

The Battle of Britain's Home Computers

Gareth Halfacree

What is a Home Computer?

- **Low-cost**
- **Compact and bijou**
- **At least a nodding familiarity with user-friendliness**
- **More complex than a programmable calculator**
- **More flexible than a word processor**
- **Specifically targeted at home and educational use**

What is a *British* Home Computer?

- **Designed by a British company**
- **Manufactured anywhere**
- **Sold in the UK for at least a brief period**
- **Available as a preassembled unit, not just a kit**
- **Priced around the £200 mark, or lower**
- **Success and longevity no barrier**
- **Eight-bit technology - “the golden era”**

What is a *British* Home Computer?

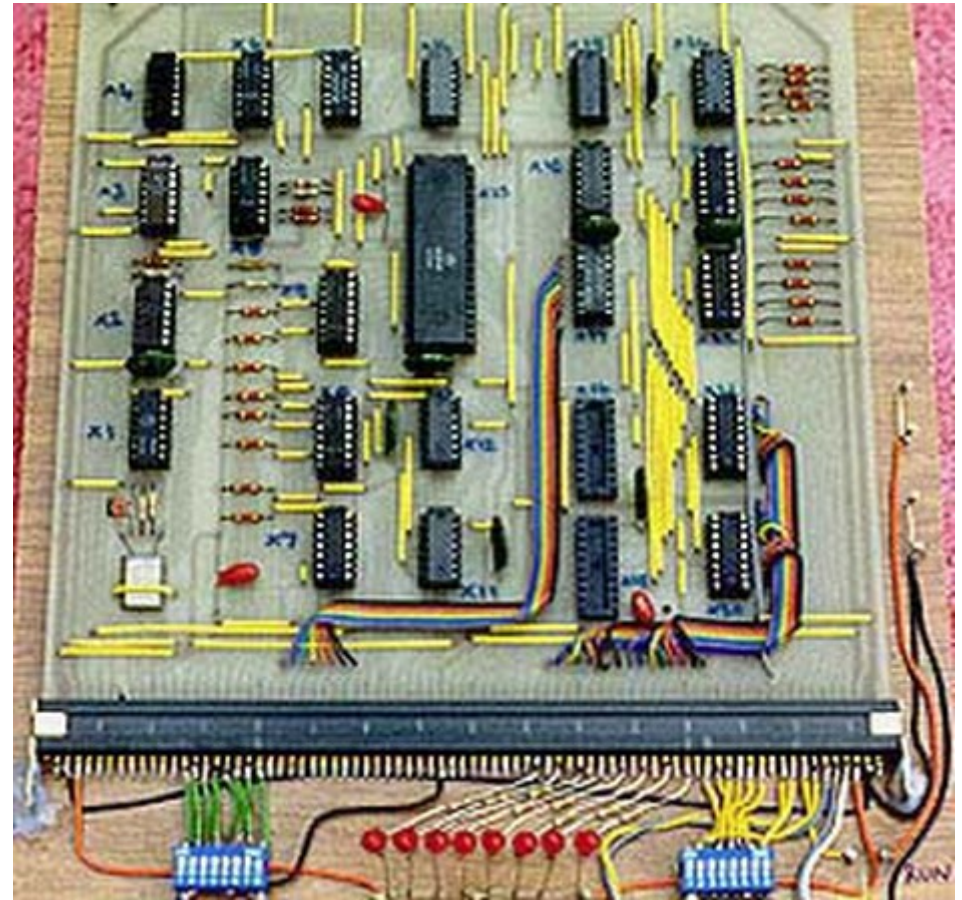
“It's not easy for a U.K. citizen to write about home computers for an American magazine. We use the term to refer to an altogether different object on our side of the Atlantic. In the U.S.A., an Apple II is a home computer; the IBM PC in its smaller configurations is a home computer; the Macintosh is a home computer. In the U.K., those computers would be considered rather expensive as business computers, let alone for home use.”

Dick Pountain, BYTE Volume 10 Number 01, 1985, p.401

Notable Exceptions: The Newbear Electronics 77/68

1977, £50 (~£314)

- **CPU: Motorola 6800**
- **RAM: 256 bytes**
- **Arguably the first British home computer**
- **Exclusively sold as a kit**
- **Direct-memory toggle switches**



Notable Exceptions: The Nasco Nascom 1

1977, £229.19 (~£1,397)

- CPU: Zilog Z80
- RAM: 2 kilobytes (to 32KB)
- Launched as a kit, later available preassembled
- Included full-size keyboard and video output
- Sold as “evaluation kit”



**NASCOM 1
MICROPROCESSOR Z80 KIT**

Includes interface for:	Potential:
TV or Monitor—cassette,	High Level Language,
dump—Teletype—spare,	Mini Floppy Disk,
PIO,	Excellent Z80
Expansion RAM-	evaluation kit.
BOARD up to 32K.	£197.50+VAT.

Write for details or send order to:
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CHESHAM, BUCKS. Tel: 02405 75151, Telex: 837571.

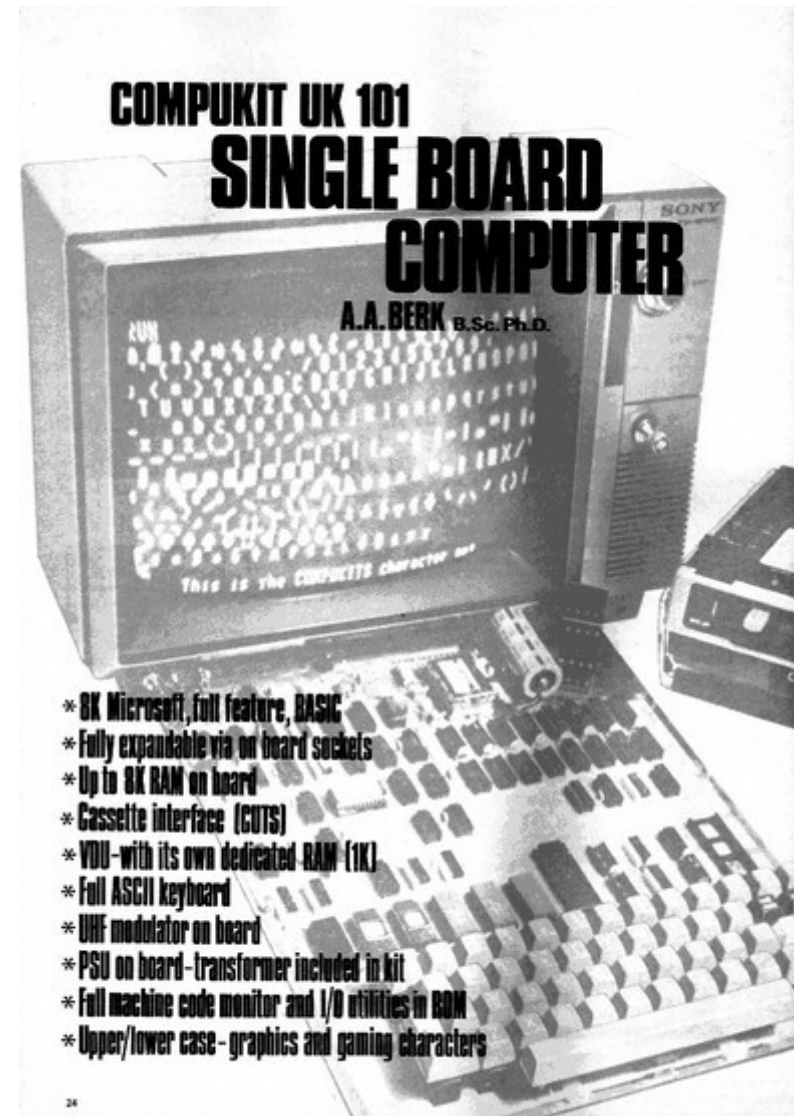
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ELECTRONICS TODAY INTERNATIONAL — JUNE 1978

Notable Exceptions: Compukit UK101

1979, £251.85 (~£1,263)

- CPU: MOS 6502
- RAM: “up to” 8 kilobytes
- Kit, with instructions published in Practical Electronics
- Clone of the US-made Ohio Scientific SuperBoard – not truly a British creation!



