AN EMAP PUBLICATION

WHICH MICRO? SOFTWARE REVIEW

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Acorn's £200 computer finally revealed

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Soft Release
Reviews of all the latest programs

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Cheap Software
Special offer - details inside

Computer Crime
Technological fraud and fiddles



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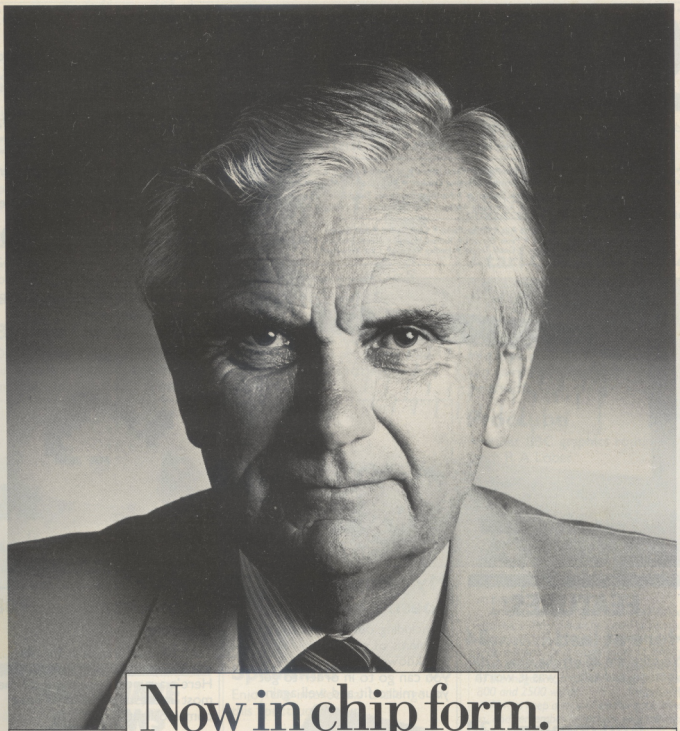

Now in chip form.

If your BBC Micro could talk, what sort of accent would it have?

A BBC English one, of course.

Which is exactly why Acorn Computers, who designed and built the machine, have produced its very own speech chip featuring the dulcet tones of Kenneth Kendall.

Called Speech Synthesis, it's a pair of chips that can be plugged into your BBC Micro by your local BBC/Acorn dealer. On them, you'll find 164 words/syllables spoken in familiar fashion by the famous retired newscaster, all of which can be combined to form several hundred other words.

The chips also provide the 'serial' processing capability whereby future software cartridges can also be plugged into the front of your BBC Micro. (The machine's vocabulary will be widened via such cartridges.)

Priced £55, Speech Synthesis is available from your local BBC/Acorn dealer. (To find out where that is, simply call 01-200 0200.)

If you'd like more information, he'll complete the story. In plain English, of course.

ACORN COMPUTER

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SEPTEMBER 1983

WHICH MICRO? AND SOFTWARE REVIEW
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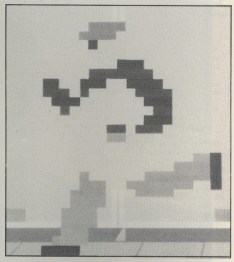

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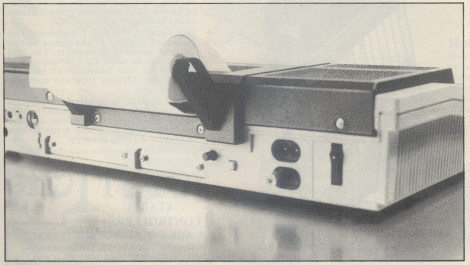

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Cover retouching by Richard Manning
Software Review cover by Brian Aldred

CONTRIBUTORS

We are always on the lookout for interesting articles and reviews for publication in Which Micro? If you think you have something to say, why not put your ideas on paper?

Articles must be original and unpublished elsewhere. They should be typed or printed (dot matrix is fine), double spaced, and with wide margins. As a rough guide to length, there are about 800 words on a typical page of the magazine, so articles range between 800 and 2500 words.

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To answer the most commonly asked question – we do pay well for published material, payment normally following a fortnight after publication.

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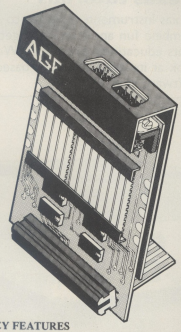

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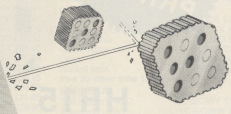



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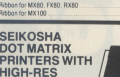

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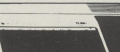

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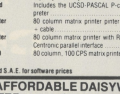

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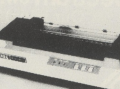

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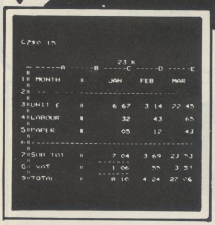

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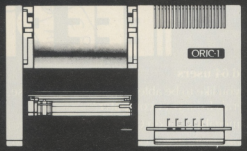

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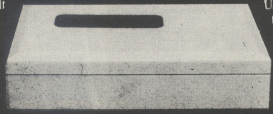

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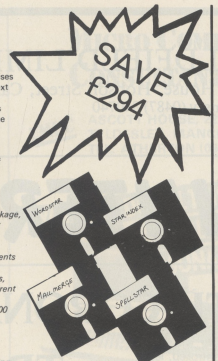

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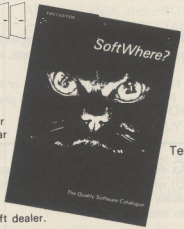

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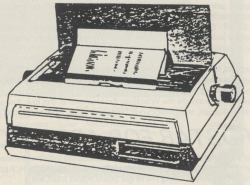

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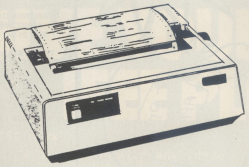

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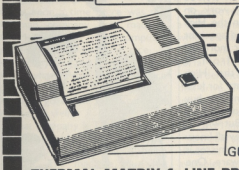

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******OVERSEAS ORDERS A SPECIALITY******

They're only after your money

You may have seen all those stories recently about Texas Instruments, the manufacturer of the 99/4A, taking a financial pasting. You may have thought that there was a company which, in a few months time at the outside, would be dead and gone from the home computer business. Not a bit of it.

The battle is now well and truly on between the manufacturers to buy the biggest slice of the home computer market. It is your money they are after, and there are signs that not all may be fair and scrupulous out there just at the moment.

Take, for example, Texas Instruments. It has taken a $100 million-plus loss on making the 99/4A this year, and is rumoured to be actually selling the beast at a price lower than its manufacturing cost. Though this could hardly be called an unscrupulous tactic, it is possible to view it as not entirely fair. This is because TI, as a very big company, can afford to carry such a loss, and shows every sign of doing so for some time to come. It wants a goodly share of the business (after all it did, arguably, start it).

The High Street retailers also want to buy a market share — to be the one that the customers come to. That is one reason why they all started to discount the retail prices of machines like the Vic 20 at the back-end of last year — a time when no dealers or retailers could get product to sell anyway, and when customer demand was astronomical. This, in other circumstances, is a recipe for prices to go up, not down.

The other manufacturers are joining in. Commodore and Sinclair have both bombed their prices. More recently, Oric has chopped £30 off its 48K machine and brought the 16K down to under £100.

For some of the smaller manufacturers the result of this is unfortunately eminently predictable. Many of them will be squeezed financially until their corporate pips eventually pop out and the companies will be no more. What is more, the pricing tactics of the main High Street multiples (which are broadly the same as the manufacturers) will mean that the smaller, specialist dealers will also be squeezed out.

This last factor will be especially sad, for in a market where the purchasers are predominently sold products they do not understand by sales staff that do not understand the products, the potential demise of the specialist dealers that *do* understand the products cannot be seen as anything but bad.

They will go, of course, because 'understanding' costs money, so the margins that they work on need to be higher than the High Street companies. Good specialist dealers will get 35% or more off the resale price from a manufacturer, while the High Street people will operate for less.

Indeed, if they want to buy market share they will operate on next to zero margins. But why?

The why is simple, they all know that the really big thing in micros is not hardware, but software. One computer can generate many, many program sales, just like hi-fi with records. Get your brand of computer accepted as the market leader and watch the software sales roll in. And those sales can be both long term and lucrative.

It is arguable however whether all this is to the long term benefit of the users, and more specifically, the potential users. There is a great deal to be said in favour of achieving some degree of standardisation in software formats, and the like. This would greatly expand the market potential for any author/publisher and keep prices down.

There is less to be said in favour of the price war on the hardware side, however. It is likely to terminate many manufacturers with extreme prejudice over the next year or so, thus reducing consumer choice and playing even more into the accountant-oriented, box-shifting attitude the industry has recently acquired.



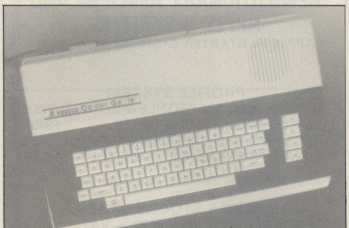
Question: what is the difference between the object on the left, and the object on the right in our picture?

Answer: approximately 3,480 bytes. (Yes folks, these are the jokes).

The computer being held by Christine Haughton is a Sharp PC1500, with 3.5K bytes of RAM. The bowl being held by Dominic Powlesland holds approximately 20 bites of ram (or cow, or porridge).

The bowl is in fact one of the finds at the Hesterton Parish Project in North Yorkshire, which is one of the most significant archeological excavations of recent history. Evidence has been unearthed of occupation from around 500 BC.

The Sharp machine is part of £4,000-worth of kit loaned to the project by the Japanese company. This is why the general manager of Sharp's Business Equipment Division, Paul Marfleet, stands behind finds researcher Christine, and project director Dominic.



Cutting prices and doubling 'thumpability' is all the rage these days, the latest company to participate being Lowe Computers which distributes the Colour Genie machine.

The price on this has been chopped from £192 to £168, while — at the same time — memory size has been doubled from 16K to 32K.

Lowe claims that this makes the Genie the lowest priced home computer with a full-sized typewriter-style keyboard. Some companies, perhaps not a million miles away from a naval ranking in Slough, might find that claim contentious, however.

More information can be obtained from (0629) 4995.

Grab-a-load-a-this

Mention the name Pifco and what doesn't come to mind? . . . Right, computers. But what about joysticks?

That famous purveyor of appliances guaranteed to make your hair curl in lots of interesting ways has entered the electronics field via its new wholly-owned subsidiary, Consumer Electronics, and its first products on offer are . . . joysticks!

The range is being imported from Suncom in the States and prices start at £9.95 for the 'Slik Stik', going up to £29.95 for the 'Joy Sensor' which is an electronic touch sensitive controller.

The joysticks will interface with the Atari CX2600, Atari Personal Computer, Commodore 64, Vic 20 and Texas Instruments 99/4A.

If you have an Apple IIe and around £40 to spare you can get a special souped-up version of the Starfighter joystick which has such refinements as a centering adjustment and a throw selector.



Consumer Electronics tells us that this is just the beginning; it will soon be supplying other bolt-on equipment and its own software products.

Germans jump in

Once upon a time there was this German company that made a CP/M desk top microcomputer system which was quite nice. It wasn't anything too amazing, if you know what I mean, but it was nice (still is). Now this company is having a go at the home/personal market as well.

That company is Triumph Adler, best known for creating the typewriter upon which this is being written. The machine, due for launch in October, is intended to be a £350 'professional' machine. On the face of it this sounds like a contradiction in terms, but it could prove interesting.

For the money, the user will get a 64K machine with 32K of ROM, which contains a Basic interpreter. There will be both parallel and serial interfaces, a cassette recorder interface, and an optional disk drive. This will be important if users wish to make use of the machine's main claim to fame — a full CP/M implementation.

It would appear to be one of the cheapest CP/M machines so far available, and marks a growing trend being fostered by CP/M producer, Digital Research, to push the operating system down into this marketplace.



"Well, Michael, I know that Russell Grant thinks that the occlusion of Saturn in Mars with a bad aspect to the sun in Virgo means that the Royal Marines' head-banging formation team will demolish the Eiffel Tower in under three minutes, but the computer has a different view. The computer is predicting a BDOS error."

Yes, this is David Manuel, one half of the pair of pundits on London Weekend Television's game-to-end-all-games-and-give-us-all-a-rest. The Ultra Quiz. *But these days, behind every pundit is a computer, and in David's case that machine is the Epson QX10. This is not totally surprising as David is Epson's training manager.*

More Soft Hits



Stand by your beds, the publisher's on the rampage again. 'He-who-must-be-obeyed', the great Lord Alfred of Rolington, is about to marmalise an unsuspecting country with *Soft Hits*.

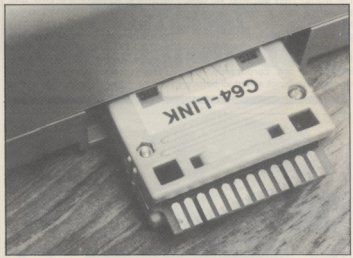
Those of you with sharp eyes and long memories will remember the name *Soft Hits*, a new software publishing operation. A few months ago, it started life with *Phasorchase*, a game program for the Sinclair Spectrum. 'Life' in this context was a test marketing exercise in the north of England *(what had they done to deserve that?—Ed)*.

Now *Soft Hits* is going national with *Which Micro?* publisher, the aforesaid Lord Alfred, geared to launch a game called *Painter* for both the Spectrum and the BBC A/B machines.

A novel way of covering both machines at the same time has been used. 'He-who-must-be-obeyed' has come across the cunningly obvious notion that, as cassette tapes come with two sides, they can hold programs in two different formats.

Painter will be followed by *Phasorchase* once it has been re-written for the BBC machines. The games will be available at £2.25 on mail order and on news-stands where you see *Which Micro?*

64 widgets from Whitstable



Here's an interesting little goodie for the Commodore 64. It comes from a new company to the business, The Sixty-Four Supply Company, all the way from the wilds of Whitstable.

C64-Link is a cartridge port attachment that upgrades the Commodore Basic V2 to Basic V4. It also allows the user to then drive many of the existing Commodore peripherals, as well as hardware from other suppliers.

Fit the right leads to the cartridge and, according to the company, any combination of IEEE, serial or parallel devices can be linked. This includes other 64s, which sounds like fun. It costs £100.

The Link is one of several products the new company is offering from a wide range of US-based manufacturers. Others include Script 64 which is, yes, you guessed it, a word processing package. It's available in either disk or tape format and costs £65. It is capable of handling up to 120 screen 'pages' or 999 disk pages. There is also Recipe Box which is a disk-based cookery book program that costs £15, and Pet Emulator, which turns a 64 into a machine capable of running Pet programs.

The Sixty Four Supplies Company can be reached at PO Box 19, Whitstable, Kent.

Get rich?

Are you a bright young thing who sincerely wishes to be rich? Do you know lots and lots about computers — especially in business applications — and feel your time is worth at least £60 per hour to anyone of consequence?

Well, that is what the National Computing Centre is now charging at its Microsystems Centre for consultancy services to potential micro users.

This is an example of correct pricing strategy that the rest of the industry could follow (even though the customers might not like it). The prices charged by the NCC are going up in response to demand, not down as in retailing and manufacturing business.

The demand is now so great it can't be serviced by the existing staff, and the Centre is looking for more people to take on this onerous but obviously lucrative task.

If you fancy your chances, the Centre is headquartered in New Fetter Lane, London.

In-shore ants

I have mentioned the word 'insurance' before within these pages, and at the risk of being terminally boring, I'm going to say it again . . . "insurance". There, I've said it.

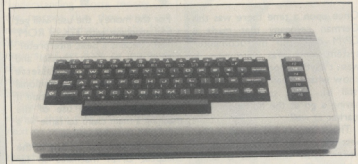
It is, unfortunately, one of the subjects that is of no interest to anyone until there is no longer any point in being interested in it. But with the average home computer costing well into three figures — representing a goodly slice of personal income as well as someone's pride and joy — insuring it against accidental damage or loss is a sensible move, especially if it costs nothing to do it.

'Nothing' is, of course, relative here, for it depends on one important factor, an existing insurance policy. Home computers have now been included for coverage in the home insurance policy issued by the Cornhill Insurance Group, and have been included for free. Previously, the policy only covered TVs, audio and video equipment.

The company no longer discriminates against portable equipment either, so all those Osbornes, Epsons and the like are as secure in their cover as their more sedentary relations.

Cornhill is on Guildford 68161 and at your friendly, neighbourhood insurance broker.

64 price de-elevation



Anyone who has recently bought a Commodore 64 at the full retail price of £345 is officially advised to kick themselves. In response to the fact that the High Street dealers have been generally discounting the system to at least a considerable degree already, the company has responded by officially cutting the price.

The 64 now costs £199.13 exclusive of VAT — £229 with the tax. It can be expected, I suppose, that the dealers will now start discounting this price as well, but that will be their problem.

Slough's own naval people have also cut the prices of some of the peripheral bits that come with, and for, the machine. For example, £70 has been lopped off the price of the single disk drive, £10 off the 3K RAM cartridge, and £35 off the 16K cartridge. Games cartridges have been more than halved in price.

Japanese get set, maybe

The Japanese can normally be relied upon to produce electronickee things faster, smaller, glossier and/or better than anyone else in the world. They do, after all, have something of a reputation for squeezing in more gizmos per pound than all the others.

What is strange therefore, at first sight, is the fact that both individually and corporately, the orientals have not swept all before them in the micro business, just as they have elsewhere.

The major reasons why they haven't become the dominant hardware suppliers are two fold. The first, and less important, is that the Japanese manufacturers have been fairly busy servicing their own market. The second reason is the more important . . . it's software.

The Japanese, for a variety of reasons, have been somewhat lacking in their appreciation of the importance of software availability, and slow in developing actual programs and operating systems. They have subsequently discovered that it doesn't matter if you make the best hardware in the world: without readily available software, only programming freaks will buy it.

So the recent announcement of a collaborative contract between 14 Japanese manufacturers of home computers and the American software house Microsoft (producer of the Basic upon which most home machines are based) is liable to correct this deficiency.

The deal covers the development of MSX, a specification for standard hardware and software features for 8-bit machines in the home use, games-oriented, low-cost market.

The 14 companies include NEC, Matsushita, Sony, Pioneer and Yamaha, and there is one US company, Spectravideo, also represented. The standard MSX specification includes Z80 processor, standard instruction set, standard Texas Instruments video display processor, and standard interfaces.

If it takes off as a standard, and there is every likelihood that it will, the MSX specification will give the manufacturers a considerable degree of 'clout' in the marketplace. This will come because there wil be, for the first time, signs of a standardised format for software products that will run without modification on a number of machines. This will make a bigger volume market for each new game or educational program, which should make them (theoretically at least) cheaper and thus more attractive to the user.

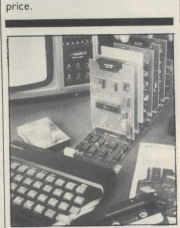
The first product announcements to meet the MSX specification are anticipated to appear some time before the end of the year.



The man apparently drying his under-arm deodorant is Barry Young, managing director of Leisurebase.

This is a new franchise group that has set up around the country, and is an off-shoot of the Photomarkets camera shops franchise. Leisurebase is selling them-there home computers. Particularly, that means machines like the Atari, Commodore and Texas computers as well as the Sinclair stuff, like wot young Mr Young is holding in his left hand. The other thing is a Vivitar camera.

Despite franchising new dealer operations in 21 towns around the country, from Basildon to Weston-super-Mare, one question still remains. Why does he look so unhappy about it all?



So, what happens if you want to expand your Spectrum, you know, really expand it, not just add some RAM.

One answer is to get a buffered expansion system like this one from U-Microcomputers. Having made a living out of making add-on boards for the Apple II, it has now turned its attention to the Spectrum, and produced an expansion system that allows a maximum of seven add-on boards to be plugged in.

It consists of two expansion boards, one a 4-slot buffered backplane, and the other a 3-slot extension backplane. It has also produced a prototyping/hobby board for those with a penchant for soldering irons, and two interface cards.

To start with, the expansion set will be available on mail order only and more information can be obtained by phoning (0925) 54117.

An IBM PC in your pocket

What have Dr Adam Osborne, a technology agreement between semiconductor manufacturers Intel and Harris, a licensing deal between IBM and CP/M author Digital Research, and a dinky little briefcase all got in common?

In all fairness, the answer is nothing — at present. In the future, however, the connection could be quite strong.

The long-term reason for this will be the design, development and sale of an IBM PC-compatible, battery-powered portable computer running multi-tasking software that could eventually be really rather inexpensive — one hates to use the word cheap, doesn't one?

Now this is, of course, all speculation at present, but to start at the beginning . . . A few weeks ago, Harris Semiconductor and Intel announced the formal culmination of a technology deal that existed between them. The objective was to produce a version of Intel's 8086 processor in the low-power semiconductor technology, CMOS. This it has now done, and it plans to follow that with a version of the 8088, together with all the peripheral and memory chips needed.

Harris intimated that it was "talking" to several companies about using the 8088 version in an IBM PC-type box, though it wouldn't say exactly who. This would make a small, low power PC-compatible machine running from batteries a distinct possibility.

More recently, a deal has been announced between IBM and Digital Research, making Concurrent CP/M-86 officially available on the PC.

At present Concurrent CP/M is pretty heavy metal stuff, aimed primarily at the business user. There, the advantages of being able to multi-task — have the computer run a print program while doing something else, for example — are considered a 'good thing'. But Digital Research knows that the home user end is where much of the future lies, and is looking to that market, gearing its software prices accordingly.

Dr Adam Osborne's part? Well, he recently suggested two factors for the future in micros. One is that IBM compatibility is going to be the thing, "no more and no less, otherwise you're in trouble," to quote the good doctor. He also said that within a couple of years he could see flat-screen displays offering 80-column by 24-line capabilities being available at a reasonable cost.

Put that lot together and what could you get (with reasonable emphasis on the 'could')? Yes, a fully portable, flat-screened IBM-PC compatible machine running multi-tasking software and able to operate from a few small batteries. Sounds like fun doesn't it, especially if the price could be squeezed down low.

As to who will do it, and when? Well, it could be a number of companies, not least of which could be the jolly blue giant, IBM, itself. If it comes, expect it to be announced within the next 18 to 24 months.



"What," you may well ask, "is she doing?"

Well, she's getting fit — and playing with her Atari CX2600 video game system, of course.

"But what's the connection?" says you, raising a weary voice to ask the obvious.

Good question. The idea works on the principle of a treadwheel sewing machine. Your exercise bike is linked up to the Atari and the faster you pedal, the faster you get blasted to smithereens on the screen.

Suitable for most road race or action games, the 'aerobics joystick' costs £34.95 and "takes away the boredom from biking, the guilt from idle gaming, and puts fun into fitness". We're going to take some convincing . . .



Dave Briskham and John Humphreys are seen here taking a break from looking for the Ring of Darkness in Epping Forest.

They won't find it there, however, because it is, of course, a games program, and none of the big retail chains have branches there yet. (Geddit?)

Ring of Darkness *is the big one from Wintersoft and its two partners, Messrs Briskham and Humphreys. They now hope to emulate its success with a new game, called* Operation Gremlin. *Here, the player controls eight characters (Captain Bono and his crack squad to be exact) in an attempt to save an evacuated city that has been attacked by the dreaded Sennapods.* Like Ring of Darkness, *it has been written for the Dragon and the Oric machines.*

Wintersoft can be found in Enfield, on 01-367 5720.

Romox comes to U.K.

The Romox programmer, about which I wrote last month, has rapidly found a UK agent, Prism MicroProducts.

This is the system that will allow dealers to produce copies of programs in cartridge form, for use in such machines as the Vic 20, Commodore 64, TI 99/4A and Atari.

Instead of using the standard read-only memories of the cartridge format, the Romox variants use programmable ROMs, which can be erased and re-programmed in a manner analogous to the cassette. At the same time as gaining this flexibility, the users gain the robustness of the cartridge format.

Trials of the Romox machine are due to start in the Autumn with dealers in the Birmingham area. A national launch is expected in 1984.

One feature that might be added to the machine before it finally hits the streets nationwide is the facility to actually run the programs available in demonstration mode. This way, customers will get to see the goods before they pay.

Prism is on 01-240 1042.

Micronet Spectrum modem



A key development in the potential success or failure of Micronet 800 has now occurred, with the launch of the VTX5000 viewdata modem from Prism. This, together with a Sinclair Spectrum, creates the lowest cost videotex terminal so far produced, and provides access into Micronet 800, and Prestel in general, for under £200.

The VTX5000 turns the Spectrum into an intelligent videotex terminal and communications system. It does this by providing both 1200/75 baud full duplex transmission rates for viewdata work, and 1200/1200 half-duplex communications for user-to-user operation. It has been specifically designed to work with both the 16K and 48K versions of the Spectrum, and fits exactly underneath the beast.

The retail price of the modem is £99.95, but for those who take out a subscription to Micronet as well (or those Spectrum owners currently sitting on the waiting list) the price will be less.

Prism's new modem is a key development for Micronet because it broadens greatly the number of users that are potentially open to the service, which offers a tele-software service for users, as well as news, views and information.

MR CHIP SOFTWARE

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This is it, the ultimate fruit machine program for the VIC, with nudges, hold and respin, 100% machine code. "Jackpot is a beautifully written simulation giving superb graphics, animation and use of colour. In fact, this program makes Commodore's fruit machine cartridge look unbelievably cheap and nasty". Home Computing Weekly, 19th July 1983 ..... **£5.50**

Kwazy Kwacks Accuracy and speed are required for this shooting gallery, superb use of colour and graphics in this new and challenging game from the author of JACKPOT, 100% machine code joystick and keyboard control **£5.50**

BUGSY (Joystick Only)
This is a Minefield with a difference as you step on the stones whilst collecting purple boxes which give you both time and points, they disappear from beneath your feet. DO NOT DESPAIR! "BUGSY" will randomly replace the stones but avoid bumping into him or it's sudden death! An original compulsive and challenging game.

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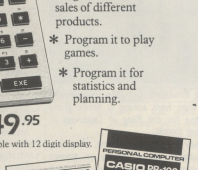

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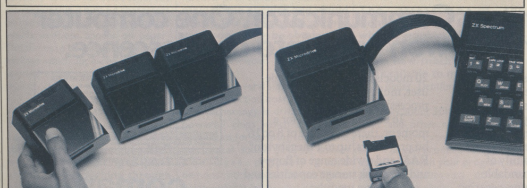
SINCLAIR'S SECRET

The Microdrive has finally appeared — is it a revolutionary breakthrough for Spectrum owners?





In the end you almost get to be glad that it's over. After all the ballyhoo, and all the on-off announcements, the Microdrive for the Sinclair Spectrum has finally appeared. That said, it seems logical to suppose that the next question might be along the lines, "Is it worth buying?"

The short answer has to be yes, for it gives the large army of Spectrum owners an extremely useful form of mass storage that is, theoretically at least, considerably better than cassette. The long answer may well require some qualification, for the Microdrive is like nothing else on the market, and as such takes Sinclair users even further away from what seems to be becoming accepted as a standard approach for mass storage, the microdisk.

This, of course, has never worried Sinclair the man, or Sinclair the company, and it shows no signs of doing so now. The drive blows all sorts of holes in normally accepted pricing for secondary storage, even with its essential add-on interface, though the techniques used to do it are certainly different.

The drive itself is a small unit, some 8 × 9 × 5 cms in size. Into its small frontal orifice goes a tiny tape cartridge which is filled with a continuous loop tape capable of holding a guaranteed minimum of 85K bytes of formatted data. The drive has a retail price of £49.95.

That, unfortunately, is not the end of the story on price, for to make the drive run at all on the Spectrum, it is necessary to also purchase Interface One. This is the special interface unit that contains the operating system for the Microdrives.

It plugs into the expansion socket at the back of the Spectrum and is screwed to the underneath of the machine. This effectively jacks up the back of the computer, making the keyboard that little bit more accessible. It also means that those owners who have put their Spectrum into one of the enclosure systems that include such things as proper keyboards could be rather upset when it comes to using Microdrives, for the interface will not fit.

This interface, which costs £49.95 by itself but only £29.95 if bought with a Microdrive, can directly drive up to eight cascaded drive units from one Spectrum. In addition, it brings to the machine an RS232 port — which adds the chance to set up communications with other machines — and a local area network. This is a high speed communication link that can accommodate up to 64 Spectrums. A full screen of data can be transmitted between machines in three seconds. In true LAN style, this network will allow one machine to be dedicated to such functions as print serving, and any Spectrum will be able to access the data on the Microdrive of another machine.

The built-in operating system can cope with up to 680K bytes of storage split between up to eight drives. Each cartridge will be able to store up to 50 files which can be individually identified, sorted automatically and displayed in alphabetical order. It is primarily an extension of the Sinclair Basic which includes file handling and communications capabilities. It is capable of loading a typical 48K program in 3.5 seconds.

There is, of course, one other cost that needs to be added to the £79.90 so far spent on getting one Microdrive working, and that is on the cartridge itself. Each one, which is a small continuous loop tape in a neat plastic housing less than one inch square, costs £4.95. It looks remarkably delicate, but Sinclair claims it is quite robust.

One potential weak-point however, especially for any Spectrum user contemplating a reasonably arduous work schedule with the machine, is the relatively low guaranteed read/write cycle rate. Sinclair states that each cartridge is good for just 5000 read/write cycles. Now this may sound to be a reasonable number, and for simple applications like loading games programs it is. But for anyone planning to use the drives for tasks like word processing or some form of database management, it does not amount to much.

The cartridges will be available both direct to the end user and via third party software suppliers on an OEM basis. Some of these are being supplied with Microdrives so that programs can be prepared for sale in the new format. This could be a small bone of contention, for some leading software companies have not received drives for this purpose. There have been suggestions that only those software companies closely associated with Sinclair are currently being favoured.

The drive itself is powered directly from the Spectrum's power supply, and this can drive only one at a time. Cascaded systems are no problem, however, as the Spectrum switches on the drive in use only when required.

The big question for Spectrum owners, of course, is can Sinclair deliver the goods? It would not be the first time that the company has perhaps not been quite as diligent as it might have been with the launch of a new product, though in the past it could hide behind an understandable underestimation of sales potential. With the Microdrive, this excuse won't wash, and the company seems to know it.

The drive system is already being manufactured by Thorn EMI in numbers that are intended to be sufficient to meet the expected demand. Even so, there will be some early rationing, especially while the backlog of orders on the waiting list are serviced first. Much, according to the company, will depend on how many drives individual customers order. If they all order one, there should be no delay problems at all — if they all order eight then it will be long waiting list time again.

As there is an Interface One, it presupposes that there will be an Interface Two, and there will be. This will be for both ROM program cartridges and joysticks, and is scheduled to appear in the early part of next year.■

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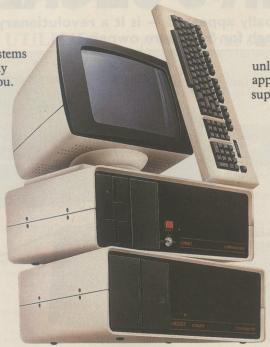

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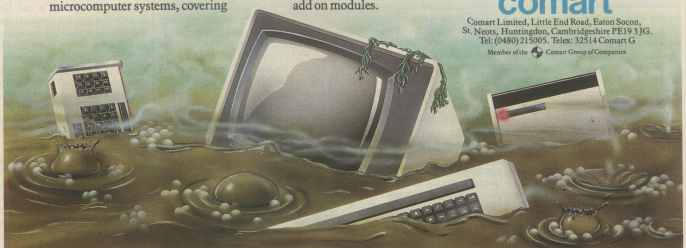

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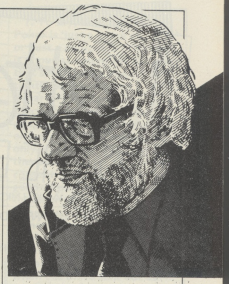


Letters to: Hedley Voysey, Which Micro & Software Review Scriptor Court, 155 Farringdon Road, London ECIR 3AD

Write on

Can the Spectrum be used for proper word processing? What bothers me is driving a printer to use a normal line length.
Colin Carter, Andover

The 48K Spectrum might fit the bill if an interface for a plain paper printer is added. The extensive use of word processing would probably justify the purchase of a proper keyboard and at that total price the Spectrum stops looking quite so cheap. However, I am guessing that you want to use the Spectrum anyway for its fun potential, and you may have bought one already.

