overall time per employee was 1.5 seconds:[11] this on a machine that had been described as having a hundred-thousandth of the power and storage of a modern PC.

An important feature was the operation's comprehensiveness. It was some years before computers came to be regarded elsewhere as an acceptable vehicle for payroll, but even when they were, it was unusual for the application to start at the clock card and go all the way through to the pay envelope. In the LEO case, there was just one exclusion from the computer calculations—the premium bonus payment—which required calculating the payment for groups rather than just for individuals. There was no problem making the calculation by hand and passing the amount for each employee to the computer for incorporation in the gross pay.

While aiming at integration, it became a matter of policy in LEO applications never to endanger the reliability or timeliness of a routine to feed the vanity of completeness. Many major applications elsewhere have foundered over the years by the resolution to leave nothing out, whatever the economic and security considerations.

The backup

The Lyons payroll application was checked out by pilot and parallel runs and pronounced ready for service by the applications team in the autumn of 1953. However, because there was still no backup machine, Simmons was reluctant to run the slightest risks and so the trials went on until the system went live early in 1954. As he said later, "[F]rom then onwards we kind of lived on tenterhooks, afraid that the machine might break down and that the Bakery staff wouldn't get their money." He went on, "but in fact it never did break down and by the end of the year we had got about ten thousand people on the payroll."[2]

The lost two years had not been wasted. As soon as it had become clear that there would be a severe delay in commissioning the full system, I specified a management accounting job that required little more than the facilities provided by the basic EDSAC. Known as the bakery valuations job, its implementation has been described in *LEO—The Incredible Story*.[2] It ran for the first time in November 1951 and continued week by week for several years. With his strictly logical mind, Simmons had been loath to permit precious machine time to be used on a job that, as he saw it, could have been carried out on the scientific machine at Cambridge. In practice, the job became a valuable testbed for the systems analysis and programming techniques that had been worked out. The team learned, for example, how careful the precautions needed to be to prevent a rotten apple in the data from corrupting the barrel.

Service bureau activity

In this period, too, Lyons performed a great deal of scientific and actuarial work on a service bureau basis. None of this work was sought, but as soon as the success of the bakery valuations job became known, there was a steady stream of mathematicians, crystallographers, meteorologists, and representatives of insurance and aircraft companies wanting to use this new facility. Organizations were charged at a standard rate, but at the outset, we freely assisted them in getting their jobs operational. Generally, LEO Computers did not appropriately charge for this, so if the operational runs were short, the whole effort could be uneconomical. Later, at the completion of the Lyons payroll job, a formal operating section was instituted under Tony Barnes, who had joined us after service as a lieutenant instructor in the Royal Navy, and the arrangements became more businesslike. From that time, the idea of a service bureau as a profit center developed.

The service bureau work was characterized by highly repetitive calculation loops; it provided good practice for the programmers in carrying out optimization. Saving an instruction became a favorite pastime, and this skill became a valuable asset in business programming, too. A second feature of this work was that runs were often long, and it was important that if a break occurred, as little runtime as possible should be lost. To achieve this result, we devised a system of routine checkpoints and restarts.

In a sense, the mathematical programs provided a real-life set of test programs to complement the comprehensive set of standard tests that the engineers and programmers had devised for the system. The test programs were tools in the determined efforts over this period to improve the system reliability and make repairs more rapidly.

It was a second major difference from scientific work that in business, producing timely results was as essential as producing accurate results. In most computer work of the period, scientific work was being executed so much faster than before and such a load was being taken off scientists that it mattered little if the results were a day or two late. That was a leeway that was seldom available for business. It was not surprising that Simmons was concerned about the bakery operatives' paychecks.

LEO II

Without any formal decisions to the contrary, the initial intention that live work would always be covered by a backup machine had evaporated. As a token of this delay, the size of the Lyons payroll handled by the computer was limited to 10,000 personnel until the backup was online. It was not until July 1954 that plans were finalized for a LEO II (see Figure 5). The original machine was given a new name because the engineering had been further developed. The temptation to take advantage of experience and technological advancements proved stronger than the anxiety to produce a backup. Among other changes the storage system was refined and a new, smaller, faster mercury delay line system was incorporated. The whole configuration was faster and, because of the reduction in memory tube length, less difficult to keep in perfect synchronization.