Notable Exceptions: DAI Personal Computer

1980, £684.25 (~£3,026)

- **CPU: Intel 8080A**
- **RAM: 12 kilobytes (to 48KB)**
- **Created by the UK arm of Texas Instruments, following displeasure over 99/4 delays**
- **Sold by Dutch Data Applications International**



The Technology: A (Very) Brief History

Transistors

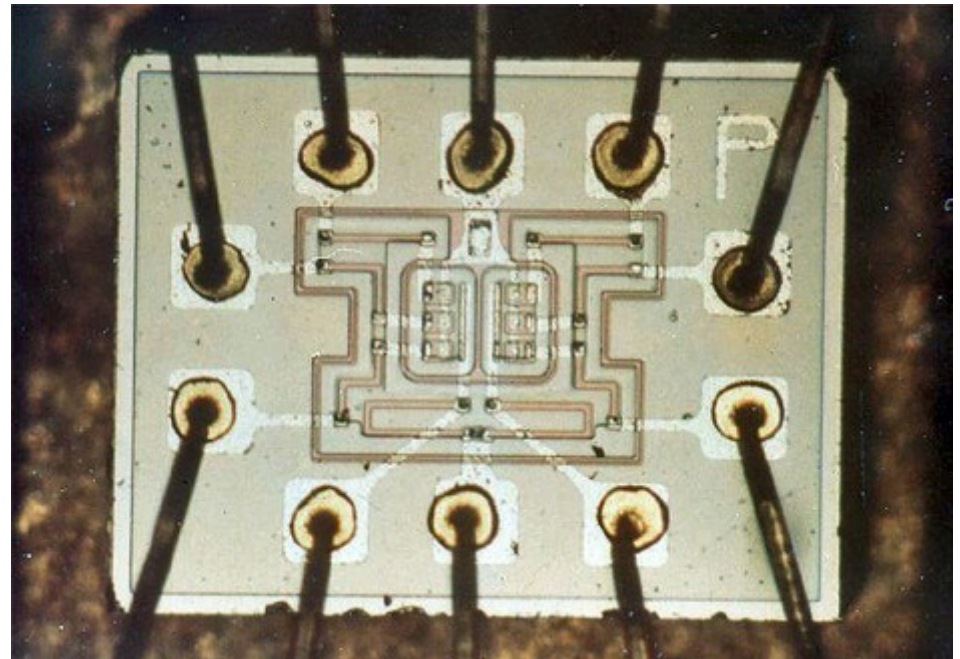
- No more vacuum tubes
- Small, reliable, low-power
- Patented in 1925 as a triode replacement
- First point-contact transistor made in 1948 at Bell Labs



The Technology: A (Very) Brief History

The Integrated Circuit

- Proposed in 1949 by Werner Jacobi
- Envisioned as a monolithic silicon device by British engineer Geoffrey Dummer in 1952
- The heart of modern technology



The Technology: A (Very) Brief History

Very-Large-Scale Integration

- **Progression: SSI in early 1960s, MSI in late 1960s, LSI in early 1970s, VLSI followed**
- **Thousands of transistors per integrated circuit**
- **Massive reduction in footprint, power draw, and cost**

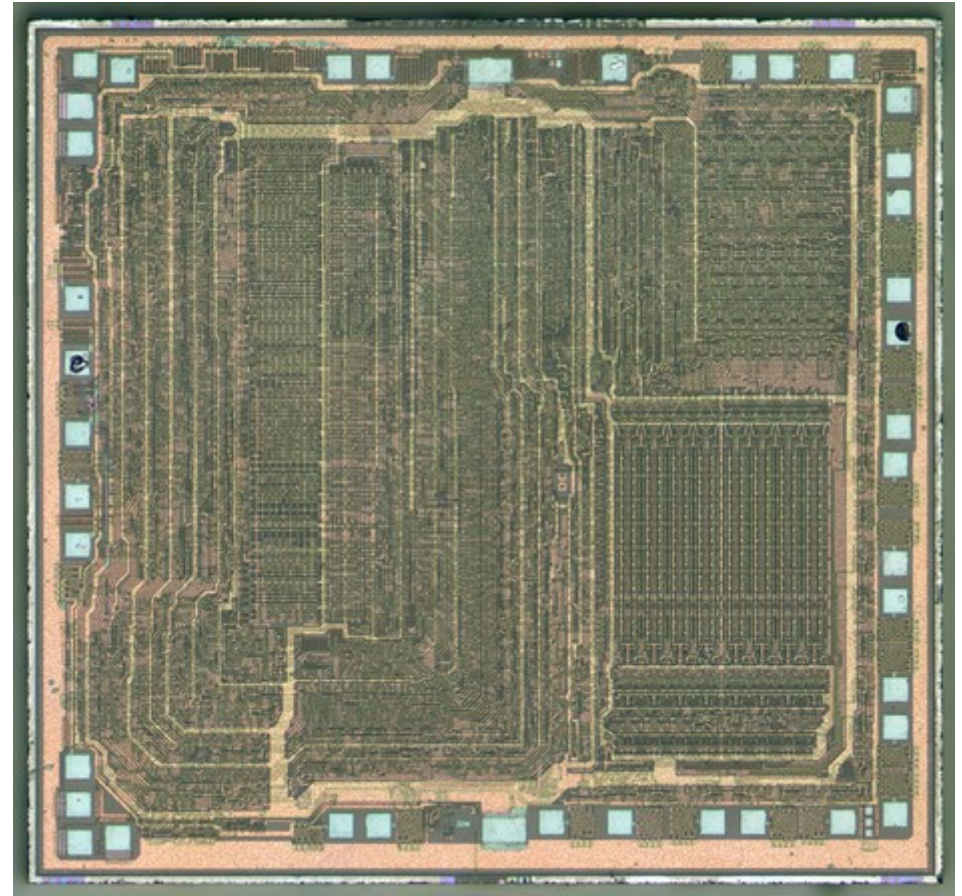


Image courtesy ZeptoBars

The Technology: A (Very) Brief History

Microprocessors

- Integrates the functionality of a central processing unit onto a single chip
- Massive reduction in complexity, footprint, cost and power
- Paved the way for the computing revolution

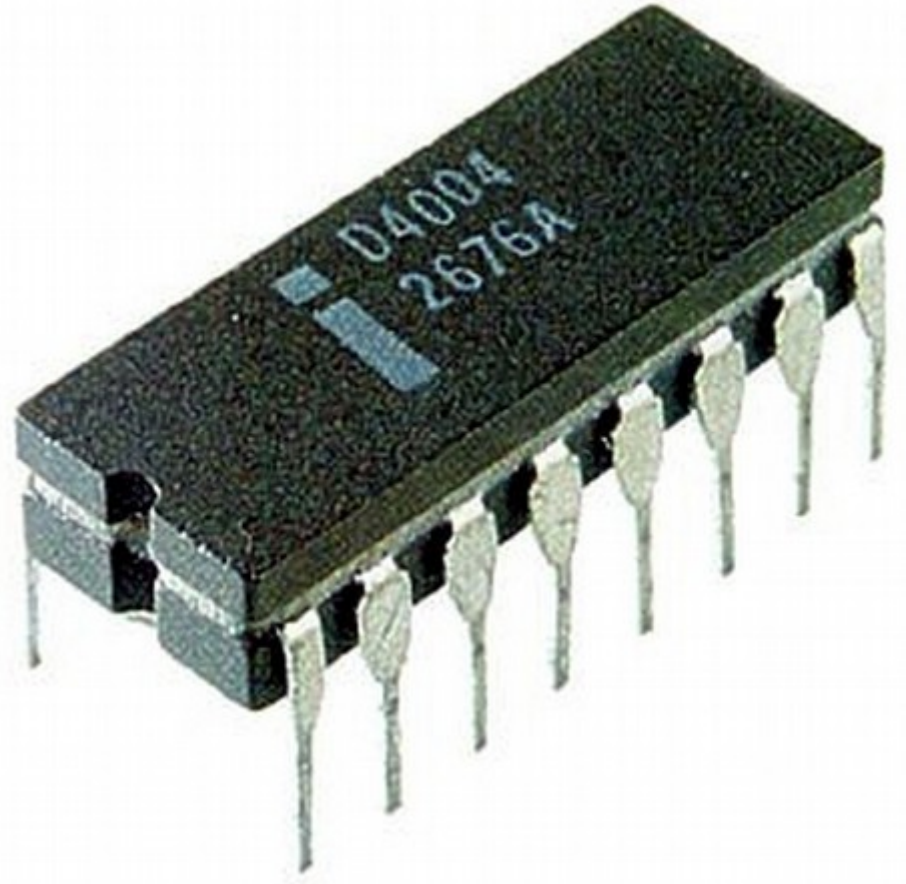


Image courtesy Luca Detomi

Governmental Interference

Microelectronics Education Programme

- Headed by Richard Fothergill
- £9.5 million fund (~£48M)
- Provided training facilities for teachers in secondary and primary education

INTERVIEW RICHARD FOTHERGILL

Richard Fothergill heads the Microelectronics Education Programme which is backed by £9.5 million of State funds. Bill Bennett visited him at his North-East base.

THE PROGRAMME is run from a small semi-detached house on the campus of Newcastle Polytechnic, a short ride on the new Tyne and Wear Metro from the centre of the city. After we had met and I had been introduced to the staff, there was one burning question: "Why run such a seemingly important project from such a remote location?" The answer provided not only justification, but also a deep insight into the mind of the man who leads a team with a very important job.

"I was already working in Newcastle as a teacher trainer on this polytechnic site, I didn't really want to move anyway as I like it here. However, if microelectronics can do all that we are told it can, then it should present no problems. The one advantage of living in the microelectronic age is that one doesn't have to travel to work; the work can travel to you. Information transfer is readily available and we are using it."

What about the inevitable travelling that needs to be done in the course of your work? "Newcastle is fortunate in that it has excellent rail links: the Inner-City 125 trains mean that London is just over three hours away. Most of the travelling is done by the information team though."

"One advantage of our location is the peace and quiet — there is no busy traffic passing our windows all day. It means we are left to get on with our work here. The only disturbance is the occasional cheer from the football pitch". Cheviot House, the nerve-centre of the programme is located next to a sports field.