Tasman Software of Leeds has software which I have not used, but the claim is that it puts 64 characters on the screen and with appropriate interfaces these appear on paper. This seems to be a development of a package which appeared earlier and seemed to be useful with the ZX printer.

Lisp

I am not sure I should admit to this — but having bought a BBC micro and not wanting to spend all my time ploughing through programming in Basic, I have wondered about buying Lisp. Lisp seems to be cheap as a new language to try. Would you think this worth experimenting with?
John Plowden, Bishops Stortford

I guess that what you are pondering over is the fact that Lisp has connections with students of artificial intelligence and the like. The biggest snag I can think of about Lisp (which is an old established programming language with some good text books to ease the transition to using it) rests with the fact that the UK set of people who use it is rather small.

It is always rather intimidating to find that you are doing something as a hobby and have few people to swap notes with. Most of those who use Lisp are those who have access to one of the university machines. It has been used to develop other ways of programming via Logo and Prolog.

Logo costs a bit to start using and all these languages tend to eat up memory capacity which in turn costs more money. My hope is that Logo will not go on for ever being thought of as just a tool for introducing people, especially children, to computing, but will also be used to develop more interest in Lisp-like programs of many kinds.

The user group of the BBC micro world would form a basis for finding out if there are others working themselves into the Lisp scene. It would be pleasant to hope for more memory to be available on the BBC machine soon.

Natural speech

I have visited several computer clubs where there have been demonstrations of voice synthesis. These have all been very mechanical in style. I am told that this need not be so. I have a professional reason for making the enquiry and would dearly like to know if natural voice sounds can be obtained at a reasonable cost.
A. Marks, Newark

There are several suppliers of good voice production boards in the UK. The technology is driven by more powerful chips which use better techniques for sampling to avoid the mechanical sound you so dislike. You have probably heard demonstrations of software driven voice systems for producing speech patterns. These mostly use crude methods to save space and they can rarely match anything but the most basic style of speech. Without knowing more about your finances or technical abilities I am unable to do more than encourage you to persist.

BBC upgrade

Is there a snag with the Torch disk pack 'CP/N' operating system addition to the BBC micro — as the words used are not clear as to absolute compatibility with CP/M?
Mike Heather, Basildon

There should be no really fearful snags. The special difference with the Torch version is that the operating system is based in read-only-memory so that it is immediately available without having to load from disk. However, if you wish to use commercial programs you still have to be able to read the disks they are written on and you should check that the format is suitable for reading on the Torch units. This should be no problem for most suppliers of programs.

The other main gain with the Torch upgrade to the BBC is the provision of decent amounts of user memory that comes with it. The Acorn people have been slow to put into dealers the promised twin processors with 64K store in each. The idea here was that for the faster 6502 the available user memory would rise to about 46K while the Z80 would have 64K also.

At the moment the Torch upgrade supplies the CP/M-based user with more memory than the BBC Basic user whose free space can be whittled down to as little as 4K or so, which is absurd in 1983.

Commodore pics

The attraction of the Commodore 64 for me lies with its graphics. If I am to use its full capabilities I want to know how much user store is still available to me.
H.D. Bailey, Deptford

Probably about 30K if you are using Basic and other normal programming areas. Even this space can shrink as you proceed to develop a connection with your program that produces values to drive the graphics. However, for a cheapish experiment in home computing, complete with graphics fun, it does look as if the 64 is a reasonable bet.

Low-cost printing

A dealer has told me that printers for attaching to the Commodore 64 involve a lot of expense, apart from the standard printer which I do not like. Is this true and are the disks for the Commodore up to scratch?
Sara Down, Dorking

I think the problem referred to is the lack of a Centronics parallel interface with the 64. The printer connection would use the IEEE 488 interface and to get away from the rather poor printer used by Commodore the extra cost might be worth it.

However, the dealers in the 64 seem to be quoting rather wide price variations for printers when fully connected to the 64 so it pays to shop around on the telephone rather thoroughly.

The disk options are more limited. The Commodore units supplied as standard with the 64 are not well liked and are rather limited in capacity. I do not think there is much wrong with their engineering. However, the escape route provided by many dealers is to enable drives for the original Pet range to be hooked up, but there is of course another special box to buy to enable you to do this.

However, it dramatically enlarges the file capacity of the 64 so if serious business use is what you are after then this is a good route to take.

Sending messages

Will it be possible to use one of the new portable computers — such as the Epson HX20 — for composing text and then to hook up to an electronic mail service to send this to people? How much extra will this involve apart from buying a portable machine?
D. Cherry, London SW7

Yes, this way of doing things must alter the whole convenience factor in switching over to electronic mail. However, the adaptors for using Prestel for the message passing service differ from some other couplings to network services.

The costs based on the HX20 will be something over £800 using an ordinary acoustic coupler, fairly standard terminal software and text composing software. This cost will go higher if the unit is used in an expanded form and you will need a printer for keeping a hard copy of the messages sent back to you.

So, the capital investment is not trivial which is why the Micronet experiment in message handling via Prestel is welcome since the adaptors should be a bit cheaper. However, in either case it should be quite possible to keep the costs of using services such as these right down.

Using the portable machine to compose the messages and set up the handling steps will reduce the 'connection' time to the switching service to a brief period.

Letters TO THE EDITOR

THE EDITOR, WHICH MICRO & SOFTWARE REVIEW
SCRIPTOR COURT, 155 FARRINGDON ROAD, LONDON EC1R 3AD

Advertising Rap

May I contribute to the light tone but serious intent of your June article 'Advertising Rap'?

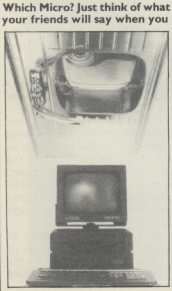
Your columnist accurately diagnosed the major purpose of our Microframe commercial — that today's Microframe will still be in use in ten years time because of its 'future-proof' capacity to add new peripherals and processors as they become relevant over the next decade, without needing to alter the existing system's components.

I expect that *Which Micro's* "vast and approximately intelligent editorial crew" will, to judge by the responses of our intelligent customers, have worked out by now that the flying sink is a visual metaphor of the same point, i.e. that Microframe is a micro that will handle everything, including the kitchen sink.

Finally, may we at Tycom not only match your generous £10 prize for the most original suggestion to explain the sink's significance, but also present that same sink to the witty winner?

Peter Williams,
Tycom

This has got to be a prize beyond rubies or diamonds for the cognescenti that constitute the readers of Which Micro? Just think of what your friends will say when you tell them that it was you that won £20 and the kitchen sink that flew through the air upside down.



Don't forget, what we want is the real reason that sink flew across the screen upside down. Peter Williams has told you the actual reason it was there — (honest) — but don't let that stop you. Remember the old publishing maxim: never let the facts get in the way of a good story.

The winner will receive these stunning prizes at a champagne-style reception in the Luton Station refreshment bar.

So get your pens to paper and your WordStars to create-new-file: let us know why that sink flew across the screen upside down in the Tycom ad.

Vic 20 lives?

I am the happy owner of a Commodore 64 plus various peripherals, disk printer etc. I also have access to and on occasions (unhappily) use a BBC computer.

Having just read your July edition of *Which Micro?* I came to the conclusion that its name is soon to change to "Another BBC User Mag". All bow down to Cambridge.

My reasons for this are as follows: In *Commodore Call* you say and I quote, "you'll get a reasonably balanced view of Commodore". You missed the bit which should have said through the hands and eyes of people who don't like and have probably never used a Commodore, and we don't like them anyway, please buy a BBC.

You also said, "Now personally, I can't imagine why anyone would want to purchase a Vic 20". You go on to say, "With new computers springing up every month many offering substantially better features at a much reduced price".

What computer on the market today has as much to offer as the Vic 20 for the price: proper keyboard, not the rubber thing like the Spectrum or Aquarius or the calculator thing on the Oric; a real screen editor, so you don't have to copy the whole line again like on the Dragon or the much overrated and over-priced BBC; a cassette recorder system that works and is easy to expand with disk printers etc.

Well, I can't name one. What other things do you want? More memory and 40 columns — OK, you win on those two, but 16K is only £27.50 and screen expanders start at £9.95.

I mentioned the tape system earlier. I saw in my local computer shop the best reason why the BBC is overrated. A BBC owner had taken *his* BBC and *his* cassette to the shop so he knew that the programs he purchased would load.

It was a good thing he did, too. He tried 20 different programs — he gave up on 17 of them because all the copies in the shop failed to load. Of the three only one loaded first time. That's not very good now is it?

On the other hand, with the Vic 20 I find it is very rare that a program will not load first time and I have never been through an entire stock of programs to find that none of them work. Why is it then that you and all other mags refuse to state these facts in your biased reviews?

You also give the impression that you have never used a Commodore computer by the things that you say, for example, "a clumsy series of poke commands". To use the sound on a Commodore 64 there are only seven pokes, to use the ENVELOPE commands on a BBC there are 14 and the order has to be correct. That's what I call painful.

The comment about the BBC being good value for money — it's the most expensive around. By the time this is read the Commodore 64 will be about £229.95 — nearly £200 less than the BBC, or half price.

One last question — would the BBC sell if it was called the ITV computer? No!!!

I would like to end this very biased letter by saying that I am not, and never have been, paid by Commodore or asked to do anything for them. I don't even like Commodore themselves — only their computers.

R.W. Barton, Aldershot

We *do* think that it's our job to help people decide what computers they should or shouldn't buy. If we can't think of any reason for readers to buy the Vic 20, we certainly won't invent them just to please those who use Commodore computers.

The fact is this; the Vic 20 is now an obsolete micro, offering very limited performance for a relatively high price. Commodore has now decided to stop production which obviously implies that its view is similar. Recent price cuts on the 64 would also indicate that this is now Commodore's main product for this market.

To describe Pete Gerrard, the author of our Commodore Call, and until recently the editor of the magazine *Commodore Computing*, as someone who has "probably never used a Commodore" is daring to say the least.

The Vic 20 cassette system is one of the less useful on the market. It gives almost no information as to how the load is progressing, and is painfully slow. That of the BBC Micro is almost as sophisticated as a slow disk system, and although it did have its initial teething troubles, these were nowhere near as severe as the initial reliability problems experienced on Pets and Vics — the four Vic 20s we have used this year have all broken down at least once, with cassette and display problems heading the list.

Commodore's philosophy on improving its Basic interpreters and operating systems is well known — it doesn't do it very often. The slow, unfriendly Basics of the Vic and 64 are the result.

As for value for money, the Commodore 64 price cut to £230 does now make both BBC models look overpriced, partly as they contain many expensive facilities most home users will never want or need. However, the Electron, much closer on specification, should be launched by the end of August at a lower price ***(see Here at last, page 34).***

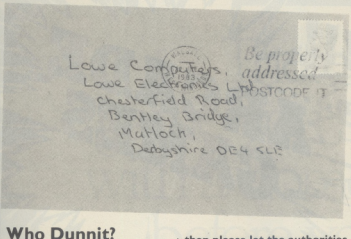
Show time

We would like to draw your attention to the forthcoming *Sutton Library Computer Fair* at the Central Library, St. Nicholas Way, Sutton, Surrey SM1 1EA on Friday 16th (9.30am to 8pm) and Saturday 17th (9.30am to 5pm) September 1983.

The last *Sutton Library Computer Fair* was a great success and many exhibitors are expected. The Association of London Computer Clubs will have a stand.

The Fair is being organised by Sutton Library, and enquiries for stands should be addressed to Peter Smithson at the Library. (Tel: 01-661 5027).

David Wilkins, Secretary
Sutton Library Computer Club



Who Dunnit?

Our Client, Lowe Computers has received the enclosed slip from one of your readers in Walsall.

As you can see, the reader has forgotten to fill in the name and address section!

Is there any possibility of your editorial team finding room in the next issue to print a message to this reader, perhaps with a picture of the envelope and style of writing asking him to contact Lowe again — *with* his address? They are keen to provide a good reader reply service and the message may bring a smile to other readers' lips!

Our thanks in anticipation of your help.

Penny Hett,
East McFarland Advertising

Bring a smile to our lips? Goodness me no. This is serious and should be taken seriously.

Now, we want whoever it was that didn't fill out the coupon to own up this minute, otherwise all our readers in Walsall will be sent straight to bed without any tea.

We are doing our bit by publishing, at enormous expense, a shot of the culprit's envelope. If you recognise the writing as yours then please come clean. If you think it belongs to a friend then please let the authorities know. Your information will be treated in the strictest confidence.

We're actually considering turning this into a new Whodunnit game, Hunt the Punter, where the entire population of Walsall is lined up against the wall and sequentially exterminated with photon torpedoes until one of them can be persuaded to confess to depriving Lowe of a potential Colour Genie customer.

See the evidence above ...

Champion review!

Just a brief note to let you know that I felt Mike Gerrard's review of *Champions!* was the fairest, most informative and most accomplished appraisal of one of our programs to be published in any magazine.

Had Mike been gushing about the program, I suppose you would be inclined to take a letter of this nature with a pinch of salt. It wasn't . . . so I hope you don't.

I think I can claim to be the world's most experienced *Champions!* player, and I earned my living from writing for 16 years, but I could never have hoped to capture the atmosphere of *Champions!* with half the effectiveness of Mike's review.

Harry Whitehouse, Peaksoft

Strip Poker

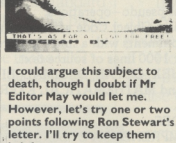
I have been most impressed with the wide ranging debate over the Strip Poker program in recent issues. As the person who wrote the original review I think it is time I had my two-penny worth.

We seem to have lost sight of the fact that the program is just a game of poker. The fact is that the computer does play a technically good game and it does take some time to remove the young ladies' outer and inner apparel. In fact, I seem to remember the esteemed editor of this august periodical taking most of the afternoon trying to get the clothes off one of the ladies for the photo session. Need I say more than he in fact failed miserably.

I think that the general consensus of opinion that day was that the Strip part of the Strip Poker added a bit of competition to what would otherwise have been just another boring card game on computer.

It is at this point that I must ask if Mr. Banks has even seen the program run or did he just base his comments on the photographs published alongside of the review. I would not go so far as to call the program "tacky soft porn", either. It really does not go far enough to even qualify for this tag. It is, after all, just a computer program.

Ron Stewart



I could argue this subject to death, though I doubt if Mr Editor May would let me. However, let's try one or two points following Ron Stewart's letter. I'll try to keep them brief.

1. To say, Ron, that Strip Poker is 'just a game of poker' or 'just a computer program' is about as defensible as saying that setting off a bomb in a tightly packed airport departure lounge is an efficient way of upsetting people. The only difference is one of degree. Now, this is only a personal view, but ... there can be a lot right when consenting adults (of any gender) play strip poker together for real, all three-dimensional like. There is something odd (my word is tacky) in someone playing against a computer and a two dimensional image (especially when the blurb sent out as publicity material shows a man sitting in front of a screen and obviously losing).

2. It would be very easy to put in bits that could come straight from the 'Feminists Diatribe Handbook' and it would be just that. However, some of those women do have a point. As I have said on this subject before, I like women who are both three-dimensional and people. I don't go for women who are two-dimensional and object-oriented. Games like Strip Poker just show these object-images as 'things' to be played with. Yet the image is of something tangible, and it is a far easier step than most people accept for the apparent responses of the image to become expected, and then perhaps demanded, in other examples, especially the live ones. That, to me, could be defined as "soft porn" in this particular context. (In other contexts, it sometimes gets called "advertising"). Given that, I don't feel it relevant whether I saw the program or not.

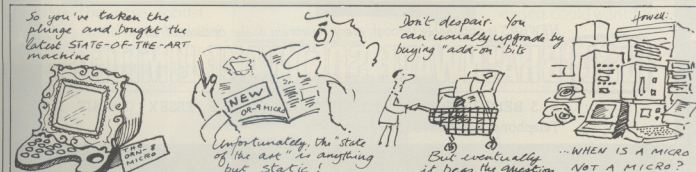
Just out of interest I wonder what some women readers feel about this?

Martin Banks

SILICON TIPS

Handy Hints for Micro Users

By Richard Howell



ANOTHER BRAINWAVE!!!

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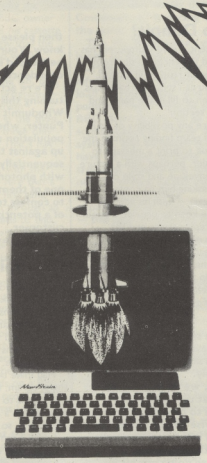
For your

New Brain

COMPUTER
with

NEWBAS



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There's one game you should play with a home computer before you buy it.

If you're looking for your first home computer, may we make a suggestion.

Tear out this page.

And ask these questions of every computer you look at.

1) Is the basic price reasonable, say under £180?

2) Does it work with a monitor as well as with an ordinary UHF T.V.?

3) Does it include a basic training manual that doesn't require a science degree to understand?

4) Does it have colour?

5) And sound?

6) Does it take cassettes?

7) And cartridges?

8) And can you operate them with joysticks working directly off the basic unit?

9) Does it have a professional quality keyboard that's guaranteed for twenty million depressions (and no headaches)?

10) Does it have colour graphics that are capable of producing detailed pictures?

11) Is the case robust enough to stand up to the kids?

12) Does it use a standard language that's not a million miles away from English?

20 Questions.

13) Is there an expanding range of high quality software available from the makers?

14) Does the software include educational programs for adults as well as the very young?

15) And is there software sophisticated enough to satisfy the experts?

16) Does it use the most up to date technology, for instance the 6809E microprocessor?

17) Will it drive a standard printer directly from the basic unit?

18) Is it made in the UK?

19) And for the basic price will I get an easily accessible, yet large memory of at least 32K?

20) Or will I have to add lots of extras (and lots of money) for that much?

After you've finished pestering every computer salesman in sight, compare your answers to these, courtesy of the Dragon 32 (this is, after all, an ad for the Dragon).

Questions 1-19. Yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes and yes. Question 20. No.

If you're thinking that that's a lot of computer for the money, you'd be right.

However, when you come to read the handbook you'll soon realise that something's missing.

The jargon usually associated with computers.

You see every part of the Dragon has been carefully designed to be easily understood, even by total beginners. Yet it has all the features an expert could want. Just ask it.



T.V. not included in price.

DRAGON 32

The first family computer.

Here at last...The

Acorn has finally unwrapped its long-promised Electron. At £199 and
is likely to be the subject of more interest than any other this year. Hazel James and

The Electron is finally here and while some other magazines have looked at pre-production versions we are proud to present the first full review of the version you will be able to buy in the shops. And we also have an interview with Acorn's marketing manager, Tom Hohenberg.

During our exclusive interview back in July last year, Chris Curry led us and the rest of the waiting multitudes to believe that the Electron would be on the shelves in October or November 1982. It will in fact be launched at the Acorn User Show in August, and will be on the shelves in September or so Acorn claims.

The only High Street distributor, at least for the immediate future, will be W H Smith, but orders have also been received from other distributors around the UK.

Our first question, then, had to be — why the terminally long delay?

"We shouldn't have talked about the machine a year ago," admits Hohenberg. "The product simply didn't exist — it was just a twinkle in somebody's eye. We were expecting to produce the machine in May this year, but there was a production problem with one of our suppliers."

If this was the case, then why did Acorn let the cat out of the bag so prematurely?

Could the answer be that Acorn was trying to influence people not to buy the recently-launched Spectrum, but wait to spend their readies on the superior specification Electron?

Curry told us last year the machine would cost in the region of £150, which would have been right in Sinclair territory. In the event, the price will be £199 including VAT, so anyone who's waited this long has some justification for feeling slightly peeved — especially since the Sinclair has now dropped to around £130 for the 48K version.

Size has been kept to a minimum by using an external mains transformer integral with the mains plug.

However, we would be the first to admit that the Electron's specification is impressive — dare we say it was worth the wait?

Here is the final spec, so settle down, read and judge for yourself.

The first thing you notice about the Electron is its small size — it is about the same shape as the keyboard on the BBC Micro, only not quite so wide. Size has been kept to a minimum by using an external mains transformer integral with the mains plug.

The power supply arrangements are disappointing, especially for a machine costing £199. That the power supply unit itself is external is perhaps forgivable, but two economies in particular may turn out to be false.

The lack of a switch, either on the computer or on the power supply itself, is bound to mean unnecessary wear and tear on the socket where the lead plugs into the computer. On the Spectrum, one of the Electron's main rivals, this has been known to lead to infuriating crashes, with the user losing his program (invariably before saving it on cassette).

Another complaint is the way the power supply plugs into the mains. It does so directly, without the benefit of a cable and



Acorn Electron...

offering software compatibility with the BBC micro this machine

Simon Craven take the lid off Acorn's new computer and ask was it worth the wait?

a conventional plug, as employed by the Sinclair power unit. Although all the parts are sufficiently well made to be safe, such an arrangement is bound to be less positive and less convenient than having a separate plug.

There is a 56-key keyboard with 10 programmable keys. Along the left hand side of the unit are a cassette socket (1200 baud) and outlets to an RGB or black and white monitor, and a colour or black and white TV.

The keyboard is not quite up to BBC standards, being of the less expensive type whereby the key must reach the end of its travel to produce the required effect. On more expensive keyboards, the depression of a key to within a few millimetres of full stroke is sufficient to generate a character. In fact, the Electron's keyboard is just like that of the Lynx — indeed, it would not surprise us to learn that the two units came from the same supplier.

Many potential Electron users are those with Sinclair machines who want something more versatile. The inclusion of tokenised keyword entry is perhaps intended to entice them away from their Spectrums. With the comprehensive set of abbreviations in the BBC Basic run by the Electron, and the many functions available by using control characters, the two-key entry system (press FUNC with L to LIST, for example) offers less of an advantage to Electron users than to those with a Spectrum.

The Electron scores heavily over rivals such as the Commodore 64 in ease of use of the function keys.

The familiar red user-definable keys of the BBC Micro disappear, but their function is taken over by the numeric keys on the top row of the keyboard. Pressing FUNC with one of the numeric keys enters whatever the user has defined that key to be.

Incidentally, the Electron scores heavily over rivals such as the Commodore 64 in ease of use of the function keys. All you do to redefine key 4 is enter *KEY4 followed by the new definition.

The Electron has 32K of user memory, with 32K of ROM (including the Basic interpreter). Like the BBC, the Electron has a 6502 microprocessor running at 2MHz, and BBC Basic is standard.

Electron software is upwards compatible with the BBC, but not all BBC cassettes will run on the Electron.

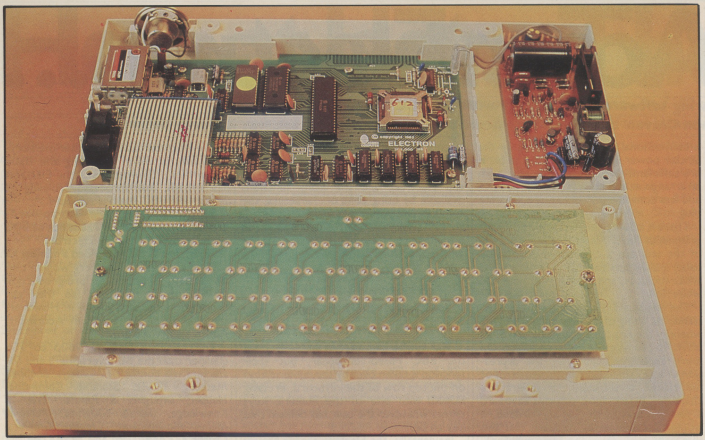
Acorn has already provided a number of software houses (Hohenberg wouldn't let on exactly who) with pre-production models of the Electron, so they can develop lots of software for it. However, the first batch will be from Acornsoft, Acorn's software arm.

The cassettes will be "60p to 70p cheaper than the BBC versions", and for starters will consist of *Monsters, Snapper, Meteors, Chess, Starship Command, Hopper, Draughts & Reversi, Tree of Knowledge, Turtle Graphics, Personal Money Management, Creative Graphics, Graphs & Charts, Lisp* and *Forth*. The last four will have accompanying books.

Even though the software prices are marginally down on the BBC — typically around £10 — they're still pretty high



Hardware Review



compared with, say, Imagine's newly designed packaged cassettes at £5.50, Sharp MZ-700 cassettes at £3.95 and Sinclair *cartridges* soon to be released at £10. The Electron cassettes are likely to be around the £9 mark.

"Our software is very good quality," Hohenberg assures us, "I would say that the graphics capability is better than other software." Yes, but *twice* as good?

By the end of the year, Acorn hopes to be supplying the expansion box which will upgrade the Electron to a specification approaching but not equal to that of the BBC Micro. Unfortunately, the price is not available yet. It will include RS423 and Centronics printer interfaces, provision for games paddles *(what about joysticks? — Ed)*, a slot for extra ROM memory cartridges, a disk drive and connection to an Econet network.

All the BBC Micro graphics and text modes are present in the basic Electron model except the teletext mode 7. Sound output is by means of a built-in loudspeaker.

Acorn is taking orders from dealers now, and expects deliveries to commence in mid September. So theoretically you should be able to get your hands on one then. But, asked whether the company will meet the expected demand, Hohenberg admitted candidly; "Initially, no. We already have more orders from Smiths and dealers than planned production for the first couple of months."

It all sounds boringly familiar, but it's probably put a smile on the face of Acorn's bank manager.

And who is going to buy this little winner?

"People who want a machine that will do most of the things a BBC machine will do but can't afford £400," comes the reply, "the basic games person who wants superior graphics. It's way ahead of the Spectrum, for instance."

And it would be fair to argue that with the general price cuts by other manufacturers the BBC B, though a fine machine, is now very expensive at £400.

As you read, Electrons are coming off the production line at the rate of thousands a week.

Hohenberg foresees a lot of interest from parents whose offspring use BBC Micros at school and have been nagging Mummy and Daddy to buy one for after school. "There are thousands of BBC machines in schools. Parents can afford £200 for the Electron, whereas they can't afford the BBC," he said.

But its appeal doesn't stop there; what about the schools themselves? "Yes, I think we will sell them to schools."

As you read, Electrons are coming off the production line at the rate of thousands a week. They are being assembled in, of all places, Malaysia, and as the production process gets into gear the volume will increase to meet the demand — hopefully.

This was probably jumping the gun somewhat, but we asked Hohenberg what would happen if an Electron broke down. It seems that you should take it back to your dealer rather than Acorn. During July and August, Acorn has been training distributors to service the machines — including Smiths. (We'll watch this one with great interest as owners have usually known more about their respective micros than the chain stores.)

Although the warranty period hasn't been settled yet — it's getting a bit late isn't it? — it's likely to be either six months or a year like its predecessor.

If you are itching to get your hands on this long-awaited machine, it looks like your best bet would be to find a major branch of Smiths and get to the front of the queue. Acorn won't start selling mail order until later — presumably when it's fulfilled all its existing orders.

FINSBURY BENCHMARK

All times in seconds.

	Electron	Dragon 32	Commodore 64	BBC Micro
1.	9.0	15.1	14.1	7.2
2.	3.85	10.7	9.5	3.4
3.	11.0	19.8	18.0	8.2
4.	11.5	21.8	19.9	9.1
5.	11.6	23.5	21.6	9.5
6.	17.8	34.2	32.0	14.7
7.	17.5	49.8	51.5	21.1
8.	72.5	128.6	156.5	48.3

SPECIFICATIONS

Processor: 6502

RAM: 32K

ROM: 16K operating system, 16K Basic

Graphics: six display modes, four including graphics. Resolution between 160 × 256 and 640 × 256

Colour: eight colours, plus flashing combinations

Sound: one music channel, one white noise channel

Price: £199 including VAT

Until then, you can always go along to the Acorn User show on the 25th to 28th of August and join in the scrimmage to get your hands on one. Wouldn't it be funny, though, if the Electron didn't turn up after all.....?

The first reaction of any BBC Micro user when confronted with the Electron is bound to be how close the similarities are. The main difference from most users' point of view is that the teletext display mode (mode 7) is missing.

For the uninitiated, the BBC and Electron use a system of different display modes, each allowing the programmer to select his own compromise between the complexity of the display required (degree of graphics resolution, number of colours etc), and the amount of memory reserved by the display. This allows a great deal of flexibility, and makes the Electron a great deal more versatile than its competitors.

The advantage of the BBC's Mode 7 is that it only uses up to 1K of memory, making it ideal for long programs which do not require complex graphics. Many programs such as adventures will therefore have to be simplified for use on the Electron.

On the positive side, the Electron is designed so that BBC-only commands slip through ignored, rather than stopping the program. Selecting Mode 7 merely puts the machine into Mode 6, and any teletext graphics symbols are reproduced as random blobs.

The same principle applies to the Electron's sound facilities. Although they are not quite the same as those of the BBC Micro, all BBC sound commands are permitted, even though they might not do anything. The upshot is that most existing BBC arcade games run on the Electron — we tried half a dozen cassettes, and only one which relied heavily on Mode 7 refused to run correctly.

To get down to specifics, the maximum graphics resolution of the Electron is 640 × 512, there are eight screen colours with eight extra flashing combinations, and there are four independent sound channels. The sound comes through an on-board speaker, which is unusual for a micro in this class. The Dragon and the Commodore machines put their sound through the television set, giving the user easy control over the volume. The advantage of an internal speaker is that using a monitor does not mute the computer, but this will not be important for many prospective Electron purchasers.

In addition to the manual, the Electron is supplied with a demonstration cassette containing 14 programs.

The Electron has an excellent Basic by any standards, with features like named procedures making programming much easier to understand for the novice. The long variable names are a great improvement over those offered by the Microsoft-based competition.

Although the Electron is very fast (about 60 per cent faster than either the Commodore 64 or the Dragon), it is slower than the BBC. The unfortunate effect of this is that BBC games software will run more slowly on the Electron. It is quite likely that the major software houses will re-write machine-code routines to make their Electron games more comparable to the BBC versions.

Another advanced feature inherited by the Electron from the BBC is the loading and saving of programs or data on cassette. The amount of information offered by the system is exemplary, and the user is kept informed about the progress of the load. One feature unique to the Acorn machines is that if something should go wrong in the middle of a load, the tape can be rewound a short way for a second shot at the tricky area, instead of having to start all over again.

As many of those contemplating the purchase of an Electron will be complete newcomers to microcomputing, the standard of the documentation with the machine is of great importance.

In this area the quality is mixed. The manual itself is reasonably thorough, covering the Basic and the built-in machine-code assembler in detail, but the omission of an index is a major fault. Let's hope that a future edition of the manual will correct this (though with the number of delays encountered in getting the Electron ready for release, Acorn might reasonably have been expected to see to such things before now.)

In addition to the manual, the Electron is supplied with a demonstration cassette containing 14 programs. Most of these are simple games which help the first time user to find his way around the computer. The quality is very high, and these programs will be more than enough to keep the proud owner happy for a week or so.

Meanwhile, the process of learning simple programming will be aided by another 138 page book. "Start Programming with the Electron" is a fairly standard "teach yourself Basic" text, dealing with most aspects of Electron programming including graphics and sound. Although there is some degree of overlap with the manual, it is generally helpful and well written.



COMMENT

At £200 the Electron is a sure success. It has an advanced specification, a reasonable software base, and the success of the BBC micro working for it. For anyone who uses a BBC Micro at school and wants to run the same programs at home, the Electron at £199 is much better value than the BBC B Micro at £399. In fact the BBC model A has effectively been dropped and the BBC B now looks very overpriced.

So the BBC B Micro is bound to lose a lot of sales to the Electron, then, but what are the other main rivals?

The Dragon 32 at £175 now looks very dated. Despite a loyal following, it is bound to lose out because of the BBC bandwagon. The pulling power of a cheap micro which is compatible with the computers children use at school may well be stronger than Acorn bargains for — it will be interesting to see if supply of the Electron becomes as big a problem as it was for the Spectrum and BBC Micro.

