Lean, Tom. "Computers for the Man in the Street." *Electronic Dreams: How 1980s Britain Learned to Love the Computer*. London: Bloomsbury Sigma, 2016. 61–88. *Bloomsbury Collections*. Web. 26 Apr. 2023. <<http://dx.doi.org/10.5040/9781472936653.0006>>.

Downloaded from Bloomsbury Collections, www.bloomsburycollections.com, 26 April 2023, 11:12 UTC.

Copyright © Tom Lean 2016. You may share this work for non-commercial purposes only, provided you give attribution to the copyright holder and the publisher, and provide a link to the Creative Commons licence.

Computers for the Man in the Street

Early in 1980, adverts began appearing in British newspapers for something rather unusual. Sandwiched between pages of economic and social troubles, Thatcherite politics and Cold War paranoia was an advert for a small white box. It looked a little like an overgrown calculator, but declared itself to be the Sinclair ZX80 Personal Computer, and could be bought, ready made, for just £99.95. Despite the implausibly low price, the ZX80 was not only a 'real computer', but one that cut through computer 'mystique' to teach programming, and was so easy to use that 'inside a day you'll be talking to it like an old friend', or so the advert said. It was an impressively crafted piece of marketing, creating an impression of affordability and accessibility, ideas hitherto rarely associated with computers. The little white box, and the bold claims that sold it, marked the beginning of a redefinition of computers as affordable and everyday appliances for the masses.

At the time microcomputers were broadly split between two basic types. The first were do-it-yourself machines, typically *hobbyist computers* that were cobbled together from kits of electronic components. They were often quite cheap, but required an intricate understanding of how computers and electronics worked, and an owner who was not put off by the complications. The second type were more user-friendly *personal computers*, machines that arrived ready-built in a neat case, which simply needed to be plugged in to start computing with. There were still technicalities to be grasped, but the machines were much easier to use and more like appliances than hobbyist machines. A few of them were even being spoken of by their manufacturers and journalists as

computers for the home, but for the British market these American domestic machines were far too expensive. Such computers were too complicated, or too expensive, to become common household items, but what if they could be user-friendly *and* affordable? Ready-built for under £100, the ZX80 offered just the right combination of user-friendliness and affordability to open up computing to a mass market in Britain for the first time

Owned by Clive Sinclair, Sinclair was well placed to take the conceptual leaps needed to make the computer suitable for everyday use. Sinclair's earlier company Sinclair Radionics had a track record in innovative and low-cost electronics devices, in both enthusiast and consumer electronics markets, and a talent for eye-catching marketing, with bold claims for product performance and value. The thing that stood the company apart, however, was a streak of inventive minimalism to its design philosophy, a harnessing of innovative ideas to do more with less, and to produce ever smaller, lower cost and more capable devices. In 1972, Sinclair used this approach to introduce the first popular pocket calculator, the £79.95 Sinclair Executive. Before the invention of liquid crystal displays, calculators had a fearsome appetite for electricity, limiting them to mains power or bulky batteries. Sinclair's designers discovered that rapidly pulsing the power on and off, rather than leaving it on continuously, made no difference to the display or the operations of the calculator circuitry. However, it reduced the power consumption to the point where the calculator could run on tiny hearing aid batteries. It was the sort of neat technical trick that brought about savings in components, size and cost. Not only was the Executive a huge success, but it was swiftly followed by even smaller, cheaper and more advanced calculators. The company was not without its critics, who pointed to extravagant advertising claims, reliability problems and occasionally eccentric products. For example, the Black Watch of 1975, one of the earliest low-cost digital watches, could have its circuitry scrambled by the static of a synthetic fibre shirt and ran at

different speeds depending on the temperature. Sinclair would never quite manage to shake off its critics, but the products and unquestionably inventive approach won millions of admirers too. 'You're really pushing the frontiers of technology,' explains Rick Dickinson, who joined the firm in late 1979 as its industrial designer. 'You're creating the future here, you're evolving things, you're absolutely cutting, leading edge in every way with Sinclair.'

Sinclair had become involved with personal computing in the 1970s, firstly with an unrealised computer project at Radionics, then with the Science of Cambridge MK14 hobbyist computer kit. Financial problems and the collapse of the calculator market brought financial assistance to Radionics from the Government's National Enterprise Board (NEB), but the eventual NEB takeover of the innovative Radionics did not make for a happy marriage. Clive Sinclair resigned to take up at Science of Cambridge full time, at this point it was a tiny electronics company with offices above a parade of shops. Within a few years, renamed Sinclair Research, it was producing more computers than almost anyone else in the world. The company did not invent the personal computer, but the cost reductions it achieved through innovation and design economies made complete computers more widely affordable than the American machines had been. There were 'some very good machines, but they were very expensive,' recalled Sir Clive Sinclair in a 2008 interview. 'My idea was, that if we could get the price way, way down, five times down, to £100, we could aim straight at the general public, by saying, "Here you are, here's a computer, you can learn about computers at home."' The result was a machine with the complete and user-friendly nature of the expensive American imports, but at a fraction of the price, and well suited for a country that was becoming interested in understanding computers.

Like previous Sinclair devices, the ZX80 was a tiny machine, little larger than a desktop calculator. Designed to a price point, its capabilities were quite basic. Within the white case

was a machine with just 1k of RAM, enough memory for little more than simple programs. It had no sound,* limited interfacing abilities and a blocky monochrome display. Set against more expensive contemporaries, such as the Apple II, which had more memory, colour graphics and sound, it is tempting to see the little ZX80 as primitive, yet there were many innovations in its minimalist design. 'Of course you can't just suddenly make something for £100 that other people have to charge £500 for. We did a complete redesign,' remarks Sir Clive. 'There were a lot of radical ideas in the thing to get the cost down.' There were just 21 chips inside the ZX80, dozens less than in other computers on the market – the NASCOM-1, for example, had used 55. The way its display flickered whenever the machine had to divert its attention to processing data was another sign of cost-reduction innovations. To avoid the expense of dedicated video circuitry, the machine used the main processor to drive the display, and employed the same memory bank for display and program storage.