Having disposed of the questions regarding what now seems like a wise choice of location, I asked Fothergill to sketch the background to the DES Microcomputers in Schools programme. He at once pointed out that it was a microelectronics in schools and not just a microcomputers in schools programme, and that the scheme was to cover pupils from the age of five through to 13.

The sum of £9.5 million indicated to the 1979 value had been set aside for the programme by Neil Macfarlane, the then Parliamentary Under-Secretary at the DES, and the programme was to be run from March 1980 for five years. In November 1980 Richard Fothergill was appointed director.

"When I had assembled a team, we proposed a strategy. In effect, we began implementing our plan from February 1981, but it didn't begin officially until April. It was decided to concentrate on three main areas which, for the want of better titles, we have called: resource, teacher training and curriculum development, which is really a catch-all. We decided that because education is run in this country by local authorities,

'We are on the verge of an explosion'

ities, we realised the importance of involving them.

"The money we were given was not enough to make us significant to each individual local authority, so we divided the country into 14 regions; 12 in England, and one each in Northern Ireland and Wales. The Scottish run their own show from Glasgow. Both groups work in co-operation with each other.

"The resource part of the programme is designed to provide teachers with the support and information they need. It is vital that we can keep these teachers up to date with all the advances that are constantly taking place.

"This will be done by using regional information centres, exhibitions, as well as the more traditional access to books. There will be some machines and some software set aside for the purpose of demonstrations which should enable teachers to see the applications."

At the resource centre at Newcastle Polytechnic, in the middle of the floor, is an exhibition, mainly of posters. Around the edge of the room were all manner of teaching aids involving microelectronics, ranging from the Texas Instruments Speak and Spell game to Pet, Apple and Research Machines microcomputers, and even a word processor. To the side of the main room is a smaller one — this is where teachers are taught how to use the

latest in new technology devices. Teacher training is the second of the three points in the programme.

"We train teachers to think of the computer as an instrument. We show them how it can revolutionise the office — indeed, part of the teacher-training programme is devoted to familiarising teachers with the electronic office.

"We also train the teacher to use the computer for computer-based learning. I call it that because of the confusion between the existing terms such as CAL, CAD etc., which all mean separate things. Computer-based learning is my phrase to cover this.

"There is in fact another area in which we train teachers: that is in technology. There is in existence a course in control technology and electronics — run by the Joint Matriculation Board. This takes in just about everything from the switching of one transistor right up to control devices and beyond into the world of microcomputers and the addition.

"The third part of our programme is called curriculum development. In effect, it covers everything not covered by the first two parts. Through this part of the programme we provide schools with relevant books, films and charts.

"Although in the main the work is done via the regions, we held back some funds to see centrally. This

money will be spent on what we call our national activities. The in-service training of teachers by the Open University is an example of this.

"One of the tasks facing us is the establishment of some standards, we will issue guide-lines on how to configure equipment, for example. This needs to be done because safety is an important factor in the classroom. We shall also advise on operating systems as well as languages and dialects. This will be done by a process of evolution — we will not lay down hard and fast standards, mainly because we couldn't make them stick. This means we shall have to evolve a set of agreed standards."



Governmental Interference

Microcomputers in Schools Programme

- Department of Industry
- Subsidised half the cost of a microcomputer for schools
- Initial choices: Research Machines 380Z, BBC Micro (Acorn Proton)



Governmental Interference

Information Technology Year

- Kenneth Baker appointed Minister for IT
- Declared 1982 “IT Year”
- Opened training centres, ran a conference, even had IT-related Royal Mail stamps
- “I am very keen to promote British hardware.”



INTERVIEW KENNETH

In January 1981, Kenneth Baker MP became the first Government Minister with responsibility for Information Technology — an all-embracing term covering everything from space satellites to Sinclair ZX-81s. He talks to Duncan Scot about his hopes for reversing Britain's decline and his plans for the future.

KENNETH BAKER is the force behind the designation of 1982 as Information Technology Year, the year the Government hopes to use its considerable propaganda skills and power to push a new message across to individuals and industry. That message is that unless we use new technology now, our living standards will not only lag behind those of our industrial competitors but will, for almost the first time in centuries, stagger into absolute decline.

Kenneth Baker had a conventional background for a Conservative minister. He was born in 1934 and educated at St Paul's and at Magdalen College, Oxford. During his national service, from 1953-55, he was a lieutenant in the Royal Artillery in North Africa and also an instructor to the Libyan Army. During his time at Oxford from 1955-58 he was Secretary of the Oxford Union.

Soon after Kenneth Baker first entered Parliament he was described as a Peter Walker clone, articulate, fond of satire and casual in his dress, although only by the austere standards of Conservative ministers. He is also something of a rarity in that he is often billed as a minister who actually knows something about his subject.

"Although I have been involved in computing for some time I am not a trained computer man at all — I studied history at Oxford. When I came down in 1958, I moved straight into general management working for several companies. In the early sixties I ran companies, groups, sometimes public groups, working very much to pull them round.

"Doing that I discovered the advantages of using computers. This was in the very early days of computers, but there were definite advantages in doing jobs like payroll and simple stock control."

In the meantime, he was working hard within the Conservative Party. He served on Twickenham Borough Council from 1960-62 and contested a number of elections before finally entering Parliament in a by-election in March 1968 as member for Acton.

"It was when Wilson was at the absolute trough of his popularity — I won the by-election in an even bigger swing than the SDP did in Crosby in November. So I won a Labour seat in 1968 but it went back to its rightful home in the general election in 1970. Then I won a by-election in Marylebone three months later. I was very lucky to have been given the first by-election to come up when Lord Hailsham became the Lord Chancellor. I think I have the record for the shortest gap between two seats."

"In 1972 I joined Ted Heath's Government as a junior minister in charge of the Civil Service Department where I found, among other things, the Computer Agency being set up. There were two things which particularly interested me then; they were the HMSO and the Computer Agency. I put management accounts into HMSO to try and turn it into a commercial operation. It takes a long time for those kinds of thing to happen."

"I also ran the Computer Agency and took a very considerable interest in that. It was really a buying agency for the Civil Service. The particular policy I followed, and it was well known at the time, was to increase the amount of business being pushed out to the software houses of Britain and giving every little bit of encouragement along that particular road."

Kenneth Baker's greatest job must give him a certain sense of déjà vu. In 1972 he was involved in the then rescue of ICL, the State-backed computer company. In 1982 he found himself again responsible for trying to push the company back on to the road to commercial viability. He was largely responsible for persuading the Government that it was worth another try with new management, rather than selling the company off to a foreign computer agency. ICL now has £200 million of Government guaranteed loans.

The Conservative Government was defeated in the general election of February 1974 and Kenneth Baker returned to the backbenches of Parliament and to business, spending more of his time as a consultant. As a Parliamentary Private Secretary to Ted Heath from 1974-75 he was regarded very much as a Heath man, an advocate of state intervention to support and help certain industries and was left out of the Government formed by Margaret Thatcher in 1979. He remained very active, however, writing numerous newspaper articles, making speeches and working within the Conservative Party and on various committees.

One speech he made in June 1980 is now seen as the turning point in his career. In effect, he detailed his own job specification. In the speech, at a business telecommunications conference, he outlined a "National Strategy for Information Technology" which included a 10-point programme. Many of the 10 points have now been sanctioned.

The first was the appointment of a Minister of Information Technology who would act as a focal point in Government for this diverse industry. He went on to demand that schools should be provided with small and low-cost personal computers and software systems and that British companies should be asked to design and supply these, that a national training programme in the new skills should be started at all levels, from schools to universities including both teachers and pupils.

As he said in his speech, "The opportunity in this country is immense and we must not let it slip between our fingers. It is a fiercely competitive industry. Since every developed country has reached the same conclusion, their governments have decided to involve themselves in promoting or protecting their own information-technology industry. The Japanese government, for example, has injected £1,300 million into the industry to catch up with America. I am not arguing for vast state intervention — the role of the Government should be that of co-ordinator and catalyst."

"I drew up the specification for

'Government should be co-ordinator and catalyst'

Auntie Beeb

Computer Literacy Project

- Planned a series of programmes and associated learning materials
- Needed a microcomputer on which to hang the project
- Turned to the nascent British home computing industry for help



The Heavyweights: Sinclair & Curry

INTERVIEW CLIVE SINCLAIR

CLIVE SINCLAIR started business by making hobby electronic kits and scientific instruments but is better known for his breakthroughs in consumer electronics products. His achievements include the first pocket calculator — so successful that at one time his company was Europe's largest manufacturer of calculators.

He also created the world's first electronic watch, the Black Watch, which proved the enormous potential demand for such a product. The watch was, however, so dogged by production failures and apparently poor quality control that it was quickly withdrawn from the market — then the foreign competition stepped in.

He made Microvision, the first almost pocket-sized television, now sold by the National Enterprise Board. Earlier this year he announced a new breakthrough with the first flat-screen television, due to go into production next year.

He is now working on an electric car and is studying economics at King's College, Cambridge, in the hope of seeing some of his ideas about job creation.

Sinclair's breakthrough into the personal-computer market occurred in February 1980 with the launch of the ZX-80 which quickly became the world's largest-selling computer. Earlier this year, he followed it with the even less expensive and far more powerful ZX-81.