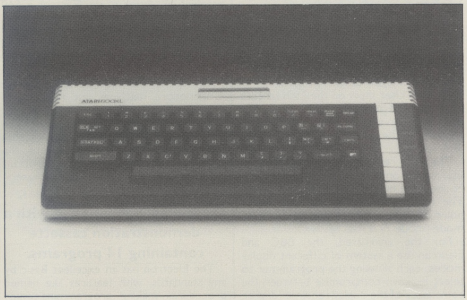
The Commodore 64 which is now just over £200 is a more potent rival. It is already very well supported by manufacturers of both software and supplementary hardware, and Commodore's new policy of producing several versions (including a portable model and a special educational model) should make the 64 one of the market leaders. How far Commodore deserve this market share in terms of the technical merits of the 64 is another question.

The Spectrum 48K at £129 is probably not at much risk, even though it was Acorn's original target. At the old price of £170 the balance would have been tipped in favour of the Electron, but Sinclair seems determined to make the Spectrum unbeatable value for money at the cheaper end of the market.

And coming soon

This Autumn should see the debut of several young pretenders to the home micro crown. What are their chances in this increasingly crowded market?

Atari's range



News has reached us of four new computers from Atari — the 600XL, the 800XL, the 1400XL and the 1450XL. The best news of all is that these machines will operate all the software that runs on the present 400 and 800 machines. This is almost an industry first and Atari is to be congratulated for its efforts in this respect. The company is also lining up a number of new peripherals, but more of these later.

The 600XL looks very much like the 1200 in design. The main case is moulded in white plastic with the keyboard and its surrounding areas in black. A cartridge slot is provided above the keyboard and joysticks etc are plugged in at the side of the computer.

Along the right hand edge of the console are the specialised function keys and the power on/off switch. Amongst these keys is the HELP key first seen on the 1200 which provides additional information and menu screens at the touch of a button.

Technical specs are very much like the old 400/800 computers and at the time of going to press we are not sure whether the computers have more player/missiles etc available. The main specs for the 600XL are as follows: Memory — 16K RAM expandable to 64K RAM with 24K ROM expansion module which includes an expanded Basic. Keyboard — 62-key, full stroke, including four special function keys and a Help key. The character set includes selectable international characters, notably those used in Germany, France and Spain. CPU — this is a 6502C running at 1.79 MHz. Graphics — 11 graphics modes with 256 colours, 128 of which are displayable at any one time. Maximum resolution of 320 × 192. Antic modes will also be directly available from Basic. Sound — four voices with a three and a half octave range. Output through the TV speaker.

That's the basic spec, but we would imagine that Atari has built in one or two other little goodies for us. We would also expect the computers to have better colour saturation *a lá* 1200. The 800XL has an identical spec except that it comes with 64K as standard and it is slightly larger in size.

The real revolution in the Atari range comes with the 1400 and 1450 computers.

One again the basic specs are the same except that the 1400 and 1450 have four programmable function keys. These also have 12 pre-programmed instructions. Both the 1400 and 1450 have a voice synthesiser chip built in which will be programmable from Basic and will be used by many new programs from Atari. In this respect we can expect to see a large range of educational software being made available.

In America the two top-of-range computers have built in modems but obviously these may not appear in the UK because of our different telephone system. The British computers may have a modified modem of some sort built in.

The 1450XLD has a built-in double sided double density disk drive plus space for another drive to be installed. The disk uses DOS III and each side of the 5¼ inch floppy will hold 127K of information. The drives will also sense if an old single density disk is being used and switch automatically. The 1450, obviously aimed at the business market, is big and butch enough to support a monitor on its back.

The 600XL and the 800XL should be available in this country before Christmas and the 1400 and 1450 some time in the new year. Prices have not yet been set but they are expected to be higher than US prices. In the States the 600XL will sell for $199, and the 800XL for about $299. The new 800XL has no die-cast metal structure and is probably made on a single board instead of the three that can be found in the present 800.

Your 810 disk drive and 410 cassette will not be junk if you decide to upgrade, either. Both will operate with the new computers.

As well as the computers, Atari is releasing a number of new peripherals, the most notable of which is a CP/M expansion module that will plug into all computers old and new.

The 410 cassette recorder has been re-styled and is now called the 1010. The 810 disk drive has been replaced by the 1050 drive. This is a dual density, single sided drive using 5¼ inch floppies. Each disk will hold 127K bytes of information. The drive also has automatic switching between single and what Atari calls enhanced density disks. Up to four of the drives can be chained together.

Atari has three printers in its new range: the 1025 which is an 80 column printer; the 1020 which is a four colour text and graphics printer; and the 1027 which is an 80 column letter quality printer using an Elite 12 typeface.

On the lighter side a touch tablet is being produced. Atari's dislike of the light pen has been known for a long time. Rumour has it that a lawyer once said that Atari could be sued if someone managed to poke one through a TV set and injured themselves.

The software side of things has not been forgotten either and a new educational series will be available soon. Atari has tied up with Disney to produce *Mickey in the Great Outdoors*, two adventures using the cartoon character to help word recognition and number skills. The series will go on to use Peter Pan and other Disney characters in teaching science, social studies and maths.

Microsoft Basic is coming out on cartridge. This does appear, however, to be a cut down version of the one currently available on disk and it looks as if an extension disk will be included in the package to expand it. Yes, I know it seems daft but there it is!

Staying on the language front, Atari will also be producing Logo on cartridge. One can only assume that Atari's Pilot has not gone down too well in educational circles.

On the games side, *Eastern Front* will soon be on cartridge as will *Caverns of Mars*. New games will include the superb

Pole Position for all budding racing drivers and *Joust* where you must knock other players or the computer off Buzzards, while you ride on an Ostrich. (Who thought that one up?). There's also *Donkey Kong Junior* where Kong's son pursues Mario through the jungle; *Pengo* which I won't attempt to describe as it's too bizarre and *Ms Pac-man*.

A new sports line will see us playing Tennis and Soccer and perhaps American Football if the game takes off in this country. I look forward with anticipation to the Soccer game, local rumour has it that the ball can be chipped over players heads when passing. Move over Dalglish your time has come.

Tandy MC10

The Tandy MC-10 is the latest in the long and bewildering line of Spectrum clones. Rubber keyboard, one word entry, 32-column display. Sound familiar?

The price is set at 'under £100'. Exactly how far under is not currently clear. Like the Laser, this machine offers only 4K of memory, so it would be as well to budget for the 16K RAM pack.

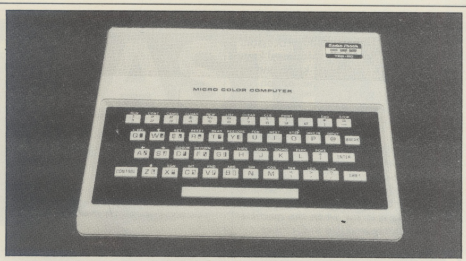
The machine does boast an RS232C interface, however, and will give access to a fair number of commercial printers. And the CPU is the 6803. Eight colours are available and — yes — the keyboard clicks.

The machine is at least assured of a reasonable number of retail outlets, since there are something like 350 Tandy shops throughout the UK. And the benefits of large back-up are likely to prove important in generating new software for the micro. Software is, according to Tandy, "available in the near future," and it is claimed that, "virtually all standard colour Basic programs" for the TRS-80 (4K) can be used on the MC10.

Coleco's Adam

Like Atari, Coleco seems to feel that it had unnecessarily limited itself by marketing a dedicated games console. It is launching an upgrade of its existing ColecoVision games module which will amount to a complete home computer system.

The system is called the Adam, and it in effect inverts the current pricing policies of computer manufacturers. For $600 Americans can now buy a system comprising a detached typewriter-style keyboard, a memory module, two games controllers, and (wait for it) a daisywheel printer with built-in word processing software.



The Adam will be available here from the end of September either as a complete, one-shot system or as an add-on for existing ColecoVision owners.

Anyone who has seen the Coleco Vision games console in action will feel confident of the Adam's video capabilities. The ColecoVision has some of the best games software around, and the Adam can run all of it, boasting 16 colours, three sound channels and the ability to display 32 sprites simultaneously.

The heart of the system is the memory console. It houses a remarkable 80K of RAM, with provision for an additional 64K memory module. The memory console accepts ColecoVision games cartridges and, most remarkable of all, has a drive for stringy micro floppy Datapacks.

For the uninitiated, a stringy micro floppy is an endless loop of tape, similar to an ordinary cassette tape, which runs at very high speed past the read/write head. It's basically a poor man's disk system, and Coleco's success with the set-up will add to the embarrassment down at Sinclair Research where they've been struggling for months over the very similar Microdrive.

The two games controllers will be familiar to ColecoVision owners. Each features an integral joystick, two fire buttons and a touch sensitive numeric pad. There is provision for one of these controllers to be fixed to the keyboard for cursor control and rapid number entering.

And an expansion module is available to enable the machine to accept games cartridges from Atari, ActiVision, Imagic, Parker Brothers and others.

The system's games playing ancestry is also apparent in a second expansion module featuring a steering wheel, foot-operated accelerator pedal and free *Turbo* game cartridge. And two other games controllers will be made available, including a 'roller controller' (not to be confused with a mouse) which allows speed control of the on-screen character.

And if all that isn't enough for you, then ponder the attractions of a ready-to-go word processing package built around an 80-column daisywheel printer with its own ROM-based SmartWriter word processing software already built-in.

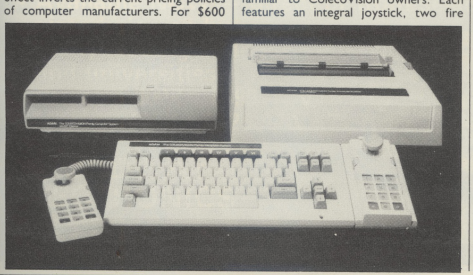
Early reports suggest that the printer is based on the Smith-Corona TP-1 printer. Whatever the truth of that, the machine has a friction feed mechanism for paper up to nine inches wide. A cheap tractor feed mechanism is promised soon.

The Adam is CP/M compatible, and the makers promise to supply CP/M software on Datapacks or on the coming-soon disk drives. Coleco also says that many programs in Applesoft Basic will run on Adam.

And the verdict? Well, if the machine holds its US price of the equivalent of £400, and if the specifications hold good, then it has every chance of being a winner.

Any snags? Yes. The ColecoVision cartridges cost between £28 and £30. Indeed, the whole Adam system might be seen as a lost leader for the eventual software sales.

Any last niggling little uncertainties? Yes. Will all these games playing facilities in ROM really be controllable from the keyboard?



Alphatronic

The West German company Triumph Adler is likely to be better known to most people for its typewriters than for its computers, although the company has been manufacturing business machines for some years.

Triumph Adler has now launched its first personal computer, the £400 Alphatronic PC. It has a Z80 processor, 64K RAM, 32K ROM, a professional keyboard with six function keys and a cartridge port, and has the option of another 16K of RAM.

Outputs comprise RS232, Centronics, monochrome TV, RGB and monitor and floppy disks. The machine can operate CP/M, and a disk drive is already available. Eight background and eight foreground colours can be displayed.

The company hopes to have around 400 programs — half educational and half games — available for when the machine becomes publicly available in October.

Laser

The Laser, to be sold through the Computers For All chain of retailers, is the current holder of the title Cheapest Colour Computer. But the £70 price tag has only been achieved at the cost of some pretty drastic corner-cutting.

Made by the Hong Kong company Video Technology, it offers a Spectrum-style rubber keyboard, a Z80A processor, 16K ROM and one sound channel. So far so good.

But the graphics resolution is limited to a chunky 128 × 64, and the RAM is down-right claustrophobic at 4K.

The Laser boasts one-touch keyword entry, and there are promises of joysticks, a Centronics interface, a four colour printer and a 64K RAM pack. The machine has an uncanny resemblance to the Texet, reviewed in our April issue, and none of the fundamental snags outlined then need to be re-written.

A 16K RAM pack will prove essential for any serious programming, and at £30 this add-on drops the machine into that arena where the Spectrum and Oric are currently slogging it out.

In such company, the Laser's low resolution graphics, lack of established software support, and generally unremarkable specifications are likely to prove fatal.



Memotech MTX500

The Memotech MTX500 is a big black slab of a machine, offering the experienced programmer some of the most sophisticated on-board software currently available. It also offers painless step-by-step expansion up to full business capacity.

The basic machine is housed beneath a professional 79-key keyboard. It's an impressive-looking beast, housed in Memotech's familiar black anodised aluminium.

The MTX500 runs a Z80A processor at 4MHz and has 32K of RAM, expandable to a massive 512K of paged RAM. Its 16K ROM contains the MTX Basic and, as part of the machine's consistent support for the programmer, a Z80 assembler/disassembler is built in. Machine code routines may be included within a Basic program, and can be stepped through one instruction at a time to help in error-trapping.

The machine's 'front panel' display enables the programmer to examine and manipulate the contents of the computer's memory and registers, useful again in the development of machine code programs.

Besides MTX Basic, the machine has two other built-in languages. To aid in the manipulation of the 16K of dedicated video RAM, the 500 can run Logo, the graphics language. The computer has a sprite facility, enabling the easy creation of user defined graphics characters.

Sprite characters appear to run independently of the background graphics, and can be programmed to move from and to given positions at a certain speed, and then virtually forgotten for programming purposes. Priority can be written-in so that one sprite will pass behind or in front of another, and collision checks can be run.

Just to reassure you that the MTX is not wholly for sophisticated software authors, Memotech has included a third resident language for programmers at the most elementary level.

It is called Noddy and provides "a very simple method of programming the computer to display information or ask questions and then move on to another display depending on the previous response".

Eight virtual screens are available, which help the programmer in the organisation of the display. The display can be 48 × 24 in text mode, or 32 × 24 when mixed with graphics. Graphics resolution is 256 × 192, and 16 colours can be displayed at the same time. An 80 column video board is available.

Standard outputs are Centronics, twin joysticks, 2400 baud cassette, TV, video, hi-fi for the three voice sound, an uncommitted I/O port and a dedicated games cartridge.

The obvious competition for this machine is the BBC, and in certain lights the MTX500 makes Acorn's offering appear over-priced and half-finished. But the BBC is by now very heavily entrenched, being almost the Government-recommended micro.

The marketing manager of Memotech's US division believes the MTX500 is a machine for the second time buyer, and until good games software comes along to demonstrate the machine's capabilities to the uneducated eye, it is likely to be the experienced user who will most readily appreciate its impressive specifications. ■



AT LAST!



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SHARP MO





Sharp has never made a really big impression on the home micro market. But its new £250, 64K MZ-700 could change all that when it is launched later this month. We put it through its paces and assess its chances.

The Sharp MZ-700 is a big, heavy machine. In terms of physical size, it bears quite a similarity to the BBC Micro, being abut twice as large as the Commodore 64, perhaps the main rival, and its weight (at least with the added printer and cassette recorder) is enough to test the strength of many a desktop.

The heavyweight impression continues when you try out the keyboard. There are 69 keys in all, the normal QWERTY keys supplemented by a row of five blue function keys at the top left of the machine, with the four cursor keys and INSERT and DELETE on the right hand side.

The feel is very good, with a heavy, well-cushioned movement making it easy to touch-type at high speed. The space bar on our example, however, feels as if it belongs to a different machine — its action is annoyingly light in comparison with the others, and it announces its use with a rather cheap-sounding clatter.

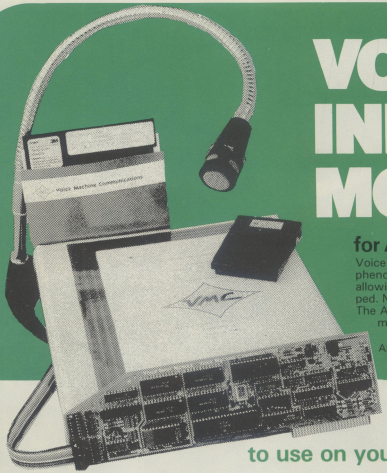
The layout of the keys is reasonably standard, but one particularly odd irritation is the un-shifted question mark. This takes quite a bit of getting used to, especially for anyone who normally uses this as an abbreviation for the PRINT statement in Basic.

The four cursor keys are mounted in a cross configuration in their own area of the keyboard, making cursor control very easy, and providing a workable alternative to a joystick for playing games.

Another thoughtful touch is the clear plastic strip above the five user-definable function keys. The user can remove this to insert his own labels as a reminder of what the keys are programmed to do in any given application. The functions keys are remarkable for the length of the commands which may be assigned to them — a generous 255 characters.

An immediately noticeable feature of the MZ-700 is that the graphics characters are printed on the front surfaces of the keys, the selection between alphanumerics (ordinary letters and numbers) and graphic characters being made by depressing the GRAPH or ALPHA keys.

As we shall see later, this camouflages the Sharp's graphic capabilities to some extent, since the export models of this



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Voice Machine Communications Inc.

Japanese machine have an additional 256 graphic characters available to them.

Moving towards the rear of the machine, it becomes clear why the Sharp is twice as deep as a Commodore 64. The built-in, four colour printer/plotter dominates the machine, and the integrated cassette deck slots in neatly to one side.

This policy of providing built-in peripherals is not new to Sharp, as those familiar with the integral monitors and cassette units of the MZ80 range will testify, but on this latest model its implementation is much more sensible.

For a start, you don't have to buy the add-on bits and pieces if you don't want them. The basic price of £240 is for the bare machine, and our experiences showed that the interface provided for use with ordinary recorders worked perfectly well. Those wishing to use printers other than the £135 miniature are catered for, since there is a plated-over socket marked PRINTER at the back of the machine. This will accept the MZ80A printer, and several other types of printers should be adaptable.

The omission of the monochrome monitor which was a part of previous Sharps is also a sensible move in a market dominated by demand for colour graphics. Supplying a colour monitor would have been prohibitively expensive, but the rich and successful will be pleased to find the outlets for connection to RGB colour monitors and green screen monitors along the rear edge of the machine.

A most unusual, and surprisingly useful feature is the volume control for the internal speaker. We frequently complain about the lack of any sound adjustment facility on computers which do not use the television set as a loudspeaker, but the Sharp allows for midnight Space Invaders sessions while ensuring that "loud" can be very loud indeed!

Another advantage of this approach is that the MZ-700 does not become mute when connected to a monitor.

More common-sense thinking is apparent in the extra cassette ports fitted — although the Sharp cassette unit is very neat and efficient, and reasonably priced at under £40, its use is not compulsory. Most normal small cassette units will cope perfectly well. It all seems to be part of a deliberate policy of giving the user as much choice as possible in the way he or she wishes to use the system.

The other main features of interest on the crowded back panel are the twin joystick port (unfortunately not compatible with the Atari/Commodore standard which is finding favour with manufacturers of specialist custom joysticks), and a large input/output bus for disk drives or other peripherals.

The printer/plotter is bound to be one of the Sharp's most talked-about features, especially since it is perhaps better known as the Tandy CGP 115 in this country. Actually made by Sharp, the basic mechanics of this unit have found their way into a number of re-packaged alternatives, including the recently-announced Oric printer and a forthcoming Commodore version.

COMMENT

Sharp has never made a big impression on the home micro market, but this machine could give the company its best chance ever.

The machine's two weaknesses are its limited graphics and the need to load the Basic from cassette. Both are irritating, but interestingly become less significant the more serious the applications for which the machine is used.

At £240 for the basic unit, the Sharp must be regarded as very good value indeed, matching the Commodore 64 very closely on price and specification.

The bells-and-whistles model with built-in cassette recorder and printer works out at about £420. Again, this is good value for money, making the BBC Micro look over-priced, despite its advanced specification.

Acorn's current launch date for the Electron puts it at a few days after this issue of *Which Micro?* goes on sale. At under £200 it may well be the Sharp's toughest competition.



FINSBURY BENCHMARK

Sharp MZ-700 v. BBC Micro v. Commodore 64

All times in seconds

	Sharp MZ-700	Commodore 64	BBC Micro
1.	12.3	14.1	7.2
2.	3.6	9.5	3.4
3.	9.5	18.0	8.2
4.	8.6	19.9	9.1
5.	9.4	21.6	9.5
6.	17.5	32.0	14.7
7.	32.1	51.5	21.1
8.	82.5	156.5	48.3

For those still unfamiliar with it, the printer is of neither thermal, daisywheel nor dot matrix design — it actually draws the letters on to the plain paper roll using tiny ball-point pens. This makes it rather slow, but the print quality is excellent and the process is fascinating to watch.

The amount of care and thought which has gone into making the MZ-700 is obvious from the hardware design — for attention to detail and thoughtful provision of touches such as the volume control it must be the clear market leader. But when the machine is switched on, this excellence only makes the shortcomings of the Basic more disappointing.

Its main failing is that it is not resident in ROM. Like the MZ80K and MZ80A before it, the 700 has no resident high-level language. After switching on or using the reset button on the back, the user enters the machine code monitor, and the command LOAD permits the loading of Basic from cassette.

The loading process takes almost three and a half minutes, and that can feel more like three and a half hours on occasions. This factor alone is bound to put off many prospective buyers, especially those who have had difficulty loading programs from tape with other micros. To be fair to Sharp, the cassette loading is relatively fast at 1200 baud, and only once did Basic fail to load first time on our review machine, but one wonders what will happen a few months after purchase, when the cassette itself becomes corrupted or damaged as cassettes inevitably do.

As long as replacement Basic cassettes are freely available, and preferably free of charge too, all will be well, but we would recommend sounding out your dealer's attitude before purchase.

Sharp's reason for putting Basic in RAM rather than ROM is that it gives much more scope for using other languages, and ensures plenty of memory is left for serious purposes like word processing or finanical modelling.

The MZ-700 contains a full 64K of free memory, with even screen RAM held separately, and offers 36.5K of space available for Basic programs. But the two machines which offer similar facilities —

THE MZ-700 — A 76K MICRO WITH 4 LANGUAGES & 45 PROGRAMS FOR £215

KNIGHTS DESIGN

We have been to Sharp at Osaka, Japan three times in the last 18 months and have been closely involved in the European release of this mode. Sharp originally intended to export the MZ-700 with 256 characters similar to those on the MZ-80K. We persuaded Sharp to incorporate our character generator which gives 512 characters.

Many computers have a very limited number of characters, often just 128 and sometimes with no small letters. Some micros get around this limitation by allowing the user to define shapes but this involves complex programming. Our easily programmed 512 characters include all the original Sharp shapes with the addition of "outline" letters and numbers, space invaders, rockets, planes, tanks, cars, snakes, bullets, guns, faces, gremlins, fruit, ghosts, flying saucers, chess pieces, a TV set and the MZ-700 itself. For more serious applications we added a mass of electrical symbols including transistors, diodes, capacitors, gates, etc, plus scientific, Greek and other language characters.

All of us at Knights were involved in designing this section of the MZ-700 and we would like to publicly thank the staff at Sharp for their help and enthusiasm. It is a great honour for our British design to be incorporated in Sharp's MZ-700 export production.

FREE PROGRAMS

Each MZ-700 from KNIGHTS will be supplied with 4 languages and 40 programs. The prices in brackets are what you will pay if you buy your MZ-700 elsewhere!

TEN of JAPAN'S best games — SNAKE, SPACE BEE, SEND ONE, PAINFUL MAN, LAND ESCAPE, CIRCUS STAR, SEARCHER, BATTLE, ROUND STREET, & SUPER PUCKMAN.

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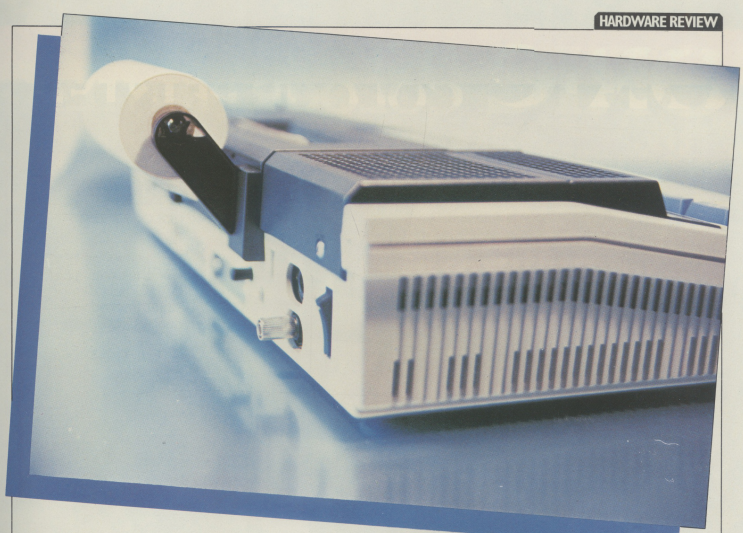


the Commodore 64 and the BBC Micro — both do so in a much more convenient way.

The Commodore's approach is the more flexible — the Basic is held in ROM and overlays part of the RAM when Basic is selected, giving about 38K of program space. The BBC treats the problem differently, with its use of 'paged' ROM chips, so that Basic, word processing or any other chip-based programs can all have full use of the available RAM.

The other way in which the Sharp lags behind these rivals is in its graphics. Games programmers in particular will find it impossible to produce software with the same graphic excellence provided by the easily-programmed sprites of the Commodore or the flexible high-resolution plotting of the BBC Micro which also offers user-defined characters.

To some extent, the Sharp compensates with an amazingly diverse set of predefined graphics characters. The standard 256 characters of the earlier MZ80K are retained, but those models earmarked for export from Japan get an additional, alternative character set, developed by Graham Knight, a third-party computer dealer from Aberdeen who is being charged with much of the responsibility for Sharp's MZ-700 software.

The extra 256 characters give a lot of scope in designing displays, but the inability to plot high-resolution lines between two calculated points is bound to frustrate the games programmer.

Sound is one of the Sharp's stronger points — the Basic offers control over only one "voice", but some demonstrations by Graham indicated that machine code can produce the sophisticated effects familiar from the best software for the Commodore and BBC.

The Basic does feel old-fashioned, and this can be pinned down to the omission of features such as IF . . . THEN . . . ELSE, procedures, or the REPEAT . . . UNTIL offered by the Oric and BBC. Some useful features are implemented, however, with the provision of error handling with ON ERROR GOTO making life easier for programmers.

Although the lack of innovation in this respect is slightly disappointing, it has one great advantage — the MZ-700 is directly compatible with cassette software written for the MZ80K. The later MZ80A is not so tractable, but a software convertor to allow the use of its programs is due for early release.

The inclusion of commands such as CIRCLE at first implies hidden graphics capabilities, but these relate to the printer/plotter rather than the VDU display. They make it very easy to draw graphs and charts, and demonstrate just how important the printer is to the MZ-700 concept.

The command PLOT ON transfers all screen output except graphics characters to the printer, so it is just possible to use the machine without a television or monitor if you don't mind the expenditure on pens and paper. PLOT OFF restores visual output to the screen.

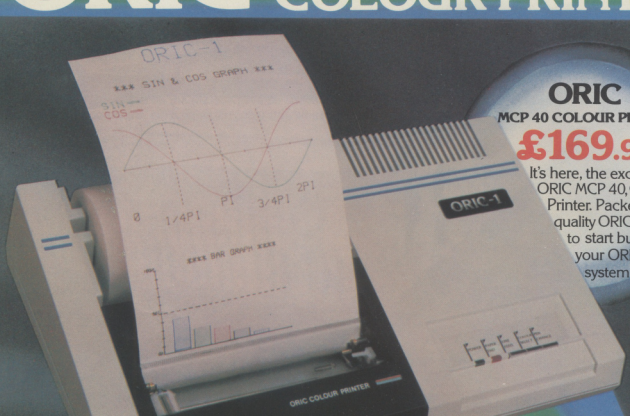
The manual which explains all this is one of the best we've seen. The detail is excellent, and the inclusion of circuit diagrams for the printer and cassette recorder as well as the computer itself indicates real willingness to help. The contrast with almost all other manufacturers is remarkable — only Tandy is comparable, and even the otherwise excellent Aquarius manuals provided by Mattel are lacking in technical information.

Those who really want to learn the Sharp's secrets will be delighted to see a full assembly listing of the monitor program, and an explanation of the processor's instruction set. ■

SPECIFICATIONS

CPU: Sharp LH0080A (Z80A)
Clock: 3 MHz
Memory: ROM 4K (ROM) 2K (character generator) RAM 64K (program area) 4K (video RAM)
Screen size: 40 characters × 25 lines 8 × 8 dot character matrix
Colours: 8 colours for characters 8 colours for background
Music function: Built-in (500 mW max. output)
Clock: Built-in (24 hour clock, no backup)
Keys: 69 keys ASCII standard. Definable function keys, cursor control keys
Editing function: Screen editor (cursor control, home, clear, insert, and delete)

ORIC MCP 40 COLOUR PRINTER



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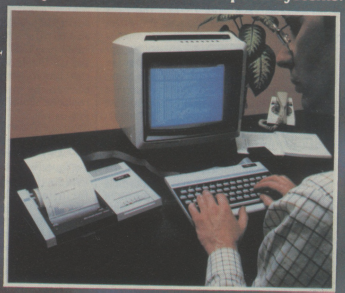
We believe that with the launch of our MCP 40 colour printer, and our combined computer/software value packs, we will continue to lead the small micro market in both quality and value.

*Titles may vary subject to availability but the approximate value will not.



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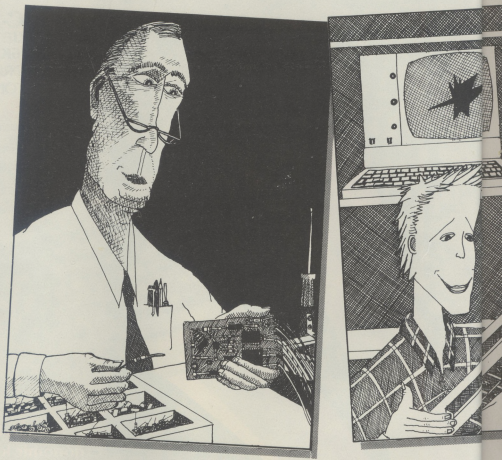
Part 2

My computer

How to get it fixed and where to go — we ta



What do you do if your machine happens to be one of the small percentage that does develop a fault of some kind? Well, as computer-minded people are more inclined to be rational, logical human beings, the first thing to do is probably panic, just like everyone else.

But once you've exhausted your supply of swear words, kicked the cat, and checked the obvious things (see Part I — *Which Micro?* August) like have you paid the electricity bill, what are the next steps you have to take in order to restore your micro to its full functioning glory?

If it is still under guarantee, the simple answer might seem to be just to take it back to the place where you bought it, or return it to the manufacturer in the mail, but this may not in fact be the best thing to do. Different manufacturers have different policies, and some faults can even be fixed over the telephone. This isn't some startling new offshoot of Micronet, but it's just that what might seem to you to be a fault with the computer could be something very simple, like a loose connection or a fault with the power transformer.

"Problems can often be put right over the phone," a spokesman for Dragon Data told me, "as you do get similar faults recurring which can easily be diagnosed, and many of them aren't problems with the machine anyway, so there's no need for someone to go to the trouble of returning it.

"If a fault develops on a Dragon, the first thing anyone should do is speak to someone in our Technical Department, or write explaining what the fault seems to be, and we'll do our best to sort it out. If it turns out that the machine does need to be examined then we'll put you in touch with the nearest service agent.

"We're in the process of setting up a chain of these at the moment, and have just signed contracts with several people, but it does take time to find the right agents. We'll be advertising all about this fairly soon anyway.

"At the moment, of course, all our machines are still under the guarantee period, having only come on the market last August, but there will be service agents available when the guarantees start to run out. If you've bought a Dragon from a dealer then naturally you can take it back to that dealer. Some of them, like Boots, are very helpful and will replace the machine out of stock if they can."

I asked Anton Boyes, who is responsible for the home computer side of Boots, if this was indeed the case.

"Yes," he told me, "that's our policy. We haven't been selling machines for a year yet, so everything we have sold is still within the guarantee period and so should be brought back to us. Although we operate an exchange system, of course we'll check first that the machine actually is faulty, and it's not something as simple as a bad connection somewhere.

"Dragon Data supplies a diagnostic cartridge to all its dealers, and you can run this through the machine to check various functions. We also have set checking routines that we carry out with the other computers we sell, too.