By using a domestic television for the display and a tape recorder for data storage, the ZX80 saved the cost of specialist equipment. This also had the side effect of associating the unfamiliar computer with common household items. Rather than go to the expense of a typewriter-style keyboard, where each moveable key was mounted onto an individual switch, the ZX80 keyboard was a flat plastic panel, with the 'keys' simply printed onto it, overlaying a layer of electrical contacts. The small, unmoving keys of the 'membrane keyboard' would be criticised by many users, but at a time when the keyboard was a major part of the cost of a computer it was a large saving. An evolution of the same basic idea is in use in most computer keyboards today. With hardly any parts it also appealed to Sinclair's minimalistic design philosophy. The original conception for the ZX80 was that it would be used for learning

*However, inventive users soon discovered that they could make the machine produce sound of sort by programming the display to make the television produce a buzzing noise.

about programming, and the membrane keyboard was intended less for typing than for tapping in programming commands. Another user-friendly innovation was that the built-in BASIC computer language allowed whole commands to be entered at the press of a single button. Rather than type out the command GOTO letter by letter, users simply pressed the G key and GOTO appeared on screen. Even if a wrong key was pressed, a syntax-checking system identified errors as they were typed, helping out beginners with their programming efforts.

The low price of the ZX80, the first complete computer for under £100, attracted much press attention, but it was still on the borderline between personal computing's hobbyist roots and the mass market of everyday consumer appliances. It was still marketed heavily at hobbyists as well as the 'man in the street', and while £99.95 bought a complete ZX80, a kit was available at £79.95. Indeed, in technical respects the ZX80 was little advance on many hobbyist computers, sharing many of the technical quirks of hobbyist computing. Yet through wrapping its complexities in a plastic case, adding user-friendly BASIC and some clever marketing, the ZX80 was made complete and appliance-like in a way that hobbyist machines could never be. In any case, to many people who bought one with little expectation of what a personal computer was, the ZX80's deficiencies mattered little. Over 50,000 machines departed Sinclair into the hands of consumers, many of whom would never have even seen a real computer before, let alone thought about owning one.

The little black box

In 1981 the little white box of the ZX80 and 'old friend' slogan disappeared from Sinclair's computer adverts, to be replaced by a little black box, the ZX81, with the promise that buyers would soon be talking to it like a 'new friend'. The ZX81 was a refinement of the ZX80, advancing the concept with a host of incremental improvements to create a machine that was both better and cheaper, at just £69.95 ready-built. *Personal Computer World's* reviewer David Tebbutt was full of praise for 'Uncle Clive' and his new machine: 'producing a superior machine to

the ZX80 and selling it for a lower price is absolutely wonderful. I'm full of admiration for the man.' One of the most startling claims made about the microprocessor back in the 1970s was that new and better devices would be cheaper than the ones they replaced. With inflation running rampant, anything better costing less in the future must have seemed a little far-fetched, but the ZX81 vindicated the idea. 'Higher specification, lower price', pondered one of the machine's adverts, 'how's it done?'

Many electronic products are made by cobbling together standard components. This saves time and development costs, but creates an end product with many parts. The alternative was the expense of designing a specialist microchip that integrated the logic of several components onto a single chip. Using standard parts pushed up production costs, but saved on design costs, the approach used with the ZX80. 'We hadn't got a lot of capital available so we used quite a lot of standard gates,' recalled Sir Clive of the ZX80 design. 'Because money poured in, we very quickly went to the ZX81, where we mopped up all the random logic on a single chip from Ferranti. And so that computer, amazing really, only had four chips... It was a very, very neat little design.' The new Ferranti chip, called an Uncommitted Logic Array (ULA), was itself a novel technology. Developing custom microchips for commercial products was generally a lengthy and expensive business, costing as much as \$250,000 and taking as long as a year. Ferranti's single ULA provided a way of producing a custom-designed chip in mere months at perhaps a tenth of the cost of a dedicated new chip. The ULA was akin to an electronic join-the-dots puzzle, a layer of unconnected logic gates that designers could make connections between to form a specialist chip, but without the cost of a purpose design. Ferranti and Sinclair squeezed the functionality of 18 of the 21 chips of the ZX80 onto the single chip, slashing costs and even adding improvements. The microprocessor made the personal computer possible, but the ULA was essential in making it affordable in Britain, and would be at the heart of many later home computers.

The ZX81's technical specifications were similar to those of the ZX80: 1k of RAM, black and white display, no sound

and Z80 processor. However, the machine had a number of refinements. A new mode was added to stop the display flickering whenever the machine was processing, and there were improvements in the BASIC and mathematical abilities. Moreover, the changes outside the box were at least as significant as those inside it. The ZX80 may have been a complete computer, but its form was unappealing and unrefined. The thin white case was compared to plastic egg cartons by one reviewer, and the 'cooling vents' on its case were just black stickers. Although still available as a kit as well as complete, the ZX81 was a much neater and more consumer-friendly package, as its industrial designer Rick Dickinson recalled: 'The product I think Clive was pushing me towards was much more of a consumer product and I found that very difficult because there were no home computers in the shops. What is a home computer? You know, how would people relate to it? How do you identify it? What should it look like? Should it have a feel of Dictaphone or tape recorder, or a feel of television about it? Where will it sit in the home?'

