GROWING PAINS: 1970–1979

The early 1970s saw high inflation, the oil price shock and industrial action by coal miners, which led to rolling power cuts and the three-day working week for the first months of 1974. Many companies struggled to survive. But as the decade began, Cambridge Consultants was close to collapse for a different reason – despite the enthusiasm and technical brilliance of the people who worked there, a lack of management skills and business experience threatened the company's survival. However, at the same time, two other companies, Metals Research and Sinclair Radionics, were riding high and new companies were being formed at an increasing rate. The development of the Cambridge Science Park also began to have an effect. By the end of the decade, things would look very different.

When George Kent Ltd took over the **Cambridge Instrument Company**, it had four divisions: Industrial, Scientific, Electronic and H W Sullivan Ltd, a company purchased in the 1960s that made precision electrical measuring instruments. In 1970, Kent Electronic Products was set up in Cambridge, and in 1971 the industrial section was merged with the Foster Instrument Company. The medical element of the scientific section became a separate company a year later, Kent-Cambridge Medical Ltd, through a merger with another Kent acquisition, Elmed Ltd.

The premises on Chesterton Road were sold in 1974, and what remained of the original company moved to Rustat Road. The same year, the Kent group was bought by Brown Boveri, which led to the formation of the next incarnation of Darwin's company, Scientific and Medical Instruments Ltd, under the Brown Boveri Kent umbrella.

The early 1970s saw contrasting fortunes for different sections of the former **Pye Group**. Increased competition from Japanese television manufacturers, the arrival of colour television and the pending arrival of a fourth channel forced Philips to move Pye's television production to the Far East. Pye TVT shed half of its approximately 1,000 workforce, but the arrival of Richard King as CEO in 1972 marked a turning point, and the company was soon profitable again, helped by a series of very large orders from overseas. Total sales for Pye TVT between 1974 and 1979 were £76 million.

When the Health and Safety at Work Act came into force in 1974, Pye TVT had to start looking for new premises, as their existing labs could not meet the new requirements. In 1976, the company moved into the old ironworks that had previously been home to George Lister and Sons, manufacturers of the successful Lister sports cars in the 1950s.

Philips took complete ownership of the Pye Group during the 1970s, and Pye TVT was renamed the Broadcast Company of Philips. The Cambridge group took on the leadership of all broadcast operations for Philips, coordinating activities in Holland and the US.

Pye Telecom, meanwhile, had obtained planning permission for a new building on St Andrews Road, and in 1975 received financial approval from Philips to go ahead with construction. The building was formally opened in May 1978, and Pye Telecom operations from various locations around Cambridge were consolidated on the site.

Despite an increasing range of radio telecommunications products and agents in 113 countries by 1972, Pye Telecom faced internal competition from Philips' other mobile radio companies. Fortunately, Philips decided to establish a Mobile Radio Management Group to coordinate product development and commercialisation worldwide, and based this group in Cambridge.

Marshall continued to expand both in the automotive and aviation industry. Along with adding car dealerships, a new company, Marshall Thermo King, was founded to specialise in refrigerated vehicles. Arthur Marshall was knighted in 1974 for services to the RAF.

The Marshall engineers were given a new challenge in the late 1970s, when the company was commissioned by NASA to

Sir Alan Hodgkin, Lord Butler and Lord Adrian plant three trees to commemorate the opening of the Cambridge Science Park.

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Marrying pure science to filthy lucre

RICHARD MILNER tells why the Government has paid £4.5m to let a firm go private

Peter Dunne

The Cole brothers, Michael (left) and David: checking the market before taking the experimental plunge

METALS RESEARCH is not yet a name to conjure with in financial circles. It is a private company set up 18 years ago by a Cambridge researcher, Dr Michael Cole. It operates from the Government-sponsored Industrial Reorganisation Corporation was fending off the Rank Organisation and wading into the stock market to deliver Cambridge Instrument to George Kent. Now the DoI has been compelled to allow Brown restore the material fortunes of this export-intensive sector of UK industry.

phate crystals, which among other things give a glow to the LED or light emitting diode nology has to pay off. And to maximise profits, the company is not too proud to do its own low- Financial godfather John Moores of Littlewoods, a non-executive director of Metals Re-

design and build a medical research sled that would be used to study space motion sickness, scheduled for space shuttle flights in the 1980s.

By this time, **Metals Research** had grown to around 500 employees. Sales through its overseas subsidiaries were increasing, pushed by new CEO Bob Heil, recruited in 1971. Colin Fisher finally took the post of Technical Director, and the Cole brothers appeared on BBC programme *Tomorrow's World* to demonstrate their metal crystal technology the following year. With three Queen's Awards for Industry and burgeoning sales, turnover reached £4.1 million by 1974–5, and 85% of what the company produced was exported.