"Once machines start to go outside the guarantee period then we're hoping to be able to offer a repair facility, though that's something that's still under discussion yet, and at the moment any faulty machines that are returned to us have to be sent back to the manufacturers — but we will replace them if we have another machine in stock."

No repair facilities

The biggest High Street micro dealer, WH Smith, has no plans to offer any repair facilities. "We're retailers, not repairers," a spokeswoman told me.

"If someone has bought something from us then they should bring it back at once and naturally we'll do our best to sort it out; but we deal with the manufacturers on this and it's often up to them as to whether a replacement is made, or the customer has to wait for the repair to be carried out. Subject to availability, we may be able to offer an instant replacement, but we couldn't absolutely guarantee it in every branch every time. It just depends on the circumstances."

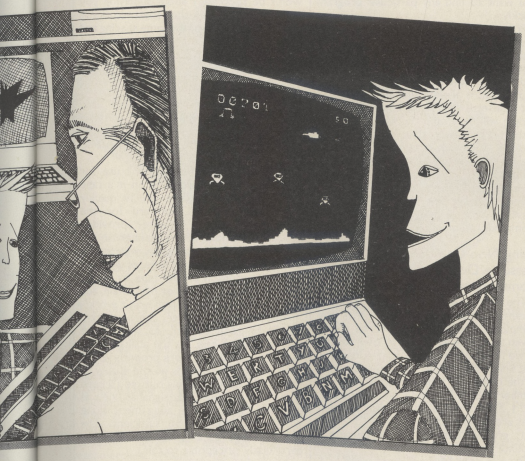
If you happen to have bought a machine by mail order and there's no friendly or even grumpy High Street dealer to return it to, what then? As the chances are that it's a Sinclair machine, I asked a company spokesman about its policy on repairs.

"There are two main loops, if you like: one for mail order and one for purchase through a retailer. For the second you should simply take it back to that dealer, as they all have their different ways of doing things. For our machines, then, the big dealers such as Smith and Boots would probably offer you a simple exchange over the counter and you'd walk out with a new machine.

"For those bought by mail order, we prefer it if the customer writes or rings first to try to explain what is wrong. There are one or two common faults that occur, such as colour drift for example, which may not be the computer but the TV it's being used with, and we can offer advice

r doesn't work

we talk to the manufacturers and dealers



on that without seeing the machine.

"If we do need to examine it then we'll provide labels and so on for returning it to our central warehouse where there's a continual repair process going on. We don't have any official service agencies anywhere, and have no plans to set any up, so the machines do have to come back to us for attention."

Acorn machines are not as widely available through dealer networks as others, and this is partly due to the fact that any dealer selling Acorn machines must also be able to provide some service back-up.

I was informed by yet another spokesman: "An Acorn dealer has to have some on-site servicing facilities, and we do provide our own training courses for this. Not everyone can fix every fault, of course, and one dealer might have to pass the machine on to another for attention, but they're all quite capable of dealing with most of the faults that are likely to occur. It is a fairly wide dealer network, and in fact when someone buys an Acorn machine they're provided with a list of our dealers for reference."

George West is the manager of the Customer Relations and Product Support Department of Atari International, which, because of its dual interest in micros and games machines, has to deal with a variety of both software and hardware problems — including the machines that get blown up by people who think it would be a good idea to connect them direct to the mains.

"Any software problems are easily dealt with," George West explained, "as the software only has to be returned to us with proof of purchase and we'll test it and replace it. For hardware we have the Customer Relations Department here, and if there are any problems then people should get on the phone to us and explain what's wrong.

"We have a separate phone number with five lines, and that's Slough 24561, so if any Atari machine goes wrong then that's the number to ring.

"It often turns out that it isn't the machine that's at fault, of course, but if the people here do deem that it's broken down then they'll refer you to one of the 57 independent service centres that we have throughout the country, although we do also have our own service centre here in Slough.

"But when anyone buys an Atari they also get a booklet listing the service centres, anyway. All people need to do is to take their machine along to one of these, again with proof of purchase, and they'll examine it for them. If it's out of the guarantee period then they should ask for a quote for the cost of repair. Although these centres are independent, they are all Atari trained and supplied, so we wouldn't really recommend going to anyone else."

Although you may well find a good independent repair serivce, there aren't too many around.

Back to the dealer

"Take your machine back to the dealer," a Commodore spokesman said, "even if it's out of the guarantee period. There's nothing much else you can do, unless you happen to live in an area like London, where there are one or two specialised repair services. But we have so many end-users that things have to be done through the dealers, really."

Because the micro boom is so new, with the vast majority of machines in British homes not even being out of the guarantee period yet, one possible method of dealing with repairs has still to be fully developed, and that is the maintenance contract.

Anyone who has ever worked in an office will know that there are many firms offering maintenance contracts for typewriters and other equipment, where for an annual payment they will guarantee to send someone round should any of the equipment happen to break down. But this form of insurance against the cost of repairs hasn't yet touched the world of the home micro.

Maintenance contracts are available on larger business machines, and one company doing this is Mills Associates (0600 4611), which told me that it deals with Commodore, IBM and Zenith machines among others.

"You only really need a maintenance contract where the repair has to be done in a short space of time, and that generally means the business user. We will do *ad hoc* repairs on the smaller machines, with something on a Commodore 64, for instance, costing about £36 to £60 for a single repair, depending on what it is. But as yet there just isn't the demand for maintenance contracts on these smaller machines. Maybe there will be in a few years' time, we don't know."

Though space only permits a look at the policies of the 'big five' micro suppliers, if you happen to have another machine then it might be helpful to check in advance what to do should yours be one of the unlucky ones which develops a fault. Of if you don't yet have a micro, then these various comments are worth bearing in mind while you're deciding which machine to buy, and where to buy it. ■

GET IT

WITH SUCH A WIDE CHOICE OF TAPE RECORDERS FOR HOME MICRO USERS WE H

Cassette decks have come a long way from the days of the giant reel-to-reel recorders which we would get as Christmas presents if we were lucky.

Now you can buy tiny Walkman (or Plodman, if you're like me) recorders that are portable, have a fairly reasonable sound quality, and which don't put too much of a strain on your flexible friends.

Faced with as many types of tape recorders as there are microcomputers, which one do you use for your own computer?

Do I Really Need One

Before plunging into your friendly hi-fi store and purchashing the latest technological marvel you have got to decide whether you want, or need, a cassette deck at all.

The answer for most newcomers to the microcomputer scene will be a definite yes. Disk drives are expensive, microdrives seemingly belong to another age, and the only other readily accessible means of storing your programs and other information is the cassette recorder.

So, having decided that you will buy one, how do you go about making the choice?

If you've got a Vic 20 or a Commodore 64, that choice is fairly limited, as Commodore has so designed the cassette adaptor on these computers that an ordinary cassette deck will simply not plug in. Instead they offer their own C2N as they like to call it, which is compatible, and varies in cost from £25 up to £40 and beyond.

There are good reasons for using this specially adapted cassette deck. It works, is the principal one. It's been designed for Commodore computers, and those are the ones that it will work perfectly well on. They are fairly reliable, and they also have a built-in tape counter: invaluable if you want to find any particular program quickly.

From round about the beginning of June you're not going to have any say in the matter at all. Commodore is annoucing a complete package of Vic, cassette deck, and various software items, for around £139. That is all very well if you haven't got a cassette deck in the house, but most people will have, and the idea of parting with more money than necessary just because Commodore says that you must use its cassette decks is galling to most people.

However, Which Micro? can now proudly reveal that you can use any cassette deck in the world with your Commodore computer! Here's how.

Using Non-Commodore Cassette Decks on Commodore Machines

The only reason why the Commodore cassette decks are unique is that the computer supplies the power to them. Given a cassette deck with its own supply, all we have to alter is the edge connector that links us up to the computer. Looking at the connector, the terminals on it are numbers A,B,C,D,E and F on the bottom, and 1,2,3,4,5 and 6 on the top. The pin-outs are in pairs, thus:

A-1: ground (connect this to computer ground)
A-2: + 5 volts (this one's not used)
C-3: cassette motor (use a remote source i.e. a plug!)
D-4: cassette read (earphone)
E-5: cassette write (microphone!)
F-6: cassette switch (this one's not used either)

The only problem might be getting a suitably sized edge connector: Commodore uses an odd size for its machine. Since Commodore presumably won't be too happy about supplying you with one themselves, the easiest solution is to get a larger one of the same spacing and cut it to fit.

Simple really!

The Problems For Non-Commodore Owners

Everything we mention here will also apply to Commodore people who want to use their own cassette deck. Just what do you look for?

Every recorder that you will use for your computer should have on it a tape counter. This will enable you to quickly search forward or backward for the program that you require, provided you've made note of the number on the counter when the program was saved! This will save you a lot of time, as trying to guess the position on the tape by simply looking at it is a very hit or miss affair, and more often than not it just won't work!

Apart from a counter, the next item should be tone control, as well as the normal volume one. As the ability of any cassette recorder to work properly with a microcomputer depends on the quality of the signal that it's sending out, you'll need to be able to adjust that signal as finely as possible. Mere volume adjustment alone would probably not be sufficient. The Sinclair range as a whole seems to be particularly susceptible to this.

After that, providing that you've got the rudiments of play, record, fast forward and fast rewind, there isn't too much else to look for in the actual deck. If you haven't got a tape counter, a remote microphone socket would be a good idea, as this allows you to actually listen to the programs on the tape as you're doing a fast forward/rewind, which would roughly allow you to gauge when one program ends and another one begins. You'll soon get to know what the beginning of a program (the header) sounds like. The rest of it bears uncanny resemblance to Lou Reed's Metal Machine Music album! Save yourself £6 on record buying and invest in a recorder with a remote microphone. Tandy's recorder, at £29.95, has this feature, but as it also has a tape counter there's not much point in using it.



Commodore's C2N model with built-in tape counter

Microcomputers in Particular

As Spectrums, ZX81s and 80s seem to be among the most popular micros around, we might as well start there.

I know of many people who are successfully using the aforementioned Tandy recorder, although the Smiths Computer Compatible recorder (fancy name for a fairly ordinary cassette deck), and the

TAPED

WE HAVE PUT TOGETHER A GUIDE TO THE BEST BUYS, AND HOW TO USE THEM.



Ferguson 3T27 portable cassette recorder with computer compatibility

Triumph C15 (no, it's not a cassette), all seem to function properly.

The Triumph has the added advantage of being able to adjust the position of the tape head, in case volume and tone adjustment fails you. Badly aligned heads was a common failing on early (and not so early) Commodore machines, and would also affect any other cassette deck. It would mean, amongst other things, that you'd probably never be able to load a commercially available program. So head adjustment is a good idea. Provided that you don't have the ear and the mike leads plugged in at the same time (this causes feedback, and produces extra noise on the tape: not very sensible), the only other problem for Sinclair people is experimenting with the volume and tone controls.

Tone is normally set to maximum, so as to get the sharp edge of the signal being sent out from the micro. Volume, well you'll just have to experiment. No two micros seem to be alike on this, so it will probably take you a little time to get it right. If you have a microphone, one BBC user I spoke to recommended starting off with the volume at the sort of tolerable level you'd use to listen to a record. Any adjustment required from there will probably be fairly minimal.

On the BBC, it's easy to adjust the volume by using the BBC Welcome Tape, and trying a few times until the TAPE SET OKAY message appears on the screen.

The BBC has been the subject of many unfair remarks and rumours about the reliability of using tapes, but in reality it seems to be very tolerant (unlike the Tandy micro which seems to require volume adjustment to within one tenth of a percentage to different volume levels. One user I know has been using the "cheapest and natiest Sharp recorder I know!" for a long time, without any problems whatsoever.

The only problem with the BBC machine is an inherent bug in the original operating system, which you really did sent out for far too long, didn't you chaps? Every now and again (Acorn claims about 6 per cent of the time) when you're recording, the serial ULA is not initialised, and consequently the first block of program is not recorded. This means that you can't subsequently re-load your program. Always make two copies of your program to get around this, working on the old adage about lightning never striking twice.

Dragon users are in a fairly variable position. One user I know just uses the Ferguson radio recorder, and after a little playing around with column and tone has had no trouble at all. Well, there was once, but this sort of thing happens to us all. For one commercially bought program, the tone had to be turned down from its usual maximum position before the tape would load, and then back again for everything else.

Other users however, report many problems. Sony, Aiwa and Hitachi do not appear to be liked by Dragons, nor (as with most other micros), do fairly inexpensive recorders. The time taken to reach full motor running speed is usually too long on the cheaper makes, so you'll save yourself an awful lot of aggravation by spending that extra £15 on a decent machine. A much recommended model appears to be the Binatone Radiocorder, and no one can really complain about spending 20 quid to have a properly working micro.

Anything else, well, the Panasonic Slimline cassette recorder seems pretty reliable. Indeed, Oric specifically recommends that you use that one.

Conclusion

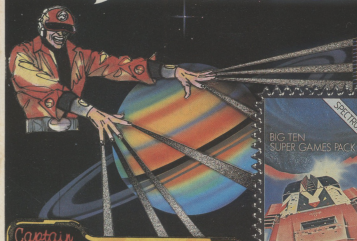
We've recommended some specific recorders for specific machines, that various users have been happily working with on their own particular micro, but the basics remain the same. Tape counters, microphones, and experimentation with volume and tone controls apply to all home computers. It IS worth spending a couple of extra quid to get a decent make. It will save a lot of hair tearing!

And finally, don't spoil the ship for a ha'porth of tar. Use decent cassettes, preferably C10s or 12s (longer tapes suffer from tape stretching, and consequently problems on reading back programs later), and go for a good name like TDK. That little bit of extra expense is well worth it for a trouble free life with your computer. ■



Panasonic Slimline cassette recorder — recommended by Oric

Welcome to the Incredible World of Captain Lasersound! Join me on a Journey to the Fun Palace of The Universe!



LASERSOUND

Captain Lasersound PRESENTS
Lasersound PRESENTS
Lasersound PRESENTS
Lasersound PRESENTS

A Galaxy of New STAR Cassettes making their Screen Debut!

The waiting's over, they're here. A sensational collection of mind warping games, created to stretch the barriers of human endeavour. Do you dare to accept the challenge of Captain Lasersound and enter into the electronic wonderland, a world where only the ultimate warriors survive.

ZX Spectrum 16K/ 48K **£5.00**

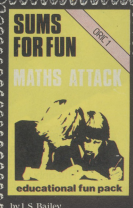
Fantastic collection of arcade thorough-breds and exciting newcomers. Superb hi-res graphics make this pack a visual bonanza. This compendium starts, where others finish.



by Paul A Thomson and Lyndon John Knowles

ZX Spectrum 16K/ 48K **£5.50**

You just love eating those green eggs. But watch out, mother hen is getting angry and when she does the feathers start to fly. A fast arcade game that can make even the bravest turn chicken.



by I. S. Bailey

Oric 1 **£5.00**

Fun while learning with this dual program cassette. Full colour and excellent graphics combine in a shoot-them-down concept. Only the correct answer will bring success. This cassette serves as an ideal method of introduction into computer assisted education.



Hummer house of horror

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SOFTWARE REVIEW

& HOME COMPUTING

September 1983

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Our Spectrum listing shows the way

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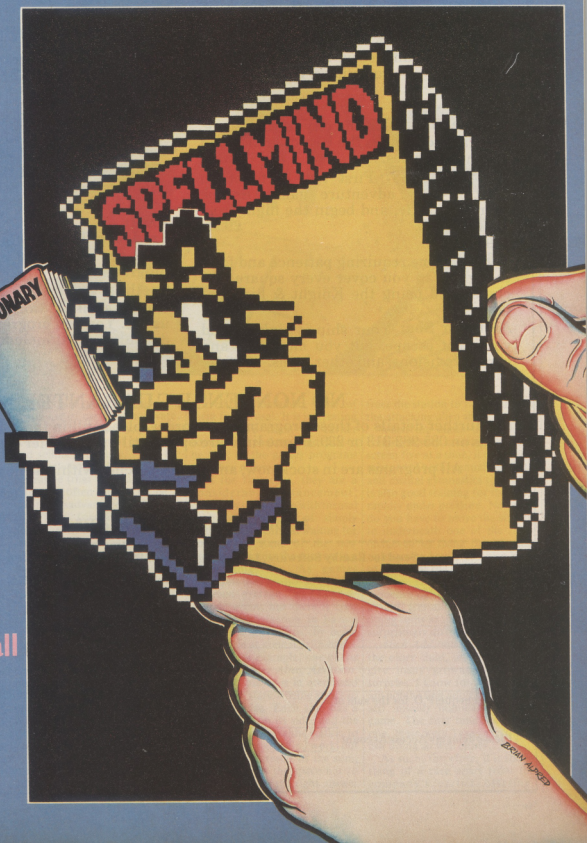
TI's cartridges for the 99/4a

SOFT RELEASE
Full reviews for home micro users

STOP PRESS
What's new on the shelves

PLUS:
Software roundup - what's new?
Commodore Call
Dragon Tales
ZX Soft
Atari Column
Acorn Angle





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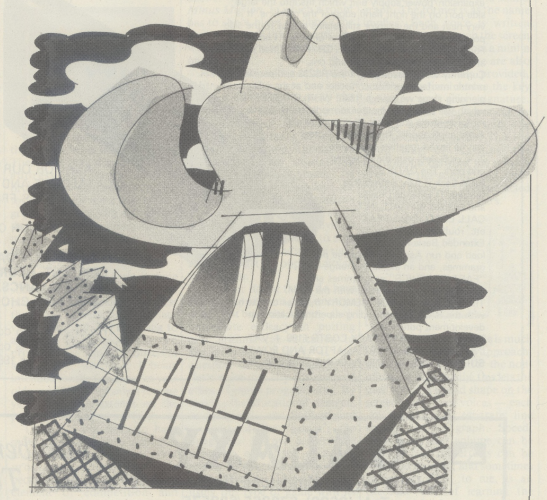
TEXAS TUTORIAL

Texas Instruments manages to combine fun and learning together in its educational programs. We look at its latest cartridge based software



In a funny sort of way, it has been sad to see that dowager duchess of the home computer scene, the Texas Instruments 99/4A, become involved in all the nasty skirmishing of the current price war out there on the High Street. Arguably the first computer to carry the moniker of 'home' machine, and still (arguably) one of the best engineered of that genre, it has had to get into battle with many a young 'upstart' machine, such as the Sinclair, Commodore and Dragon, to name but a few.

The battle, unfortunately, has been about price, and it is one that the dowager had implicitly lost. This had happened precisely because it was the first system, and the best engineered. It was born in an era when micros were still new, and minicomputers reigned. Texas was already known as a mini-maker, and so the 99/4A followed the same high-quality engineering path.

It was thus always an expensive machine, and this was its major drawback, for in trying to compete on price with the other machines, Texas had to cut its profit margins first to the bone, and then on down into the marrow. The company currently carries a noticeable loss on its home computer operation, and that is the big news about the system.

This is a shame in a way, for there are some features about the machine that make it one well worth investigating, especially if you are interested in using the machine for more than just fighting off the massed hordes of Alpha Centaurii (or is it Neasdon?).

The 99/4A has developed an enviable reputation for its educational software, and it is an area which Texas seems intent on exploiting. It may well seem a trifle altruistic of the company, and it does smack just a little of the paternalistic nature so often attributed to those from the southern states of the USA, but education is a BIG NUMBER with them, and they do it well.

The machine itself is, of course, ideally suited to the rigours of educational use. In this context, the users are predominantly young, and predominantly ham-fisted. To combat this, the 99/4A is the home computer industry's answer to the Sherman tank — it is tough, but also tolerant.

It was also one of the pioneers in the use of cartridge software. Now this is, arguably, not the most economic way of producing and selling programs. From the end user's point of view they are expensive (that word again) and this can often prove to be a greater disadvantage to the user than the format's inherent advantages — particularly its ease of use, robustness and safety. These are in practice, however, important features when letting small persons loose on high technology.

The software itself is also good, and the latest batch to come from the company takes the role of fun and game playing in education a bit further. Indeed, some of the new programs now combine some of the features of the classic computer arcade games with a reasonable degree of manual dexterity, and a goodly proportion of mental agility.

The company has introduced a total of eight new programs in the education area, and *Which Micro?* has obtained some of them for perusal. It is interesting to compare them to earlier educational packages and, just to be fair, to the games programs that they mimic.

In the first case, they are a considerable enhancement, especially those to do with mental arithmetic. Instead of simply setting a problem and waiting for an answer, some of the new programs require the answers in a tight timescale. As games programs they are not so exciting as your average 'let's-nuke-a-galaxy' event, but there is considerable satisfaction in having beaten off the 'aliens' by being reasonable at mental arithmetic.

Take, for example, one of the new programs, *Alien Addition*. Here, the player is in command of a missile station being attacked by alien ships. Each ship has a sum written on its side, and the player has to move the station to under a selected ship, work out and enter the result of the sum, and then press the space bar to shoot. Entering the right answer frees the station to fire a salvo at the attacking alien ship.

When the damn things keep coming at you, moving down the screen five at a time, it requires a mixture of both manual dexterity and mental gymnastics to win. It is also good training for thinking rapidly under pressure. Not only do you have to move the station to underneath one of the ships (achieved by using the left and right arrow keys), you also have to work out the sum and enter it before firing. Getting the sequence right is an effort of will in itself (certainly to begin with), doing sums at the same time gets surprisingly difficult.

Alien Addition is certainly for the older child, and indeed can give many grown-ups quite a surprise. I know for a fact that I am not the first adult to find himself initially humiliated by the game. The first time I saw this one, there were Texas executives not doing so well either.

As such, therefore, it is something of a race apart from the company's earlier offering,

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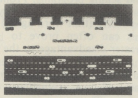

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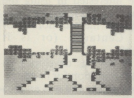

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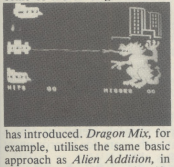
DEALER ENQUIRIES WELCOME

Number Magic. Aimed at the younger user, this provides what are essentially the same tests in mental arithmetic, but in a form where manual dexterity and speed of thought are not important.

Here, each sum is displayed individually, and the player gets time to work out the answer and key it in. None of the sums are too difficult and the program keeps a score to let the players know how well they have done.

On a general point, all the educational programs make extensive use of the 99/4A's colour graphics and sound generation capabilities, giving lavish 'praise' in the form of fanfares and suchlike when the right answers are entered. None of them are too nasty when mistakes are made.

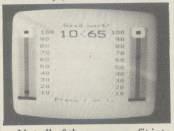
This theme of combining arithmetic problems and the games approach is continued in some of the other games Texas



has introduced. *Dragon Mix*, for example, utilises the same basic approach as *Alien Addition*, in that sums have to be completed in order to win the game.

In this one, the Dragon is defending a city against an enemy equipped with tanks, or ships, or something. Anyway, on the side of the three somethings on the screen are the sums, and on the stomach of the Dragon is just one answer. So, what the player has to do is look at all three sums and work out which matches the answer on the tum.

Now, the Dragon has a long tongue which it points at each of the enemy in turn. The object therefore becomes one of waiting until the tongue points to the right question and pressing the space bar. This will zap the enemy, which has been advancing on the city with a view to bombing it. (This is another example of how sums are important to the defence of life and liberty.)



Not all of the programs fit into this sums-'n'-games category. There are two that attempt to address the more general problems of numerology and try to cover the far more treacherous ground of providing a form for the concepts of numbers and mathematics. Not surprisingly, they are called *Numeration 1* and *Numeration 2*.

The objectives here include such elements as testing the player on the concepts of 'less than' and 'greater than', 'place value', and number rounding to an integer value. The two programs are aimed at different age groups, with No. 1 being intended for the five to seven year olds, and No. 2 for seven to nine year olds. This extends on the program developed in No. 1.

These did not seem to have quite the level of built-in interest and excitment that the other programs produced, partly because there was less of an element of competition and immediacy. Don't let this put you off, however, for numeracy is one of those things that all children should acquire one way or another, and the *Numeration* programs provide a more studious and leisurely environment in which it can be acquired.

The other programs forming the latest batch of releases from Texas include *Alligator Mix*, in which hungry alligators eat apples that have correct answers written on them. The problems are written on the alligators' stomachs and the player has to get the alligator to eat the right answer to win. Then there is *Minus Mission*, in which a robot has to shoot blobs of slime. The player assists this process by working out the problems written on the blobs.

Having dealt with addition and subtraction, there are two more programs that cover the problems of multiplication and division. *Meteor Multiplication* has the inhabitants of a star station defending themselves against meteors containing multiplication problems, by firing a cannon that has the correct answers. *Demolition Division* has four tanks advancing, each with a division problem. The player has to stop their advance by finding the right answers to get the opportunity to shoot them.

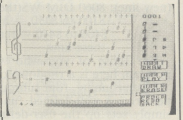
A minor doubt that I do have about the programs, and one that does not detract from their immediate efficacy in putting over arithmetical education in an entertaining way, is the question of actually using the 'let's-nuke-this-city-for-starters' ethos of games programming. By making the educational elements an integral — and fundamental — part of the 'games', the programs follow a sensible approach of making education appear as something else.

I just wonder, however, about using this type of game with its predominantly violent approach as a means of education. It is unfortunate that violence seems today to be 'fun'.

Despite this personal quibble, the programs I tried seemed both inventive and, dammit, exciting. My ego suffered a few times, but then I never was much good at sums.

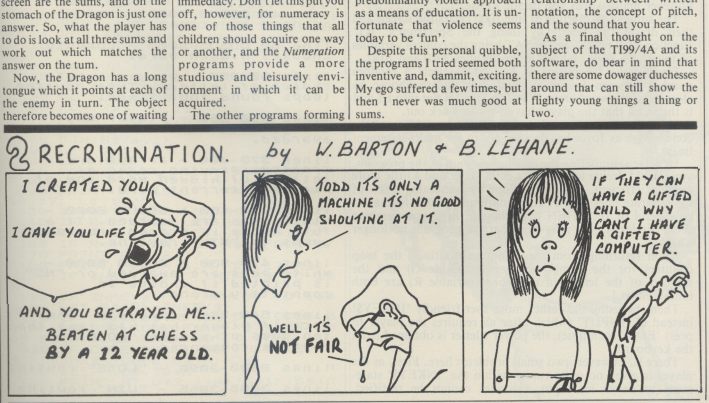
Another program I did enjoy, and one that can be fitted into the education framework, is *Music Maker*. This allows the user to write music (or should I say 'music') for three voices. The effect can be, well, interesting.

Two modes of writing are provided; traditional, and sound graph. The former is as the name implies. Each voice is written onto a one bar stave on the screen using notes ranging from a minim to a semi-quaver. There are also rests and accidentals provided, and the user can choose the key signature and time signature. Each or all of the voices can be played and edited, and the volume can also be set. This is a good way of learning the relationship between the written note and the sound, and quite complex pieces can be constructed by adding subsequent bars.



The sound graph mode is much less 'authoritarian' in approach, and much more fun for the non-musician. Essentially, this lets the user 'draw' a sound shape on the screen using three voices — each voice having a separate line shown on the graph. Speed, pitch, tone and volume can be selected and the effects can be both entertaining, and sometimes surprising. This, to me, is an excellent way of learning the relationship between written notation, the concept of pitch, and the sound that you hear.

As a final thought on the subject of the TI99/4A and its software, do bear in mind that there are some dowager duchesses around that can still show the flighty young things a thing or two.



SPELLMIND

Joyce Tettmar's Spellmind is a rather nice Basic interpretation of the "Word Mastermind" genre of board games.

As it is printed here, it runs on the 16K Spectrum, but with the helpful documentation Joyce has provided, conversion to other home micros should present few problems for the average enthusiast. The key is in those detailed descriptions of how the program works — listing these also helps in the process of eliminating those annoying bugs which usually creep in when typing in a program listing.

One modification which will spring to the mind of all 48K Spectrum owners is the use of extra memory to increase the size of the word store. To make this possible, try the following changes:

(new line): 6010 LET W = INT(RND * the number of words in data) + 1

(new line): 8060 DIM W$(the number of words in data,4)
8100 to 8350 — add/change words
8400 to 8440 — renumber if new DATA overlaps these lines

For those of you who want to expand or alter this program here is a rundown of how it operates.

Upon running, four subroutines are called, each of which performs a well-defined function. The first, at line 9000, simply sets up the user-defined graphics for the game by POKEing the bit-patterns into the relevant area of memory.

Joyce has chosen to represent the user-defined graphics by their character codes rather than by the more usual 'USR "A"' method. It could be argued that as the latter way would mean only one FOR..NEXT loop, it is the more efficient, but this isn't really at issue.

The next subroutine, at line 8000, prints the instructions for the game and reads all the data from lines 8100 to 8350 into the character array W$.

As Joyce says, with a 48K Spectrum, this list of words could be expanded, which would also mean that you would have to increase the size of the FOR..NEXT loop on line 8070 and the DIM W$ statement on line 8060 from 250 to however many words you decide to use.

The subroutine starting at line 7000 clears the screen and then draws the board by using the Spectrum's 'AT' function, and parameters for AT being the control variables of two more FOR..NEXT loops on lines 7020 and 7030.

Finally, the subroutine at line 6000 selects a random number between 1 and 250 and uses this to choose an element of the word array W$. This word is put into L$ and is the word that the player has to try to work out.

Note that throughout the program the readability of the code is high as Joyce has decided not to use multi-statement lines.

If, after assimilating the *modus operandi* of the program, you should decide to make it a little faster and a little more memory efficient, this can be done by combining a few of the separate lines into a rather more unreadable format — be careful of IF..THEN lines though, as if you combine these carelessly, you may find that the program no longer works!

Upon returning from these four subroutines, the loop counters for the number of goes (variable G) and the number of the letters in the word (variable R) are both initialised to 1.

Then, by using the rather more user-friendly 'INKEY$' instead of 'INPUT' (which after all requires the player to press 'Enter' each time), the player's letter is obtained from the keyboard.

There is, however, two small problems here. First, as the player is given no opportunity within the 'INKEY$' statement to delete his input, mistakes cannot be rectified. Secondly, there seems to be a slight misunderstanding of the operation of 'INKEY$'. By the use of the lines

```
190 IF INKEY$ = "" THEN GOTO 190
200 LET B$(R) = INKEY$
```

it is only because of the human's slowness that the structure works.

'INKEY$' returns the character for the key being pressed as the function is called, so that in fact that value that INKEY$ returns to break out of line 190 is only the same as the value put into B$ because the player would have to have pretty fast reactions to change key in between lines 190 and 200. A more correct way of doing it would be as follows:

```
190 LET X$ = INKEY$ : IF X$ = "" THEN
    GOTO 190
200 LET B$(R) = X$
```

A minor quibble, but there are a couple of examples of it in the program and we wouldn't want to be accused of lying.

Lines 210 and 220 check to see that a valid character has been entered, and to change it to upper case if necessary by subtracting 32 from the code. A loop is then entered in which you are given ten attempts at getting the word, with corresponding calls to the subroutine at line 5000 to place the pegs on the board as required.

The comparison of guessed letter against actual letter is done a little inefficiently by converting the four letters of each word into their character code equivalents and storing these in two auxiliary arrays B and L.

You could easily alter this to make string comparisons.

All in all, a nicely structured program demonstrating a few interesting techniques, but with room for improvement by enthusiasts and perfectionists alike.

```
line 20 GOSUB 9000 - define
graphics.

line 30 GOSUB 8000 - print
introductory page and read store
of words into string array.

line 40 GOSUB 7000 - board
printed on screen.

line 50 GOSUB 6000 - computer
chooses hidden word.

lines 60-250 - player inputs
choice of letters. This routine
loops round four times.

lines 260-360 - player may
change mind before pegs are
awarded.

lines 370-400 - arrays are
created carrying codes of
letters of hidden word and of
player's current word.

lines 410-460 & GOSUB 5000 -
black pegs are awarded. If a
full house is scored program
jumps to "WIN" routine.

lines 470-530 & GOSUB 5000 -
white pegs are awarded or "NO"
is printed if choice is
completely wrong.

lines 540-550 - program loops
back if player has had less than
ten goes otherwise "LOSE"
routine commences.

lines 2000-2090 - "LOSE" routine

lines 3000-3065 - "WIN" routine
```

lines 3070-3200 - hidden word is displayed. Another game?

lines 9990-9999 - "Goodbye"

"SPELLMIND" - variables, strings and arrays:

A,B,C - GOSUB 9000 - used to read and POKE data for graphics.