Clive Sinclair was recently appointed the chairman of British Micro, a lodge which believes that intelligence can be measured and quantified. "Surely IQ is the definition of intelligence," says Sinclair. "There is no doubt that wherever it is that intelligence tests are measuring, it selects people I find a sight easier to get on with than the average."

Sinclair has had no formal training in any of the subjects he has worked in: "I taught myself electronics at school from textbooks. When I left school in 1958, I chose not to go to university because most of them only offered electrical engineering and I had no desire for such a broadly-based course."

"I had written for the magazine *Practical Wireless* while I was still at school. So when they advertised a job, I joined. The title was editorial assistant but dog's-body was what it was. There was an editor, an assistant editor and me."

"The editor became very ill and

He is one of the few makers of personal computers in Britain whose name is known to millions. Many admire him for his inventiveness: some distrust the ephemeral quality of many of his products which, however well-designed, are launched on a market which is increasingly resentful of poor reliability. He talks to Duncan Scot.



retired so the assistant editor stepped into his shoes and promptly had a nervous breakdown at the thought of having to work with the great F J Cams who had started the magazine. I was left running it on my own — it took about two days a week.

"As a result, I was offered the job of running a little publishing firm called Bennett's. I did that for three years while I worked towards making a transistor-radio kit. Transistor radios were starting to enter the market. The Japanese were just beginning to become a force to be reckoned with but the import controls did not allow them into the country."

"I tried to raise funds: I, in fact, persuaded a company to back me and I left my job but they got cold feet and it fell through. I looked around for money for about nine months doing some freelance writing. I took another job and started producing electronics in my spare time until it was going well enough to support me."

"The first thing I did was to buy transistor components from Piemy. It was making transistors for the computer industry and had very tight specifications. It had many transistors which were perfectly good but did not meet that particular specification so I bought, tested, graded and sold them."

"The next idea was an amplifier kit, followed shortly by a radio kit. These products went reasonably well and we moved into stereo kits. I went into kits because as a mail-order business, I could sell them without much capital. I put us firmly into the hobby market."

"We had some very innovative designs from the technology point of view, such as a new type of tuner. We started to sell ready-built stores to the shops and that developed into a medium-sized business which took us through to 1972 when we launched the first pocket calculator."

"The pocket calculator was the first one in the world. Its success was so great that its sales totally over-

'I make mistakes, everyone does, but I never make them twice'

shadowed the current business. At the same time, we moved into making instruments."

"The calculator market was very interesting; there was no precedent. When we started, calculators were sold exclusively through office-equipment shops. Although we sold some to those shops, I believed that that was the wrong kind of outlet. In principle, we needed mass-marketing so we approached Boots. It seemed an unlikely choice at the time, but Boots had a very large chain. We also approached W H Smith."

"The breakthrough into calculators occurred because two or three companies more or less at the same time had developed single chips which contained most of the logic

for a calculator. You could only make a calculator of a large size because the power consumption was far too high."

"What we did was to develop special circuitry which effectively switched the calculator chip on and off in a way which had not been intended in the design. It was effectively off for most of the time but the charges on the various devices remained until they were switched on again and so the data was retained. That meant we gained a power saving of 10 or 20 to one."

"The problem we faced eventually was that the Japanese released little liquid-crystal machines. At one time, we were planning a diverse machine which used liquid crystals but to drive them, you need CMOS chips and those were made only in Japan. Whereas when the Americans had the lead in calculator chips they were prepared to supply to us, the Japanese were only willing to supply last year's chips. They support their own manufacturers."

"That was one problem; the other was that the calculator business became fiercely competitive for everyone; everyone was selling at a loss. The big companies could afford to sell at a loss, we couldn't as it was our main business."

"Our instrument business was working in parallel. Although it was less spectacular as far as the public was concerned, it gave us a reasonably substantial business."

"Then we unveiled the Black Watch. That was technically very exciting. We were the first people in the world to put all the electronics of a watch on a single chip. Originally,

INTERVIEW CHRIS CURRY

THE ATOM computer is one of the few approved by the Departments of Industry and Education for purchase by other Government departments. Acorn's other products include its networking system, the Econet, which is designed to link Acorns together in a classroom. Acorn will shortly be releasing the first of the BBC computers and a larger version of the same system which will be known as the Proton. At present, the company is quartered in four offices in Cambridge — new business accommodation is being built on the outskirts of the city. Its turnover is about £3 million per annum and a new financial controller in planning systems which will take



'The Basic is as good as anyone can make it'

the company into the £15 million to £20 million bracket.

All this has happened in the space of 18 months. Perhaps ironically it was Clive Sinclair, craze and manufacturer of the ZX-80 and ZX-81 personal computers, who led Chris Curry into the field of computing. Curry left school with some A levels and a keen enthusiasm for all things electronic — he used to spend much of his spare time trying to build amplifiers from old television valves.

After working in several different jobs, Curry answered an advertisement, placed by Clive Sinclair, for

engineers. Curry was given the job just when Sinclair was starting his work on miniature radios.

"Things really took off when Clive returned from the States with the first single-chip calculator. He gave it to me with a wadge of paper and said 'get the working'. It was completely new to me."

"I built a prototype with another chap in the laboratory. We built a breadboard around the chip and built a keyboard from bent wire. After a little fiddling, the thing worked. It really was like magic to see those numbers appearing on the display; and then when you used one of the functions and the result flew across the screen — it was incredible. To see this happening with this little piece of electronics was really exciting."

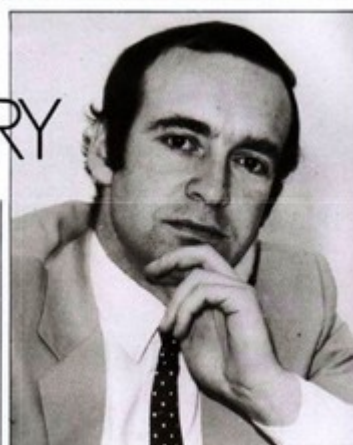
By 1977, the fortunes of Sinclair Radionics, the main arm of Sinclair's operations, were waning. The company was struggling with the National Enterprise Board; there were technical problems with the infamous Black Watch and the first of the Microvision television sets were proving extremely expensive. Clive Sinclair decided to re-launch another company he owned, Science of Cambridge, with Chris Curry in charge.

"I had been very interested in the computer market, watching, buying the U.S. magazines and seeing what was happening. I actually tried to negotiate an import agreement with an American company which had, what they called, a computer in a box."

"We nearly went ahead with an inexpensive home computer which would have been based on the use of a calculator chip for keyboard and display. Eventually, we went away from the use of a calculator and used more conventional interfaces to provide a display and keyboard — and produced the Mi-14."

"That became a great favourite very quickly. The first arrived on the market in February 1978, but in fact it wasn't until May that we distributed them in reasonable quantities. I think we sold about 1,500 of them."

"By this time, I was thinking in terms of a better product. I had been trying to persuade Clive that we should do a low-cost personal computer which ran Basic and could be attached to a television set. At the same time, Sinclair Radionics started developing the machine now known as the NewBrain. I could see that



Chris Curry's Cambridge company, Acorn, is beginning to emerge as one of the strongest personal computer firms in Britain. Its main product, the Acorn Atom, has proved both popular and reliable. The company won the coveted contract to design and build the computer to be marketed by the BBC and accompany the BBC's planned computer literacy series. Chris Curry talks to Duncan Scot.

Clive was not going to support this kind of product at Science of Cambridge if he was going to do it in Sinclair Radionics."

One of the side-effects of Chris Curry's work on the Mi-14 was that he had many enquiries from people wanting to use microprocessors in various industrial applications. That led him into what was effectively a part-time consultancy and brought him into contact with Dr Herman Hauser, who later became a partner in Acorn, and a member of the Cambridge Processor Group, the university computer group. Curry decided to try and keep the team together, outside Science of Cambridge.

"We went ahead with the System 1. It was a kind of equivalent Mi-14, but based on Eurocards so that it could expand and link the system. When the advertising appeared, Clive opened the trademark."

Chris Curry stayed at Science of Cambridge for a few months while

Clive Sinclair found someone else who could run the operation. In the meantime, Acorn had already set up offices in Market Hill in Cambridge and was a thriving little operation with four full-time staff.

'It's a philanthropic gesture by the BBC'

"There has always been a fairly amicable relationship between Clive and me. We always pretended that there was not much competition between us. I think it is certainly growing more intense now that Clive is obviously aiming hard at the education market."

"The System 1 appeared in January 1978 — exactly a year before

'Science of Cambridge'

- Headed by Chris Curry
- Clive Sinclair's attempt to escape a deal with the National Enterprise Board
- Created the MK14 single-board computer
- Believed Sinclair would not support a low-cost microcomputer follow-up

MK14-the only low-cost keyboard-addressable microcomputer!

The new Science of Cambridge MK14 Microcomputer kit

The MK14 National Semiconductor ScaMP based Microcomputer Kit gives you the power and performance of a professional keyboard-addressable unit - for less than half the normal price. It has a specification that makes it perfect for the engineer who needs to keep up to date with digital systems or for use in school science departments. It's ideal for hobbyists and amateur electronics enthusiasts, too.

But the MK14 isn't just a training aid. It's been designed for practical performance, so you can use it as a working component of, even the heart of, larger electronic systems and equipment.