Metals Research had been working with the Cambridge Instrument Company for a while on the development of the scanning electron microscope, since it was often sold together with the Quantimet, with a combined price tag of around £250,000. By the mid-1970s, the continuing disruptions following the takeover of the Cambridge Instrument Company by the Kent Group and then Brown Boveri were causing problems. Anthony Wedgwood Benn, at the time Secretary of State for Industry, was keen to protect strategic technologies. Since the two companies were producing what have been described as the most important scientific instruments of the 20th century, and roughly 80% of what both companies produced was exported, combining the two seemed to make sense. Metals Research was offered government funding to take what had once been Cambridge Instruments out of the Brown Boveri Kent alliance, and the acquisition went ahead in 1975, overseen by new managing director Brian Smale-Adams.

The merged company was christened The Cambridge Instrument Company Ltd, and employed some 1,800 people. But the new ownership structure, in which government had a shareholding, created control and decision-making problems, and management were not able to run the business as they wished. The timing was also not as good as it looked at first, with the long-term effects of the 1973 oil price shock forcing severe funding cuts to the primary market for the machines, government and research. The glory days for Metals Research and Cambridge Instruments were over. By the end of the decade, the National Enterprise Board had sold the company to Gladecrown for £500,000, despite having invested £7 million and the company having a turnover of tens of millions in its heyday.

1971 was an awkward year for **Torvac**. Customer Rolls Royce went into receivership the day Torvac was due to ship a very expensive vacuum furnace to the company's RB211 jet engine research works. Realising Rolls Royce was in difficulty, Torvac kept the furnace and sent it to their new sub-contract factory at Skelmersdale. Luckily the machine was already part paid for, although it was some time before Torvac got the rest of the money – and even then, the newly nationalised Rolls Royce (1971) Limited cut that research and never took delivery of the machine.

As well as manufacturing vacuum furnaces and electron beam welders, Torvac also undertook a lot of sub-contract work, which was an important income source. Companies would commission Torvac to do vacuum heat treatments, complex precision welds and vacuum braising, typically on parts for jet engines and missiles. This provided a regular income to counteract the cyclical nature of equipment sales. The company also coped well with the three-day week and rolling power cuts, thanks to employee Sid Hamon, who found an old fairground diesel generator in a scrapyard, bought it and managed to get it going again.

Determined to avoid any outside investment, the company funded itself through bank loans secured on the founders' houses. This inevitably limited expansion, but the nature of Torvac's highly specialised offering and niche customer base meant that it was never going to be attractive to large investors or the stock market. Having survived the worst of the decade, the end of the 1970s was a prosperous time for the company, with some 50% of production exported. On a visit to the Indian Atomic Energy Authority, director Christopher Saunders entered the first kilometre-long building he had ever seen, the cutting edge science inside contrasting with its setting in typical Indian countryside.

Despite doubling in size every year since it began, **Cambridge Consultants** was not making money – ascribed by some to the drain on resources of the AIM and manufacturing side of the company, and by others to researchers in the Cambridge Consultants subsidiary of the group focusing on what they were interested in rather than what would sell. Each side thought that they were supporting the other.

New recruit Paul Auton, who had joined in 1969, recognised very quickly that the company was a shambles financially. At the age of 29, he was older and more experienced than most of the others, and also had the benefit of management training during his time at Marconi. He found that record-keeping was so poor that producing a set of accounts for 1968 was impossible, and cash-flow problems meant that it was getting difficult to order parts and components from suppliers.

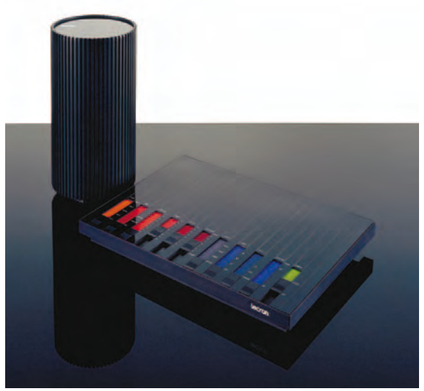
Debts were mounting and the company's bank, Barclays, was ready to put the company into receivership. One possible rescuer was Robert Maxwell, who wanted to become sole voting shareholder in exchange for paying off the company's debts, but instead Eiloart persuaded Clive Sinclair to provide the necessary funds. Sinclair became chairman and reorganised the management, appointing three directors, Richard Cutting, Robin Smith-Saville and Paul Auton. Smith-Saville ran AIM operations at the St Ives Mill, Cutting was in charge at Bar Hill and Auton was his deputy. Sinclair also separated the finances of the two parts of the business, ensuring that Cambridge Consultants had its own bank account and accounting functions, with the result being that if the team at Bar Hill did any work for the electronics group at the Mill, they were paid for it.

Although this bought them some time, it was only a year before it became clear the company would have to be sold. The search for a purchaser, however, was unsuccessful, and the receiver was called in. While Cambridge Consultants was a going concern and cash positive, the group as a whole was not, and the receiver split the consulting business out. Finally, in 1972, Cambridge Consultants was bought by Arthur D Little – at a fraction of the £500,000 price suggested to them the year before – to be its European research headquarters, and Richard

Above: Clive Sinclair became Chairman of Cambridge Consultants in the early 1970s.

Below: Paul Auton.

Right: Cambridge Consultants demonstrate an electric bike to HRH the Duke of Edinburgh in 1974.