W$() - holds complete set of 250 words.

X,Y - used in FOR-NEXT loops as co-ordinates in PRINT statements.

W - random number (1-250) to choose hidden word.

L$() - array of 4 single character strings comprising 4 letters of W$(W)

B$() - array of 4 single character strings holding player's current guess.

G - counter incremented on each go. Used to determine position of player chosen letters and of pegs.

R - counter incremented after each choice of letter within a go. Used to determine position of player chosen letters.

Q$ - Used with INKEY$ for yes/no? input

B() - each element = CODE of corresponding element of B$()

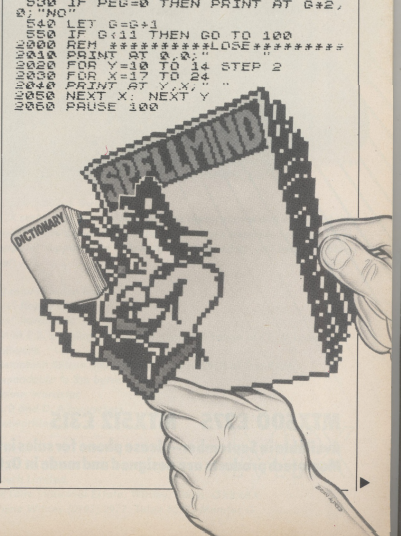
L() - each element = CODE of corresponding element of L$(). Compared with B() for scoring.

PEG - counter incremented each time a peg is awarded. Used to define position of printed pegs.

I,P - define ink and paper colours before pegs are printed

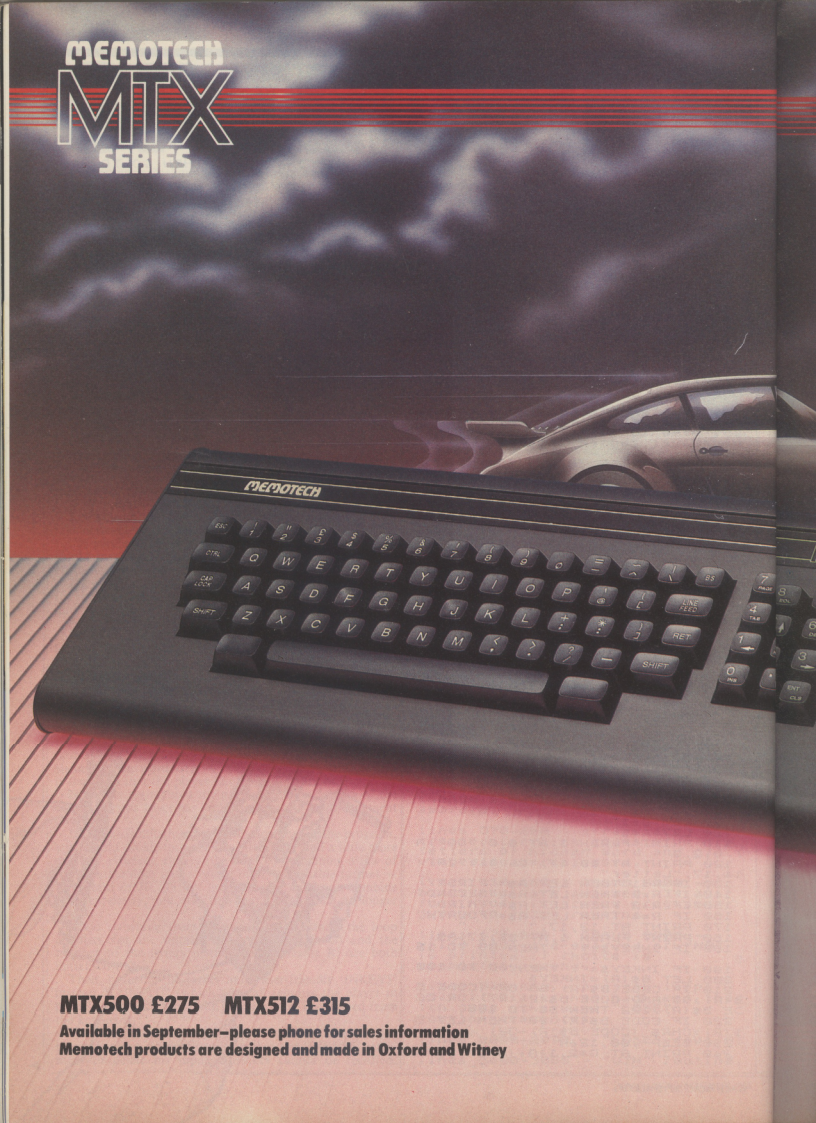
N,M - general purpose counters used in FOR-NEXT loops.

```
  1 REM ************************
  2 REM ****SPELLMIND********
  3 REM ****© J TETTMAR 1983****
  4 REM ************************
 10 BORDER 1: PAPER 1: INK 7: C
LS
 20 GO SUB 9000
 30 GO SUB 6000
 40 GO SUB 7000
 50 GO SUB 5000
 60 FOR X=5 TO 11
 70 PRINT INK 0;AT 0,X;"▀": NEX
T X
 80 DIM B$(4,1)
 90 LET G=1
100 LET R=1
110 PRINT FLASH 1;AT 0,0;"GO";A
T 0,3;G
120 PRINT AT 10,17;"Choose";AT
14,17;"Letter"
130 IF R=1 THEN LET A$="FIRST"
140 IF R=2 THEN LET A$="SECOND"
150 IF R=3 THEN LET A$="THIRD"
160 IF R=4 THEN LET A$="FOURTH"
170 PRINT AT 12,17;"      "
180 PRINT FLASH 1;AT 21,17;A$
185 IF INKEY$<>"" THEN GO TO 18
5
190 IF INKEY$="" THEN GO TO 190
200 LET B$(R)=INKEY$
210 IF CODE B$(R)<65 OR (CODE B
$(R)>90 AND CODE B$(R)<97) OR CO
DE B$(R)>122 THEN GO TO 185
220 IF CODE B$(R)>90 THEN LET B
$(R)=CHR$ (CODE B$(R)-32)
230 BEEP .05,12+R
240 PRINT AT G+2,1+A+(A-1);B$(R
)
250 LET R=R+1: IF R=5 THEN GO T
O 110
260 PRINT AT 10,17;"      ";AT
12,17;"      ";AT 14,17;"      "
270 PRINT PAPER 2; FLASH 1;AT 1
0,18;"DO YOU WISH";AT 12,17;"TO
CHANGE THE";AT 14,19;"WORD? Y/N"
275 IF INKEY$<>"" THEN GO TO 2/
5
280 IF INKEY$="" THEN GO TO 280
285 LET Q$=INKEY$
290 IF Q$="Y" OR Q$="y" THEN GO
TO 320
300 IF Q$="N" OR Q$="n" THEN GO
TO 350
310 GO TO 275
320 BEEP .05,24: PAUSE 5: BEEP
.05,19
330 PRINT AT 10,18;"
";AT 12,17;"      ";AT 14
,19;"      "
335 PRINT AT G+2,5;" ";AT G+2,7
;" ";AT G+2,9;" ";AT G+2,11;"  "
340 GO TO 100
350 BEEP .05,24: BEEP .05,12: B
EEP .05,24
360 PRINT AT 10,18;"
";AT 12,17;"      ";AT 1
4,19;"      "
370 DIM B(4): DIM L(4)
380 FOR N=1 TO 4
390 LET B(N)=CODE B$(N): LET L(
N)=CODE L$(N)
400 NEXT N
410 LET PEG=0
420 LET P=7: LET I=0
430 FOR N=1 TO 4
440 IF L(N)=B(N) THEN LET L(N)=
300: LET B(N)=300: GO SUB 5000
450 NEXT N
460 IF PEG = 4 THEN GO TO 6000
470 LET P=1: LET I=7
480 FOR N=1 TO 4
490 FOR M=1 TO 4
500 IF L(N)<300 AND L(N)=B(M) T
HEN LET L(N)=300: LET B(M)=300:
GO SUB 5000
510 NEXT M
520 NEXT N
530 IF PEG=0 THEN PRINT AT G+2,
8;"NO"
540 LET G=G+1
550 IF G<11 THEN GO TO 100
2000 REM ##########LOSE#########
2010 PRINT AT 0,0;"
2020 FOR Y=10 TO 14 STEP 2
2030 FOR X=17 TO 24
2040 PRINT AT Y,X;" "
2050 NEXT X: NEXT Y
2060 PAUSE 100
```



MEMOTECH

MTX SERIES



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Software for the MTX SERIES

CONTINENTAL SOFTWARE UNIT 24 STATION LANE WITNEY

```
3070 PRINT AT 10,17;"BUMMER!";AT
12,17;"YOU LOSE"
3080 PAUSE 150
3090 GO TO 3070
3000 REM **********WIN**********
3010 PRINT AT 0,0;"  "
3020 FOR Y=10 TO 14 STEP 2: FOR
X=17 TO 24
3030 PRINT AT Y,X;" ": NEXT X: N
EXT Y
3040 PRINT AT 10,17;"WELL DONE!"
: PAUSE 100
3050 PRINT AT 12,17;"You took";A
T 14,17;G;" go!"
3055 IF G=10 THEN PRINT AT 14,22
;"s"
3060 IF G>1 AND G<10 THEN PRINT
AT 14,21;"es!"
3065 PAUSE 100
3070 PRINT AT 16,17;"Here's the"
: AT 18,17;"first row"
3075 PAUSE 50
3080 FOR X=1 TO 4
3090 PRINT PAPER 3;AT 0,4+X+(X-1
)*3;X
3100 NEXT X
3110 PAUSE 150
3120 FOR Y=10 TO 18 STEP 2: FOR
X=17 TO 27: PRINT AT Y,X;" ": NE
XT X: NEXT Y
3130 PAUSE 50
3140 PRINT AT 10,17;"Do you want
";AT 12,17;"another go?";AT 14,1
7;"Y/N"
3150 LET 0$=INKEY$
3170 IF 0$="Y" OR 0$="y" THEN GO
TO 3200
3180 IF 0$="N" OR 0$="n" THEN GO
TO 9990
3190 GO TO 3150
3200 BEEP .05,12: BEEP .05,16: B
EEP .05,19: BEEP .15,24: GO TO 4
0
3000 REM *******PRINT PEGS*******
3010 PRINT PAPER P; INK I;AT G+2
,PEG;"▀"
3020 LET PEG=PEG+1
3030 RETURN
3000 REM ******CHOOSE WORD******
3005 RANDOMIZE
3010 LET L=INT (RND*250)+1
3020 DIM L$(4,1)
3030 FOR N=1 TO 4
3040 LET L$(N)=W$(L,N)
3050 NEXT N
3060 RETURN
7000 REM ******SET UP BOARD******
7010 CLS
7020 FOR Y=1 TO 21 STEP 2
7030 FOR X=5 TO 11 STEP 2
7040 PRINT AT Y,X;"■"
7050 NEXT X: NEXT Y
7060 PLOT 107,175: DRAW 0,-171
7070 PRINT PAPER 7; INK 0;AT 0
,15;"▀"; PAPER 8; INK 8;AT 0,17;
"correct letter";AT 1,17;"correc
t space"
7080 PRINT AT 3,15;"▀";AT 3,17;"
correct letter";AT 4,17;"wrong s
pace"
7090 PLOT 107,132: DRAW 148,0
7100 RETURN
8000 REM ******INITIALISE******
8010 PRINT PAPER 7; INK 1;AT 0,1
1;"
IND ";AT 2,11;"
8020 PRINT AT 8,4;"Discover the
hidden word"
8030 PRINT AT 10,0;"The word is
 of four letters and can be found
 in any good Englishdictionary"
8040 PRINT PAPER 2; INK 7;AT 20,
5;"PLEASE WAIT A MOMENT"
8050 RESTORE 8100
8060 DIM W$(250,4)
8070 FOR N=1 TO 250
8080 READ W$(N)
8090 NEXT N
8100 DATA "ABLE","ACRE","AKIN","
ALSO","ANON","AREA","AURA","BABY
","BAKE","BARK"
8110 DATA "BASK","BEAK","BEEN","
BELT","BILL","BLOB","BOAT","BOLD
","BOND","BOOK"
8120 DATA "BOTH","BRAN","BROW","
BULK","BULL","BURN","BUSY","CALL
","CANE","CASH"
8130 DATA "CELL","CHIN","CHUM","
CLAW","CLOG","COAX","COLD","COOK
","COPE","COST"
8140 DATA "CRIB","CUBE","CURT","
DALE","DARK","DATA","DEAD","DEAR
","DEER","DENY"
8150 DATA "DISC","DIVE","DOOR","
DOSE","DRAG","DRAW","DROP","DUEL
","DUMP","DUTY"
8160 DATA "EARN","ECHO","ENVY","
EVER","FACE","FAIR","FARM","FAUN
","FEEL","FEND"
8170 DATA "FILE","FIRM","FLAP","
FLAW","FLOP","FOAL","FOOD","FORM
","FOUR","FULL"
8180 DATA "FURY","FUSS","GAIN","
GAME","GATE","GIFT","GIRL","GLEE
","GLUT","GOAL"
8190 DATA "GONE","GOOD","GRIP","
GULF","HAIL","HALO","HARE","HATE
","HEAD","HEAT"
8200 DATA "HERO","HIDE","HINT","
HISS","HULL","HUMP","HUSE","HULK
","HURT","IDEA"
8210 DATA "INCH","ITCH","JERK","
JOKE","JURY","JUTE","KEEP","KILN
","KINK","KNOB"
8220 DATA "LACE","LAMB","LANE","
LATE","LAUN","LEAP","LENS","LIAR
","LIFT","LIMP"
8230 DATA "LINK","LION","LOAN","
LONE","LOOP","LOVE","LURE","MACE
","MALE","MASH"
8240 DATA "MATE","MEAN","MEET","
MESH","MIND","MISS","MULE","MOON
","MOTH","MUTE"
8250 DATA "NEAR","NEXT","NOSE","
OATS","OILY","ONLY","ORAL","PACE
","PAIN","PAL"
8260 DATA "PART","PATH","PEAT","
PEST","PINE","PITY","PLUM","POLE
","POOR","POSE"
8270 DATA "PROD","PULP","PURA","
QUIT","QUIZ","RACE","RAIN","RARE
","REEF","RICE"
8280 DATA "RINK","RISK","ROCK","
ROOK","ROSE","RUBY","RUSH","SACK
","SAIL","SAND"
8290 DATA "SCAN","SEED","SELF","
SHIP","SHOU","SIGH","SING","SKIP
","SLAP","SLIT"
8300 DATA "SNAG","SNUG","SOCK","
SOLD","SOOT","SPIN","STAB","STEW
","STUB","SUET"
8310 DATA "SURE","SWAN","TAIL","
TAME","TAXI","TELL","THAN","THIS
","TIDY","TINY"
8320 DATA "TOMB","TRAN","TRIO","
TUNE","TURN","TYPE","UGLY","UNWE
","VARY","VEIL"
8340 DATA "VEST","VINE","VOTE","
WAGE","WALK","WARE","WARY","WASP
","WEED","WEST"
8350 DATA "WILD","WINE","WING","
WOOD","WORD","YARD","YAUN","YELL
","ZERO","ZONE"
8400 PRINT AT 20,6;"

8410 PRINT PAPER 3; FLASH 1;AT 2
0,4;"PRESS ANY KEY TO CONTINUE"
8420 PAUSE 0
8430 BEEP .05,12: BEEP .05,16: B
EEP .05,19: BEEP .05,24: BEEP .1
,24
9000 RETURN
9000 REM ##########WHAT'S UP##########
9010 DATA 0,60,126,126,24,24,24,
24
9020 DATA 255,255,255,255,0,0,0,
0
9055 RESTORE 9040
9060 FOR N=0 TO 1: FOR B=0 TO 7
9070 READ D: POKE USR CHR$ (144+N)+B,D
9080 NEXT D: NEXT N
9100 RETURN
9110 REM #####
9120 REM #   #
9130 REM #   #
9140 REM #####
9150 RETURN
9991 BEEP .05,24: BEEP .05,16: B
EEP .05,31: BEEP .15,28
9995 PRINT AT 11,0;"Thankyou for
 playing Goodbye"
9999 STOP
```

SOFT RELEASE



Ah Diddums

Computer: **Spectrum 16K or 48K**
Price: **£5.50**
Supplier: **Imagine Software, Masons Buildings, Exchange St East, Liverpool, Merseyside.**

When people are bored by standard computer games and it is your occupation to produce and sell these games, it doesn't take you long to realise that you can't go on existing solely by churning out run-of-the-mill stuff, and quite soon originality becomes your key word.

Imagine, which seemed to have started off with this precept in mind anyway, presented two new games to us recently, both of which can certainly claim to be different.

However, whilst this difference is refreshing for we reviewers, it seems that Imagine is trying a new tack, confusion.

On receipt of *Ah Diddums,* I spent a week trying to work out how to play the thing as the instructions, although voluminous, are far from clear, and no matter how I tried, I could not achieve the object.

So, I phoned Mark Butler at Imagine, and finally figured it out — at least it was worth it.

You are a teddy bear (this is a standard chat-up line of mine!), and you have to go and comfort your young human owner who, as owners of teddy bears are wont to do (even Sebastian Flyte), is crying.

To cheer him up, you have to climb out of the toybox that you've been unceremoniously stuck in for the night, and in order to do this, you have to collect all the coloured bricks in the toybox and put them in order at the top of the box.

Simple, I thought, and so indeed it is (initially, anyway) once you have discovered how to actually do this part correctly.

I thought, as indeed did everyone I know who has tried to play it, that this meant that you pick up a brick, and go and deposit it in the position of the same colour at the top. Having done this once, I found that all the brick positions took on arbitrary colours, and thus confusion reigned.

So, instead of doing that, I tried all sorts of things, all to no avail. In the end, I consulted my teddy bear, and he said "phone Imagine". I did, and now I feel like I should be working for Jimmy Young, as I go around saying "this is what you do".

It's easy, really, but daft — you saunter up to the top of the screen with your brick, position yourself a little to the right of the place where the bricks are supposed to go, and drop the brick, whereupon it jumps into its proper place.

Now, I realise that all children expect their toys to be magical at night, but isn't this going over the top, just a little?

Anyway, you do this for all the bricks on the screen, avoiding the soldier on the left hand side, and collecting the little bits and pieces that don't qualify as projectiles (ie the things that disappear when you walk over them), and suddenly find yourself in the next box.

Ahah! a two-toybox family, you think. In fact, it's worse than that, as it appears that these boxes are actually infinite, but I'm probably wrong.

In each box, things get progressively harder, as eventually you get three soldiers, a train set, four mamma dolls resembling loopy cockroaches, two what I can only describe as 'things', and an aeroplane — all out to get you.

Quite an enjoyable game, with quite superb graphics, and a satisfactory antidote to invaders, et al.

Chateau

Computer: **Dragon 32**
Price: **£7.95**
Supplier: **Gem Software, Unit D, The Maltings, Station Road, Sawbridgeworth, Herts.**

"You are in an old chateau. When the old count who lived there died, he left all his worldly goods in the house. He also hid a hoard of treasure (valued at $2 million)."

The opening might not be startlingly original, nor the adventure itself anything out of the ordinary, but this new tape from Gem does offer a certain amount of challenge and amusement.

You always begin in the same room, whose position is indicated in the top right of the screen: 1-3-6. This tells you the floor number, the X co-ordinate and the Y co-ordinate.

Although your start position is always constant, the movements you can make from that room and the objects you will find are different every time you set off, meaning there's always an element of luck no matter how much you learn through several playings.

All entries are single key, and the choices open to you are Move, Explore, Open, Status and Plan. These are really self-explanatory, movement being the usual compass directions, while Plan offers you a floor plan to show where you are and how you arrived there — would that there was a similar plan for life itself.

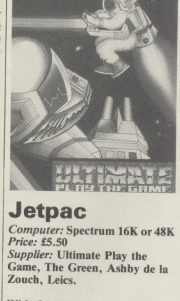
The first three floors our reviewer managed to investigate were all 6×6 in size, and while this sounds small not all the rooms are immediately accessible, and those that are contain pianos, fireplaces, clocks, statues, bookcases and other objects to be opened or explored or both.

The status display is disappointing in that it lists fully the various things you might find such as keys, lamps and clues, so that you know right from the beginning what items you are looking for. The status also has a note of the time lapsed, the treasure collected, and the strength units you hold, which start off at 100 but don't stay that way for long.

Strength is used up when you encounter one of a seemingly infinite number of monsters that populate the chateau: bats, salamanders, Golems and a few horrors more. Faced with one of these you have four options: Retreat, Fight, Gamble or Advice, the final one explaining the first three.

Retreating often works and so saves your strength, but not always; gambling puts your fate in the hands of the RND function and fighting needs some of your strength units to counter those of the appropriate nasty. Run out of strength and it's back to square one, or rather square 1-3-6. If you've amassed a little treasure, though, the computer will do a deal with you and allow you to buy some more strength, but at what can only be described as a Dragonian rate of exchange.

There are still several features our reviewer hasn't yet stumbled across, such as the mysterious travel agent who apparently turns up and whisks you off to exotic climes but the parts explored so far show it to be perfectly adequate. *Chateau* uses up all but about 3K of the Dragon's memory, and responds instantly to the commands, but being about 95 per cent text it does lose out when compared to software which offers you some graphics as well, such as *Pimania* or Wintersoft's *The Ring of Darkness.* Still, it should offer something to all but the hardened adventure freak, who will undoubtedly want more than the vintage offered by this chateau.



Jetpac

Computer: **Spectrum 16K or 48K**
Price: **£5.50**
Supplier: **Ultimate Play the Game, The Green, Ashby de la Zouch, Leics.**

With the now-apparent polarisation of games software houses into the good and the bad, it requires a great deal of skill and experience for a new company to get amongst the established big boys.

According to its press releases, Ultimate has just this skill — it is an ex-arcade game writer — but such claims are sure to engender great expectations.

A new idea, excellent implementation, extreme playability and addictiveness — *Jetpac* has all these, making all our preconceptions well-founded. Basically, capitalism is the name of the game; you have to visit an infinite number of planets, stealing the conveniently floating jewels, gold and treasure while collecting enough fuel to take your rocket to the next planet.

SOFT RELEASE

Every five planets, you have to assemble your rocket all over again, as well as doing everything else. Naturally, the planets' indigenous populations aren't too keen on you stealing all their valuables, and take steps to stop you.

Being a 16K program, there isn't much scope for variation, but even so, Ultimate has laudably created six or seven alien types, with various patterns of behaviour.

The first type always travel in straight lines and so are easy to avoid, but they get progressively more devious as the game is played, the final type being positively man-hunting, and it took us a long time to exactly understand their movement.

With *Jetpac*, as with any arcade game, a technique can eventually be discovered, but before that stage is reached it offers far more enjoyment and fun than the majority of games.

The graphics and sound are truly professional, taking the Spectrum very close to its limits, and the keyboard controls are sensibly placed and easy to master. There is also the option of using a Kempston joystick in place of the keyboard, which is a facility every game should offer, despite the highly personalised views of the use of these aids.

Definitely a 'five star' game in every respect. An excellent buy.

Zodiac

Computer: **Oric 48K**
Price: **£10.39**
Supplier: **Oric Products International, Coworth Park Mansion, London Road, Sunninghill, Ascot, Berks SL5 7SE.**

Zodiac, an adventure game, comes in possibly the most uninspiring packaging around. (It's the same as the 'Welcome to Oric' cassette.) It also comes with both slow and fast recordings.

We could not load either of the fast recordings so we tried the slow one. Success — it was loading! So, we sat back and waited ..... and waited ..... and waited. Some 20 minutes later the game started.

This long wait heightened our expectations of an excellent adventure, but on starting the message "Please wait a minute" appeared. This could only mean one thing. On typing ctrl-C our suspicions were confirmed — the program is written almost entirely in Basic.

It's amazing enough that people still write games in Basic but to expect anyone to pay £10 for an adventure game that will have mediocre response times and allow the player to stop the program to examine both code and data whenever he/she gets into trouble is ridiculous.

The plot is quite straightforward; you have to collect six treasures and return them to the starting point.

The only difficulty arises when you try to get the sixth treasure, which is obtained by placing objects that represent the 12 astrological signs into a secret room.

The cassette inlay claims that the game "has lots of colour and sound" and indeed it has, if randomly changing ink and paper colours on entering each new location counts as colour. This, thankfully, can be switched off, unlike the sound, which is a horrible cacophony that is played on entering each location.

In the end, we deleted the code that produces the sound to make the game bearable. This also improved response times.

In conclusion, this is definitely over-priced at £10.39 but, for those of you who want to write adventure games, having the source code and data may provide some useful ideas.



Zzoom

Computer: **Spectrum 48K**
Price: **£5.50**
Supplier: **Imagine Software, Masons Buildings, Exchange St East, Liverpool, Merseyside.**

Having apparently come to the conclusion that its highly-stylised packaging has taken it above the run-of-the-mill companies, Imagine has decided to consolidate this position by maintaining the price at £5.50 but raising the standard of the packages so far that it leaves everyone else standing.

The new format consists of a very large box with 'Imagine' embossed upon it, that opens up to reveal the cassette and a well-printed instruction leaflet, surrounded by a 'marbly-spacey' high-gloss backing.

Of course, all this flash PR will come to nothing if Imagine's games follow its usual inconsistency of playability mould, but with *Zzoom* Imagine knows that it's not playing around; for once, this *is* the name of the game.

Your mission is to rescue innocent refugees from the genocidal enemy, whose sole intent seems to be bombing them to smithereens. Without you, everything is in the napalm of their hands!

Installed in your 'Ground Skimmer', you await each enemy attack wave, watching the indicator go from condition green through to red, and then the fun starts.

The first four waves consist of a mixture of bomber planes and 'remote piloted vehicles' (rpv); that is, guided missiles.

Just for once it is daytime, with clouds skimming across the scene, the red specks of the enemy gradually getting larger and larger as they get nearer.

At present, you only have machine guns as weapons, but with practice you don't get hit too often. The rpvs dive in horrifyingly realistic 3-D straight for you, and the bombers fire 'exocton' missiles resembling flying swastikas at you.

Your shields allow you to sustain some damage, but as each level is progressively more difficult, it doesn't pay to get hit too often. Another ever-present danger is bad flying, ie hitting the ground. This accounted for more lost ships than any mere rpv until the problem was overcome — then came the tanks.

Again, four waves of these, but the desert (love the palm trees) was teeming with divisions of the things. From now on, despite having missiles as an extra weapon, things get decidedly tricky, and subsequent stages were never reached. The package indicates that submarines and helicopters come into play from this point onwards, but we can't verify this.

A really excellent game, with the best graphics ever seen on the Spectrum. Yes, there are bad points, but they only amount to minor details. Here, though, is a list of the ones we found: poor sound usage; awkward to control when using the keyboard; the program crashes when the Kempston joystick option is selected.



The Black Hole

Computer: **Spectrum 16K or 48K**
Price: **£5.50**
Supplier: **Quest Microsoftware, 119 The Promenade, Cheltenham, Glos.**

The Black Hole uses a difficult key arrangement making it very hard to play, coupled with a rather less than inventive plot.

The scenario is this: in the middle of space, temporarily compressed into your television set, is a black hole which, unlike most other games involving this phenomenon, you do not have to try to avoid — your ship's computer does this for you.

Floating around the hole are numerous aliens on fast, if predictable, courses. Every so often, big jelly-fish type aliens come out of the black hole, and are worth more points, being rarer.

You have at your disposal three weapons — a neutron blaster, which fires in a straight but short line; a positive ion gun, which has a long range but whose path is dependent on your proximity to the black hole; and a negative ion gun, which simply bends in the opposite direction. It becomes easy to see why CND is a burgeoning movement!

In theory, you could just move around zapping the odd alien as you go, but because of the key arrangement, it is not quite so easy. This is the only challenge to the game — figuring out a way of co-ordinating your fingers to be able to use seven keys on the same row. Expletives abound, the mildest being the proposed banishment of the author to his own black hole.

It is said that very little is known about black holes, but Quest teach us one thing — there is nothing to know.

SOFT RELEASE



Backgammon

Computer: **Dragon 32**
Price: **£8**
Supplier: **Microdeal, 14 Truro Road, St Austell, Cornwall PL25 5JE**

The bad news for backgammon players is that it has taken almost a year for the first program to appear for the Dragon. The good news is that this first one has been produced by Microdeal, which has been giving the other software houses scarcely a look-in on the top ten lists.

But you do need to be a player already to make use of this, or at least be prepared to buy a book on the subject, as although the instructions for the program are comprehensive, there are no rules included for the game itself. This does seem to be rather penny-pinching, as versions for other machines find room for the rules on fold-out cassette inserts.

After a short burst of unusual organ-like music, making you feel you're in the inappropriate setting of a church, you are given several options to choose from: double speed, if your machine can handle it; instructions; light pen or keyboard; with or without sound; input dice throws yourself or let the Dragon do it; level of play (0-9); and finally whether you wish to play against a friend, the Dragon, or see the Dragon play against itself.

As can be seen, there are 10 levels of play, despite the cassette sleeve saying nine and the instructions saying six.

The board itself, in high-resolution, takes up most of the screen, and the counters and board are easily distinguished whether playing in colour or black and white. As there is only room on each point for up to five counters, you are also told the number of counters at the top of each point.

Moving is done by giving the number of the point you're starting from, followed by any key, then the number you're moving to, and Enter. A useful facility is the 'u' key, which will repeat your previous move.

The sound option seems at first to be a good thing, giving you a beep to confirm that a key has been pressed, which shows that the writer is aware of the Dragon keyboard problems.

However, I soon dispensed with the sound, preferring to clip a few seconds off the average response time. This seemed to be about 7 to 10 seconds on the lowest level, and between 20 and 30 seconds on the highest, though reaction is much quicker towards the end of the game when counters are simply bearing off, thank goodness.

The program does detect illegal moves automatically, and while it obviously offers most of the facilities you would want from a backgammon program, the most important question, of course, is the standard of play. This is slightly difficult to judge, depending as it does to some extent on the throw of the dice, but at the highest level it did provide a fair challenge to an average player over a series of games.

There was a tendency to make the occasional puzzling move, such as refusing to capture counters when this would have proved extremely awkward for the human challenger, and the prime consideration always seemed to be to move the furthest counters nearer home.

Our reviewer would have preferred a tougher opponent with slightly fewer facilities (why play against a friend on TV when you can use a proper board?), but having said that, the cassette is up to Microdeal's usual high standards and should prove a useful challenge to all but the best players.

View

Computer: **BBC Micro**
Price: **£59.80**
Supplier: **Acornsoft, 4a Market Hill, Cambridge CB2 3NJ.**

The first item on many people's software list is a word processor, and Acornsoft's *View* offers a lot of facilities one would expect of an advanced system. The program has automatic word-wrap, allows block moves, right justification and will search, change, replace or count words. There is full control of the page format and it is easy to correct, delete or insert text.

View is supplied as a 16K plug-in ROM, which has the major advantages that it takes up none of the machine's valuable RAM space and you don't have to load the program to use it.

It is always in the computer and you merely type '*WORD' to see the Command Page come up on the screen. Plug-in ROMs will only work on BBC Micros fitted with operating system 1.0 or later, but a suitable upgrade will be supplied free when ordering *View*, if required.

The word processor works with any of the BBC machine's eight screen modes, although Mode 7 gives the best use of memory and holds roughly 4500 words, seen through a text window 36 characters wide. When using the 80 character per line display of Mode 3, the window expands to 76 characters but there is only room for about 1500 words.

The width of a block of text is governed by the 'ruler' above it — that is a line which is not printed but contains the tabs, left and right hand margins that the following text obeys.

It is a simple matter to alter the tab settings or the width of a ruler to format the text beneath it, either before or after the text has been entered. A new ruler may be inserted anywhere, and can be up to 132 characters wide.