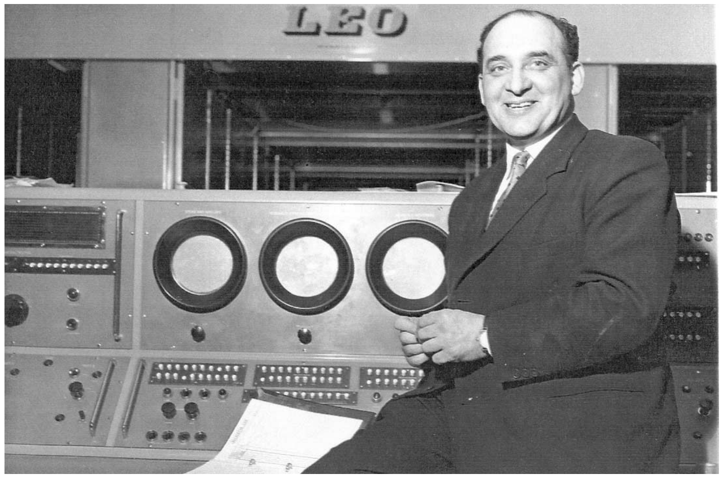

Figure 5. David Caminer at a LEO II console, late 1950s. (Photo from David Caminer's personal collection.)

A second factor in the delay was the company's decision to build on the payroll success by offering LEO systems for sale. New pressures were encountered from some potential customers who wanted features they might have read about elsewhere to be included in whatever configuration they ordered from Lyons.

It was not until May 1957 that LEO II was ready for service. It was something of a miracle that Lyons had been spared a calamity. Although the Lyons payroll had been limited to 10,000, the payroll for a LEO customer—the Ford Motor Company car plant in Dagenham, England—had also reached 10,000, and there were other smaller payrolls enjoying the service. Additionally, the delivery service to the 200 Lyons tea shops was being controlled by the computer, together with the paperwork for the distribution to grocery stores all over the country and the stock control of the company's vast tea blending plant. This was highly time-critical work, and the applications team had become increasingly concerned about time spent on adding features while the workload expanded.

In hindsight, the extra work, accepted at a time when there was no backup, amounted potentially to at least as great a blunder as the magnetic tape fixation that had cost two years. But the LEO system—inherently frail due to its several thousand vacuum tubes—met its obligations, although there were occasional crises. When there were faults, day or night, the maintenance engineers generally rapidly brought the system up again, sometimes with programmer support. It became a LEO Computers tradition that we could not say that it was the computer's fault if there were a delay. The computer's reputation must not be tainted.

Success: LEO III

The trip to the US that Pinkerton and I took in 1958[12] stimulated further development. Rightly or wrongly, it seemed that we were still a long way ahead on systems architecture and business applications but were falling behind on technology. As a consequence, one of the first steps on our return was for Pinkerton to plan a magnetic core memory in LEO II in place of the interleaved delay line memory of which we had been so proud. It increased speed but, more importantly, it reduced the space requirements. Most importantly, it gave experience in handling a solid state memory in preparation for the LEO III, which appeared a year after the last LEO II delivery to Ford.

Much has been written about LEO III, and many in the LEO camp believed it to be three years ahead of the corresponding IBM system in facilities and performance. The system parameters are set out in Peter Bird's book.[1] The new system fully met the "second generation" description. It was designed in diode and transistor technology for the logical circuits, magnetic core storage, and transistor registers. The words were longer, and the fast memory had a capacity more than 30 times larger than on LEO I, giving a potential size (massive for those days) of 65,000 words. Add time was 40 times faster at 34 microseconds. The I/O system was now thoroughly integrated into the mainframe instead of being latch-ons at the front end and back.

In addition to these speed and capacity increases, which reflected the continued advance of solid-state technology, there were two major innovations. The first was the use of microprogramming to build the instruction set. This was a technique derived from Wilkes, who recounts how he thought out the idea on the way back from a visit to the Whirlwind computer at the Massachusetts Institute of Technology.[13] The technique involved a wired-in array of basic actions, which could be invoked by microprograms held in read-only core matrices to form the instructions available to the programmer. An incidental outcome was a further speed improvement as references to the memory to pick up instructions were significantly reduced.

Pinkerton quickly latched on to the new technique, and John Gosden (from the consultancy team who worked on the system software aspects of LEO III) joined with the engineers in determining what the instruction set should be. Gosden brought with him the experience gained by the whole team working on the full spectrum of business applications as well as a remarkable variety of service work. A rich repertoire of 92 instructions was developed.[1] Even this large number could be added to without too much difficulty if, in a particular program, a macro sequence was frequently employed.

The second innovation was multiprogramming, or time-sharing. This enabled several separate programs to run concurrently with no danger of interfering with each other. The calculator speed had advanced more than that of the peripherals, and this feature enabled it to be fully exploited.