Cutting was installed as CEO. There had been two other offers for the company, from Clive Sinclair and from the Huntingdon Research Centre; the staff voted to accept the offer from Arthur D Little (ADL).

The first Cambridge Phenomenon Report describes the takeover by ADL as bringing to Cambridge Consultants 'a business-like discipline and a sophistication that it lacked before'. The management structure was kept the same, but ADL placed a few people on the board and seconded one of their staff from the US to sort out the business functions in Cambridge Consultants and bring everything up to ADL's own standards.

At the same time as the ADL sale, the audio manufacturing part of the AIM group was sold to Colin Hammond. Under parent company C E Hammond, the manufacturing arm was renamed Lamb Laboratories, with Cambridge Audio being the sales side of the business. Eiloart left the company he had founded and would later become involved in the Green Party and development projects.

Southward also moved on, setting up Lecson Audio in 1971 with Bob Stuart from Marconi and John Greenbank, a writer on *Wireless World* magazine. They bought in design work from Allen Boothroyd, whom Southward had met at a wedding.

Boothroyd designed what he called the 'box' for the audio equipment they were developing, the result being the Lecson AC1 preamplifier and AP1 power amplifier. More than simply a couple of 'boxes', the Lecson amplifiers won the 1974 Design Council Award and were displayed in the Museum of Modern Art, New York. Despite this success, the company was vulnerable because it had been funded by a property developer. When property prices started to fall and interest rates rise in the mid-1970s, their funder had to get his money out in a hurry, and the company was sold. Southward left to work for Metals Research.

At the suggestion of Southward, Allen Boothroyd joined Cambridge Consultants to set up a design group. The company had around 90–100 employees but only one person working in the drawing office, with little knowledge of industrial design. However, Cambridge Consultants was not focused on developing and designing products for consumers, and after two years, Boothroyd left to set up a design consultancy with Bob Stuart. The first incarnation, Boothroyd-Stuart Associates Ltd, went bust when a customer did not pay, but Boothroyd-Stuart and Partners started trading the following day.

The next move was to start designing for themselves rather than for clients, and the pair set up Meridian Audio Ltd in 1977. At the time, pension funds were investing in giant warehouses around St Ives and Huntingdon. Regulations required a certain number of toilets per square foot of warehouse – even though the warehouses were only used for storing grain – and Boothroyd and Stuart found themselves manufacturing their first audio systems in the toilet block of a warehouse in St Ives.

Another person who left Cambridge Consultants when Arthur D Little took over was Gordon Edge. Along with Roy Hawkins (who had been at Cambridge Consultants since 1967), Edge had been involved in the earlier discussions with

Gordon Edge set up PA Consulting's Technology Centre in the early 1970s.

Above left: Lecson AC1 preamplifier.

Left: David Southward receiving the 1974 Design Council Award from HRH the Duke of Edinburgh.

PA Technology's award-winning new building, 1975, designed by Richard Rogers.

Below: Plessey's vandal-resistant coin-operated telephone, designed by PA Technology.

Arthur D Little, but was then approached by PA Consulting, an international management consultancy firm founded as Personnel Administration in London in 1943.

Originally set up to help with the war effort – improving productivity in making armaments for the Lancaster bomber was one of their first jobs – PA was the largest management consultancy in the world in the early 1970s and was keen to set up a global technology operation alongside its core business. Arthur D Little was a smaller organisation and more interested in focusing on technology consulting in the UK.

Edge and Hawkins met up in Liverpool Street station and decided that PA was the better opportunity. Adding technology to the PA offering proved to be a wise choice as increasing competition from companies such as McKinsey and the Boston Consulting Group began to hit the management consultancy side of the business.

Technology operations were initially run from London, with the team being given the support to do what they wanted, as long as they made a profit. But the intention was always to move back to Cambridge, and within two years they had moved into a large semi-detached house on Milton Road, near the Science Park. Since the house had previously been occupied by a firm of solicitors, planning issues were seemingly avoided, although the fact that the solicitors had never set up laboratories was conveniently overlooked.

PA Technology, or PAT Centre as it became known, grew rapidly and was profitable within six months. Parking became a problem as staff numbers increased, prompting complaints from the neighbours. The City Council got wind of the laboratories and took action, eventually forcing the PA team out three years later. The house was sold for £50,000 and Edge and his colleagues moved into temporary premises in an old joinery factory at Milton.

Their success meant that the parent company was willing to invest in new premises, a site in Melbourn was chosen and Richard Rogers commissioned to design a building that would be highly flexible and create an environment that promoted innovation. Opened by the Duke of Edinburgh in 1975, PA Technology's new building was modular and open-plan. Having no internal walls meant that space could be re-configured as necessary, and the open-plan arrangement was intended to encourage the exchange of ideas. The building won the Financial Times Industrial Architecture award in 1976 and the Royal Institute of British Architects regional award in 1977.