View has been carefully integrated with the design of the BBC Micro, and makes full use of the cursor and function keys on the machine, although the 'copy' key has been disabled.

Most of the function keys are made to perform three actions by combination with the control and shift keys, and a guide to these is supplied with the program to slide under the clear cover on top of the computer. It certainly helps when trying to find your way around.

The 'escape' key acts as a toggle between the entry of text in Text Mode and the Command Mode, from which it is possible to control operations such as printing, filing and word count, search or replace.

Command Mode also displays the remaining memory, the file name, current screen mode and the number of markers set in the text. The 'star' commands, such as *FX and *MOTOR, can all be used in the Command Mode.

In the Text Mode, the function keys may be used to format, amend or correct the text file, and also enable 'Stored Commands' to be placed in the left-hand margin, which take effect only when the document is being printed.

Stored Commands can define things like page layout, headings, printing of page numbers, and the centreing of text. All the commands are described in the *View Guide* and *Into View* books, which accompany the ROM when purchased. They are well-written, and make it easier to get to grips with wp.

The *View* ROM is geared for use with disks, but works satisfactorily with a cassette filing system.

It is necessary to 'save' or 'write' a file on tape or disk in order to print it out, which makes the printing process very slow when cassettes are used.

Before printout, a file can be SCREENed (in 80 character mode if required) to show the final format with page numbers, headers etc. This command is useful, but it has not been carefully thought out, as no effort has been made to indicate the use of special control codes for the printer or, more importantly, the exact position of the edges or end of each page.

One snag with *View* is that it does not cope well with files as they get near to filling the machine's available memory. Rather than writing the file to disk automatically, or telling you to save the file and begin a new one, it becomes somewhat unpredictable in use, and has a tendency to suddenly 'beep' and destroy the line being worked on.

And as the system is fairly complicated to use, it would have been a good idea to include a 'Help' guide to each command — particularly as there is lots of space left in the ROM.

On the plus side, *View* will support continuous processing of sorts when using disks, such that an existing file can be edited and extended into a new one, using the command sequence : EDIT <old filename><new filename>: MORE : FINISH.

The theoretical limit for a file created in this fashion is half the capacity of the disk drive, but it is not possible to make back-ups when working in this manner — as I have just discovered to my cost while correcting this article. Any SEARCH or REPLACE operations would have to be used several times over to check the entire file for one mistake.

View also has a 'Macro' facility, whereby a block of text may be defined and printed anywhere in the text. Each macro has its own two letter code, and can incorporate a number of variables.

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Standard letters can be printed after a fashion using this facility, although the system will not handle external data files, such as mailing lists. *View* can be used to edit Basic programs, although the manual gives no hint as to how to do this.

It is aggravating that adequate control of the printer can only be achieved when the Printer Drivers are bought for the extra £10, and there is at least one bug in the final ROM — checking the page layout using the SCREEN command sometimes leaves the machine in page mode. It can drive you mad if you begin to print, because you have to keep releasing the shift key.

All things considered, *View* does represent reasonable value for money at £59.80 and would be a useful addition to most collections of software for the BBC Micro.

It is likely to appeal to the more 'professional' user needing an 80 column display and advanced editing facilities, although it is not suited to the real business world. It has been designed to work best with disk drives.



Violent Universe

Machine: **Spectrum 16K or 48K**
Price: **£5.50**
Supplier: **Quest Microsoftware, 119 The Promenade, Cheltenham, Glos.**

Whilst by no means winning the most poignant title of the year award, *Violent Universe* is at least a bit more adventurous than the many attempts that abound. However, the game itself fails to break the mould, and this universe's violence is rather more mundane than some of the hell-holes that the Spectrum has already taken us to.

The aim is to traverse this universe as guardian of a 'vital' convoy — ie the more left at the end, the more points scored. This convoy is endangered by anti-matter, but otherwise tame and somewhat predictable, aliens, which can be removed by laying anti-anti — ie real matter — gas clouds in their paths, and it eventually turns out that the only truly violent being in the universe is you.

One reason for your violence could be the not exactly ergonomic ship controls, all the keys initially being on the same row.

Initially, because upon reading the cassette inlay, you discover (almost too late in our case) that you can re-define the layout.

Good practice, but it still doesn't excuse what appears to be one of the author's more disagreeable traits — why start off daftly in the first place?

Possibly this seemingly minor quibble could be overlooked if the game were really original or exciting, but unfortunately it is not, mainly because of the sheer repetitiveness.

ZX Tool Kit

Computer: **16K or 48K Spectrum**
Price: **Unknown**
Supplier: **Star Dreams, 17 Barn Close, Seaford, Sussex.**

When you are developing a long program in Basic on the Spectrum, you will soon find yourself wishing that the Spectrum came with a few more utility functions, so common on the more expensive computers.

This toolkit cassette from Star Dreams offers just such facilities, together with block move, case change, hex dump, search and replace, REM kill, line merge, memory map, trace and variable dump.

Before describing more completely what each function does, it may be useful to explain how the program is used. There are two versions supplied, one for the 16K machine and one for the 48K machine, on opposite sides of the cassette.

Upon loading, the program deletes itself except for line zero, which contains all the facilities as defined functions. You then MERGE your own program, and everything is ready for use.

By simply issuing a 'RANDOMIZE FN x(v1..v2..)' command, the function is invoked, and being in machine code, all are fairly fast. In the example above, x is the particular defined function you require, and v1, v2 are the parameters for that function. There can be between one and four of these parameters. Now to describe them....

Block move; this simply moves the block of lines specified by the first two parameters to the place indicated by the third parameter — at least in theory, as we could not get this one to work.

Case change; there are three options with this function; upper case to lower case, lower case to upper case, and upper to lower, lower to upper. This worked fine, but is there much use for it?

Block delete; as it says, no problems with this function, but be careful when using it. You may get the parameters wrong!

Hex dump; by specifying where you want to print the information (ie the screen or the printer) and from what address you want the dump to start, this does just that, and chucks out the contents of the memory in hexadecimal — not very useful for Basic programmers, and any serious machine code programmer has a good monitor for this sort of thing.

Search and replace; this type of facility is a feature of every good line editor, but in general they are a little more advanced than this, in that it is possible to selectively replace strings. Here, every occurence of the search string is replaced by the new string. Nice, nevertheless.

REM kill; when you get to that happy stage when you are sure your program is finished, you may in your madness decide to get rid of all the helpful REM statements — unless memory is very short, this is not recommended.

Renumber; this is the second most useful function of the lot, and is better than most at doing it. You frequently see similar routines published in the magazines, but very few are able to successfully renumber the destinations in GOTO and GOSUB statements. This one can and does, which slows it down a bit, but it is still very useful.

Variables dump; without a doubt the best of the lot — this prints to your selected output device the entire contents of the variables area, in a very readable format, with line and statement numbers for FOR..NEXT loops.

If you find yourself in the habit of writing extensive and/or tortuous Basic programs, this is well worth getting, but the purists would no doubt say that an efficient programmer has no need for it. Oh, to be efficient!



Egg Farm

Computer: **16K or 48K Spectrum**
Price: **£5.50**
Supplier: **Lasersound, Stratford Workshops, Burford Road, London E15.**

A long time ago, Sinclair released the Spectrum, which despite it's flaws is selling a hell of a lot. The lack of quality inherent in the first batch of software was at least partially excusable — Basic games were considered acceptable.

Fifteen or so months hence, there is really no justification for this still to be the case, and one would have thought that to release another version of an old game into an already overcrowded market was possibly a little foolish.

However, *Egg Farm* seems to suffer from both shortcomings in that not only is it a very thinly-disguised variation on the time-honoured *Pacman* theme, but it's also entirely in Basic. This limits the game in a number of respects: you get character (as opposed to Pixel) graphics, terribly slow reaction times and inefficient memory and therefore lack of facilities.

Quite possibly, these limitations could be overlooked if the game were able to offer anything new, but unfortunately with a myriad manifestations of *Pacman* already available to the Spectrum user, we find it very difficult to recommend this game.

To top it all, we had to break into the program in order to find out which keys to use, as nowhere are they indicated.

Without being unduly discriminatory, it appears that Lasersound is possibly a little naive at present — let's hope this isn't typical of them.

● *This is an entirely new computer system. It was designed with both eyes fixed firmly on the future. So that whatever shape the future takes, we'll be able to fit it into the system. Just as simply as the peripherals and software already available fit into the system. That way, the system will grow with you. And you'll never get left behind.*

● *Based around the Z80A microprocessor, and utilising Microsoft™ BASIC, Aquarius™ has 8K ROM and 4K RAM resident within its console. It is able to provide up to 16 colours and resolution of 320 x 192, and generates its sound directly through the television's speakers.*

● *With twin cartridge ports, the mini-expander allows simultaneous use of additional RAM and software cartridges. Twin disc game hand controls are included and the unit provides two additional sound channels. The 16K RAM cartridge plugs into either the console or the mini-expander, increasing Aquarius™'s RAM capacity to 20K.*

● *With the ability to reproduce the entire graphic and character set of Aquarius™ at 80 characters a second, the printer's 40 column output allows transcription of the complete monitor image.*



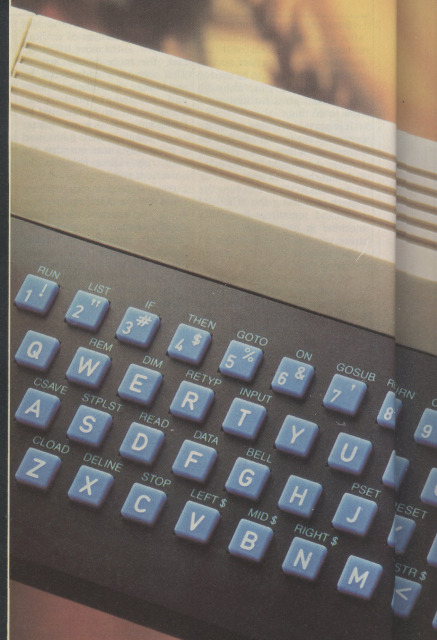
● *Using standard audio cassettes, the data recorder provides storage for programs and information, and allows the use of cassette based software. Incorporating a digital tape counter and transmission indicator, it operates sequential searching.*



● *A large number of games, designed to take advantage of Aquarius™'s sophisticated colour and sound capabilities, are available on cartridges that plug into the console either direct, or through the mini-expander. Cassette based games can be used via the data-recorder.*



● *A wide range of preprogrammed cartridges is available, including the LOGO teaching program and practical home data systems like FILEFORM™ and the spreadsheet calculator package, FINFORM.™*



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Talking Android Attack

Computer: **Dragon 32 (+ 1 joystick)**
Price: **£8**
Supplier: **Microdeal, 14 Truro Road, St Austell, Cornwall PL25 5JE**

"The first of a new generation of talking arcade games," say the ads for this recent *Berzerk* variant from Microdeal, though quite what the androids might have to say to those of us who spend hours trying to wipe them out is probably not repeatable.

In fact what the androids do say in this game is unrepeatable, but that's only because the sound is so metallic and forced that it's impossible to make out exactly what's being uttered. Again according to the ads, the statement at the start of the game is "Intruder alert," though on the version we tested it sounded more like "Issaythanger," a word which would tax even the panel of *Call My Bluff* for a definition.

The second phrase is clear and unmistakable: try and run away and you're called a coward. But the third phrase is another puzzler. Clear the screen and you should be regaled with "I'll get you next time," although it seems to us to be "You are in the next frame." We wouldn't stake money on it, though.

All of which is rather a pity as this does detract from what would otherwise be a fine machine code version of *Berzerk*, for one player only and needing a joystick, and with the familiar introductory options that Microdeal seems to be making standard for its arcade adaptions: background colour in black, buff or green; enter your name; level of difficulty from zero to 15. This skill level affects the number of androids you face, and their ability to zip around and fire at you.

For those not familar with the *Berzerk* scenario, you are trapped underground in a maze of rooms, each one containing several androids who are after you. In this version you are an animated matchstick man, and you can move and fire in eight directions, as well as being able to jump or duck if you can manoevre the joystick just right. There is also a crown in each room, which you collect for extra points, and you must be careful to avoid the radioactive walls. Brush against those and you sizzle like a sausage in a pan.

Simply shooting the androids once isn't enough to see them off, as they only turn into a mine, which you can neither shoot nor touch, and then after a while this hatches into a ghost android, which has the useful ability (for them if not for you) of being able to move or fire through walls.

The game also incorporates a count-down timer, with you scoring what's left on the clock if you kill everything in sight, swipe the crown and escape; and you have a protective suit, whose units are shown at the bottom centre of the screen. As long as you still have three or more of these you can sacrifice one in each room by jumping through a wall to create a doorway.

There is also an automatic difficulty adjustment, which reduces the number of androids you have to face if you're obviously having problems, but will increase their numbers and nippiness if you're getting a bit too big for your matchstick boots.

This is the usual arcade simulation from Microdeal, then, not quite as perfect as *The King* or *Katerpillar Attack*, but not far behind them. The movements in each room, and between rooms, is speedy, though don't go buying it just for the talking element or you might find yourself muttering a few words of your own in response.

Character Generator

Computer: **Dragon 32**
Price: **£9.95**
Supplier: **Gem Software, Unit D, The Maltings, Station Road, Sawbridgeworth, Herts.**

How pleasing to see a piece of software that allows you to create aliens rather than kill them. You're not restricted to aliens, though; you can create whatever you can define in a 9×7 grid — or even several such grids side by side, if you find one too constricting.

The cassette comes complete with four pages of instructions, which are annoying in that they are just too large to squeeze into the cassette case itself, but they do explain very clearly how you can create a file of characters from scratch, or amend a file you've already created, each file being a possible 128 characters in length.

Potential uses that spring immediately to mind are a file of lower case characters, of foreign alphabets such as Greek or Russian, or of various scientific notations. As well as being able to choose between 128 different varieties of alien, of course.

The creation of a file requests you first to input the file name, and then to number each character as you design it. On the left of the screen is shown the large reference grid, with rows labelled A to I and columns 1 to 7. You type in the co-ordinates of each block you wish to fill in and when you are satisfied with the character this is transferred to memory prior to being saved. Invalid inputs are not accepted, and the response is very quick indeed.

Also on display is the character as it will appear in normal size, done on a 3×3 grid to show how a line or row of characters would shape up, thereby automatically reminding you to leave at least one row or column blank to allow for spacing. It would be helpful, though, if you could see the character on its own, too.

When satisfied with the file that you have created (and any character can be recalled at any time simply by typing in its number), type 'End' and then save the file as normal onto a data tape. A second program on *Character Generator* then shows you how to load a file into memory, and gives you a demonstration file of a sine curve to illustrate this, which also shows how characters can be used horizontally as well as vertically, if desired.

The slightly high price reflects the more limited market for a piece of software such as this, especially as more experienced programmers could probably design their own programs to perform these functions, but many readers would no doubt find it a useful tape as it effectively and speedily achieves what it sets out to do.

Metacraft Forth

Computer: **Apple II**
Price: **£79**
Supplier: **Metacraft, 144 Crewe Road, Shavington, Crewe**

Perhaps the greatest problem facing computer users is that of non-standardisation. Metacraft's product proves that Forth is not only different from other languages, it is also prone to variations itself.

The nearest thing to a standard for this particular language is the '79 Standard Required Word Set, and Metacraft has included most of this as a core. A Standard Extension Word Set handles strings and double precision arithmetic, and a Reference Word Set contains words left out of '79 Standard and some "candidates for standardisation" — words which are non-standard, at least for the time being.

Almost inevitably, the manual supplied is a reference work rather than a teaching guide, and as such it performs competently. Anyone wishing to start Forth programming would need to invest heavily in some more general texts on the language and its applications.

One potential stumbling block for many Apple II users is that Metacraft Forth does not support Apple's DOS 3.3, though the necessary interleaving routine can be patched in. The disk handling system included does most of its own housekeeping, updating blocks on disk as the user edits their screen equivalents in memory.

Editing is performed with a screen editor, probably the most accessible feature of Metacraft Forth. Although conventional Apple cursor control (using the ESCAPE key) is not supported, the extra arrow keys of the Apple IIe are compatible.

Getting used to not having the ESCAPE functions can lead to some accidents at first, as the editor uses ESCAPE to cycle overwrite, insert and delete modes: once mastered, however, input and editing are up to word processing standards.

Forth on the Apple is likely to remain the province of specialists. That said, Metacraft Forth runs smoothly and offers an up-to-date vocabulary, including most contemporary Forth improvements and a number of original contributions.

SOFT RELEASE

Homac

Computer: **48K ZX Spectrum**
Price: **£8.95**
Supplier: **David Martin Associates, 71A Princes Road, Richmond, Surrey.**

There comes a time when even the arcade-crazed staff of *Which Micro?* get bored of playing games and settle down to using computers for real applications. However, with Homac, two objections immediately come to mind — first, what Monty Python says about chartered accountancy may well not be the joke it appears to be, and second, is it really viable on a Spectrum?

If you should decide that these conclusions do not hold and you want a program to handle all your home finance, then with a very extensive (not to say formidable) program and equally large manual, Homac at least provides the facilities.

Having acquired the package (on the assumption that you are prepared to commit your financial data to cassette — a prerequisite here), you are then unfortunately faced with the huge job of deciphering the manual. To coin a computer *cliché*, it is not user-friendly, and this is reflected in the product itself — it seems to have been written with the author in mind rather than the user.

Therefore, you either have to re-read the manual a few times, or try using the program a little more than should be necessary in order to get to grips with it. With one hundred different accounts for a veritable multitude of financial sins, clarification comes a long way after confusion.

On initial release, Homac was written entirely in Basic, and even with the new machine-code additions, certain functions can, on the manual's own admission, take up to an hour to conclude. These delays, combined with the inconvenience of loading from cassette, may deter serious use.

So if your home accounts are of such a complexity that you feel you require such a comprehensive system, and you are prepared to put in the effort and time to make use of the program, then certainly Homac would fulfil that need. In general, the average Spectrum owner would probably find this product redundant. If finances were this complex, a human accountant would be needed anyway.



Heathrow Air Traffic Control

Computer: **Any Spectrum**
Price: **£7.95**
Supplier: **Hewson Consultants, 60A St Mary's Street, Wallingford, Oxfordshire.**

It must be said that this is not a standard simulator — in fact, it is not meant to be. It is more a tutor on the subtleties of reality in that it is as near as possible a small-scale emulation of Heathrow's control area. How on earth they managed to get half the London Borough of Hillingdon and substantial proportions of Surrey, Buckinghamshire and Berkshire into 16K we may never know!

Although the cassette cover is by no means startling, there is more information contained therein than is found in most companies' entire product range — a full 11 sides of densely packed text that is initially rather daunting, but is essential reading if one wants to appreciate this product.

Having spent an entire afternoon taking all this stuff in, you are finally prepared to load the cassette and 'play' the 'game'. The inverted commas are not derogatory, they merely indicate that this product is not a game which is played, it is a program that is run.

Apart from reading the text, it is vital that on first running you use the demonstration facility, and closely watch what is going on. If flight simulation, control or just aeroplanes in general interest you, then you can expect some highly absorbing (but very anti-social!) and extremely challenging times with this very well implemented program.

Wordwise

Computer: **BBC Micro**
Price: **£45**
Supplier: **Computer Concepts, 16 Wayside, Chipperfield, Herts WD4 9JJ.**

The design of the *Wordwise* word processor comes as an 8K EPROM for the BBC Micro. It needs a 1.0 operating system (or greater) to run, and once plugged into a spare ROM socket inside the machine it will normally remain dormant until *WORD-WISE or *W. is typed. The chip is then activated and the menu will appear on the screen.

The extreme right-hand socket in the micro should be occupied by the Basic ROM, but placing *Wordwise* there will cause the word processor to run whenever the machine is switched on, as the BBC Micro defaults to the right-hand language ROM on power-up.

Being menu-driven, options such as loading, saving, printing or previewing text are quite straightforward on *Wordwise*, and the normal operating system calls such as *FX and *MOTOR still function in the menu mode. The 'escape' key switches between the menu and 'edit mode' (for text entry), which uses the teletext display and hence is easily read on most monitors and television sets.

A status line at the top of the screen shows a word count, the amount of memory free and whether 'insert' or 'over-write' has been chosen with one of the function keys used for text corrections.

An aid to editing is that text is entered or amended in the centre of the screen, and is always seen in the context of a fixed amount of material either side. The text is moved about this 'centre line' using combinations of the cursor, shift and control keys.

Pressing CTRL «up» or CTRL «down» is particularly useful at the editing stage, displaying one pageful of text at a time.

Embedded commands may be inserted anywhere to govern the format of the document at the printing stage. These commands are differentiated by appearing on the screen in green, or dark grey on a black and white set. As on any word processor they are quite complex, and take some getting used to, but the system defaults to an 'average' set of values for page lengths, justification, top, bottom and left hand margins, which would enable the most inexperienced operator to achieve some sort of printout.

Fortunately, the commands have been carefully named to make them easy to remember. For example, 'JO' means Justification On and 'PLn' will set Page Length to 'n' lines.

Special printer features such as double-width printing and underlining can be obtained anywhere within the text by following the 'OC' command with the necessary printer control codes. It is possible to preview the layout of the text held in memory using the 80 character per line mode of the BBC machine, but this display takes up 16K of RAM and if there is insufficient room the preview will switch to the teletext mode.

There are two nice touches in *Wordwise*. The first is that the 'shifted' function keys can be pre-programmed with commonly used strings of commands or text to save time during text entry and formatting.

Additionally, it has the ability to read Basic programs which have been *SPOOLed as ASCII files from the machine onto tape or disk. In this form the programs may be edited remarkably easily, using facilities like insert and search and replace to knock them into shape at speed.

The drawbacks of the system are that it will not tie in with external data files for standard letters and it will only handle files as long as the machine's memory, or about 4500 words. There is no facility to print multiples of a document, or to draw from several 'chapters' in one printing run.

It is very difficult to create tables using *Wordwise* because of its 40 character display, but owners of another Computer Concepts ROM, the *'Beebcalc'* spreadsheet, will find that they can create tables on that system and incorporate the files in *Wordwise*.

On the plus side, this word processor will print direct from memory, which is a bonus for users running cassettes. Computer Concepts is able to offer the operating systems necessary to run *Wordwise* on BBC Micros without '1.2' for a nominal charge.

While *Wordwise* lacks some of the features necessary for 'professional' word processing, it does offer some nice facilities and is perfect for the hobbyist who needs to edit Basic programs as well as entering and amending normal text without too much effort. And at around £45, *Wordwise* is certainly good value for money.

STOP PRESS

A brief round-up of those software products which landed on the *Which Micro?* desk just too late for a full review

Vic 20



Fantazia

What would you do if you were invaded by beings from the planet Interceptor? Zap!! them of course, while they fly in formation and bombard you with lazer pods. For the unexpanded Vic 20, written in machine code.
Price £6.00
Interceptor Software, Lindon House, The Green, Tadley, Hampshire

ZX81 16K

Cosmic Guerilla

Sounds quite exciting, this one. It's got aliens with no feelings, Svlegian (I had problems saying it too) Raiders and even a Space Farers Anthem. The usual adventure.
Price: £3.95
Quicksilva, 13 Palmerston Road, Southampton SO1 1LL

U.F.O.

You have to blast Kamikaze aliens out of the sky and avoid

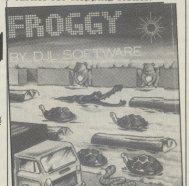


a neutron bomber at the same time.
Price: Unobtainable
Protek Computing, Clydesdale Bank Building, High Street, South Queensferry, Edinburgh EH30 9HW

Spectrum 16K or 48K

Froggy

Froggy wants to go home, but it's not that simple. There's a busy main road to cross, a river to negotiate with logs and turtles for stepping-stones.



Hazards such as alligators and snakes appear as you increase your speed with each game.
Price: £5.95
DJL Software, 9 Tweed Close, Swindon, Wilts



Cosmic Guerilla

Struggle to protect Earth's dwindling supply of ion laser cannons at all costs against waves of rampant alien attackers. Mind they don't wipe out your vital force field, though.
Price: £5.50
Crystal Computing, 2 Ashton Way, East Herrington, Sunderland SR3 3RX



Jumping Jack

At last, something different. Jumping Jack knows something you don't — a four verse limerick. He'll recite it to you if you help him jump the levels to the top of the screen. There are 20 screens to go before you learn the whole rhyme, each completed screen is worth two lines. Happy reciting . . .
Price: £5.50
Imagine Software, Mason Buildings, Exchange Street East, Liverpool L2 3PN

Learn To Play Guitar

This program takes the learner through all the elementary



stages of guitar playing using graphic display and sound.
Price: £6.00
Lasersound, Stratford Workshops, Burford Road, London E15

Roadrunner

Arcade-type game where you have to drive a hot-rod car round a course while trying to avoid various hazards.
Price: Unobtainable
Protek Computing, Clydesdale Bank Building, High Street, South Queensferry, Edinburgh EH30 9HW

Spectrum 48K

From Russia With Luck

This one should keep you amused for a while. You are lost in Europe in possession of secret documents which the KGB (no less) would like. If you don't reach London then the whole Earth is in trouble, but never mind, if all is lost, then you can always take your suicide pill. This game uses genuine European travel timetables (honest).
Price: £9.95
Jabberwocky Software, 610 Washwood Heath Road, Birmingham B8 2HG





Spectrapede

The creepy-crawlies are revolting! Defend your mushroom patch against scorpions, worms and other assorted nasties.
Price: Unobtainable
Protek Computing, Clydesdale Bank Building, High Street, South Queensferry, Edinburgh EH30 9HW

Go To Jail

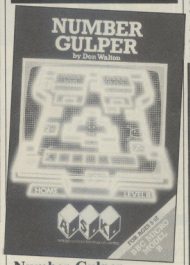
Monopoly-type game with a difference — your Spectrum can play too. Features an automatic honest banker though in my experience it's more fun if the banker's dishonest.
Price: Unobtainable
Automata UK Ltd, 65 Osborne Road, Portsmouth, Hants PO5 3LR



Hummer House Of Horror

You have to rescue a young maiden from the dear old Count's clutches. She's trapped in a room in an old house and you've got four floors of rooms, creatures and objects to contend with. Oh, and one hour to do it in.
Price: £7.00
Lasersound, Stratford Workshops, Burford Road, London E15

BBC B



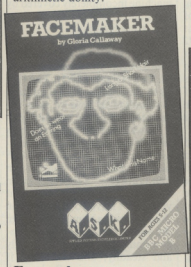
Number Gulper

(for ages 5-12)
Children can practise number skills — addition, subtraction, multiplication and division — in an interactive game by building numbers using only those displayed on the screen. 19 levels.



Number Puzzler

(for ages 4-12)
Four games to improve mental arithmetic ability.



Facemaker

(for ages 5-12)
Face-building step by step.

Hide & Seek

(for ages 5-12)
Three games, *Hide It, Seek It* and *What's Missing?* to develop short term memory for learning to read.



Let's Count

(for ages 3 upwards)
This is a program which introduces children to simple counting using the numbers up to nine.
Price: £9.95 each
Applied Systems Knowledge, London House, 68 Upper Richmond Road, London SW15 2RP

Atari 400/800/1200

Orc Attack

(Cartridge)
The horrible Orcs have the castle under seige but they're bored now and want to play really nasty war games. Of course, you can kill them by hacking their heads off, but your best and final weapon is the boiling oil which will tide you over until the evil Sorcerer appears to spoil the whole thing for you.
Price: Unobtainable



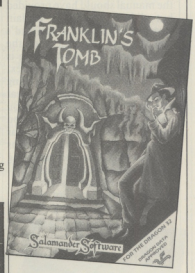
Atari International (UK) Inc, 185-195 Ealing Road, Alperton, Wembley, Middlesex.



River Rescue

(Cartridge)
Rescue some explorers lost in a wild jungle by navigating a dangerous river. You have to avoid or shoot obstacles in this river — which could be extremely messy if they turn out to be mines laid by your rivals.
Price: Unobtainable
Atari International (UK) Inc, 185-195 Ealing Road, Alperton, Wembley, Middlesex

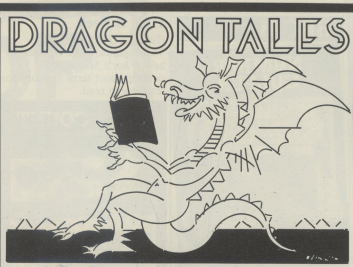
Dragon 32



Franklin's Tomb

Your name is Diamond. Dan Diamond. You must explore the crypt and unlock the puzzle. Adventure game requiring the use of lateral thinking and magic words, comes with 18-page booklet containing witty black and white illustrations.
Price: Unobtainable
Salamander Software, 17 Norfolk Road, Brighton, East Sussex BN1 3AA

DRAGON TALES



Mike Gerrard winds up his look at the best of this year's crop of Dragon books

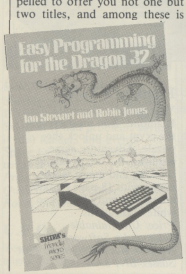
Before continuing last month's round-up of Dragon books, it's worth remembering one of the many Iron Laws of Computing, which people usually discover very quickly for themselves: the quality of a product is in inverse proportion to the claims made by those trying to persuade you to buy it.

I was reminded of the truth of this while looking through the titles now available on Dragon users, and though this month's concluding batch of books is generally worth having if your finances can stretch to it, one of the poorer efforts is described on the jacket as "Another great book," offering "thirty magnificent games."

Among these wondrous offerings are such earth-shattering examples as Hangman, Hunt the Wumpus, Battleships, Pontoon, and two versions of Lunar Lander: Venus Probe and Martian Module. There's a minimum of explanation, and not a lot of high resolution graphics either, so the title I wouldn't rush out and buy is *Dynamic Games for your Dragon 32* by Young, Bush and Shrimpton (Interface Publications, 180 pp, £4.95).

To show that there's no bias against the publisher, Interface has also brought out one of the best books around; *Making the Most of your Dragon 32* by Clive Gifford (296 pp, £5.95). This gives much of the information the manual should have provided but didn't, or didn't explain clearly enough. Clive Gifford's text certainly has clarity, and the book's only real shortcoming is the inexplicable lack of an index, with not even the contents being page referenced. This is a great pity as it is the kind of book you could otherwise turn to if you wanted to check how particular functions worked. The sections on Peek and Poke and mastering graphics are especially useful.

Most publishers seem compelled to offer you not one but two titles, and among these is



Shiva Publishing, whose Friendly Micro series includes *Easy Programming for the Dragon 32* (122pp, £5.95) and *Further Programming for the Dragon 32* (106pp, £5.95), both by Ian Stewart and Robin Jones. I liked these two books, which have a relaxed but informative style, constantly setting the reader small projects to do to ensure that the information is going in. This teaching technique has been around for a few thousand years, so I wonder why most books that are attempting to teach you programming ignore it?

Easy Programming is aimed at the beginner rather than the expert, and takes the view that the most important thing is simply to get the program to work. The second title then aims to improve your technique, so that the programs not only work but do so economically and logically. The only drawback to the two books is the cost. Comparing size, price and content, the Clive Gifford book effectively offers you two for the price of one.

This is far better than offering you precious little for the price of one, which I'm afraid is what *Learning to Use the Dragon 32 Computer* by George Knight does. This is one of a series from Gower Publishing, and costs £4.95 for its 112 pages, many of which are either blank or contain endless repetitions of what has already been said.

Although the book is aimed deliberately at the young and inexperienced reader, there is still an excess of padding: a half-page photo of a cassette tape, in case you don't know what one is like, an exciting photo of what the screen looks like while the machine is searching for a program, and two equally exciting identical photos in different places of the left-hand side of the Dragon. I suppose if you are an absolute beginner and totally baffled by the computer then the book might be worth trying to get through the library, as one read should be more than enough.

Granada's impressive list of computer titles is increasing at the speed of light, and it can now tempt Dragon owners with three books. Least tempting is *The Dragon 32 Book of Grames* by James, Gee and Ewbank, which will set you back £5.95 for its 132 pages of "21 Top Quality Games". This is another book that is not exactly over-modest about its own contents, with a liberal sprinkling of words such as "compulsive" and "impressive", though how anyone can describe a computerised sheepdog trial as "extremely realistic", I don't know. Some of the games are different and good, but the familiar names are all here: invaders, dice, squash, tennis, noughts and crosses, and so on.