To complement the hardware, Gosden had sketched a software package aimed at enabling the programmer to concentrate on what the computer was asked to do rather than to consider how the system would do it. By Microsoft's Windows standard, the operating system was tiny but efficient, occupying only a relatively small part of the memory. Because it dealt only with essentials, it was free from the faults that so often plague modern operating systems.

The integrated hardware and software LEO III system was backed by a remarkable cadre of consultants. Several of these consultants had been won from further talent trawls through Lyons' existing personnel, but the majority came fresh from university. Oxford and Cambridge had been particularly cooperative in steering some of the more venturesome students in LEO's direction, and the team reflected this quality. None of the recruits brought with them any computer knowledge. Yet all had become proficient programmers and learned to write clear, concise specifications before developing applications of their own. Although they were responsible for sales, they received no bonus or commission. They were called consultants.

Peter Hermon, a senior consultant, who later designed and implemented the award-winning reservation system for British Airways, declared:

> Much of the excitement came from the thrill of handling a job in its entirety, definition, store lay-out, coding, testing, operating instructions and user liaison. Not for us the drudgery of the assembly-line coder. In our enthusiasm (and sometimes naivety), nothing was sacrosanct, nothing impossible.[2]

Demise

So, in the early 1960s, LEO Computers saw itself ahead of other vendors not only in the suitability of its equipment for large-scale office work, but also in its ability to go into large institutions, analyze their needs, and put their computers to do productive work.

Leo Fantl and Peter Hermon have already been mentioned. Among others in an implementation-tried team were Frank Land, who became chief consultant; Doug Comish, a wartime Cambridge footballer; John Aris, later on the Director of the National Computer Centre; and Ninian Eadie and Mike Jackson, both international-class sailors.

Why, then, with a lead in systems design and such strength in consultancy personnel, did LEO Computers disappear from the market within a few years? In hindsight, there were many reasons. The home marketplace was too small. British industry and administration were traditionally less venturesome than their American counterparts. The British government was resolutely noninterventionist and timid in its own computerization. LEO Computers, unlike its main competitors such as IBM and International Computers Ltd. (ICL), had no sizable market base on which to capitalize. And, perhaps equally important, the LEO team was so convinced that it had the right answers that it tended to lose sight of the fact that the ordinary businessman had no taste for adventure and risk in a field that, at the time, was not essential for his operations.

Further, the LEO management team, so cohesive in the past, was now divided—differences were not aired and they were not resolved. At the operational level, Pinkerton and I were convinced that we had produced a state-of-the-art system, both hardware and software, for which there was a significant market. In our coast-to-coast tour of leading US installations,[12] we had been startled by the number of large and expensive IBM, Univac, and other systems that were either employed or were on their way. We were unable in many cases to identify how the systems had been justified economically, but we learned to appreciate that it had already come to be regarded as axiomatic that every large business had to have its suite of large computers. The computer had become as much fashion as utility, and it stood to reason to believe that this fashion, like so many others, would cross the Atlantic.

However, at the other end of the management spectrum, Lyons' Anthony Salmon was becoming concerned that the growing demands of LEO Computers were threatening to become greater than the parent company could bear at a time when the core catering activities were themselves going through a challenging postwar period. With the need for continuous investment both in development and in work in progress, the subsidiary had become burdensome. LEO Computers' future was becoming a strategic business matter to be resolved in the Lyons' manner at the highest level.

Simmons' attitude also played a role. Simmons had warmly supported the building of the first LEO because he saw it as the answer to Lyons' own compelling office needs. Similarly, he had supported the sale of copies of the LEO II to chosen outsiders because it was a way of spreading the development costs, rather than because of any inclination to go into the office machine business. Now, he welcomed LEO III because it met Lyons' ultimate ambition for integrating all the applications for all its divisions in what was described as its master plan.[11] However, backed by his experience as the head of the Office Management Association, the representative body of UK office administrators, Simmons was unconvinced that there was any substantial number of users capable of constructively and creatively using large-scale computer systems.

Another line of thought at this time had been to concentrate on the service bureau activities. The successful relationship with Ford, Kodak, and many others had indicated that there was a large market to be tapped if users could be weaned from their distaste of being experted by what was still widely seen as a tea shop company. The case for this approach had been strengthened by a partnership formed with a leading South Africa gold-mines organization. After a world survey, Rand Mines had decided that LEO III was what they wanted, but, in view of the geographical distance, proposed that it and LEO Computers should jointly offer a bureau service. Thompson was particularly involved with this proposition, and he agreed to this.