Among PA's successes and near misses in the 1970s were three products they designed for Plessey. Sir John Clarke, Plessey CEO, invited Edge to visit his Liverpool factory. A product the factory was scheduled to manufacture was over two years late and the workforce was idle – Clarke wanted Edge to come up with something for them to do. PA developed three products: a new payphone, a pocket phone and the Viewtel.

The coin-operated, vandal-resistant phone box that PA designed enabled Plessey to win an extremely lucrative contract to supply British Telecom, beating GEC in the process. It became the most successful product in Plessey's history and is still in use around the world.

The pocket phone, an early mobile phone, was tested in Liverpool Street station to dispel claims that it would not work in buildings with a lot of metalwork. Plessey spent £1 million on development, and offered to wire up Glasgow for free to demonstrate that the phone would work across a city. The BBC even made a film about how the new phones would be used – one example being to make calls from the train. The Post Office, which still had a monopoly on telephones at the time, claimed that such a tiny phone could never meet the necessary audio requirements and they could not permit competing telephone services on inferior technology. Besides, no businessman would ever want to use a phone on the train. He would much rather have a glass of wine and read the newspaper.

PA's Viewtel was an integrated keyboard and display, and had some of the functionality of the personal computer,

but Plessey decided not to develop it. Nor, to Edge's disappointment, was funding forthcoming for a later project to explore his suggestion to link computers wirelessly to databases.

Despite the relationship with Plessey, the vast majority of PA Technology's business was outside the UK, particularly in Sweden through an associate PA company in Stockholm, and Germany, with companies such as Bosch. The company also developed the first electronic petrol pump, for US company Dresser-Wayne, in 1971.

In 1978, PA Technology won the Queen's Award for Technological Innovation for the digital micrometer it had developed for client Moore and Wright. PA was the first consultancy to win this award, and sales of the micrometer reached hundreds of thousands over the next decade and a half.

Although Cambridge Consultants lost its founders and some of its earliest employees in the 1970s, it was not a total exodus, and the company continued to attract new people to Cambridge. One of these was Howard Biddle, who arrived in 1972 from a two-year graduate apprenticeship with the British United Shoe Machinery Company in Leicester. Biddle's apprenticeship had included a year on the shop floor as an engineer, working on machine tools, and a year in an office role, working on production control and other processes. A three-line advertisement in the *Daily Telegraph* for Cambridge Consultants attracted him away from a move into industrial design, and Biddle was soon working on mechanical engineering problems at the Mill in St Ives. One of his early projects was yet another carpet machine, this time one which blew wool cuttings down tubes onto glue-coated hessian.

After four years at Cambridge Consultants, Biddle followed his enthusiasm for product design and development and went to the Royal College of Art to do a course in industrial design. When he finished two years later, he had not planned to return to Cambridge Consultants, but the offer to help build a product design capability for the company, where the focus would be on designs that brought down manufacturing costs, was too hard to resist, so by the late 1970s Biddle was back.

The 1970s also saw the early days of a new technology cluster emerge from Cambridge Consultants: inkjet printing. Graeme Minto had been working for a Cambridge Consultants' client on continuous inkjet technology since 1971. When the client decided to halt the project, Minto believed the technology was still worth pursuing. Eventually, he licensed some of it from Cambridge Consultants and founded **Domino Printing Sciences** in 1978. Within a year, the first machine had been sold to a customer wanting to print numbers on bingo tickets, still a customer more than 30 years later.

Far left: The Moore & Wright digital micrometer designed by PA Technology was a big seller.

Below left: Howard Biddle joined Cambridge Consultants in 1972.

Below right: Graeme Minto founded Domino Printing Sciences in 1978.

Enderby's Mill housed Sinclair Radionics in the 1970s.

Below: Sinclair Executive calculator.

Sinclair Radionics was expanding at the start of the 1970s. Moving into Enderby's Mill in St Ives in 1971, the company recorded a turnover that year of £563,000 and profits of £85,000, increasing to £97,000 the next year on a turnover of £761,000. Products initially included hi-fi equipment and radios, but 1972 saw the launch of Radionics' first pocket electronic calculator.

Chris Curry had travelled to Texas Instruments' Dallas headquarters on New Year's Day 1971 to collect three samples of a new chip the company was developing, the TMS1802. An indication of the reputation of Sinclair at the time was that Texas Instruments had only produced five samples; the other two went to Japanese companies.

The original 'computer on a chip', the TMS1802 was used by Curry to develop a prototype pocket calculator. In the process, he made a key discovery. In order to make the calculator small enough, he had to find a way around the high power demands of the components and LED display. Curry discovered that the chip itself had a residual memory so that it did not have to be powered continuously. Pulsing the power to the chip resulted in greatly reduced battery consumption and enabled the device to be operated on three small button batteries.

The production model was christened the Executive, cost £11 to manufacture and was sold for £79.95. Around a quarter of the size of other calculators around at the time, the Executive was a huge success. Described by the *New Scientist* as 'not so much a professional calculator – more a piece of personal jewellery', the Executive won a Design Council award and was put on display in the New York Museum of Modern Art. By 1974, the company was producing 100,000 calculators each month.