Desktop PC, laptop computer, tablet; today we are used to the forms personal computers commonly take. They differ in the details, but are familiar shapes and sizes that have become established by decades of gradual evolution and use. Back in 1980 there was little precedent for what a home computer should look like. Industrial designers, those responsible for the look and feel of products, had to consider some quite fundamental questions about the nature of the home computer. 'It had to reflect some level of high-tech, it had to be elegant, well considered in its design and its detail,' explains Dickinson. 'It certainly wasn't hi-fi but it certainly would live in the bedroom or in the lounge, certainly not in the kitchen or the bathroom or the garage... it had to look high-tech and desirable.' Using sturdy ABS plastic, Dickinson's design of the ZX81 created a neat device well suited to the home environment. Like most Sinclair machines it was small and economic, but the sleek, angular case, with its black, white and red colour scheme, could have come from the future.

Selling the future

Alongside low-cost circuitry and accessibly user-friendly design, there was a third magic ingredient in the success of Sinclair's early machines. A clever marketing campaign encouraged not just a few thousand enthusiasts to buy the computers, but hundreds of thousands of 'normal' people too. Highlighting just what a crossover product the ZX80 was, it was presented quite differently to the two audiences. Jargon-filled adverts in *Practical Wireless* and other enthusiast magazines listed technical features at length, complete with pictures of circuitry to tantalise the hobbyist and lured them with such phrases as 'you've heard the excitement... now make the kit!' Meanwhile, in the pages of national newspapers large adverts targeted a new mass market of computer illiterates. Not for this audience of novices detailed technical notes, but rather soothing promises of how easy the machine was to use and how it 'cuts away computer jargon and mystique'. Whatever the market, the low cost featured prominently, presented as the outcome of smart design rather than simply being cheap.

Outside the small handful of dedicated computer shops, there were few places where people could just walk in and buy a computer in 1980. Prospective computer owners typically had to send off a cheque to the manufacturer and patiently await the arrival of a box in the post, frequently weeks later than the advert promised. The personal computer was in the same bracket as X-ray spectacles and miniature radio watch kits, a gadget too fanciful or technical to be sold on the high street. This changed in Christmas 1981, when the bookseller WH Smith began to sell the ZX81 through its stores. 'What would I do with a computer?' Smith's bold adverts asked of its customers as it began a major drive to sell the machines. The highly profitable experiment took personal computers out of the realm of the hobbyist and put them on the high street for everyone, legitimising the idea of computers as consumer appliances.

Despite the growing buzz about the threats and opportunities of the microprocessor revolution, computers were still a largely unfamiliar technology to most people.

Sinclair pitched the ZX machines perfectly at a new audience of beginners who wanted to learn about them. They were presented as powerful tools to help the novice master this incredible new technology, a 'passport to the future'. Yet although powerful, they were promoted as easy to use and to understand. As the marketing matured, the promises of the information technology revolution were invoked to encourage people to buy computers to prepare for the profound changes about to sweep society. Buying a Sinclair computer 'represents a firmer grip on the way the world works, an opportunity to join what is certain to be a British way of life', claimed one later ZX81 advert. Clever design may have made the ZX80 and ZX81 easy to use and affordable, but marketing added a gloss of accessibility, with the promise that learning about computers was essential for the future.

The ZX80 may have been the first complete computer for under £100, but the ZX81 rivals it for historical significance. In later adverts the ZX81 was presented as the 'Model T-Ford of computers', in homage to Henry Ford's first mass-produced motor car, the affordable vehicle that introduced America to the automobile age. It was an apt comparison. Not only were both black, but both redefined technology into a more accessible form that opened it up to a mass market. The ZX81 was hugely significant in redefining computers as accessible appliances for all. Placed alongside more expensive machines like the PET and Apple II, the small size of the ZX machines led some to dismiss them as mere toys. However, with little for most people to compare them to in 1980 and 1981, this did nothing to dent their appeal. Their enormous popularity spearheaded the computer's invasion of British homes.

By December 1981, a quarter of a million ZX81s had been sold, and the demand overwhelmed Sinclair and led to lengthy waits before many customers received their machines. Quite apart from the sheer numbers sold, Sinclair became something of a cultural phenomenon. Thousands of people queued to get into the ZX Microfairs, where exhibitors sold programs and hardware upgrades for the Sinclair machines. Part archetypical

British inventor, part entrepreneur, Clive Sinclair himself became a figurehead for the whole computer boom. While his critics played on the quirks of some of Sinclair's products to suggest he was some sort of mad scientist or more marketing than substance, he was also widely respected as a technological guru and admired for making computers affordable for everyone. As he would frequently tell journalists, he preferred inventing things to running a big business, but the success of the ZX computers exemplified the sort of entrepreneurship that appealed to the Thatcher government; he was knighted in 1983 for services to industry and won *Guardian* Young Businessman of the Year. The computers themselves became popular culture icons too. 'People would write about it, they would include it in lyrics of their songs. I remember going to a theatre production in Cambridge and someone was singing in a song, "and I've even got a ZX81!"' recalls Rick Dickinson.

Atomic theory and American invaders

Sinclair was far from the only company working towards a cheap and accessible home computer. Mere months after the ZX80, Sinclair's Cambridge-based rival Acorn launched the Acorn Atom. 'Chris Curry decided that he wanted a better home computer. Home computers had remained in the pretty techie horrible thing area,' recalls Sophie Wilson. 'And then you had the Apple II. And Chris wanted something that had that sort of ergonomics but much cheaper.' The Atom was more expensive than the ZX80 and ZX81, £170 ready-built or £120 as a kit, but rather more upmarket, with a typewriter-style keyboard and sound. It could also display colour and high-resolution graphics, albeit not at the same time. Although still available as a kit, signs were emerging that there were more people interested in owning a computer than there were people capable of building one. 'We were fed up with receiving phone calls from people who had misassembled the machine,' remembers Wilson, who recalls particularly the return of one faulty Atom assembled by a novice with an aversion to soldering. 'He'd sent it back to us and we discovered that he'd

glued everything together, knowing that heat could damage the integrated circuits, which was written in the instructions... So he glued it together and nothing worked.'