MK14 Specification

- Hexadecimal keyboard
- 8-digit, 7-segment LED display
- 512 x 8 Prom, containing monitor program and interface instructions
- 256 bytes of RAM
- 4MHz crystal
- 5V stabiliser
- Single 6V power supply
- Space available for extra 256 byte RAM and 16 port I/O
- Edge connector access to all data lines and I/O ports

Free Manual

Every MK14 Microcomputer kit includes a free training Manual. It contains



operational instructions and examples for training applications, and numerous programs including math routines (square root, etc) digital alarm clock, single-step music box, mastermind and moon landing games, self-replication, general purpose sequencing, etc.

Designed for fast, easy assembly

Each 31-piece kit includes everything you need to make a full-scale working microprocessor from 14 chips, a 4-part keyboard, display interface components, to PCB, switch and fixings. Further software packages, including serial interface to TTY and cassette, are available, and are regularly supplemented.

The MK14 can be assembled by anyone with a fine-tip soldering iron and a few hours' spare time, using the illustrated step-by-step instructions provided.

Tomorrow's technology - today!

"It is not unreasonable to assume that within the next five years... there will be hardly any companies engaged in electronics that are not using microprocessors in one area or another."

Phil Potman, Wireless World, Nov 1977.

Just
£39.95
(+ £3.20 VAT, and p&p)

The low-cost computing power of the microprocessor is already being used to replace other forms of digital, analogue, electro-mechanical, even purely mechanical forms of control systems.

The Science of Cambridge MK14 Standard Microcomputer Kit allows you to learn more about this exciting and rapidly advancing area of technology. It allows you to use your own microcomputer in practical applications of your own design. And it allows you to do it at a fraction of the price you'd have to pay elsewhere.

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Science of Cambridge Ltd,
6 Kings Parade,
Cambridge,
Cambs., CB2 1SN.
Telephone: Cambridge (0223) 311466

To: Science of Cambridge Ltd,
6 Kings Parade, Cambridge,
Cambs., CB2 1SN.

Please send me an MK14 Standard Microcomputer Kit. I enclose cheque/ Money order/PO for £43.55 (£39.95 + 8% VAT and 40p p&p). Allow 21 days for delivery.

Name _____
Address (please print) _____

Science of Cambridge

'Sinclair' NewBrain

- Developed by Sinclair Radionics
- “I could see that Clive was not going to support this kind of product at Science of Cambridge if he was going to do it in Sinclair Radionics.”
- Abandoned by Sinclair due to high projected retail price

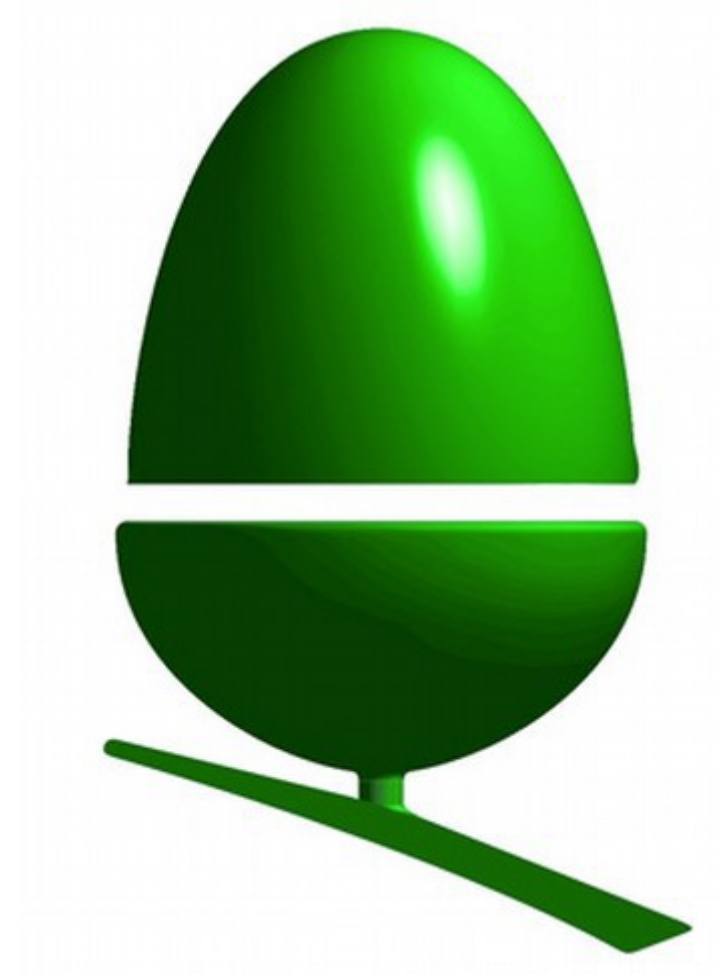


Image courtesy Rama & Musée Bolo

Acorn is Born

- **Launches System 1, an MK14 equivalent designed by Sophie Wilson**
- **Hits the big-time with the Acorn Atom, Curry's low-cost micro**

“There has always been a fairly amicable relationship between Clive and me.”



Acorn Atom

1980, £174.50 (~£772)

- CPU: MOS 6502
- RAM: 2 kilobytes (to 12KB)
- Available assembled, or as a kit
- Based on the System 3 (£775)
- Custom BASIC, written for speed rather than standards adherence

Unique in concept—the home computer that grows as you do!

The Acorn Atom

£120
plus VAT and p&p

Special features include

- * FULL SIZED KEYBOARD
- * ASSEMBLER AND BASIC
- * TOP QUALITY MOULDED CASE

NEW!
Colour Encoder for full colour graphics
£21.50

Also available ready built
£150
plus VAT and p&p

• The picture shows mixed graphics and characters in three colours

The Acorn Atom is a definitive personal computer. Simple to build, simple to operate. A powerful, full facility computer with all the features you would expect. Just connect the assembled computer to any domestic TV and power source and you are ready to begin. (Power requirement: 8V at 800mA). There is an ATOM power unit available – see the coupon below.

The standard ATOM includes:

HARDWARE

- Full-sized QWERTY keyboard
- 6502 Microprocessor
- Rugged injection-moulded case
- 2K RAM
- 8K HYPER-ROM
- 23 integrated circuits and sockets
- Audio cassette interface
- UHF TV output
- Full assembly instructions

SOFTWARE

- 32-bit arithmetic (i.e. 2,000,000,000)
- High speed execution
- 43 standard/extended BASIC commands
- Variable length strings (up to 256 characters)
- String manipulation functions
- 27 x 32 bit integer variables
- 27 additional arrays
- Random number function
- PUT and GET byte
- WAIT command for timing
- DO UNTIL construction
- Logical operators (AND, OR, EX-OR)
- Link to machine – code routines
- PLOT commands, DRAW and MOVE

FREE MANUAL

Free with every ATOM, kit or built, is a computer manual. The first section explains and teaches you BASIC, the language that most personal computers and the ATOM operate in. The instructions are simple and learning quickly becomes a pleasure. You'll soon be writing your own programs. The second section is a reference manual giving a full description of the ATOM's facilities and how to use them. Both sections are fully illustrated with example programs.

The ATOM modular concept

The ATOM has been designed to grow with you. As you build confidence and knowledge you can add more components. For instance the next stage might be to increase the ROM and RAM on the basic ATOM from 8K + 2K to 12K + 12K respectively. This will give you a direct printer drive, floating point mathematics, scientific and trigonometric functions, high resolution graphics.

From there you can expand indefinitely. Acorn have produced an enormous range of compatible PCB's which can be added to your original computer. For instance:

- A module to give red, green and blue colour signals
- Teletext VDU card (for Prestel and Ceefax information)
- An in-board connector for a communications loop interface – any number of ATOMs may be linked to each other – or to a master system with mass storage/hard copy facility
- Floppy disk controller card.

For details of these and other additions write to the address below

ACORN COMPUTER
4a Market Hill, CAMBRIDGE CB2 3NU

Your ACORN ATOM may qualify as a business expense. To order complete the coupon below and post to Acorn Computer for delivery within 28 days. Return as received within 14 days for full money refund if not completely satisfied. **All components are guaranteed with full service/repair facility available.**

Quantity	Item	Remaining Price	TOTALS
	ATOM KIT - 8K ROM + 2K RAM (KIT)	£174.50	
	ATOM ASSEMBLED - 8K ROM + 2K RAM (MIN)	£174.50	
	ATOM KIT - 12K ROM + 12K RAM (MAX)	£255.00	
	ATOM ASSEMBLED - 12K ROM + 12K RAM (MAX)	£255.00	
	3K RAM SETS	£11.22	
	54 P/P CARTRIDGE PORT ROM (inc. 12K version)	£23.30	
	PRINTER DRIVE 6522 VIA	£50.35	
	inc. 12K version 13244 Buffer	£3.17	
	COLOUR ENCODER	£21.50	
	MAINS POWER SUPPLY 0.5amps	£10.20	
	TOTAL		

To: Acorn Computer Ltd., 4a Market Hill, CAMBRIDGE CB2 3NU
I enclose cheque/postal order for £
Please debit my Access/Barclaycard No.
Signature
Name (please print)
Address
Telephone No.
Registered No: 1403803, VAT No: 255 400 220

PC3/81
• Circle No. 165

Sinclair Research ZX80

1980, £99.95 (~£442)

- **CPU: Zilog Z80**
- **RAM: 1 kilobyte (to 48KB)**
- **Built to a definite budget**
- **Membrane keyboard**
- **'Flicker' on keypress**
- **Sold some 50,000 units**

Sinclair ZX80 Personal Computer. £99.95

Including VAT.
Free post and packing.
Free course in
computing.
Free mains adaptor.