A cheaper model priced at £29.95, the Sinclair Cambridge, was launched in 1973, followed by the Oxford and then the Sinclair Scientific in 1975 (developed by former CCL employee Nigel Searle, who would subsequently set up Radionics' sales offices in the US), and a programmable version of the Scientific in 1977. The Silver Jubilee year also saw the launch of the Sovereign calculator and another Design Council award, but the market had already peaked and the tax position on imports (17.5% on components, but only 5% on finished machines) meant that Radionics lost out to overseas manufacturers.

The market situation began to have serious implications. While the company had achieved (admittedly small) profits of £45,000 on a turnover of £6.3 million in 1975, fierce competition in the calculator market and the ill-fated Black Watch project resulted in a loss of £355,000 in 1976. When the bank refused to extend the company's overdraft limit that August, a rescue package from the National Enterprise Board (NEB) had to be accepted and the NEB took ownership of 43% of the company. Total losses amounted to £1.29 million by the end of 1977.

Sinclair retained his position as CEO, but a year later, the NEB injected another £1.65 million to keep the company afloat and increased its ownership to 73%. Sinclair was replaced as CEO by Norman Hewett. By this time, Radionics was already working on a miniature portable television, the Microvision TV1A, and its launch in 1978 was a chance to revive the company's fortunes. Sales, initially promising, were affected by a fall in the US dollar, and the follow-up model, the TV1B, could not reverse the losses.

The first microcomputer project undertaken by Radionics was an attempt to produce a cheap computer – other computers available at the time, from companies such as Commodore (the 'PET'), Olivetti, Apple and Tandy, were too expensive for the consumer, and one of Radionics' driving forces had always been to bring prices down. However, the NEB transferred the project to Newbury Laboratories, another company owned by the NEB, in 1978. Dubbed the NewBrain, the machine would eventually be launched by Grundy in the early 1980s, but not before it had played a pivotal role in the Cambridge computer industry.

Realising he would lose control of Radionics, Clive Sinclair had already made alternative plans. He had bought an off-the-shelf company in 1973, and in 1975 changed its name to Sinclair Instrument Ltd. Chris Curry moved across from

Left: Hermann Hauser, co-founder of Acorn Computers.

Below: MK14 microcomputer kit, Science of Cambridge.

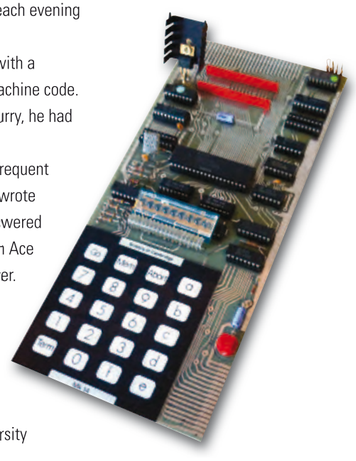
Radionics to get this company started. A £500 loan from his father paid the first month's rent on offices on King's Parade and provided some furniture. There were large stocks of surplus calculator components to use up, and the first product that Curry came up with was a miniature calculator worn on the wrist. To their surprise, it generated over £50,000 in sales.

Curry made frequent visits to the States, where most of the wrist calculators were sold, and on one trip spotted something in an American electronics magazine. It was an advertisement for a 'computer in a book', and was a kit for a basic computer. The kit was sold as a 'book' (in reality a ring binder containing all the parts and instructions) to avoid American purchase tax, which at the time was 15–20%. Curry thought it would be easy to do something equivalent back in the UK, and would not need the rigmarole of creating a book.

In July 1977, the company name was changed again, to Science of Cambridge Ltd, and the MK14 microcomputer kit was launched. So-called because it had 14 components, the original prototype was developed with Ian Williamson at Cambridge Consultants. David Johnson-Davis created the first set of application programs, and the MK14 could play tunes, and a game called bulls and cows. It could also be used to turn things on and off, described as 'magical' at the time. Around 90,000 MK14 kits were sold by mail order, mostly in the UK, with Curry producing the components and Sinclair and others assembling the kits at home. They were packaged into a container designed to fit into the standard letter box, and it was Curry's job to make the trip to the Post Office each evening to send the kits off.

Curry was keen to follow the MK14's success with a machine that ran BASIC, as the original only ran machine code. Sinclair, however, was not interested. Luckily for Curry, he had met someone else who was.

Austrian PhD student Hermann Hauser was a frequent visitor to Curry's office on King's Parade, where he wrote add-ons for the MK14 for fun, and occasionally answered the phone. One of the phone calls he took was from Ace Coin Equipment, a Welsh fruit machine manufacturer. They needed help to develop a microprocessor-controlled fruit machine, and Hauser and Curry took the job, without telling Sinclair. Since they could not use the MK14, they had to design a new microprocessor from scratch, and enlisted the help of Steve Furber from the Cambridge University engineering department and Chris Turner, previously at Pye. Within three weeks, they had built a novel twin-processor system, using the IBM370 in the Computer Laboratory to simulate the processes as they tested their design.