With the hardware principally designed by Nick Toop, the Atom was affordable, but not cheap, and lacked the minimalism of Sinclair's products. Like Acorn's earlier machines it was built with expansion in mind, and marketed as user-friendly enough for a beginner, but expandable as their knowledge grew. On the other hand, the compromises to keep the cost down were evident too. The mounting of the chips on the underside of the keyboard sometimes led to components falling out of sockets as the machine was used. The display controller components were designed to the 60Hz frequency of American televisions rather than the 50Hz used by British ones, meaning the Atom would not work properly on some televisions. Just like Sinclair's machines, the Atom was on the cusp between hobbyist and home computer, but still sold by the thousand.

Imported American home computers started arriving around the same time. Atari, already a successful maker of video games consoles, a major market in 1970s America but far less so in Britain, launched its first home computers in 1979, the Atari 400 and 800. The video games lineage was obvious, with joystick ports, cartridge slots and bright graphics. Compared to the simplicity of the ZX81 or workmanlike Atom, they were solidly built and positively elaborate in construction. This was reflected in their prices, £345 for an Atari 400, with a flat membrane keyboard, and £695 for an Atari 800 in 1980. Expense was also the failing of another 1979 home computer, the TI-99/4 from semiconductor and calculator manufacturer Texas Instruments, priced at £695, plus the cost of a monitor or modification to work with a British television. 'Are people in the UK ready to spend this sort of money on a home computer?' sceptically asked David Tebbutt in *Personal Computer World's* review. In Britain, these machines only became more viable as mass-market home computers when their prices dropped.

By far the most successful American invader was a new offering from Commodore, the VIC-20. 'Jack Tramiel, the

founder of Commodore was always wanting the mass market, that's what his aim became in computers. The Commodore PET wasn't going to be that,' explains Kit Spencer, of Commodore UK. The threat of Japanese imports was also significantly on Tramiel's mind after the calculator wars of the 1970s. At a strategy meeting in London in early 1980, Tramiel declared 'the Japanese are coming, we will become the Japanese', and redirected the company towards a cheap colour computer. Commodore were already very familiar with the mass market, but the recent launch of the low-cost Sinclair computers also served as an example. 'Sinclair I think demonstrated the potential for a home computer,' explains Kit Spencer. 'I think that probably convinced Jack to push much harder in a direction he already wanted to go in anyway.'

Commodore's chip-development company, MOS Technology, had already developed the Video Interface Chip, VIC, as an integrated sound and video chip, intended for video-games consoles and embedded applications. As luck would have it, an inventive MOS engineer named Robert Yannes had already designed a prototype 'MicroPET' using VIC and the 6502 microprocessor, also developed by MOS. The concept was engineered into a neat \$300 personal computer with colour, 5k of memory, sound and a full-size keyboard. Called the VIC-20, it was a simple but attractive package for the novice home computer user and well supported by Commodore. 'You moved it towards the home market and home distribution, you made sure you had good games, software, packaging, you stood it out and showed what it did, not just in a box with nothing round it,' recalls Kit Spencer. 'You had to get a bit of sizzle as well as sausage, but you made sure there was sausage by getting software, manuals, everything else with it.' The VIC was launched in Japan in late 1980, and in the US and Britain in 1981, where it initially retailed for £190. With sales better in Europe than the US initially, Spencer found himself moving to reorient the marketing effort in the US to bring similar success. 'We aimed it at the video-game market,' explains Spencer. Commodore's approach was to emphasise the machine's entertainment

capabilities, while simultaneously using its educational merits against the limitations of Atari's games consoles. American television advertising fronted by William Shatner promoted both the fun and learning aspects of the 'wonder computer of the 1980s'. "'Why buy just a video game when your kids can learn about computers too?'" So that sold in pretty big numbers,' recalls Spencer. Cheaper than the TI/99 or Atari computers, the VIC-20 came to occupy a similar breakthrough position in the US market as the ZX81 in Britain. Worldwide, the VIC-20 became the first computer to sell a million units.

These quite different designs by different companies all used similar means to reach towards the same basic concept of a computer that was more accessible to the general public than ever before. They all strived towards some sort of user-friendliness, and were available as complete machines, ready to plug in and go. Increasingly, the machines were marketed and sold through non-technical adverts in national newspapers and sales displays in high-street stores. Design cost reductions made them more affordable, even in Britain. The magic ingredients of ease of use, persuasive marketing and affordable price redefined the computer into a machine for the masses. But as manufacturers began selling home computers by the thousand, one question remained largely unanswered. Now that they had computers for the first time, just what would all those hundreds of thousands of people actually do with them? Just what was a computer in the home actually for?

What was a home computer for?

Previously, computers in universities and businesses had tended to be used for things like payroll, stock control and data analysis; tasks that few people would ever need to do at home. The main things personal computers are used for today took years to become established. In the 1980s uses were mainly untried possibilities. 'Everybody always *said* recipes, and nobody ever *did*. I did suggest word processing and I was told by all the established people that I was wasting my time thinking about it,' recalled Guy Kewney of the late 1970s. 'People said "Guy,

no male executive is ever going to type, and to operate a computer you're going to need a keyboard, and it's not going to happen is it?" Even computer designers had undefined ideas about the use of their creations. 'I'm not sure who the user was at the time,' remarks Sinclair industrial designer Rick Dickinson, 'I'm not sure anybody was.' Other than a commonly understood idea that people would use computers to learn about them and a range of vague possibilities, the specifics of computer use seem surprisingly undefined. 'I think we principally thought people would use them for learning about computers and for doing a little bit of programming – finding out what programming was,' explained Acorn computer designer Steve Furber. 'I was on the technical side, making these machines work. It was really somebody else's problem to work out why anybody would buy one.'