Inside a Day, you'll be talking to it like an old friend!

If computers interest you - and today, computers should interest everybody - you'll find the ZX80 really absorbing.

But more than that, you'll find it of immense practical value. The greatest computer understanding it gives you will be immediately useful in any business or professional sphere. And the grounding it gives your children will equip them for the rest of their lives.

The ZX80 cuts away computer jargon and mystique. It takes you straight into BASIC, the most common, easy-to-use fundamental computer language.

You simply take it out of its box, plug it in to your TV, switch on at the mains - and start. With the manual in your hand, you'll be running programs in an hour. Within a week, you'll be writing complex programs of your own, with confidence and competence.

All for under £100.

The features that make the ZX80 easy to learn on, also make it easy to use.

We designed the ZX80 with special consideration for the beginner. So the original design includes a uniquely simple way of entering commands - and of spotting mistakes before it's too late to correct them easily.

But this doesn't mean it's a junior computer. These very features help to make the ZX80 a very fast and powerful computer in one - quite capable of many of the things you associate with much larger, more expensive personal computers.

Your course in computing.

A Course in BASIC Programming

The ZX80 comes complete with its own specially-written 128-page guide to computing. The book assumes no prior knowledge and represents a complete course in the subject - from first principles to quite complex programs.

It's carefully structured so that every chapter of theory is followed by a chapter of practice. So you learn by doing - not just by reading. It makes learning easy, exciting and enjoyable.

How can anyone offer a real computer for only £99.95?

In a word - *despots*! We've taken the conventional computer and packed it on to fewer, newer, more powerful LSI chips.

For example, a single SUPER ROM contains the BASIC interpreter, the character set, operating system and monitor. If the words mean nothing to you now, they will very quickly!

How does it compare with more expensive computers? Tests by 'Personal Computer World', the leading journal in the field, show the ZX80 as faster than the 'Benchmark' results for equivalent high-level computers (all of which cost many times the price).

For personal use, high speed may not matter - but it's a demonstration of the design level the ZX80 reaches.

Price includes mains adaptor, TV and cassette recorder leads, as well as VAT and post and packing.

Your TV (whether black and white or colour) is all that's needed as a display. Normal TV reception is not affected.

Your ZX80 Personal Computer comes complete with leads and plugs for immediate connection to the serial socket of any domestic TV.

The price also includes a compatible mains adaptor (worth £3.95). (This connection for a portable cassette recorder - if you choose to use one as a useful extra for storing programs. It uses ordinary black cassette tape.)

Book your ZX80 now!

Demand for the ZX80 is very high. Use the coupon to order today for the earliest possible delivery. All orders will be despatched in strict rotation. We'll acknowledge each order by return, and tell you exactly when your ZX80 will be delivered. If you choose not to wait, you can cancel your order immediately and your money will be refunded at once. Again, of course, you have a refund option for 14 days after your computer is despatched. We want you to be satisfied beyond doubt - and we have no doubt that you will be.

Science of Cambridge Ltd,
6 Kings Parade, Cambridge, Cambs.,
CB2 1SN. Tel: 0223 311448.
Reg. No. 214 0530 00.

sinclair zx80

To: Science of Cambridge, 6 Kings Parade, Cambridge, Cambs., CB2 1SN.

Remember: prices include V.T.T. postage and packing.

Please send me _____ ZX80 personal computer(s) at £99.95. (Price includes ZX80 BASIC manual and mains adaptor.)

N.B. Your Sinclair ZX80 may qualify as a business expense.

I enclose a cheque/postal order payable to Readers Account

Science of Cambridge Ltd for £ _____

PLEASE PRINT

Name: Mr/Mrs/Miss _____

Address _____

Your comments to Readers Account/Science of Cambridge Ltd should reach our offices and *not* your local branch (unless you wish to do so at your address preferred).

Reg. No. 214 0530 00.

STW 51

Sinclair Research ZX81

1981, £69.95 (~£262)

- CPU: Zilog Z80
- RAM: 1 kilobyte (to 48KB)
- No flicker in 'slow' mode
- Bigger ROM
- Annoyed ZX80 users
- Reduced to just four chips, thanks to Ferranti's ULA

What would I do with a computer?



The first personal computer
that only
adds up to **£69.95**

You'll be surprised how much you can do with a personal computer and even more surprised at how little it costs. We made it our business to find not only the best-value-for-money computer on the market, but also the best books to enable you to progress from a beginner to an advanced user. And W.H. Smith is the only retail chain where you can buy the incredible ZX81.

The Sinclair ZX81 is a masterpiece of design. Which is why it can carry out programs you'd normally expect from more expensive computers.

Although the ZX81 is fast and powerful, it's also simple to use. Within hours you can learn to run programs and within a week you could be writing your own complex programs. All you need is your own TV (any model that receives BBC2) and a cassette player when using pre-programmed cassettes. And W.H. Smith have a range available from £3.95 each.

So take your first steps in computing at W.H. Smith and make your life easier to run.

WHSMITH  Prices correct at time of going to press.

BBC Microcomputer (Acorn Proton)

1981, £235 (~£881)

- CPU: MOS 6502
- RAM: 16KB (to 128KB)
- Redesigned in a working week to meet BBC specs – thanks to Hermann Hauser
- Became the official micro of the BBC Computer Literacy Project.



Broader horizons

The BBC Microcomputer System

BBC Model B Microcomputers are available for immediate despatch by courier to your door.

If you would like to take advantage of our special delivery offer just fill in this coupon, but remember this only applies to the Model B, and only in the UK. Any other items have to be ordered on the standard order form or from a BBC Computer Stockist.

BBC Microcomputer System Offer
c/o Vector Marketing
Densington Estate
Wellingborough
Northamptonshire NN9 2RL

Please send me by courier: BBC Model B Microcomputer(s) at £399 including VAT and delivery.

Cheques enclosed for £: payable to BBC Microcomputer System readers and/or cheque.

ACCESS ☒ BAKLAPCARD ☐

Signed: _____
Name: _____
Address: _____
Postal Code: _____

Co-Box No. 161990

BBC Microcomputer System Offer, c/o Vector Marketing, Densington Estate, Wellingborough, Northamptonshire NN9 2RL.

*Model A has a limited range of software but can be upgraded to meet Model B specifications.
**3.5" is a registered trade mark of Digital Research.
The BBC Microcomputer is designed, produced and the software in the UK by Acorn Computers Limited.

Whether your interests lie in business, educational, scientific, control or games applications, this system provides a possibility for expansion which is unparalleled in any other machine available at present: comments Paul Devereux in the July 1982 edition of *Personal Computer World*.

The BBC Microcomputer can genuinely claim to satisfy the needs of novice and expert alike. It is a fast, powerful system generating high resolution colour graphics and which can synthesise music and speech. The keyboard uses a conventional layout and electric typewriter 'feel'.

You can connect directly* to cassette recorder, domestic television, video monitor, disc drives, printers (dot matrix and daisy wheel) and paddles. Interfaces include RS422, inter-operable with RS232C equipment, and Centronics. There is an 8-bit user port and 1MHz buffered extension bus for a direct link to Prestel and Teletext adaptors and many other expansion units. The Ecoset system allows numerous machines to share the use of expensive disc drives and printers.

BASIC is used, but plug-in ROM options will allow instant access to other high level languages including Pascal, FORTRAN and LISP and to word processing software.

A feature of the BBC Microcomputer which has attracted widespread interest is the Tube, a design registered by Access Computers. The Tube is unique to the BBC Microcomputer and greatly enhances the expandability of the system by providing, via a high speed data channel for the addition of a second processor. A 1MHz 6502 with 64K of RAM will double processing speed; a 250 extension will make it fully CP/M** compatible.

The BBC Microcomputer is also at the heart of a massive computer education programme. The government has recommended it for use in both primary and secondary schools. The BBC Computer Literacy Project includes two series of television programmes on the use and applications of computers.

There are two versions of the computer. Model A, at £299, offers 16K of RAM and Model B at £399 has 32K of RAM.

For technical specification and order form, send stamped addressed envelope to P.O. Box 7, London W3 6JX and for details of your nearest stockist ring 01-200 0200.

'Newbury Labs' NewBrain

- Yes, that's the Sinclair NewBrain
- Moved to NEB-owned Newbury Labs following Sinclair Radionic's closure
- The BBC's first choice for the Computer Literacy Programme
- Abandoned for the second time



Image courtesy Rama & Musée Bolo

“Amicable Relationship”

"If it wasn't for the fact that the BBC for their strange reasons allow Acorn to stick a BBC logo on their machines I don't think they would sell many computers."

Clive Sinclair

Your Computer, November 1982, P.38

"He [Sinclair] seems to have a terrible chip on his shoulder because he was not the chosen one. Sinclair is the only one who has enough arrogance to compare the BBC computer with his own."