Curry and Hauser's share of the £20,000 fee from Ace Coin Equipment enabled them to set up a new company on Market Hill in 1978, Cambridge Processor Unit. Curry and Hauser set up **Acorn Computers Ltd** as a trading name in 1979, in order to avoid confusion between their consultancy and computer activities. They chose the name partly because it symbolised growth, but also because it came before Apple in the alphabet. Their first machine, the Acorn Microcomputer (later known as the Acorn System 1), was designed by one of Acorn's earliest employees, Sophie Wilson, and aimed at hobbyists. It was launched in March 1979 and sold by mail order, as always. Sales of the System 1 helped fund development of the next project, aimed at the consumer and to be called the Acorn Atom.

The Atom would attract two brothers who would be part of the next generation of Cambridge entrepreneurs, Alex and Nicko van Someren. In 1979, 14-year-old Alex wrote to Hauser hoping for a job. He was politely turned down, but when van Someren visited Hauser's office during the school holidays, he was given an Atom computer and sent away with the suggestion that he might try writing programs for it. Alex and his younger brother Nicko re-wrote an early Star Trek computer game into Acorn's BASIC language that evening, and took the cassette with the game on it back the next day. The brothers both went on to work at Acorn, Alex straight after he finished school and Nicko during his university vacations, before setting up their own business, but the relationship with Hauser would continue.

There was another computer start-up around at the time, Orbis Ltd, which had been founded in 1978 by Andy Hopper of the Cambridge University Computer Lab. Orbis was created to develop networking technologies based on work Hopper had been doing with Maurice Wilkes on the Cambridge Ring, one of the earliest local area networks (LANs). Hopper met Hauser at a Darwin College disco and was soon working with him and Curry on Acorn projects. Orbis was folded into Acorn the following year and Hopper became a director. Hopper would help design chips for the BBC Micro while continuing at the same time with his academic career.

Sinclair resigned from his old company Radionics in 1979, and by the end of the year the company had been broken up, with the television and calculator businesses being sold by the

Andy Hopper of the University of Cambridge Computer Lab was an early director of Acorn Computers.

Left: The Sinclair ZX80 computer was already in development by the end of the 1970s.

NEB and the remainder, Sinclair Electronics, becoming Thandar Electronics Ltd and moving to Huntingdon. Realising his mistake over computers, Sinclair set Science of Cambridge to work on designing and producing a computer that would cost less than £100 and rival the Acorn. It was to be called the ZX80.

The shake-up at Cambridge Consultants when it was bought by Arthur D Little was the trigger for a mini-cluster of hi-fi and audio companies in the area. There was Cambridge Audio out of the old Cambridge Consultants and Southward's new company Lecson Audio, and later Mission, Meridian, and others would arrive on the scene, but the early 1970s also saw the beginning of **A&R Cambridge Ltd**, which would become known for its ARCAM range of audio products.

In the early 1970s, John Dawson began a PhD at Cambridge University and started running a sound system business on the side with fellow student Chris Evans. Calling the company A&R, they built amplifiers and speakers. The business soon moved out of Dawson's college rooms and eventually into Bermuda Street, where they were joined by physics student Jacky Cross. As well as making equipment to order, they sold audio equipment out of the front room.

Cross left for a 'proper' job in the audio group at Cambridge Consultants, and, in the mid-1970s, A&R moved to the attic of French's Mill, also home to PA:CE (Parmee Acoustics and Collins Electromagnetics). Deciding it was time to build and sell their own amplifiers rather than just designing them, the team came up with the A60. Produced with the help of Pye, where the aluminium casings were machined, and a cabinet-maker who had worked with John Greenbank of Tangent Acoustics (which he had set up after leaving Lecson), they expected to sell about 50 of these new amplifiers, at a cost of £100 plus VAT, and considered it more of a project than a commercial strategy.

The first 50 A60s were built in September 1976; by Christmas they had sold out, so Dawson and his colleagues decided to build another 50. In early 1977, Practical Hi-Fi magazine published a small article about the perfect 'starter' kit for the audio enthusiast, which included the A&R amplifier, and the first overseas enquiries about the A60 came in from Canada and Europe. Demand rocketed after a positive review in *Practical Hi-Fi* magazine; Cross left Cambridge Consultants to come back to A&R full time, and the ARCAM name was adopted after exports led to a legal challenge from US company Acoustic Research. Over the next decade, A&R would sell some 32,000 A60s.

Exports meant not only coming up with a new name, but also increasing production. By the end of the 1970s, A&R was making 5,000 amplifiers a year and had some money in the bank, but they were fast running out of space. While there were government incentives to help new companies with 'nursery' units and grants, there was nothing for those already established and wanting to expand, so even though planning restrictions had eased since the 1960s, there was not much around Cambridge apart from the Science Park. A plot on an industrial development at Waterbeach was found, and A&R started building, planning to move in 1980.

Right: John Bradfield, bursar of Trinity College, University of Cambridge.

Far right: Laser-Scan, first tenant on the Cambridge Science Park.

Below right: Margaret Thatcher visits Laser-Scan.