Adverts tended to reel off dozens of ideas for what a computer might conceivably be used for rather than specifying any one 'killer application'. Learning languages, cataloguing stamp collections, address book, calculations, finances, recipe books, controlling a train set or learning about computers – the home micro was portrayed as able to do all of this and more. Few adverts were quite as sweeping as Sinclair's famous boast that a ZX80 could do anything from playing chess to running a power station, but there is a feeling sometimes of a machine with a lot of potential searching for a purpose. 'I did think that word processing would be useful. I did think that coms would be useful,' recalls Guy Kewney, 'but I think I was as vague as anybody else about the specifics. I just had this instinctive feeling that nothing this cool could be useless.'

First contact

Memories of first encounters with home computers are widely revealing. The circumstance of these first meetings and the mix of emotions they stir up tell us much about how the novel machines were seen: unfamiliar, potentially threatening, but exciting and full of promise. For many people, buying a home computer was an introduction to a futuristic technology and a

way of not being left behind by it. 'It's really important that we have a computer,' recalled teacher Jean Farrington of how her husband convinced her they needed a home micro, 'I'm really interested in it, I want to learn more about them and I think they are here to stay and they are the future, so we must get involved.' The future opportunities for people willing to update their skill set were one of the central promises of the information technology revolution. 'It was a bit of a miracle to me. It was my first computer,' recalls Jon Ritman, a television repair man who bought a ZX81 to learn about computers. His employer, Radio Rentals, was considering branching out into renting home computers. 'A fellow engineer had become the VHS expert, and he was earning more money than me as he was the only one who'd been on the training course. I thought maybe I can become an expert on computers?' Rather than becoming a computer repair man, Ritman left a few years later to become a games programmer, just one of the many people who found a new career from knowing about computing.

For others, there was an attraction to the technology and what could be done with it. 'You've got to bear in mind that in those days, the 1970s, the idea of having a computer at home was considered to be not only weirdly nerdy but actually morally suspect,' remarks Simon Goodwin, who first encountered computers through an Apple II at school in the late 1970s. 'Computers were seen as things that were demanding, that couldn't be argued with and were very, very inhuman. But that was not how I experienced them. I experienced the computer as a kind of infinite Lego set.' This isn't to say that everyone was wildly enthusiastic. 'The reaction at home was that it was completely barmy,' recalled chemical engineer Steve Higham, after taking home a £600 PET. 'You've got this? What the hell are you going to do with it?'

Whatever they did with their computer, chances are they had to make them do it themselves. There was little in the way of ready-to-run software available at first, but most home computers came with a thick guide to BASIC programming masquerading as the instruction manual. The first experience

many people had of computing was just typing something in and watching it magically appear on screen, or using the `PRINT` command to display a message. In a country of three television channels* and few domestic video machines, there was a curious novelty in something that could be plugged into the television and made to do things. Working through the manual was a gradual process of learning the machine's vocabulary and figuring out how to make it do something new. Popular legend has it that for most people, home computer programming began with:

```
10 PRINT "HELLO"  
20 GOTO 10  
RUN
```

And like magic the screen would be filled with endlessly repeating 'HELLO' messages. In reality, the first programming example to follow in the ZX81 manual was `PRINT 2 + 2`, highlighting its mathematical capabilities. With a few more commands the machine could be instructed to ask questions, add numbers or display patterns, building up to complex programs for solving mathematical problems or cataloguing stamp collections. For many people programming was hands-on learning about computers through doing, a gradual, practical exploration of what their computers could do. Aptly, there is often a subtext of discovery and exploration in memories of early programming experiences. 'With amateur astronomy,' suggests Simon Goodwin, 'you could get yourself a telescope and armed with nothing other than time, diligence and the ability not to repeat yourself, you could find things out that nobody knows, with nothing but the telescope and effort. And the same was true of a computer.'

More than that, programming could be fun and intellectually engaging too. 'Great fun. It made you think in a different way. You had to start thinking in a very logical manner, it made you

*Channel 4 was launched in late 1982.

think very clearly about what you were trying to define and the steps to get there,' recalls journalist David Babsky of learning to program the ZX81. 'Then you got a great big kick at the end if you got something right.' Programming made the home computer not just a tool, like a calculator, or a toy, like an arcade machine, but a logical puzzle that was solved in the process of creating something. 'I'd always made things when I was very young, and progressed through electronics when I was a teenager, and the problem with making things is that you need parts,' remarks Jon Ritman, noting that electronics needed money for parts and time to go to the shops. 'When you've got a computer and you want to make something, you can do it. You've got everything there. And I loved the fact that I could have an idea and I could immediately put it into action.'

Far from killing the printed word, the popularity of home computers instigated a minor publishing boom of cheaply printed introductory books on programming and type-in programs, with titles such as *30 Programs for the Sinclair ZX80 1K* and *The Acorn Atom Magic Book*. Much of the software on offer did little more than act as a demonstration of what a computer could do, such as programs to display patterns or calculate future calendars. The most clichéd examples were 'biorhythms' generators that plotted users' emotional, intellectual and physical well-being cycles on a graph, but were probably most interesting as a pretty demonstration of the computer's trigonometry functions. Computer magazines also bulked out with pages of program listings to be tapped in and run. Yet they were often so buggy, poorly printed or badly typeset, that figuring out how to get them to work was a learning exercise in itself. 'You wouldn't necessarily expect a magazine listing to work but it was a source of ideas,' notes Simon Goodwin, a prolific writer of magazine type-in programs. 'Listings in computer magazines weren't necessarily there to be typed in. They were there to be looked at and thought about and have little bits taken out of,' explains Goodwin.

Looking back from an age when hardly anyone knows what happens inside their computer to make it do things, it is amazing

that everyday people were expected to become programmers. It is even more amazing that so many of them tried to do so. The sheer number of introductory books on BASIC, letters to magazines about programming and magazine pages of software listings all point to its widespread nature and how many people were at least trying their hands at BASIC. A 1981 survey by consumer guide *Which?* found that programming and learning about computers were the most important motivations for buying a micro, far ahead of calculating accounts and playing video games.¹ Against a backdrop of worries over the information technology revolution we can see programming as an act of empowerment to control the computer, rather than be controlled by it. Yet apart from the intellectual exercise involved, programming explains more about *how* people were going to use computers rather than it answers *what* they were going to do with them.