Preferable is *The Dragon 32 and How to Make the Most of It* by Ian Sinclair (158pp, £5.95), which, like the Clive Gifford title, explains in much greater detail many aspects of the machine incompletely covered by the manual, such as use of colour and string handling.

Granada's third title — and there are more on the way — is *The Dragon Programmer* by S. M. Gee (160pp, £5.95). The first 20 of those pages are yet another explanation of how to take the machine out of the box and plug it in, which could be regarded as very basic programming techniques indeed, I suppose, though more suited to a chapter on debugging: "Your program doesn't work? First check that you didn't leave your Dragon on the bus coming home". But when the author does get going on programming, he teaches it slowly and steadily, and the book is more a course in Basic with special reference to the Dragon. A useful one to have.

Some titles fail because they try to cover everything, so you get half a dozen books competing for the same market.

More successful are those that stick to one topic and cover it in greater depth, which is what Keith and Steven Brain do in *Dragon 32: Games Master* (Sunshine Publications, 200pp, £5.95). If you can't write a half-way decent game after reading this then it will be down to your own lack of imagination, not any fault of the authors, who, because they are covering a limited topic, have the elbow-room to spend whole chapters on one technique, such as scrolling or constructing a simple maze. They also believe in making the reader do regular homework at the end of each chapter, and for that and other reasons I would recommend the Brains' book as the best of this month's selection.



As we all know, space is the final frontier, and as the editor only allows us so much of it every month there isn't room for a run-down on the many Tandy books that Dragonites could delve into, so don't forget to look round your nearest Tandy shop as well, if you haven't already.

If you're dying to get into assembly language, there's a book called *6809 Assembly Language Programming* by Lance A. Leventhal, published by Osborne/McGraw-Hill in the States but available here at a massive £12.95 for a heavy tome. I can't tell you exactly how big it is, as the pages aren't numbered, but if it does nothing for your programming it'll at least develop your biceps. Then if you get fed up with it you could always try tearing it in half.

A quick calculation with pen and paper (you remember those, don't you?) shows that if you bought all the books I've reviewed in the last two months it would set you back £102.70. Are there any bets on when the cost of the books going up will meet the cost of the Dragon coming down?

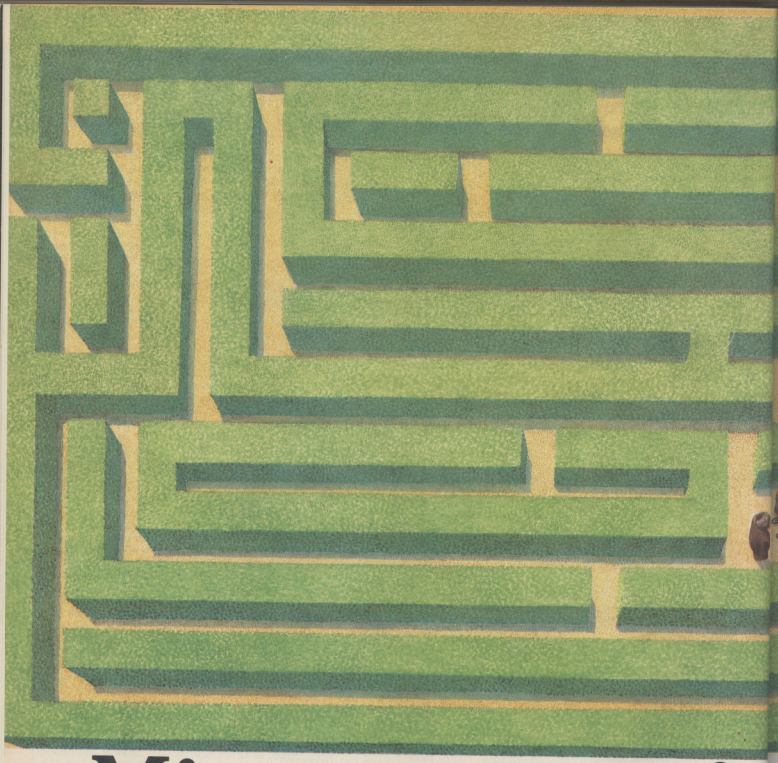
SUBMARINE HUNT

A simple but amusing game from the Garveys of Osterley in Middlesex, Submarine Hunt is reminiscent of those 'Battleships' games which people played before the invention of the personal computer.

Using your three remaining depth charges, you must track down and destroy an enemy submarine. The cove in which the sub is trapped is divided into a grid, and you enter the co-ordinates of the square you wish to attack.

Added interest is provided by the sound effects. Full instructions are included in the program.

```
10 GOTO1480
20 DIM SHP%40,10:DIM DCH%3,5:DIM RKT%7,4)
30 PMODE3,1:SCREEN1,1:PCLS
40 REM DRAW GRID
50 FOR%=3&TO15&STEP40
60 LINE(A,46)-(A,166),PSET
70 NEXTA
80 FORB=46TO166STEP40
90 LINE(36,B)-(156,B),PSET
100 NEXTB
110 REM DRAW REF LETTERS
120 DRA"BM7,59;D15"
130 DRA"BM0,101;UR15DTL15DBR15"
140 DRA"BM0,141;UR15D7L10R10D8L15U2"
150 DRA"BM49,15;U15R15D15U8L15"
160 DRA"BM89,15;U15R15D7L15R15D8L15"
170 DRA"BM129,15;R15U2D2L15U15R15D2"
180 REM DRAW SHIP
190 DRA"BM210,36;H5R10U3L8U1R9D4R6U4R5U6D6R6D4R10D5L27"
200 PRINT:220,94;2,P
210 REM CHOOSE SUB POSITION
220 X=RND(3):Y=RND(3)+3
230 IFX=1THEN C=36
240 IFX=2THEN C=76
250 IFX=3THEN C=116
260 IFY=4THEN D=46
270 IFY=5THEN D=86
280 IFY=6THEN D=126
290 TRY=0
300 REM NEXT GO STARTS
310 G=B:H=U:J=0:K=0:E=0:F=0
320 TRY=TRY+1
330 IF TRY=4THEN1140
340 A$=INKEY$
350 IFA$="A"THEN E=36
360 IFA$="B"THEN E=76
370 IFA$="C"THEN E=116
380 IFA$="1"THEN F=10:L=46
390 IFA$="2"THEN F=18:L=86
400 IFA$="3"THEN F=18:L=126
410 G=E+17:H=F+21:K=0
420 REM CHECK FOR A HIT
430 IF E=0 OR F=0THEN340ELSE440
440 GOSUB490
450 IFE=C AND L=DTHEN760
460 IFE=C OR L=DTHEN1030
470 IFE<>C AND L<>DTHEN490
480 REM MOVE THE SHIP
490 GET(206,18)-(246,36),SHP,G
500 POKE65495,0
510 FORI=20STO 1STEP-2
520 PUT(I,F)-(I+40,F+18),SHP,PSET
530 NEXTI
540 REM DROP CHARGE
550 IFE=36THEN DRA"BM54,42;D3"
560 IFE=76THEN DRA"BM94,41;D3"
570 IFE=116THEN DRA"BM134,41;D3"
580 IFL=46THEN J=H+20
590 IFL=86THEN J=H+60
600 IFL=126THEN J=H+100
610 GET(0,H)-(0+3,H+5),DCH,G
620 FORI=H TO J
630 PUT(0,I)-(0+3,I+5),DCH,PSET
640 SOUND100,1
650 NEXTI
660 POKE65494,0
670 RETURN
680 REM MOVE SHIP BACK
690 GET(E-1,F)-(E+39,F+18),SHP,G
700 POKE65495,0
710 FOR2=E TO 20STEP2
720 PUT(2,F)-(2+40,F+18),SHP,PSET
730 NEXT2
740 POKE65494,0
750 RETURN
760 FOR I=20TO 0 SUB
770 DRA"BM170,100;U10R7F3D4G3L7"
780 DRA"BM134,100;U10"
790 DRA"BM180,100;U10R10D5L10R5F5"
800 DRA"BM202,100;U10R10L10D5R7L7D5R10"
810 DRA"BM216,100;R10L10U10R10"
820 DRA"BM230,90;R11"+"DRA"BM236,100;U10"
830 DRA"BM188,115;U10D5R10D5U10"
840 DRA"BM202,115;U10"
850 DRA"BM206,105;R12"+"DRA"BM212,115;U10"
860 Z$="H3E3R15U4R6US8R2U7D7R2D5R6D4L15R15R3F3G3L3"
870 PLAY"O5T40V31CDEFGABCDEFGABCDEFGABCDEFGABCDEFGABCDEFGAB"
880 FOR I=0TO500:NEXT
890 IF X=1AND Y=4THEN DRA"BM40,76"+Z$
900 IF X=1AND Y=5THEN DRA"BM40,116"+Z$
910 IF X=1AND Y=6THEN DRA"BM40,156"+Z$
920 IF X=2AND Y=4THEN DRA"BM80,76"+Z$
930 IF X=2AND Y=5THEN DRA"BM80,116"+Z$
940 IF X=2AND Y=6THEN DRA"BM80,156"+Z$
950 IF X=3AND Y=4THEN DRA"BM120,76"+Z$
960 IF X=3AND Y=5THEN DRA"BM120,116"+Z$
970 IF X=3AND Y=6THEN DRA"BM120,156"+Z$
980 FORI=1TO1000:NEXT
990 FORI=1TO48STEP RND(6):C=RND(4)
1000 CIRCLE(E+20,L+20),I,C,,3:SOUNDI,1
1010 NEXTI
1020 GOTO1270
1030 REM SUB NEAR
1040 FORI=E TO E+40STEP5
1050 LINE(I,L)-(I,L+40),PSET
1060 NEXTI
1070 FORM=1TO3:SOUND235,4:FORD=1TO30:NEXTD:SOUND230,2:FORR=1TO500:NEXTR,P
1080 GOSUB680:GOTO300
1090 REM SUB NOT HERE
1100 LINE(E,L)-(E+40,L+40),PSET
1110 LINE(E,L+40)-(E+40,L),PSET
1120 PLAY"O1T15V31CDEFCDEF"
1130 GOSUB680:GOTO300
1140 REM SUB GOT YOU
1150 U=46
1160 DRA"BM2,34;D1R5"
1170 GET(J,U-14)-(J,U-10),RKT,G
1180 POKE65495,0
1190 FORa=1TO204STEP2
1200 PUT(W,U-12)-(W+7,U-9),RKT,PSET
1210 SOUND180,1
1220 NEXTW
1230 POKE65494,0
1240 FORI=1TO40STEP RND(6):C=RND(4)
1250 CIRCLE(210,36),I,C,,3:SOUND80,1
1260 NEXTI
1270 REM ANOTHER GO
1280 DRA"BM8,186;U8R9D4L8R8D4"
1290 DRA"BM14,186;U8F8U8"
1300 DRA"BM30,186;H3E2E3F3D2G3L1"
1310 DRA"BM41,186;U8L4R7"
1320 DRA"BM49,186;U8D4R8U4D8"
1330 DRA"BM61,186;U8R6L5D4R4L4D4R6"
1340 DRA"BM71,186;U8R8D4L8R2F4"
1350 DRA"BM91,186;U8R6D2U2L6D8R6U4L2"
1360 DRA"BM101,186;U8R6D8L6"
1370 DRA"BM120,186;U8D4R8U4L8D"
1380 DRA"BM132,186;U8"
1390 DRA"BM138,186;U8L3R7"
1400 DRA"BM154,178;F2"
1410 DRA"BM162,186;E8"
1420 DRA"BM162,178;F8"
1430 DRA"BM170,178;D2"
1440 B#=INKEY$
1450 IF B#=""THEN1440ELSE1460
1460 IF B#="Y"THEN2000ELSE END
1470 REM GARVO-SOFT CREDITS
1480 DATA250,202,314,249,281,313,228,229,230,231,234,235,102,260,261,262
1485 DATA263,266,267
1490 DATA167,88,277,134,37,270,51,238,307,112,148,154,273,78,202,100,217
1493 DATA298,50,145,100,303,203,81,213,47,115,149,214,36,68,140,54,211
1495 DATA304,123,268,133,297,83,241,73,110,132,212,276,106,299,105,137
1497 DATA219,107,57,243,39,233,43,120,142,42,153,86,46,76
1500 DATA48,91,111,204,103,208,38,216,275,135,218,110
1510 CLS0
1520 FORI=1TO3:READX:SOUNDX-60,1:PRINT@X,CHR$(186):NEXT
1530 FORI=1TO3:READX:SOUNDX-60,1:PRINT@X,CHR$(181):NEXT
1540 FORI=1TO6:READX:SOUNDX-60,1:PRINT@X,CHR$(179):NEXT
1550 FORI=1TO7:READX:SOUNDX-60,1:PRINT@X,CHR$(188)+NEXT
1560 FORI=1TO76:Y=RND(255):READX:SOUNDY,1:PRINT@X,CHR$(191):NEXT
1570 PRINT@429,"PRESENTS":
1580 PRINT@480,"SUBMARINE"+CHR$(128)+"HUNT";
1590 FORI=1TO3000:NEXT
1600 FORI=1TO300:NEXT
1610 CLS:SOUND200,1:PRINT@224,"DO YOU WANT INSTRUCTIONS ? (Y/N)";
1620 A#=INKEY#:IF A#=""THEN 1620ELSEGOTO1650
1630 IF A#="N"THEN CLS:GOTO20
1640 IF A#<>"Y"OR A#<>"N"THEN1600
1650 REM INSTRUCTIONS
1660 PRINT"YOUR MISSION IS TO LOCATE AND"
1670 PRINT"DESTROY AN ENEMY SUBMARINE WHICH"
1680 PRINT@64,"YOU HAVE TRAPPED IN A SMALL COVE"
1690 PRINT@96,"SOMEWHERE IN THE MEDITERRANEAN"
1700 PRINT"SEA,YOU HAVE ONLY THREE DEPTH"
1710 PRINT"CHARGES LEFT ON BOARD YOUR SHIP"
1720 PRINT"SO IT IS VITAL THAT THEY ARE NOT"
1730 PRINT@224,"WASTED."
1740 PRINT"THE COVE HAS BEEN DIVIDED INTO A"
1750 PRINT@288,"GRID OF NINE SQUARES.YOU CHOOSE"
1760 PRINT"WHICH SQUARE TO EXPLODE ONE"
1770 PRINT"DEPTH CHARGE IN BY THE REFERENCE"
1780 PRINT@384,"LETTERS AND NUMBERS AT THE TOP"
1790 PRINT"AND SIDE OF THE SCREEN"
1800 PRINT@480,"     ANY KEY TO CONTINUE";
1810 A#=INKEY$
1820 IF A#=""THEN1810ELSE CLS:GOTO1830
1830 PRINT"WHEN THE DEPTH CHARGE EXPLODES"
1840 PRINT"YOU WILL HEAR ONE OF TWO SOUNDS"
1850 PRINT"THE FIRST LINE A SONAR WILL SHOW"
1860 PRINT@96,"THAT YOU HAVE EXPLODED IN EITHER"
1870 PRINT@128,"THE SAME HORIZONTAL OR VERTICAL"
1880 PRINT"LINE AS THE SUBMARINE.THE SECOND"
1890 PRINT@192,"TOGETHER WITH A CROSS IN THE"
1900 PRINT"SQUARE SHOWS THAT THE SUB IS NOT"
1910 PRINT@256,"IN THAT HORIZONTAL OR VERTICAL"
1920 PRINT"LINE,IF YOU FAIL TO DESTROY THE"
1930 PRINT"SUB WITH YOUR THREE TRIES THEN"
1940 PRINT"THE SUB IS FREE TO DESTROY YOU."
1950 PRINT"THE SUB WILL NOT BE IN THE SAME"
1960 PRINT"SQUARE IN FUTURE HUNTS."
1970 PRINT@480,"     ANY KEY TO START"
1980 A#=INKEY$
1990 IF A#=""THEN1980ELSE CLS:GOTO20
```



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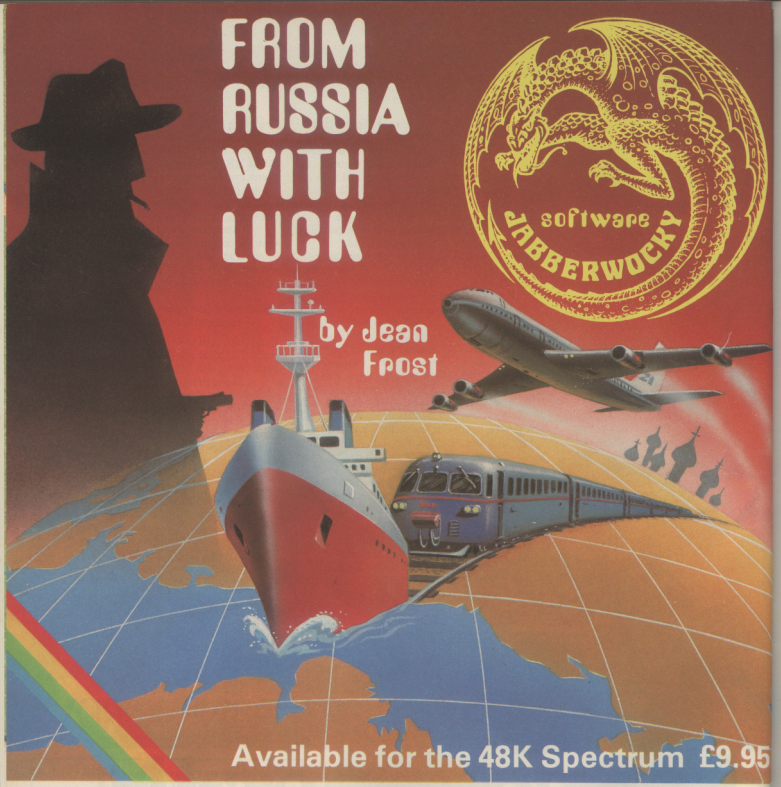

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JABBERWOCKY



Pete Gerrard reflects on the importance of public relations, user groups and US mags

Way back in June, after the heady success of the Pet Show, there were a lot of new Commodore products heralded as being just around the corner.

The Show was successful in terms of numbers of people through the door, numbers of new products that Commodore managed to get almost ready for the Commodore 64, and the numbers of 700 series machines that were on display running a wide variety of software.

So successful as a company public relations exercise was it that, just one week after the extravaganza was over, we received a press release regarding next year's Show, saying that (apart from being at the same venue) the Show for 1984 would run from the 4th to the 11th June.

You don't need a Vic 20 to work out that that means an eight day Show, running from Monday to Friday.

One could cynically argue that the new products announced for 1983 might actually be on sale on the last day of that Show. Certainly there's no sign of any of them appearing in the shops yet.

If you went to the Show you'll certainly remember that amazing football game for the Commodore 64, a two-player game featuring crowd noises, two complete teams and a Bruce Grobelaar impersonating goal-keeper. It lacked the toilet rolls and hooliganism, the tackles from behind and players being sent off, but football could do without all that anyway.

It was also being offered by one unscrupulous Commodore employee on disk, to anyone who would care to buy him/her a rather large supply of alcohol. Being offered typical *Which Micro?* column rates I had to turn that offer down, but it seems that the only way to get your hands on a copy of the program today would be to get in touch with that self-same employee.

There were many other games for the 64 there as well, but they too are noticeable in the shops only by their absence. When will Commodore learn that, if you announce a product you've also got to release it!

One Commodore employee was heard to say to one poor buyer that the 500 series would be on sale again in the summer. Whatever else he said, he neglected to report that it wouldn't be on sale in the UK. Or anywhere else, for that matter.

More Exhibition News

Also on display at the Show was Jeff Minter, the name behind the amazing Llamasoft. He writes great games, just about everything produced by Llamasoft is a gem, but...oh dear! If he ever appoints a PR company it'll have its work cut out.

Interceptor Micros suffers from the same fate at the hands of its diminutive star writer.

These new companies, products of a microcomputer age that has made them very rich very quickly, will have to learn just as much as Commodore will that it takes more than great software (or great hardware) to keep a company going. You need image too, my friends.



All right! Let's see it work this out, then.

Since the Show, there has been nothing too new on the Commodore front from the company itself. New employees come and go, most of whom seem to have had most of their computer experience selling milk, or marketing porno magazines — OK, I admit I made that one up! — or other jobs which have little or no relevance to the computer world.

Outside Commodore, however, many things are happening, you'll hopefully be pleased to know.

For instance, price cuts by the major stores continue to bring the cost of Vics and 64s down to ever more affordable levels, although there's plenty of margin yet for more cuts.

If, as seems to be true, the Vic 20 costs more to make than the Commodore 64, why is there still a vast price differential between the two? Commodore has the opportunity to wipe out all the opposition, but it just doesn't seem to be taking it.

Still, if you live in London you can always go along to Morgans Camera Store in Tottenham Court Road and pick up a nice, cheap second hand machine. See July's *Which Micro?* for more details.

New Bookware

Well, you've got to call it something. There's software and hardware, so why not bookware?

Whether you buy a machine at full price or not, you will presumably be wanting further information about your new computer sooner or later, so let's take a look at some of the American magazines that produce Commodore dedicated material.

Of these magazines, Commodore's own *Power/Play* (the games one) and *Commodore: The MicroComputer Magazine* (the more serious one) are getting better, but not yet worth the effort of seeking them out.

However, if you want to know what our transatlantic cousins are up to, writing to Commodore UK (Vicsoft, 675 Ajax Avenue, Trading Estate, Slough, Berkshire) should elicit a response.

On the more general side, *Compute!* continues to be the main American source of Commodore related useful information, with every issue containing many articles of use to owners of all Commodore machines, even back to the original small keyboard Pets.

It also covers a number of other 6502 based micros, Atari and Apple amongst them, but its long-standing connection with Commodore should ensure a healthy supply of Pet/Vic/64 related articles for a long time yet. You're not likely to see this one in the nearest shop, but your newsagent can probably get you a copy if you ask him nicely.

Byte, the monthly encyclopaedia that Daley Thompson probably uses for weight training, usually contains some articles of Commodore interest, but with this one you are well recommended to find a shop that sells it and just buy certain issues.

Each issue deals with a specific subject in the world of micros, be it robots, adventure games, financial forecasting or whatever, so just choose the one you want.

The Transactor from Canada is a very fragmentary publication, but when it does appear it always has something of note. Try Commodore UK again on this one.

The Torpet, also from Canada, is very expensive for what it is, but you do get access to its vast library of (almost) free software. It can be reached at Horning's Mills, Ontario, Canada LON 1JO. If you fancy using your boss's 'phone, it's on (519) 925-5376.

User Groups

User Groups continue to produce their offerings, some of these being very good indeed. I would heartily recommend anyone to join their local user group.

Details can usually be found in your local library or town hall, but if not then the overall figurehead is one Wing Commander Ryan (aka Mick), who lives at Riverhead, 164 Chesterfield Drive, Sevenoaks, Kent.

Drop him a line (don't ring, he's a very busy man: that's why there's no telephone number!), and as well as a courteous and speedy reply you will also get details of your nearest user group.

Subscription to a user group usually entitles you to a monthly (or bi-monthly) magazine, as well as access to a very large library of programs. Well worth joining.

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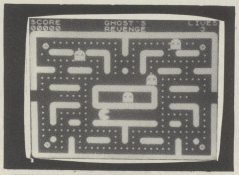

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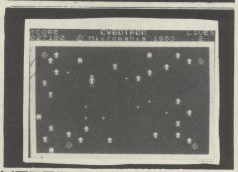

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HiSoft

Adam Denning gens up on machine code development for the Spectrum

With so much of the 'my teddy bear is bigger than yours' syndrome in home computing these days, (BBC versus Spectrum, Dragon versus Oric, etc), I find myself being driven to acting like the proverbial dirty old man when it comes to buying software, so paranoid am I about the apparent inferiority of the Spectrum.

Carrying new purchases in my inside pocket in a plain cover, fearing the ubiquitous computer elitist pointing his finger at me, shouting "He's only got a Spectrum" across the street and everyone joining in with the derisive laughter.

It comes as a great relief, then, to find that enough people take this machine seriously to produce a wider range of software for it than seemingly any other, even if half of it was scribbled on the back of a beer-sodden envelope by some innebriate opportunist (me!!).

Well, it seems that one particular bunch of decidedly sober neo-entrepreneurs have even taken the trouble to update their programs — even though they were excellent before.

New developments

This company is Hisoft, whose original *Devpac* assembler/disassembler I briefly mentioned two months ago, and after a chat with them at the Earl's Court show in June, I managed to procure the updated and much-improved *Devpac 2*.

This consists of much the same package as the original, with the same large manual, and the two programs on one cassette. As they now offer more facilities, at the time of writing there was a second manual issued as a temporary adjunct to the old one, but after a little experience they are surprisingly simple to use.

The assembler, GENS2, has all the facilities as before plus a couple more; one of particular interest being the ability to 'include' files previously written into new programs, rather like a macro-assembler. The big advantage with this is that you can have, say, 20K of text in this included file, and yet take up only about 4K of memory to assemble the lot.

This is probably the most useful feature I can think of on an assembler, and so far I have managed to assemble 20K of object code using this method, despite having text files — ie the source code — amounting to about 40K, which simply could not have been assembled in one go before.

Mind you, one facility that I have great difficulty in divining a use for is the much-vaunted conditional assembly function, ie IF condition THEN assemble code ELSE don't, which nearly every assembler review tells you is so important — it isn't.

The other part of *Devpac* is MONS2, a disassembler/monitor, which can single step through code, do all a professional monitor can do, *and* produce text files for GENS2 from what it disassembles — heaven for any programmer.

The mechanics of single stepping (ie executing one instruction at a time) have previously been such that it has only been possible to step through RAM locations, and indeed both MONS1 and 2 have this limitation, but then I never in my wildest dreams could have hoped for the ability to step through ROM — it just isn't possible, is it? Just wait until MONS3 comes out — it can! I received this version (pre-production) at Earl's Court too, and it leads me to one conclusion; if you write programs in machine code, buy *Devpac* — it is the best one currently on the market.

Nothing's perfect

Of course, there is always a cloud on the horizon — bugs. *Devpac 1* seemed to have none at all, but all the new ones have little problems which will no doubt be ironed out when they are released, but here is a list of them for future reference:

MONS2: very slight corruption in the files it produces for GENS — a quick look through the text solves this, however.

MONS3: I know this hasn't been released yet, but there is a problem with single stepping — sometimes it just won't do it.

GENS2: On return to Basic, the stack is corrupted, and if you don't issue a CLEAR command straight away (which resets the stack), the chances are that you will spuriously re-enter GENS and not be able to get out again.

Finally, all three programs disable the interrupts, so if you are single-stepping through something that relies on interrupts, beware! This is not a bug in the code, more one in the manual — Hisoft should really let us know.

(Stop Press: HiSoft claims all software is now debugged — watch this page.)

Bugs aside, I wouldn't be seen without *Devpac* — this is a wholly professional piece of software that at £12.50 is good value.

Whilst on the subject of machine code, it seems that a lot of people are put off it because someone has told them that it's hard to get to grips with, and they can find no suitable literature to convince them of the contrary.

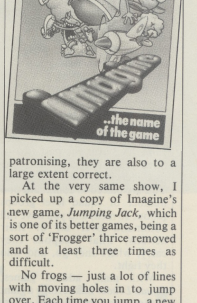
In an attempt to fill this gap, therefore, Melbourne House brought out a book some time ago called *Spectrum Machine Language For The Absolute Beginner* — a title that was incidentally ripped off from Steven Vickers' suggestion in the Spectrum manual itself — but there's nothing wrong in that. There is, however, something wrong in a book written specifically for beginners that contains numerous confusing errors, and unfortunately a few ghastly mistakes have slipped through.

Some examples: page 120: they state that the 'SLA' instruction can only operate on the accumulator — someone had better tell Zilog in that case! On the same page — "This is effectively multiplying 'A' by 2 as long as nothing is transferred to the accumulator" — they mean *from* the accumulator.

On page 136, where they are talking about reading the keyboard, they quite rightly say that a reset bit in the relevant input port corresponds to a key pressed. But then all the routines they give assume exactly the opposite to be true.

Then again, the section on the attributes file on page 143 consistently refers to 60 hex when it really should be 5A hex.

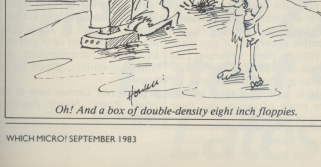
My recommendation goes to the books from Shiva and Granada publishers on this subject as they are not only less patronising, they are also to a large extent correct.



At the very same show, I picked up a copy of Imagine's new game, *Jumping Jack*, which is one of its better games, being a sort of 'Frogger' thrice removed and at least three times as difficult.

No frogs — just a lot of lines with moving holes in to jump over. Each time you jump, a new hole is generated, so the only way to ensure success is to take every chance you get and traverse each level in one go, otherwise there are too many holes to contend with. More interesting than a lot of rival games.

Hisoft is at 60 Hallam Moor, Liden, Swindon SN3 6LS.



Oh! And a box of double-density eight inch floppies.



This month, Ron Stewart dons his camouflage gear and goes on the rampage

There are, in my humble opinion, three types of Atari owner. The first is the person who plays war games and bought an Atari on the strength of *Eastern Front*, Chris Crawford's simulation of Operation Barbarossa, in which the main protagonists were the Germans and Russians in the Second World War. The second is the person who bought the Atari first and then *Eastern Front*, and the third, the person who has not even seen *Eastern Front*.

If you are one of those in the third category can I suggest that you at least try to see *Eastern Front*. You will be surprised at the graphics and smooth scrolling, the computer also plays a mean Russian. I don't intend to review the game, many people have done so before me. Instead I want to look, for the benefit of those of you in the first two groups, at new computer war games that have appeared on the market since.

Close Assault

The first of these is a recently released game from Avalon Hill. This company will be known to many wargamers as a manufacturer and publisher in the forefront of board wargaming. To many in the computer field Avalon Hill is just a company that produces computer software at a reasonable price, but often the programs are not all that they should be.

Close Assault is a computer version of a board war game known as *Squad Leader*. This game has, over the past two or three years, become one of the top sellers in the war game world. You are placed in command of a number of squad level groups (about 10 men) and you have full command over all of their actions, what weapons they carry, where they go, and who they fight.

With many add-on games, *Squad Leader* has become a giant with a giant set of rules. *Close Assault* has gone back to those early days with a small, but extremely playable system in which the computer or another human will play one of the sides.

On opening the box you are confronted with a 40k cassette or disk, a colourful mapboard, cardboard counters, a record pad and a rules booklet. The mapboard details one and two storey buildings, roads, woods, walls etc, and has a pattern of hexagons overlayed on top to regulate movement and position. Each hexagon is given an alpha-numeric code.

The counters represent the squads of men, each nationality having a different colour; blue for the Germans, brown for the Russians and green for the Americans (What! No Tommies?). Each squad counter is allocated an identification number and squads come in three groups; elite troops, riflemen and four man gun crews.

On loading the game the computer will ask various questions such as what scenario do you require and who will be commanding the countries involved. It will then go on to ask you to allocate start positions to your squads on the battlefield. This point can be crucial to the rest of the game and defensive positions must be chosen well.

The computer holds each mapboard hexagon and its contents within its memory. If you are in a hexagon directly in front of a building you will obviously not be able to see or fire into the hexagon directly behind that building. This is known as line of sight and it will have a great bearing on the way you play the game. Two storey stone buildings make good defensive positions, for instance, but are useless if you are on the attacking side.

After placing your squads in position you must allocate the weapons that are available to you. These include three different types of machine gun, as well as flame throwers and demolition charges that can be allocated to the elite squads only. These elite squads also have one smoke charge that can be fired to give you cover while moving.

Leaders are also allotted to squads to try to stop them from losing their morale and running from the battlefield. There are less leaders than squads and they must be allocated to the key squads in your battle plan. You must be especially careful of one leader for he represents you. If he is killed in the battle the computer will take over both sides and continue to the end without consulting you.