Hermann Hauser

Your Computer, September 1982, P. 38

Dragon Data Dragon 32/64

1982, £199 (~£666)

- CPU: Motorola 6809E
- RAM: 32 kilobytes (to 64KB)
- Based on same Motorola reference design to the TRS-80 CoCo
- Short-lived spin-off of toymaker Mettoy; officially closed in 1984

A FAMILY COMPUTER TO

ENTER the Dragon, the new Dragon 32. It's the first of an entirely new generation of microcomputers — British designed, British built, and ideal for all users.

With schoolchildren learning to use computers as second nature, with parents having to learn a totally new technology, with the incredible computing power such knowledge can put at your fingertips — it makes sound common sense to make the learning as easy as possible.

And it's here that the new Dragon 32 really comes into its own.

It features a standard typewriter keyboard for total familiarity, and you simply plug in a standard cassette recorder, connect up to the serial socket of a standard UHF television set — and you're ready to start an incredible adventure.

Dragon 32 is powerful, too, having a massive 32K RAM (Random Access Memory) built in as standard. With this computing power literally at your fingertips, children can carry on the learning process at home, parents can learn with them, and the whole family can be entertained for hours with the wide range of computer games currently available.

FIRE THE IMAGINATION

Or you can learn to type using one of the programs available with the Dragon 32. Sort out the family finances with a special budgeting program. Even learn new languages — virtually everything's possible with the Dragon 32's wide range of optional software packages. And, of course, you can even write your own programs using the built-in BASIC that's designed to be easy to learn — and that's when the fun can really start!

Read all about the amazing features the new Dragon 32 brings into your home in the following pages.

You'll find no other micro will fire your imagination more.



Sinclair Research ZX Spectrum

1982, £125 (~£419)

- **CPU: Zilog Z80**
- **RAM: 16 kilobytes (to 48KB)**
- **Ultra-low-cost colour system**

"The keyboard may be a limitation, but you could put another keyboard on it if you were really that desperate."

Sindair ZX Spectrum

**16K or 48K RAM...
full-size moving-
key keyboard...
colour and sound...
high-resolution
graphics...
From only
£125!**

First, there was the word beating Sinclair Z80. The first personal computer for under £100.

Then, the Z80. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they set over 100,000 an for future home computers a personal computer. And the ZX81 remains the ideal low-cost introduction to computing, giving you the ZX Spectrum the ideal way to 48K of RAM. A full size moving key keyboard. VDU colour and sound. High resolution graphics. And at a price that's unbeatable.

Professional power—personal computer price!

The ZX Spectrum incorporates all the present features of the Z80. But its new 16K BASIC ROM dramatically increases its computing power.

You have access to a range of 8 options for background, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (up to the amount of RAM). 16K or 48K (which you can upgrade later to 48K of RAM) or a massive 48K of RAM.

At the price of the Spectrum 16K, is an amazing £125! Even the popular 48K version costs only £175! You may decide to order with the 16K version, if so, you can still return it later for an upgrade. The cost? Another £50.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a main adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white). Enslaving Sinclair BASIC, (now used in over 100,000 computers) worked the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum.

The ZX Printer—available now—is fully compatible with the ZX Spectrum. And later this year there will be Microtrees for massive amounts of extra on-line storage, plus MSXDOS2 network interface board.

There's no need to stop there. The ZX Printer—available now—is fully compatible with the ZX Spectrum. And later this year there will be Microtrees for massive amounts of extra on-line storage, plus MSXDOS2 network interface board.

You have the facility to support separate data files.

You have a choice of storage capacities (up to the amount of RAM). 16K or 48K (which you can upgrade later to 48K of RAM) or a massive 48K of RAM.

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You have the facility to support separate data files.

Key features of the Sinclair ZX Spectrum

- Full colour—8 colours each for foreground, background and border, plus flashing and long-bright intensity control.
- Sound—1287 command with variable pitch and duration.
- Massive RAM—16K or 48K.
- Full size moving key keyboard—all keys at normal typewriter pitch, with repeat facility on each key.
- High resolution—256 dots horizontally x 192 vertically, each individually addressable for full high-resolution graphics.
- ASCII character set with upper and lower case characters.
- Separate compatible—user software can generate 40-character print or other settings.
- High speed LQAD & VDP—16K or 100 seconds via cassette, with VDP1 & M2000 for extensions and separate data files.
- Sinclair 10K pre-extended BASIC—incorporating unique 'on-line' keyboard control, further check, and report codes.

The ZX Printer—available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners full ASCII character set—including lower case characters and high resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 30 characters per second, with 32 characters per line and 3 lines per vertical inch.

The ZX Printer connects to the rest of your ZX Spectrum. A roll of paper (1000 gsm and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of the rolls.

The ZX Microdrive—coming soon

The new Microdrive, designed especially for the ZX Spectrum, is set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single in-line magnetic storage medium.

The transfer rate is 10K bytes per second, with an average access time of 3 seconds. And you'll be able to connect up to 16 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrive will be available in the early part of 1983 for around £750.

How to order your ZX Spectrum

BT PHONE—Access, Barclaycard or credit card holders can call 01-265-0000 for personal attention 24 hours a day, every day. BT PHONE—Access, Barclaycard or credit card holders can call 01-265-0000 for personal attention 24 hours a day, every day.

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BT PHONE—Access, Barclaycard or credit card holders can call 01-265-0000 for personal attention 24 hours a day, every day.

Access or Trustcard.

BT PHONE—Access, Barclaycard or credit card holders can call 01-265-0000 for personal attention 24 hours a day, every day.

BT PHONE—Access, Barclaycard or credit card holders can call 01-265-0000 for personal attention 24 hours a day, every day.

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Sinclair Research ZX Spectrum

"How, then, is it possible that the pioneer of the electronic calculator is unable to provide sensible delivery dates for the Spectrum? My own order, after more than 16 weeks, is now cancelled."

E R Keevy

Your Computer, December 1982, P. 19

"They're entitled to complain, and we don't take it lightly. We did get things wrong, but we've moved heaven and earth to correct it - the criticisms are justified and we'll make damn sure it doesn't happen again."

Clive Sinclair

Your Computer, November 1982, P. 38

Sinclair Research ZX Spectrum

“Our web designer came in one day and he was wearing a Spectrum T-shirt. I thought 'God, where did he get that from?' He said 'I bought it on Camden Market this weekend,' I said "what do you mean this weekend?!" He opened my eyes to this massive following of all things... Well, not all things Spectrum, but many things Sinclair certainly: the Spectrum, the QL, even the ZX81.”

Rick Dickinson, Industrial Designer, October 14th 2014

Games

- The overwhelming majority usage for home computers: games.
- Rise of the 'bedroom programmers'
- From nothing to millions, then for many back to nothing
- Very young; often used puerile humour



Hugh Jarse prepares a program for despatch to a mail-order customer

Jupiter Cantab Jupiter Ace

1982, £89.95 (~£277)

- CPU: Zilog Z80
- RAM: 1 kilobyte (to 49KB)
- Creation of former Sinclair engineers Richard Altwasser and Steven Vickers
- FORTH language “a brave gamble;” didn't pay off.

Probably the fastest microcomputer
in the universe

the **JUPITER ACE** only £89.95.



All inclusive Price

For £89.95 you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s (colour or black and white), a software catalogue and a manual.
The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.
Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.
The price includes postage packing and V.A.T.

Key Features

- Revolutionary microcomputer language FORTH.
- Full-size moving-key keyboard.
- User-defined high-resolution graphics.
- Programmable sound generator.
- Floating point arithmetic.
- Fast cassette interface.
- Upper and lower case ascii character set.
- 24 x 32 character flicker-free display.

The Jupiter Ace uses FORTH

The Ace is set apart from all other personal computers on the market by its use of a revolutionary language called FORTH. Some computer languages are easy for humans to understand, others are easy for computers; FORTH is most unusual in being both. Its underlying principles are so simple that it takes even a newcomer to computers only a few minutes to learn how to do calculations on the Ace, yet the very same principles are powerful enough to allow you to invent your own extensions to the language itself.

At the same time, the memory-saving coded form used to store your programs inside the Ace allows it to obey them very fast — typically in less than a tenth of the time it would take to do the same thing using a different language. Amongst other things, this makes the Ace ideal for “games”.

FORTH's unique combination of speed, versatility and ease of programming has already made it a prime choice for professional applications as diverse as pub games and radio telescopes, and gained it an enthusiastic national user group. Now the Jupiter Ace can bring this addictive language into your own home.

Designed by Jupiter Cantab

Leading computer Designers Richard Altwasser and Steven Vickers have a reputation for pushing technology forwards. After playing the major role in creating the ZX Spectrum they formed Jupiter Cantab to develop their latest branchchild the Jupiter Ace.

Technical Specification

Hardware

Processor/Memory
Z80A running at 3.25 MHz.
8K bytes ROM 3K bytes RAM.

Input
40 moving-key keyboard with auto-repeat on every key.

Output
Memory-mapped 32 x 24 character display with high resolution user graphics. Output to drive normal UHF TV set on channel 36.

Sound
Provided by internal loudspeaker.

Cassette
Load Save & Verify at 1500 baud, separate data storage.

Software, FORTH

Data Structures
Integer, Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types.