Electronic homes?

One possible outcome of home computers, eagerly foretold in the media at the time, was the electronic home. Many predicted that the ubiquity of the microprocessor would bring about a long-promised age of home automation. In innumerable 1980s sketches of houses of the future, the micro was entrusted with such tasks as controlling lighting, central heating, coffee machines, cookers and other appliances. An 'information technology house' was even built in Milton Keynes in 1982 with a household management system that could babysit, pay bills and run baths to the perfect temperature. The quixotic 1980s house of the future is an artefact of a society negotiating how the computer would fit into the home. While few people used their micro for household automation, many more did try to employ the computer as a domestic aid to assist with chores and problems.

Alongside programs for the predicted uses of cataloguing collections, storing recipes and doing the household accounts, software was available for all manner of unforeseen uses: Rubik's cube solvers, knitting pattern printers, horse racing

analysers, diet planners, fertility plotters and such curios as *Decision Maker*, advertised as being able to help decide which car to buy or which woman to marry. People were using the computer to *compute*, in a very literal sense. They were applying its mathematical and logical capabilities to see if it could automate things they might have worked out by hand. How useful it was seems questionable: switching on the computer to load a shopping list, then print it out, seems rather less efficient than just jotting it down on paper. Every so often a letter would appear in a computer magazine from a reader delighted that their computerised football pools predictor had paid off with a cash prize, but generally it is hard to tell just how much use the computer was as a household aide. Aside from the odd programs that had some demonstrable value to their users, it is likely that much of this software was quickly relegated to gather dust on a shelf after the novelty had worn off.

Most early machines were underpowered for more complex programs, or hobbled by design economies that made them awkward to use for applications like word processing. Only the more expensive machines had full-sized typewriter-style keyboards, many made do with flat-membrane or calculator style 'chiclet' keyboards. These were adequate for programming but unsuited for touch typing without making many mistakes. Small RAM capacity limited the size of documents that could be created, and loading and saving data from cassette tapes (disc drives were an expensive luxury at first) was slow and unreliable. Home-computer displays tended towards big and bold letters, easier to read on the low-resolution televisions commonly used as monitors, but seriously limiting how many words could fit on screen at once. A standard typewritten page was 80 characters wide, yet few computer displays approached this. On a machine like the VIC-20, with a 22-column display, or the 32-column display of the ZX81, the whole screen could be taken up by a single paragraph of text. Some people found it easier to physically cut and paste printouts together with scissors and glue rather than attempt to edit documents on screen, assuming of course they could afford a printer.

Full-sized printers started in the £200–£300 range, frequently costing more than the computers they were bought to be plugged into. They were so noisy that magazines warned they could be disruptive to family life and cautioned against using them late at night. Dot matrix printers hammered an array of pins against an ink ribbon to leave a trail of spotty characters in the wake of the print head. For letter-quality text people were advised to purchase a daisy wheel printer instead, essentially an electric typewriter under computer control. Manufacturers offered a range of ingenious mini printers as cheaper alternatives to fit their machines. The output of many of them was like a shop till roll, thermal printed on heat sensitive paper. As this had a habit of blackening if left too close to a heat source, users were advised to make photocopies if they wanted a lasting version. Other devices avoided complicated printing mechanisms altogether by using coloured pens controlled by the computer to draw onto a roll of paper. Such was the novelty of colour printing that promotional pictures inevitably showed them sketching attractive multicolour graphs. Sinclair produced the tiny ZX Printer for their machines, which formed characters by using electric current to vaporise the coating on a roll of metal-coated paper. Fans would later fable the ZX Printer as the ‘silver bog roll burner’, but at £49.95 it was cheap and sold well. The tiny rolls of paper and poor print quality of these devices made them unsuited to formal outputs, but mini printers were a cheap way of getting a BASIC listing when the only alternative was to write it out by hand.

There were many things other than printers available to plug into home computers. A cottage industry of small electronics companies and kitchen table businesses emerged to supply add-ons and upgrades. Many, such as speech boxes, sound synthesisers and high resolution graphics upgrades, were probably of most appeal to hobbyists, for whom tinkering with the hardware was part of the fun. However, the most popular devices remedied the worst deficiencies of cheap machines to make them much more useful. A huge range of

replacement keyboards were produced to replace the membrane or calculator-style keyboards on cheaper machines, including everything from stick-on keys for the ZX81 to fully fledged typewriter-style keyboards. Plug-in memory upgrades, 'RAM packs', were virtually standard issue on machines like the VIC-20 and ZX81, which had particularly small memories. Sinclair's RAM Pack, a box that simply slotted into a ZX81's expansion port, was infamous for wiping its contents if it wobbled and severed the connection to the computer. With many people making do with Sellotape or Blu-Tack to hold it firmly in place, other manufacturers quickly saw an opportunity, and began marketing their own RAM packs with the boast that they were immune to 'RAM pack wobble'. With upgrades such as these, computers grew with their users' experience, as people learned to make the most of their micro.