The Mott Report published in 1969 had recommended the creation of a **science park**, and the Senior Bursar of Trinity College, Dr John Bradfield, now Sir John Bradfield, was the driving force behind turning some land the college owned on Milton Road into England's first science park. Outline planning permission was granted in 1971, and in 1973, the first tenant, Frisch's company Laser-Scan, moved in. Laser-Scan was already selling Sweepniks to universities, but they soon discovered that their laser device could also be used to follow roads, and with this discovery they moved into the digitisation of maps. In 1979, Laser-Scan won a contract with Ordnance Survey Great Britain to create a national mapping database.

Another early Science Park tenant was LKB Biochrom in 1974, while Cambridge Communication and Goodfellow Metals took space in 1975. In 1978, Trinity College expanded the site by purchasing another tranche of land. By this time, Cambridge Consultants had outgrown its premises at Bar Hill and had taken four acres at the Science Park and started building. Business became so brisk in 1977 and 1978 that the original plans were extended twice, until the new building was double the size of the old one at Bar Hill. The new building was

Royal patronage

ON FRIDAY, June 28 1968, George Brown MP arrived to open the new building for Cambridge Consultants Ltd at Bar Hill. He didn't find anyone to receive him because CCL didn't believe in receptionists.

Instead, he found a notice which said: "Please ring 47 on the grey telephone and ask for the person you wish to speak to."

So he did and created a mild panic among the company dignitaries whose job it was to receive him.

When Prince Charles arrives tomorrow to open Cambridge Consultants latest building at the Cambridge Science Park, he won't be faced with the famous notice. CCL have accepted receptionists for many years and now have one in the regulation plate glass front office, surrounded by rubber plants and other foliage.

For the majority of Cambridge people, whether citizens or scientists, Cambridge Consultants has long remained a mystery. I have visited it on a number of occasions and I never found out what it did.

Now, to mark the occasion of the Royal opening, Rodney Dale, the man who with Tim Eiloart did more than anyone else to found this essentially Cambridge company, has written a small book on the history of the firm from 1960 to 1978. It tells much about the company but it also reveals a great deal about Cambridge life for the past decade or so.

Firstly the company. What is it? What does it do?

No better description exists than that of the manner in which it came into being.

"He (Tim Eiloart) unfolded his master plan, an organisation which would pool the Brains of Cambridge University at the disposal of the Problems of British Industry.

"We were all stunned by the brilliant simplicity of it," writes Rodney Dale.

That, briefly is what CCL is today, although the discerning will note that while CCL has prospered, British industry has gone groggy at the knees.

The first office was at 15 Park Street and the landlord was Peter Cook. In mentioning Cook, one comes across the first of a full cast of names associated with the company, which makes its official history not simply an industrial dirge but a fascinating record of Cambridge society and life.

Althea Braithwaite, the highly successful author of Desmond the Dinosaur's adventures and founder of Dinosaur Publications, was an early employee of Cambridge Consultants.

Clive Sinclair, the man who was first through the door with the modern pocket calculator and founder of Sinclair Radionics, once shared the same premises as Polyhedron Printers in Histon Road, a company which Rodney Dale ran at the time. Althea Braithwaite subsequently became manager of Polyhedron Printers while Rodney Dale joined Cambridge Consultants.

Cambridge Consultants subsequently moved to Bar Hill and began to spawn a series of companies. There was AIM Electronics, AIM Bio-Sciences, AIM Physical Sciences, CALL (Cambridge Audio Laboratories Ltd), Durcam Research and Development and so on.

Cambridge Consultants eventually decided to leave Bar Hill and move to the Cambridge Science Park "probably because the arrival of the Tesco Superstore and filling station at CCL's immediate neighbour was the final straw is making the decision to move. No self-respecting consulting operation likes to see its head, its building and plants perpetually draped with the tatty rolls and paper bags which seem to be an unavoidable consequence of living downwind from a supermarket."

So when Prince Charles arrives at Cambridge Consultants third, or is it fourth or fifth?) new building at the Cambridge Science Park on August 1, he won't find paper bags and paper rolls awaiting him. And neither will there be a notice saying "Please ring 47 on the grey telephone . . ."

Rodney Tibbs

Prince Charles "opens" the Cambridge Consultants' building on the Science Park, an illustration from Rodney Dale's book on the company.

Above left: HRH Prince Charles and Richard Cutting at the opening ceremony for Cambridge Consultants' new building on the Cambridge Science Park.

Cambridge Consultants' building in the Cambridge Science Park.

opened officially by HRH Prince Charles on 1st August, 1979, using voice recognition so that the building 'responded' to Prince Charles' declaration that the building was open.

Funding was a key issue for anyone trying to start a company, and while attitudes were changing in the 1970s, the prevailing feeling among the banks was that these young men trying to set up companies based on new and unproven technologies were too big a risk. The arrival of Matthew Bullock at **Barclays bank** in Cambridge in 1978 signalled a major change.