So, with these cross-currents, Salmon set out quietly on the threshold of the LEO III launch to seek ways of reducing Lyons' exposure to the computer trade. In discussion with Lazard's, the company's merchant bankers, it was discovered that English Electric, one of the UK's leading electrical engineering companies, had reached the same conclusion. Both Lyons and English Electric thought that additional partners were needed, so Salmon and Gordon Radley, an English Electric director, arranged a tour of Europe to see whether these could be found among the several French, German, Dutch, and Italian companies working on different aspects of data processing. They were unsuccessful in this quest but formed a good-enough relationship to agree to pool their computer subsidiaries and share the burden between the two. This, of course, was carried out in secrecy to avoid the danger of users and potential users learning that the future was uncertain. The merged entity was named English Electric LEO Computers.

It was an unbalanced partnership in the negotiations that followed. Radley was a distinguished engineer while Salmon made no claim to be knowledgeable about computers. Despite his affection for the subsidiary for which he was responsible, it was, in the end, just another business. This did not put Salmon in an ideal position to defend LEO's interests. All the discussions seem to have been about financial arrangements and appointments, with nothing about the choices that the new company would have to make from the portfolio of computers that it had now inherited. The chairman and managing director were to be from English Electric, and the electrical engineering company was to be given the lead in deciding what systems to market.

The merger with English Electric was announced in February 1963, nine months after the LEO III installation in London and eight months after the LEO III installation in Johannesburg. After a short period, LEO Computers sold its share of the merged company to English Electric and recouped its expenditure over the years. LEO was dropped from the company's name.

Thompson, who seems to have been only partly informed of how the negotiations progressed, now found himself limited in terms of deciding where to devote his energies. After years of reporting to Simmons, he could not bring himself to report to the newly appointed managing director Wilf Scott, and after a miserable three years, he left the company to join one of the largest LEO user companies as an adviser.

Meanwhile, unaffected yet by the merger, LEO computer development and marketing was reaching new heights. A top-of-the-line machine, the LEO 326, was unveiled in 1963. The LEO 326 had a memory cycle time and overall speed five times faster than the basic LEO lll. This closely met the needs of the UK Post Office, which ordered a number of them to build a service chain all over the country. In 1964 they placed a further order for five 326s. This was the largest order ever placed in Europe and large by any standard. Paradoxically, this order came a month after Lyons had sold back to English Electric its share of the joint company. In this deal, all Lyons' development expenses were recovered. It was a sad day, though, for the engineering and applications teams that had labored so devotedly over the years.

In 1965 the LEO high point was reached—17 systems, many of them top of the line, were delivered. In the following years, 14 more were delivered despite the severe dislocation caused by the merger and disposal of Lyons' interests. But the ensuing downturn was inevitable; moreover the pool of consultants was running dry. Several had no taste for what had become the norm—merely responding to invitations to tender with little opportunity for any in-depth study of the customer's problem—and left English Electric to work for large users.

There was yet another blow. For all its strength as an engineering company, English Electric soon decided that it could not provide the resources necessary to design a replacement product line. Accordingly, English Electric decided to jump the gun and import a design from RCA with which it had cross-licensing arrangements. To build the larger units in its Spectra range, RCA's design featured advanced multilayer circuitry. To meet the needs of LEO customers, however, a much larger top-of-the-line model was designed by the UK engineers, and the operating system was entirely redesigned.

Apart from anything else, English Electric felt that adopting the RCA model would bridge the gap between the English Electric and LEO wings of the organization. It was an economical way out, although this meant that the LEO brand and the English Electric KDF9, a good scientific system, had to be abandoned before their time.

It was a tough end to the LEO story. The last few years were a contradictory maze of increasing performance, higher deliveries, and successful implementations interlaced with the dead hand of a merger. All that remained was the LEO message of creativity and integrity carried by LEO people wherever they went, all over the world.

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Editor's Note

Additionally, there are two archive sources:

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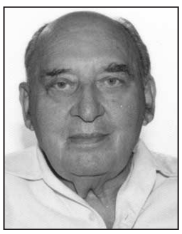

David Tresman Caminer joined J. Lyons & Co as a management trainee in 1936. After war service from 1940 to 1943, he became manager of Lyons' systems research, moving to the LEO project in 1950. He became a director of LEO Computers in 1959 as manager with responsibility for marketing and consultancy. Later, at ICL, positions included director of systems software requirements for the new range and director of new range introduction. He completed his formal career as project director for the European Economic Community's implementation of a computer and communications network. He was decorated on retirement in 1980 with the O.B.E. [Order of the British Empire] "for services to British Commercial Interests in Luxembourg."

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