Control Structures
IF-THEN-ELSE, DO-LOOP, BEGIN-WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

Operators
Mathematical +, -, ×, ÷, Logical AND, OR, NOT, XOR.
Comparison <, >, =.

Program Editing
FORTH words may be listed, edited and redefined. Comments are preserved when words are compiled.

Order Form

The **Jupiter Ace** is available only by mail order. Please allow up to 28 days for delivery.

Send cheque or postal order with the form to:—
JUPITER CANTAB, 22 FOXHOLLOW, BAR HILL, CAMBRIDGE CB3 9EP

Please send me:—

☐ JUPITER ACE MICROCOMPUTER(S) @ £89.95.

Name, Mr/Mrs/Miss

Address

CVG

Grundy NewBrain

1982, £199 (~£780)

CPU: Zilog Z80

RAM: 32 kilobytes

The machine that wouldn't die!

Design was two to four years old at launch: no colour, no sound

Failed to compete with the Spectrum



Image courtesy Rama & Musée Bolo

Computers Lynx

1983, £225 (~£694)

- CPU: Zilog Z80
- RAM: 48 kilobytes (to 128KB)
- Expensive, not a big seller
- Computers ceased trading in 1984
- All Lynx rights sold to the National Lynx User Group

YOU WON'T HAVE TO BIN A LYNX.

After you've owned a micro for a while you begin to wish you'd invested in a bigger memory. But when you want to upgrade you are suddenly faced with a number of problems the brochures didn't mention. If you have one of the cheaper models you probably won't be able to upgrade at all.

And with some of the more sophisticated machines you will be shocked by the expense of the hardware required to upgrade. Not with the Lynx. Probably the single most important aspect of Computers' Lynx is its expandability. From the start the Lynx was designed to be upgraded - internally. From 48K to 96K to 128K.

fully professional 128K - and beyond. The 128K Lynx (available December) with additional Disk Drives opens the door to the exciting world of CP/M where you will find a vast range of ready-made small business programs from famous software houses. You can buy into the Lynx system at a level that suits you and your family and be assured that when you want to move on to bigger things you won't be left with a bin full of electronic junk.

COMPUTERS LYNX
EXPANDABLE NOT EXPENDABLE

48K Lynx £225 96K £299 128K £445

Memotech MTX500

1983, £275 (~£848)

- CPU: Zilog Z80
- RAM: 32 kilobytes (to 512KB)
- Former Sinclair accessories builder
- Failed Soviet deal bankrupted the company
- Caused the Government to cease funding UK manufacturing



Oric Products International Oric-1

1983, £99.95 (~£308)

CPU: MOS 6502

RAM: 16 kilobytes (to 48KB)

The 'Tangerine Tiger'

Not the high-end machine
promised

Beset by delays, keyboard
problems, ROM problems,
arson...

THE FLEXIBLE COMPUTER SYSTEM FOR THE FUTURE

ORIC-1

CREATED BY
TANGERINE

How can Tangerine promise you a professional computer for only £99.95? Because, unlike most computer builders, we have designed the U.L.A. ourselves.

This makes the Oric-1 substantially more reliable and versatile to work with and what's more, at £99.95, you get a professional system well below the price of

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ONLY £99.95 (inc. VAT) FOR 16K RAM VERSION

(Please allow 28 days for delivery) Subject to availability

Order your Oric-1 direct from the designers

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Item	Qty	Price Inc. VAT	Total
ORIC-1 16K RAM	1	£99.95	
ORIC-1 48K RAM		£169.95	
ORIC Communications Modem		£79.00	
ORIC Owner Magazine (6-monthly)		£10.00	
Postage and packing		£5.95	
			TOTAL £

Tangerine: The Cursed Company

“The BBC approached us and described the kind of computer the series required. We said to them that there was no way that we were going to make 12,000 computers to sit on the shelves for January based on their predictions of the market.”

Paul Johnstone, co-founder Tangerine.

Your Computer, November 1981, P. 25

The result: Acorn Proton chosen to make the BBC Micro. Despite significantly higher cost, it would sell over 1.5 million units over its lifetime.

Tangerine: The Cursed Company

“I would like to express my dissatisfaction in Oric Products International. I ordered a 16K Oric-1 computer three months ago. Still there is no sign of it. I have sent several letters to Oric and have received no reply.”

C. Luke

**Home Computing Weekly, 8th March
1983,**

P. 33

Oric-1 faced major delays during manufacturing. Early units were sent out with expensive EPROMs, while errors were commonplace.

But worse was to come...

Tangerine: The Cursed Company

Kenure Plastics, Berkshire, burned to the ground on the 13th of October 1983 – destroying an estimated 7,000 completed Oric-1 systems and components for more.

Production restarted at a nearby factory, but the knock-on effect was critical.

The Oric Atmos, a bug-fixed Oric-1 with improved keyboard, would launch in 1984 as Tangerine/Oric Products' last creation.

The kicker: the arsonist is thought to have been targeting the building next-door!

Acorn Electron

1984, £175 (~£516)

CPU: MOS 6502

RAM: 32 kilobytes

Acorn's answer to the Spectrum

Cut-down Proton (BBC Micro)

The machine that killed Acorn's home computing business



With the Plus 3 module, which will soon be available, you'll have a disc drive system and will be able to enjoy all the speed and convenience of 3.5 inch discs.

But let's not get carried away too quickly. You can start using and enjoying your Electron as soon as you get it home.

All you need is your television set and a cassette recorder.

The speed of a business micro.

Some home computers respond pretty slowly to your commands. After you've pressed the keys, they leave you twiddling your thumbs for more than a mere few seconds.

The plodders, however, are a very long way behind the Electron.

In fact, on processing speed, a recent bench test survey ranked

the Electron up with such high fliers as the IBM PC and the Apple III. Both are machines which cost well over £1,000.

It's an astonishing accolade when the Electron makes no greater claim than to be a micro which is designed to become part of the family.

Your starter for free.

With your Electron, you'll receive a free introductory cassette.

It will give you a taste of the exceptional colour graphics. It will show you how the Electron can play and notate music.

And when it's given you some new ideas about home accounting, it will challenge you to a few games and even spend a few seconds doing your whole family's biorhythms for you.

But remember, although it holds 15 programs, the cassette will only give you a glimpse of the Electron's full potential.

Because the potential is as infinite as your own imagination.

No shortage of software.

Although the Electron is still a relative newcomer to the market, the range of software available for it is considerable.

Besides plenty of games, there are many educational programs for children of all ages, from play school to A Level.

There's a great deal to keep adults occupied, too. From money management to helpful domestic programs, even a range of foreign language programs, teaching the basics of French, German, Italian and Spanish.

And of course, with its simplicity and flexibility, the Electron could soon be

processing programs created and written by none other than yourself.

You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

For the address of your nearest supplier, ring 0933 79300.

The Acorn Electron.

Amstrad CPC 464

1984, £249 (~£734)

- CPU: Zilog Z80
- RAM: 64 kilobytes (to 576KB)
- Bundled with a monitor
- Alan Sugar decried competition looking as looking like “a pregnant calculator” rather than a “proper computer.”

With monitor, datacorder and £100 of software you can't lose. (Until mummy catches you.)

With the Amstrad 464 home computer the fun starts as soon as you get it home. Because unlike many other home computers the 464 comes complete with its own green screen or full colour monitor. It also comes with a convenient built-in datacorder. And you get £100 worth of software with games like Horror Attack and Kid's Maze. Not to mention Oh Mumma. 40K of RAM means you have plenty of memory to play with. And there are over 200 Amstrad games you can play, many exclusive to Amstrad. But games are only half the fun on the 464. The kids can learn spelling and arithmetic with software like Wordhug and Happy Numbers. While adults will love the way that it helps around the house with budgeting and accounts. To help you make the most of your 464, you can join the Amstrad User Club. And there are lots of books and magazines devoted to it as well. What's more you can buy joysticks, printers, disc drives, speech synthesizers and light pens to make it even more fun. But perhaps the most pleasurable thing about the 464 is the price. The complete home computer costs just £299 with green screen or £299 with colour monitor. Not much to pay for a chance to get away from mumma.

Please send no more information.

Name _____
Address _____

The Amstrad 464.
The complete home computer.
Amstrad LTD Box 662, Boreham, Essex CM8 4LE

The End of Sinclair Computers

- **Sinclair Research needed £15 million cash to restructure in 1985**
- **Money was not found**
- **Amstrad acquired the Sinclair and Spectrum brands for £5 million in 1986**
- **All post-1986 Spectrums were Amstrad, not Sinclair**



What Happened?

The North American Video Game Crash of 1984 led to investors getting antsy

Production delays and quality control issues sent many companies bankrupt

Biggest issue: market became saturated, prices began dropping unsustainably

“Sales of the Spectrum have slumped. In December 1983 every child wanted one for Christmas, and by December 1984 every child who wanted one had one.”

BBC News, January 1985

The Aftermath

- There's no “home computer” market today
- The 'IBM Compatible' became the dominant force
- The UK computing industry soldiers on: the Raspberry Pi has sold >5M units world-wide – and is based on Acorn technology



The More Things Change...

- Taking money for products that don't strictly speaking exist?
- The British computing industry: crowd-funding pioneers!