In response to the Bolton Committee's 1971 Report on Small Firms, which would also spawn the government's enterprise policies, Barclays had set up a business advisory service to provide accounting and management advice to start-ups and small companies that had no financial expertise. Bullock and his successor, Walter Herriot, both trained as business advisors, and in 1978 Bullock was given a position in Cambridge. Having grown up in Oxford, where his father was founding master of St Catherine's College, and graduated from Cambridge University, Bullock felt himself more able to talk to the academics starting businesses than many of his colleagues. His brother, an academic in the Cambridge University School of Architecture, had been involved in setting up Applied Research of Cambridge (ARC) with, amongst others, Ed Hoskins.

Barclays already had a few of the new technology companies as clients. Bullock gradually took these over from his colleagues and grew a portfolio. The first two companies he took on were both in the electron microscopy sector, having come out of the Engineering Department at Cambridge University, and both were essentially 'dead'. But Bullock soon saw that there was a new model of company in Cambridge which was easy to form and easy to grow, founded on computing and the influence of computer-aided design (CAD).

These companies got off the ground based on what became known as a 'soft start', which meant offering consulting services while developing products in tandem. Consulting as a soft start already had a track record in Cambridge Consultants, and it was evident that producing designs and reports to order could be a way for a young company to grow without equity financing. Using computers to solve problems for clients also brought down the financing and managerial thresholds for company formation, as the companies did not depend on the large amounts of funding needed to build a product and sell it. Lending to these companies based on orders from typically large customers also appeared to be a less risky proposition than lending to many other bank customers.

Bullock discovered a triangle of activity between the river, Bridge Street and Jesus Lane. ARC was above the Schofields shop on the end of Jesus Lane, Topexpress in Portugal Place and another company operated nearby. He met Jack Lang of Topexpress and they swapped notes on which companies they knew of, Jack adding among others his brother Charles' company, Shape Data, in Downing Street. In July 1979, Bullock and Lang decided to get these companies together to swap stories and experiences, and see if there were any opportunities for mutual support. Several of those involved had been students and colleagues in the Cambridge University Computer Lab, and missed the conversations and networking over tea.

Below: Matthew Bullock came to Barclays bank in Cambridge in 1978.

Below: Walter Herriot joined Barclays in Cambridge in the mid-1970s.

Invitations to a meeting at the Eagle pub were issued, and the offer of free beer (Bullock was paying) attracted people from 19 companies, including Tom Sancha (Cambridge Interactive Systems), Richard Cutting (Cambridge Consultants), Charles and Jack Lang (Shape Data and Topexpress, respectively), Graham Street and Peter Woodsford (Laser-Scan), Jeff Button, Hermann Hauser (Acorn) and Jim Westwood (Sinclair). Questioning round the room identified 36 technology companies operating in the Cambridge area, to everyone's surprise. This was the launch of what would be christened the Cambridge Computer Group. A second meeting in September of the same year had participants from 35 companies.

Recognising that these companies might need more support than the occasional free beer, Bullock wrote a paper on future economic development in Cambridge and gave it to his boss at Barclays, Edmund Parker, the senior local director. He highlighted the three things that would have significant impact on future development: better transport links to London with the opening of the M11 and electrification of the railway; better international transport links with the opening of Stansted airport; and the indigenous growth of technology companies. Bullock's report concluded that Barclays should be ready to take advantage of these trends and actively support the new technology businesses that were starting to appear in Cambridge. Unbeknownst to Bullock at the time, Barclays were actually discussing closing their Cambridge head office and transferring its operations to Chelmsford or Norwich because they thought Cambridge was a backwater. With only Marshall, Pye and the University, the commercial landscape was too thin to be of interest.

Parker summoned Bullock to discuss his report, agreed that his ideas were 'most exciting' and Bullock found himself briefed to put Barclays' new funding and business support strategy into operation, making official what Bullock had already been doing unofficially. With the backing of Barclays, Bullock could then go to the lawyers, accountants and other service providers in Cambridge – referred to by Bullock as the 'peri-polloi' – and highlight the importance of building relationships early with the new companies.

Realising how difficult companies were finding the search for premises, Bullock also went to see the planning department at the City Council. He asked planning officer Ian Purdie if he was aware of the technology companies forming in Cambridge. In response to Purdie's surprise, Bullock offered to take him to see one of these companies, as long as he would promise not to close it down, as it was almost certainly contravening the planning regulations. Purdie duly promised and was taken to a normal terraced house on Portugal Place 'packed with mini-computers and chaps with long hair and beards designing stealth submarine systems for the US navy.' This was Topexpress. Purdie's visit to Topexpress led to the creation of the B1 planning category, which allowed R&D for products and processes in commercial rather than industrial premises, as long as it did not disturb the neighbours.

One of Bullock's colleagues at Barclays was Walter Herriot, who had come to the 'rather dull' Cambridge from Liverpool in the mid-1970s. Herriot was also in the business advisory service, and helped develop the policy of lending to start-up companies. Although Barclays were effectively providing what might be termed 'mezzanine' funding, which was higher than normal lending limits for most banks, they saw lower losses than for 'normal' funding, due to the care and attention they paid to the young companies they got involved with. Herriot would take over from Bullock when he left Cambridge to go to Barclays in London at the end of 1979.