If people were prepared to put the effort in, spend some money on upgrades and accepted a few limitations, it was perfectly possible to use a VIC-20 as a word processor or computerise a small business with a ZX81. In the absence of anything better suited, people began experimenting with putting cheap computers to work. Over 1983 and 1984, *Sinclair User* magazine ran a delightfully twee series of features called 'User of the Month', which chronicled what people were up to with their Sinclairs. The results were far more than learning to program and playing *Space Invaders*. Alongside families learning about computers, a military memorabilia collector cataloguing their helmet collection and a computer cookbook writer were small businesses and professionals. An engineer running stressing calculations, a small business running its payroll, an archaeologist planning digs, a Methodist minister matching preachers with parishes, all had written programs to use these simple computers in their work. None were using a ZX80 to run a power station, but most seem amazed at how their machines could do jobs in minutes that would have taken hours before and did not make the same sort of errors that people did. In countless little stories like these, the cheap home microcomputer acted as an introduction to what computers

could do in working lives as well as domestic ones. Even big businesses with a central computer department for payroll and stock control only started to get office computers in the 1980s. For smaller businesses, nominally home microcomputers were a cheap way of getting started with computerisation and experimenting with possible things the machines might do. One 1984 survey of computers in small businesses found that as many were using cheap Sinclair computers as were using the upmarket Apple II.² For those who were willing to build up their machine or learn to work within its boundaries, the cheap home computer could be a useful tool at home or in a small business. For those who tired of such worthy efforts there was always the distraction of games.

Leisure software

The use of home computers for games was not, as is sometimes suggested, unforeseen. Games were commonly listed as among the interesting things to try out on home computers from the earliest adverts, and designers were quite aware that games would be among the uses of their machines. 'I knew that games would be a part of it, but it became a bigger portion than I'd expected,' recalled Sir Clive Sinclair. The surprise was less that people were playing games, but the *extent* to which they came to do so, and the way that gaming became an activity in its own right, rather than just one of the many things doable with a computer.

As we shall see in later chapters, the growth of games had a major impact on home computing, but home computing made an impact on games too, freeing them from the restrictions that had previously been placed on them. Curious academics had written games since the earliest electronic brains had been turned to OXO and chess in the 1950s. The first action game, *Space War*, was created on a DEC PDP1 minicomputer at MIT in 1962. DEC started using the game as a demonstration of the PDP's capabilities, but with a basic PDP1 priced at around \$120,000, it was a privileged form of entertainment for a small

number of people. Video games reached the general public in the 1970s on amusement arcade cabinets, home games consoles and *Pong* machines, but the experiences they offered were limited. Arcade games had to be simple, quick to grasp and quick to play, not least to efficiently encourage punters to part with their coinage. *Pong* machines did nothing but offer games that involved hitting a square ball with a rectangular bat. Consoles with games on cartridges, such as those of Atari and Magnavox, were more flexible, but generally limited by the rudimentary controls of joysticks, paddles or tracker balls.* Before personal computers, home video games were a packaged entertainment experience, diverting but fundamentally closed to further experimentation.

Home computers freed video games from these constraints and gave them the space to grow into new forms. In late 1977, Radio Victory, a local radio station in the south of England, started broadcasting simple quiz computer games over the airwaves. 'I just assumed there were some people around the South Coast within radio range,' explains Mel Croucher, a former architect, musician, guidebook publisher and PET computer owner, who was branching out into producing leisure software. 'I used radio distribution methods because I had no idea where anybody was who owned a home computer.'

The incomprehensible electronic squealing transmitted through Radio Victory may have sounded like a faulty radio to casual listeners, but to home computer users it had another significance. The noise could be recorded and fed into a computer, at which point it would become a quiz game with puzzles to solve and prizes to win from the radio station. 'Dead easy to win. It had to be, we had an audience of about ten to start with,' remarks Croucher. 'After a few months it increased to a hundred or so, then we got sponsored by a brewery, which

*Keyboards and programming cartridges were also released for a few consoles, such as the Atari 2600, but they were uncommon, and the very small RAM of consoles, just 128 bytes on the Atari 2600, made them rather rudimentary as programming tools.

was a dream come true.' Radio broadcasting of software was widely experimented with over the following years, but it never became a standard practice. Nevertheless, the radio computer quiz game is an interesting example of how computers started to be used for entertainment in ways never before considered.

For most people, software arrived in the form of a type-in listing or a tape, but these were open to experimentation too. Through PEEK and POKE commands in BASIC, gamers could look around inside the memory locations occupied by games, and modify what they found to enable ways to cheat and work out how the games worked. Type-in games could be easily modified into something a bit different or learned from to create new games. Games were there to be played with, not just played on. In the exploratory home-computing culture of the time, their creation was often the result of people just seeing what their computers could do. 'Each game I saw visually, without considering its feasibility. Hence I was learning to solve software problems, not just produce a game,' reflects Malcolm Evans, an early ZX81 games programmer. At first, computer games were products of the imagination, an organic outgrowth of programmers being creative, exploring their machines and expressing themselves in this new medium. 'Writing a game was a way of expressing your personality in a way where idiosyncrasy is considered good. If you're programming a cash machine you don't really want to express your personality,' suggests games writer Simon Goodwin. 'Games were simply a quick way of getting something meaningful to me and meaningful to others.'

Imagination was essential on the playing side of the experience too, as most of the games on offer at first were fairly basic. Programmers had to fit their creations into tight memory restrictions, limiting their size and complexity. Often the games world was nothing more than a single screen, such as a *Pac-Man* maze or a screen of attacking *Space Invaders*, where the action would be repeated over again with minor differences. Graphics were often extremely basic. Rather than attempt high

resolution images, many programmers simply used the letters and the ready-drawn graphics characters that most computers included in their character sets. Programmers could type pictures with the right combinations of boxes, lines, corners and other shapes, but it was like creating a sculpture out of building blocks. On the original *Pac-Man* arcade game, players raced an open-mouthed yellow *Pac-Man* around a maze, dodging different-coloured ghosts and guzzling pellets and fruit. On a ZX81 version of *Pac-Man* they might guide a letter C around a maze, pursued by hostile black squares, as they tried to eat full stops and asterisks. Gaming needed a bit of imagination, but it could be thrilling stuff when there was little better to compare it to.

At first home computer games took inspiration from existing forms, both traditional and electronic: chess, blackjack, reversi, Scrabble, bridge, and other board and card games aplenty. Home computer versions of games originally created on university mainframes quickly appeared, notably text adventures following the example of *Adventure*, which had been created in the 1970s for PDP minicomputers. Classically players found themselves on a quest in some sort of dungeon or fantasy world, reading textual descriptions and messages off the screen, and used typed commands like 'GO NORTH' or 'SAY TO BARD "SHOOT THE DRAGON"'. Versions of popular arcade games quickly appeared too, and most home micros boasted several different interpretations of games like *Pac-Man*, *Breakout*, *Frogger*, and *Space Invaders*. TV repair man Jon Ritman wrote his first ZX81 game, *Namtir Raiders*, after encountering a pub arcade machine while camping in Wales. 'I was never very good at it, but I had this vague memory in my head so I kind of very vaguely copied it. Very vaguely because it had been about six months and I'd only played it about five times.' Saving money otherwise wasted on arcade machines was even suggested as another benefit of buying a microcomputer. Just because they borrowed from existing forms of game did not mean there was not innovation and exploring going on at the same time. 'In those early days,

you have to remember that none of us knew how to do anything,' explains Jon Ritman. 'I'd played *Battlezone*, which was an arcade 3D tank game, and I thought I'd love to do something like that. I wanted to find out how to do 3D, and trying to find that sort of stuff out was a nightmare.' Magazines and books could only supply some basic concepts, and recreating a fast-moving arcade experience on a home computer was a learning exercise in the trigonometry behind wire-frame graphics.* 'Finding out how to do stuff was often an everyday journey of discovery in those early days,' sums up Ritman, who recalls spending hours staring at the magical sight of his first rotating cube as he wrote *3D Combat Zone*, his own three-dimensional tank game.

The creative freedom of home computers allowed programmers to create games that would have been unlikely on arcade machines or university mainframes. A good example is *Shop Steward*, written by Simon Goodwin on the Video Genie, a TRS80 clone, as a type-in for *Computing Today* in 1980. Fittingly enough for the time, *Shop Steward* was a trade union activity simulator based around making labour relations decisions. 'The management would make various offers to you about what they were going to pay you, whether they were going to hire more people, whether they wanted to get rid of people and bring in new technologies,' explains Goodwin. 'You would respond by what your demands were going to be, whether you were going to have a work to rule, wildcat strike, all out comrades, that sort of thing. And then the management would respond with a lockout or something along those lines.' In home-grown games like *Shop Steward*, home programmers often took things that mattered to them to create quite different types of gameplay experience from the instant gratification of consoles and arcade machine games. 'I tried to avoid twitch games, of the *Space Invaders* kind,' remarks

*In wire-frame graphics – commonly used in design or in drawing three-dimensional shapes – only the outer lines of a solid shape are drawn without filling in the surfaces between them.

Goodwin. 'They were technically difficult to do, clones of arcade games. They also didn't seem to be terribly creative and at the time I was being taught economics and politics in A-levels, and what seemed to me interesting was to try to make games that were satirical in that kind of way.'

As well as innumerable *Pac-Man* and *Space Invaders* clones, a few programmers created some surprisingly innovative action games. Among the best was 1982's 3D *Monster Maze*, one of the first three-dimensional games for a home computer, and developed simply because a programmer started experimenting to see what he could do with his new machine. 'My wife bought me a ZX81 for my birthday and I thought, what the hell do I do with this?' recalls its creator, Malcolm Evans, an engineer who worked on spacecraft electronics in his day job. 'My first task was to see if I could write an algorithm to compute a maze, so that's what I did, a 2D maze. It was a natural step then to see what it would look like in 3D when one walked through it. So the next task was to devise a method to give that impression.' Evans created a striking visual effect, the illusion of walking through a maze of corridors in first person, 'as you would see them in real life', wowed a later review in *Home Computer Weekly*. 'I mentioned to John Greye that I had this 3D maze and he suggested I put a monster in it and turn it into a game,' recalled Evans of the chance encounter at a musical society that suggested the next step.

Evans added a *Tyrannosaurus rex*, turning a stroll through a maze into a tense cat-and-mouse game, as the player tried to escape being eaten alive by the dinosaur stalking them. There were only three controls, turn left or right, or move forwards, yet it offered surprising moments of drama as the tension built, added to by messages of 'HE IS HUNTING FOR YOU' or 'RUN HE IS BEHIND YOU'. 'I didn't realise how realistic it was going to be,' chuckles Evans. 'I was testing the game before adding text when suddenly I jumped out my skin, and I thought if someone had a heart attack would I be responsible for it?' Just in case, Evans added an introductory warning to those with a 'nervous disposition'. The culmination of the

game began with the alarming moment when the lumpy *something* spotted at the end of the corridor advanced to become a recognisable dinosaur, in spite of being created from blocky graphics characters. 'With the ZX81's low-resolution graphics it had to be something bulky,' explains Evans. 'Something that could walk towards you getting bigger, and yet still be recognisable further away with very few pixels. The image of T-Rex was simply superimposed over the computed background.' The T-Rex could be outrun, but hurriedly fumbling the controls on the ZX81's tiny keyboard meant players would have to be lucky. All too often the game ended with dinosaur teeth filling the screen. After completing his game independently, Evans showed it to Greye, and the two began selling it. They soon parted ways, with Evans founding the successful New Generation Software company in 1982. *3D Monster Maze's* adverts promised that 'you've never seen anything like this before' and they were probably right. Just like so much else in the home computer world, it was new and being done for the first time.

Whatever they did with their home computer, whether it was learning to program, calculating tax returns or shooting down alien invaders, all of the early home computer users were pioneers in their own right. They were all doing something new, by taking a much-hyped but little-understood technology and exploring what it was capable of. Manufacturers may have created home computers as affordable and accessible machines for learning about computing, but they only gave them a vague purpose at the start. It would be largely down to computer users to explore the machines' capabilities and determine what they could do. However, there were other powers at work when it came to defining what the home computer would mean to 1980s Britain.