After this setting-up period the game itself commences. In each turn you will go through a series of fire and movement phases controlled by the computer. All you have to do is enter the position of the squad and where you wish to move or fire to. Only experience will tell you the best places to go and the best ranges for each weapon but the rules booklet does give some clues.

You must also take account of the "Fog of War". Enemy units will remain hidden until your troops get close enough to spot them. In some locations this can mean that you will not know of a squad's presence until you literally trip over them. The game lasts for 10 turns and a game will usually take about an hour and a half to play.

I think this is the best game of its type around and it rises head and shoulders over Avalon Hill's other two offerings in the same category. These being *Tanktics* (early Chris Crawford) and *Dnieper River Line*. Anybody who bought either of those two and thought them a bit duff should not be put off from buying *Close Assault* and if you want a departure from the grand strategies of *Eastern Front* then why not give it a try?

Close Assault is also available for the Apple and TRS-80.

Battle for Normandy

Battle for Normandy from Strategic Simulations Inc. is another type of war game that is as different from *Close Assault* as chalk is from cheese. It resembles *Eastern Front* in that the mapboard is displayed on the television screen. That is where the resemblance ends because Normandy has a lot more variants to deal with. It is quite a complicated game to play, not so much in the strategies themselves but in relation to the logistics of command.

On loading the game the computer will ask you if you want to play the historic game, in which all units, combat factors and leadership ratings closely resemble history, or if you want to change them around. This feature is great for the novice general as the Germans can be made to look as if their bullets were made of cream and their boots of lead.

You also have to allocate supply expenditure to four main elements. They are fuel, general supplies, combat supplies and amphibious transport. Calculate these figures wrongly and your whole battle plan can go to the wall. To make calculating such supply figures more difficult they have to be entered two turns in advance. This is to simulate the time lapse between asking for the suppliers and them being shipped out to Normandy from Britain. Weather is also a factor to consider as this will affect the amount of air support and supplies your troops will receive.

The game commences with the allied forces trying to land on the beaches. Not all of them can land at the same time because of the limited number of amphibians to get them ashore. Once ashore your troops will come into contact with the Germans almost immediately and this will also limit the amount of troops you can get ashore because units have to stop on contact with the enemy. So you can see, units have to be choosen carefully. Do not forget to land some depot units at the same time otherwise your forces could be left with no supplies and, in a weakened state, lose the beach-head.

When in contact with the enemy you are given options as to what units to use, how much air and naval support to give them and the type of defence or attack strategies to use. At the end of each turn you are given your victory level. Victory points are awarded for reaching certain objectives and points inland. The game lasts about three to four hours but unlike *Close Assault* and *Eastern Front* it can be saved at the beginning of each turn.

Battle for Normandy is available on 32K cassette and 40K disk and versions are also available for the Apple and TRS-80 computers.

Finally, a request for information. I am currently evaluating Maplin's new modem kit for a future article. If anyone has made the modem or is currently using it to communicate with other computers, please let me know.

Avalon Hill Games lives at 650 High Road, North Finchley, London N12.

sinclair special 3



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The New ZX Microdrive!
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The ZX Microdrive- and more!

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Microdrive provides high-speed access to truly massive storage. With just one Microdrive, you'll have at least 85K bytes of storage, and the ability to LOAD and SAVE in mere seconds. Yet the ZX Microdrive is about the size of a Spectrum mains adaptor, and costs less than £50!

First stocks are now in. Microdrives will be released on an order of priority basis. Spectrum owners who purchased by mail order, direct from us, will be sent full details including how to order, in a series of mailings that begins with the earliest names on our list.

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Don't worry — for a colour brochure with full information on Microdrives, including how to order, just send us your name and address (use the coupon at the back of this issue of Sinclair Special). But remember, the sooner you send us your name, the sooner you'll get on the list.

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Until the next issue of Sinclair Special, and more good news ...

Nigel Searle

Nigel Searle, Managing Director, Sinclair Research Ltd.

PS: Come and see us — and all that's new at Sinclair — at the PCW Show, Barbican Centre, from Sept 28th to Oct. 2nd. We'll be pleased to see you!

ZX Microdrive System preview!



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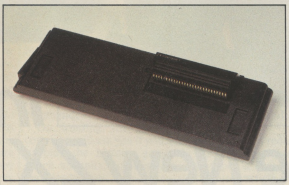

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Horace and the Spiders Make your way with Horace to the House of Spiders, armed only with a limited supply of anti-spider-bite serum. In the house, destroy the webs before the spiders can repair them. Then destroy the spiders, before *they* destroy Horace! Undoubtedly the creepiest Horace program ever produced! For 16K or 48K RAM Spectrum.

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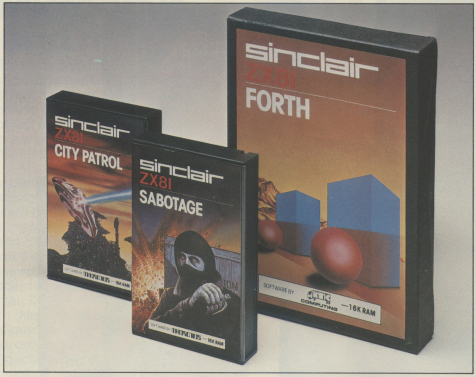
Latest ZX81 software



These three new cassettes offer two totally different challenges to you and your ZX81. The games – like so many ZX81 games today – really do use the ZX81's capability. The FORTH program is a fascinating extension of your own computer understanding.

Sabotage. Defender or attacker? The choice is yours in this exciting game.

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ACORN ANGLE



Clive Williamson reviews Acorn's new programming languages and some BBC games.

While details of the Acorn Electron have been shrouded in mystery for both users and press alike, Acornsoft's activities have been rather less 'classified'. In addition to releasing several new programs for the BBC computer it has announced plans for 12 programs to run on the Electron, which will be launched at the same time as the new machine.

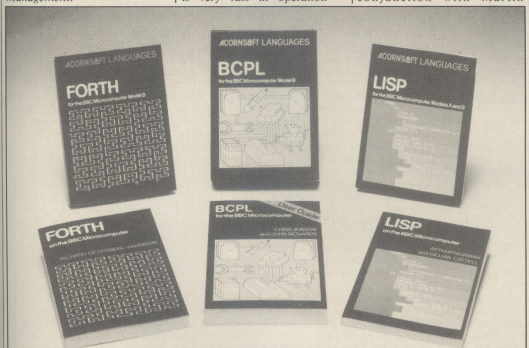
Most of the Electron software is already available for the BBC Micro, and some has undergone minor surgery to make it suitable for the new model.

There are six games titles in the release — *Monsters, Meteors, Snapper, Draughts & Reversi, Chess* and the new *Starship Command*. Programs of general interest make up the dozen — *Creative Graphics, Graphs & Charts, Tree of Knowledge, Lisp, Forth* and *Personal Money Management*.

the BBC machine will be pleased to know that both languages are now available for them on disk as well as cassette.

Forth seems to be gaining in popularity with micro users, as it is very fast in operation — major program examples, but the book is full of short program sections illustrating the text.

BCPL is block-structured, like Pascal, and the Acornsoft version has been written in conjunction with Martin



Acornsoft's new programming languages for the BBC Micro Model B.

Only *Meteors* is significantly different from the Beeb version being in black and white instead of colour. The other programs have all had the Mode 7 displays removed, as the new machine is not capable of supporting teletext. The programs are slightly cheaper than their BBC counterparts, selling at £9.20 including VAT.

Acornsoft has been very active with languages in the period up to the Electron launch date, having now completed a BCPL package for the BBC Micro, and published the long-awaited manual to go with Forth.

The fact that both Forth and Lisp are in the initial batch of programs for the Electron is indicative of Acornsoft's seriousness in this area, and owners of typically five times faster than Basic — and very little space is needed for program storage. It encourages the writing of well structured programs and is very easy to de-bug in the initial stages.

Acorn Forth

The new book *Forth on the BBC Microcomputer* has a very good pedigree, as it has been written by Richard De Grandis-Harrison, chairman of the UK Forth Interest Group. Costing £7.50, it acts as a general introduction to the language.

A glossary details all the Forth-79 standard words, and there are sections covering topics such as graphics, sound, loops, the stack and defining new words. Surprisingly, there are no Richards, the originator of the language. One of its major features is its transportability, and as an aid to programming it has a large number of different types of loops.

The BCPL compiler generates a very compact intermediate code, called CINTCODE. It is this code which is interpreted, so that although BCPL is slower than machine code, it does have a considerable speed advantage over interpreted languages such as Basic.

Acornsoft's BCPL package includes the interpreter in a 16K ROM, a dual standard 40- or 80-track disk containing the compiler and library routines, and a bulky 450 page user guide.

The price makes it more suited to educational establishments and enthusiasts though — the whole lot costs £99.65! The book *BCPL on the BBC Microcomputer*, to be published later this year, should help those who just want to find out about the language, as it will cost a more modest £7 or so.

One frustrating aspect about all this language activity is that there is currently nothing on the market in the way of programs to run under Forth, Lisp, or BCPL for the BBC Micro. Acornsoft says it is planning some support soon, with a Forth Welcome Pack in the pipeline, and a number of BCPL utilities are now under development.

The first programs to see the light of day for BCPL users are likely to be in a *Calculation Package* giving floating-point, decimal fixed-point and fast Sine, Arcsine and square root for graphics routines. In the meantime we will have to struggle through, left to our own devices.

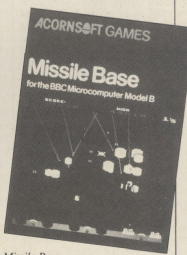
New BBC games

If all that sounds rather technical, let me tell you about the new games for the BBC Micro. Four new titles have appeared recently, and very good they are too!

Missile Base is a hair-raising attempt to defend Moon-base against salvos of deadly neutron missiles falling from space. Either joysticks or the keyboard will control your gun sights, and a separate key is required to fire from each of three defence stations.

Some strategy is involved, as you only have nine rockets in each station, and some of the falling missiles dodge your fire. The key arrangement is slightly complicated, but the game is enjoyable and colourful.

Acornsoft's *Snooker* is an excellent computer version of the game. It is essential to have a colour TV to play, of course, otherwise you could end up



Missile Base for the BBC — an old favourite in a new version.



Hopper — a new version of the arcade classic from Acornsoft.

potting the wrong balls.

Played with joysticks or keyboard, *Snooker* is very engrossing, and for once here is a game designed to be played by two people. It is possible to apply backspin or topspin to the cue ball, and the 'length' of the cue on screen determines the strength of the shot. The table is nicely designed and includes a traditional score-board.

Hopper is the Acornsoft answer to a less war-like computer game than most. It is a fairly standard version of *Frogger*, in which the player has to guide frogs across a hazardous road full of moving traffic and over a river by leaping onto floating logs and the backs of turtles.

The object is to get five frogs safetly into their lairs on the other side of the river bank without getting squashed or drowned, and there is an added problem in that a time limit is set for each journey.

Star Trek Revisited

One of the best games released for the BBC Micro in recent months is an original one called *Starship Command*, which has been loosely based on the Star Trek theme. You are in charge of a Battle Starship, and are sent into space to fight off an invading alien fleet.

The main controls are thrust, brake, rotate left or right and fire; and the ship appears at the centre of a large 'window' forming the major part of the display. The view of space drifts and spins past as the ship manoeuvers, which is an extremely odd sensation at first.

On the right of the screen are long and short range scanners showing the position of the alien ships, some of which can be invisible on the main screen. Needless to say the aliens are always in hot pursuit. Also visible are the ship's energy banks, which play a vital part in the game.

Your starship is equipped with force shields for protection and torpedoes, and it is possible to destroy the enemy ships either by repeated fire or by ramming. Both are a drain on your energy banks, as are hits to your ship by the aliens' torpedoes.

Escape capsule

When you are under severe attack and the energy levels get dangerously low, the only thing to do is launch an escape capsule. If you make a successful getaway, the Star Fleet Admirals will review your mission, and 'decide whether you are a fit person to command another of their starships'.

The presentation, sound effects and graphics are really excellent, and by using the minimal two colour Mode 4 display (in attractive blue and white) the author, Peter Irvin, has left himself plenty of room to program very sly control of the aliens.

It is up to the player to develop the tactics needed to survive in the dogfights. A high score is difficult to achieve, but despite that — or perhaps because of it — *Starship Command* is a truly



Starship Command.

obsessive game and can be thoroughly recommended.

All the new games from Acornsoft cost £9.95 for the BBC Micro. *Starship Command* is also available on disk for £11.50, and on cassette for the Electron at £9.20.

Full details from Acornsoft Limited, 4a Market Hill, Cambridge, CB2 3NJ.

Chip Chat

Acorn's speech processor for the BBC Micro has been released at last. All over the country software reviewers are patiently teaching their computers how to count, and suffering comments like "ACORN COMPUTERS ARE VERY JADED FROM 3 O'CLOCK ON!" — or being told to "TRY TYPING THAT LAST INPUT AGAIN".

The initial Word Phrase Read Only Memory — or PHROM — contains just 160 words or word parts, two lengths of pause, two tones and a couple of bizarre sound effects for <TAB> and <RETURN>. Acorn have made provision for a total of 16 such PHROMs, so the potential vocabulary is pretty large, but there is no indication of a date when more chips might be released.

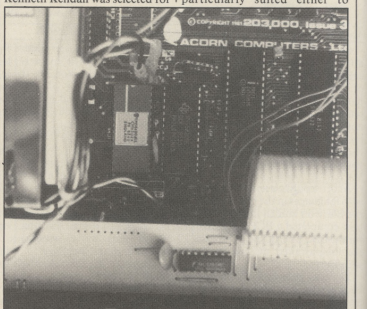
Once fitted, the processor leaps into life when the SOUND command is used, in the form SOUND -1,X,0,0 where X is the number (between 127 and 291) of the desired word or word-part. Thus it is possible to work out sentences from the present limited vocabulary, store the number in data statements, and have the computer spout obscure remarks in the middle of your games programs. "THE DATA IS INCORRECT, IF YOU MUST KNOW!"

Another simple way to obtain results is to try SOUND -1,GET, O,O — which then uses the ASCII codes generated by the keyboard to have the computer speaking the alphabet as you type in upper case, and a selection of numbers and some of the other words when using lower case. This has obvious applications for the visually handicapped, but the system tends to collapse when you type a comma and are told 'THOUSAND' and hear nothing from the <DELETE> key at all! It is in this mode that <TAB> gives a 'space zap' sound and on pressing <RETURN> a somewhat prolonged imitation of a carriage return on a manual typewriter.

Menacing tones

The quality of speech is generally good, if somewhat 'metallic'. BBC newsreader Kenneth Kendall was selected for the task of being digitised, but it is rather hard to identify him from the end result. The diction is certainly clear on most of the words, but the tone of delivery is rather flat, and makes the computer's simplest requests sound somewhat threatening. "PLEASE PRESS THE RED BUTTON NOW!" comes over with particular menace. The situation is not helped by the lack of provision for volume control in the SOUND command governing the speech.

The vocabulary is a strange miscellany, and I can't help feeling that Acorn were shooting in the dark a little when they compiled it — as it doesn't seem particularly suited either to

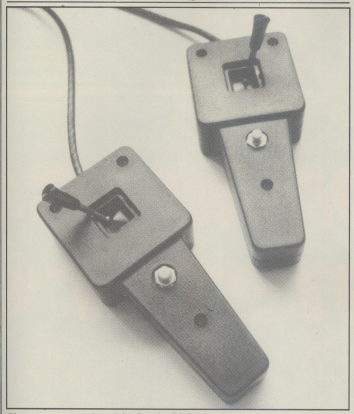


Acorn's speech processor in position on the BBC.

games or educational use. There are no directions, except UP and DOWN, and few words connected with computing in general or the BBC Micro in particular. Neither are there many friendly or conversational words like HELLO, HOPE or GET, although it will say PLEASE and THANK YOU.

Having said that, there is the promise of other vocabularies for the future, and some will be available as plug-in cartridges, which will work with the BBC machine after the speech upgrade has been carried out by a dealer. The upgrade includes a serial processor and a new socket for the left hand side of the keyboard, both necessary in order to get at software in Cartridge ROM form, but the sockets were not ready for fitting at the time this review was written.

Bearing in mind the limited vocabulary of the first Word PHROM, and the fact that the speech upgrade is the 'gateway' to software and data in Cartridge ROMs in the future, I can't help thinking that Acorn should have released the Speech Processor for rather less than the £55 they are asking. Particularly as they are bound to recoup any losses incurred now by improving the future sales potential of Cartridge ROM software. "YOU HAVE A NEGATIVE CHARACTER. I MUST SWITCH YOU OFF NOW!"



Clares easy-to-use joysticks for the BBC Micro.

Better joysticks

Those of you who have struggled with the Acorn joysticks will know that they must have been designed for American hands. They are huge! Not only that, they are wired up the wrong way round, so that you can't hold them comfortably and get the movement you expect on the screen.

A new joystick design from Clares aims to get round the problems — and nearly succeeds. Their version is wired so that it works logically when you hold it the 'normal' way round — and the fire button is in a better position for frantic stabbing during fast action. In fact I play a much better game using the Clares joysticks, which may be because they use better quality potentiometers, and they have been made so that the stick stays in its last position, which gives a nice firm feel. The cable is slightly longer than Acorn's, so you sit at a more comfortable distance from the screen.

Where Acorn's joysticks are too large, the Clares equivalents are slightly too small for most adults, and I think that they are best suited to children's hands. It would help if both the stick and the handle were slightly longer, and the fire button was broader, and hence less painful on the thumb after prolonged use.

Having said that, the Clares joysticks are nicely made, and I would rather use them than Acorn's despite the higher price of £17.95 per pair.

Clares, Providence House, 222 Townfields Road, Winsford, Cheshire CW7 4AX 06065 51374

Proccube

Another handy graphics routine for the 32K BBC from R A Lober, this program draws isometic views of cubes.

```
   1REM BOXES GOING TO TWO VANISHING POINTS
   2REM (C) R.A.Lober
   3REM 2/7/83
  10MODE1
  20VDU19,7,0,0,0,0:VDU19,0,7,0,0,0
  30VDU19,2,4,0,0,0
  40DIM X%(8),Y%(8)
  50VPT1%%=16:VPT1Y%=1000:VPT2X%=1263:VPT2Y%=1000
  60PLOT69,VPT1X%,VPT1Y%:PLOT69,VPT2X%,VPT2Y%
  80PROCCUBE(640,100,500)
  90PROCCUBE(700,580,640)
 100PROCCUBE(550,620,760)
 105PROCCUBE(550,790,820)
 110PRINTTAB(0,31);
 120END
 130
 140DEFPROCCUBE(X%,Y1%,Y2%)
 150DIFF%=Y2%-Y1%
 160MOVE X%,Y1%
 170X%(1)=X%:Y%(1)=Y1%
 180
 190REM LOWER RIGHT BOTTOM SIDE
 200GRAD=FNGRADR(X%,Y1%)
 210Y%=Y1%+(DIFF%*GRAD):U%=X%+DIFF%
 220X%(2)=U%:Y%(2)=Y%
 230
 240REM LOWER RIGHT TOP SIDE
 250GRAD=FNGRADR(X%,Y2%)
 260Y%=Y2%+(DIFF%*GRAD):U%=X%+DIFF%
 270X%(3)=U%:Y%(3)=Y%
 280
 290REM RIGHT VERTICAL
 300X%(4)=X%(3):Y%(4)=Y%(2)
 310
 320REM UPPER TOP SIDE
 330GRAD=FNGRADL(X%(3),Y%(3))
 340Y%=Y%(3)+(-DIFF%*GRAD):U%=X%(3)-DIFF%
 350X%(5)=U%:Y%(5)=Y%
 360
 370REM LOWER LEFT BOTTOM SIDE
 380GRAD=FNGRADL(X%,Y1%)
 390Y%=Y1%+(-DIFF%*GRAD):U%=X%-DIFF%
 400X%(6)=U%:Y%(6)=Y%
 410
 420REM LEFT  VERTICAL
 430GRAD=FNGRADL(X%,Y2%)
 440Y%=Y2%+(-DIFF%*GRAD):U%=X%-DIFF%
 450X%(7)=U%:Y%(7)=Y%
 460
 470REM LEFT UPPER TOP SIDE
 480GRAD=FNGRADR(X%(7),Y%(7))
 490Y%=Y%(7)+(DIFF%*GRAD):U%=X%(7)+DIFF%
 500X%(8)=X%:Y%(8)=U%
 510PROCDRAW
 520ENDPROC
 530
 540DEFFNGRADR(X,Y)
 550R=(VPT2Y%-Y)/(VPT2X%-X)
 560=R
 570
 580DEFFNGRADL(X,Y)
 590R=(VPT1Y%-Y)/(VPT1X%-X)
 600=R
 610
 620DEFPROCDRAW
 630REM LOWER BOTTOM RIGHT SIDE
 640MOVE X%,Y1%:DRAW X%(2),Y%(2)
 650
 660REM MIDDLE VERTICAL
 670MOVE X%,Y1%:DRAW X%,Y2%
 680
 690REM TOP BOTTOM RIDE SIDE
 700DRAW X%(3),Y%(3)
 710
 720REM RIGHT VERTICAL
 730DRAW X%(4),Y%(4)
 740
 750REM TOP RIGHT SIDE
 760MOVE X%(5),Y%(3):DRAW X%(5),Y%(5)
 770
 780REM TOP LEFT SIDE
 790MOVEX%(7),Y%(7):DRAWX%(5),Y%(5)
 800
 810REM LOWER TOP SIDE
 820MOVEX%,Y2%:DRAWX%(7),Y%(7)
 830
 840REM LOWER BOTTOM LEFT SIDE
 850MOVE X%,Y1%:DRAW X%(6),Y%(6)
 860
 870REM LEFT VERTICAL
 880DRAW X%(7),Y%(7)
 890ENDPROC
```

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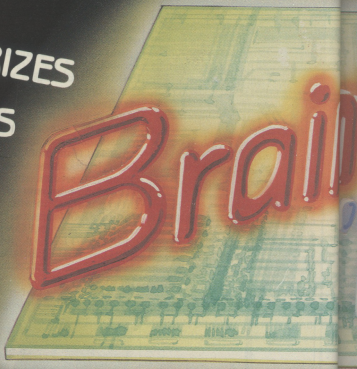

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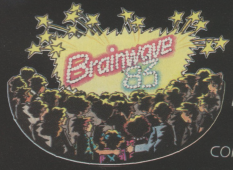

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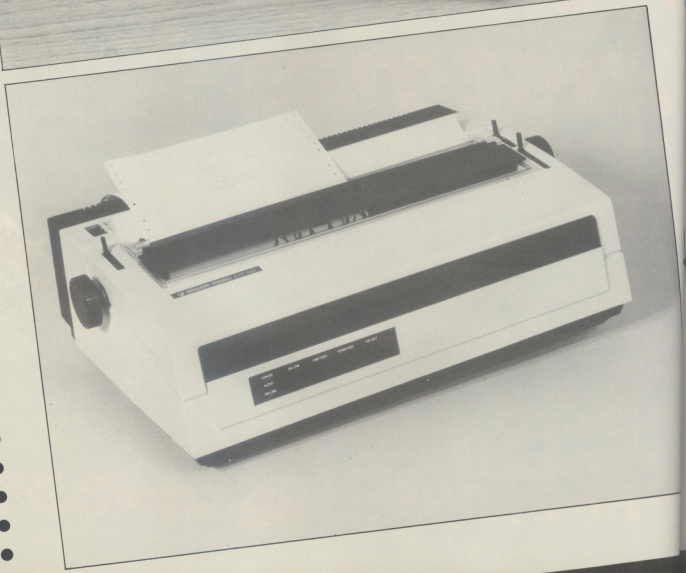


PRINTING TO A BUDGET

Printers have never been cheaper and prices are falling all the time. Which printer should you choose for your microcomputer?

Not long ago, the cost of buying a printer was just too much for most home micro users, but that is all changing as prices keep coming down.

Printers can be very useful; especially for printing out listings to facilitate debugging of programs. Even word processing is possible now at a very low cost, thanks to new word processing software packages for home computers and the competitive price of daisywheel printers.

Just like the prices of microcomputers, prices of printers are coming down — way down. A daisywheel letter quality printer under £1,000 used to be news indeed. Then it was £800, then £500. Today, if you really want a daisywheel printer and are on a budget, spend under £400 plus VAT and you could have a typewriter too.

Prices of printers don't only exclude VAT — they often exclude one vital piece of information — what will the interfaces cost? That vital cable and connection to link the micro to a printer. Prices of printers should be examined carefully to see whether this vital price is included. Without it, the printer is useless.

Today, if you want to spend a basic 'under £500 plus VAT', there are three main choices. A dot matrix printer of the type that has been made popular by Epson; there are lots of lower priced models now. A daisywheel printer for letter quality correspondence. And the daisywheel printer which also has a keyboard — known as a typewriter. Not only do you have the advantage of better quality printing, but an extra keyboard when it really isn't worth plugging in a computer and loading the word processing package.

If you want a complete word processing package including the computer, a daisywheel typewriter/printer, a stand and the word processing package, it's possible for just £980. SPT Electronics has a complete system which includes a Commodore Vic, a cassette recorder, its word processing package, The Quick Brown Fox, and an 80-column expansion board. Just over the list price of an Apple IIe without a monitor, disk drives or software.

Set your budget before starting to examine the printer market. After all, the ZX printer costs under £40, but just isn't everyone's cup of tea. Once you have a figure in mind find out what type of connection is fitted to your micro. Does it use the popular parallel/Centronics type, the serial RS 232C or the IEEE 488? It's most likely to be the parallel/Centronics type.

Now your budget and interface socket is known, which of the three types of printer will be right for you? The answer will not rest on price alone. Most of the printers we mention cost under £400 plus interface, so if you had a choice what would it be?

Dot matrix printers have been much maligned because the result looks like computer printing, but they have radically improved over the last few months. Some have a choice of typeface — the condensed option can make a very acceptable result for correspondence. The graphics facilities are also improving rapidly and a dot matrix printer can be more versatile than many people thought possible.

Compared with daisywheel printers with speeds in the lower price range of up to 20 characters per second — the dot matrix can go four times faster and more. To produce a daisywheel printer with a high-speed operation takes you well into the four figure plus price area.

However, if you have to choose between quality of reproduction versus pure speed, there is no contest. Daisywheel wins hands down. For a few letters or invoices the longer time producing them won't matter much and the higher quality result creates a better impression.

Sometimes it's easier to produce a letter, note or label using a genuine typewriter, which may seem sacrilege to computer buffs. Why bother to plug-in the computer and load a word processing program, when instead you can just slip a piece of paper into the typewriter and produce the letter? The same applies if someone in your home wants to produce a printed result and doesn't like the computer. Plus those little jobs like labels and notes.

One reason may really appeal to you. When your micro goes on the blink, and reliability isn't 100 per cent by any means, the typewriter can still be used to produce letters, reports, notes, envelopes, labels etc. All without your broken down micro. A choice well worth considering especially as this is currently the cheapest way of getting a daisywheel printer.

Where the microcomputer has a Centronics connection or parallel interface or even the RS 232C, the only extra you need is the cable to connect printer to computer. On average this will cost around £15. However, if you have a Sinclair Spectrum and no standard interface what do you do? Wait for one to appear, or make use of one from the independent companies?

Kempston Electronics produces a Centronics interface for the Spectrum which will work with any printer like the Epson, Seikosha, OKI Microline and similar models. Included is a special driving software package that lets you print up to 128 characters per line. The interface also recognises LLIST and LPRINT so that programs can be listed directly from the Spectrum. The complete price is £45. For an extra £13.90 a word processor called Tasword Two can be added.

As an alternative to the Kempston Electronics product, the ZX LPrint from Euroelectronics allows the use of a dot matrix printer and gives up to 32 characters per line. This costs around £30.

Hilderbay produces its own interface for the Spectrum which comes complete with a word processing package at no extra charge. Priced at around £45 this is a very attractive proposition.

Of if you are satisfied with the quality, buy the ZX printer and spend less than £40.

Apart from the Sinclair Spectrum another area of large scale micro sales must be the Vic and Commodore 64. Here a whole host of special interfaces have been produced so that these micros can be linked to virtually any printer available.

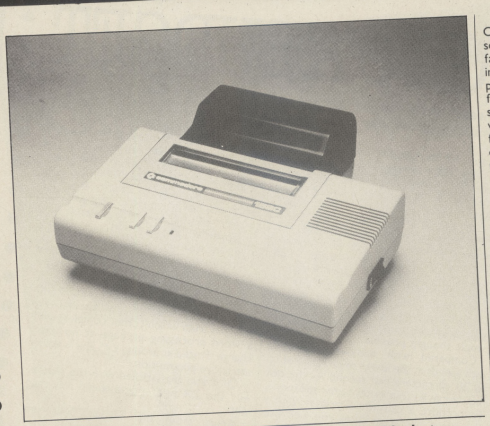
The one you choose really depends on your budget and the degree of sophistication and versatility required. You can spend from under £30 to over £100 depending on the features that are needed. While you are getting an interface consider that for a few extra pounds there are a lot of extra facilities to make your computer system more versatile.

Supersoft produces Printlink, which consists of a cable that connects the parallel printer to the user port of the Commodore 64, plus software to make the printer behave just like a Commodore product. This item costs £26 or £28 depending on whether the software has been supplied on tape or disk.

JCL Software supplies a CBM64 IEEE 488 cartridge which plugs into the rear of the Commodore 64 or Vic and accepts a standard Pet/IEEE lead to connect to the peripheral — which in this case will be a printer. This cartridge costs around £60.

Impex Software supplies an interface module for the Vic or Commodore 64 so that either of these micros can be interfaced with a range of printers including the Epson, Itoh, Okidata, NEC, Smith Corona TP1 and Gemini 10. This muliple interface is hardware-driven and plugs into the serial port. Price £79.

Stack Computing Services produces a Centronics parallel interface which consists of a cable and software cassette, price £29. There's also an RS 232C interface available for the same price.



Sample Prices and Models in the Budget Printer Market

Daisywheel printers		
Juki 6100	£399	Micro Peripherals 0256 3232
Smith Corona TP-1	£485	Discom 0386 3591
Brother HR15	£549	Thame Systems 084-421 5471
EXP550	£695	X-Data 0753 72331
Stylist	£695	Butel Comco 01-202 0262
Dot matrix printers		
Seikosha GP-250X	£287	DRG 0934 419914
Shinwa CR1CP80	£289	Key Computer Centres 09322 42777
Star DP510	£289	Micro Peripherals 0256 3232
Epson RX-80	£298	Epson 01-900 0466
Epson FX-80	£398	Epson 01-900 0466
Star DP-515	£399	Micro Peripherals 0256 3232
Daisywheel typewriters		
Olivetti Praxis 35 PT35L	£350	ZE Systems 0525 378664
Brother 8300 CI	£375	Direct Import Supply 0242 27412
Pro Tronic	£375	PMS Developments 0432 50848
Text Writer	£395	Computer Peripheral Supplies 0734 418383
Canon AP400	£699	Canon 01-680 7700
Crown Ranier	£795	Crown 0323 639983
Commodore interfaces		
Printlink 64	£26/£28	Supersoft 01-861 1166
CBM64 cartridge	£60	JCL Software 0892 27454
Interface module	£79	Impex Software 01-900 0999
Centronics parallel interface	£29	Stack Computer Services 051-933 5511
RS-232C serial interface	£29	Stack Computer Services 051-933 5511
Interpod	£125	Oxford Computer Services 0993 812700
Spectrum interfaces		
Kempston Centronics interface	£45	Kempston Electronics 0234 852997
ZX Lprint	£30	Euroelectronics, Zlin House, Oakfield
Hilderbay interfaces with word processor included free	£45	Street, Cheltenham, Glos GL50 2UJ Hilderbay 01-485 1059

Commodore information 0753 79292

SPT Electronics — complete word processing system and the Quick Brown Fox 0621 868484

However, the Interpod from Oxford Computer Systems is probably the most sophisticated of the lot, and is certainly by far the most expensive. It is an intelligent interface which fits directly into the serial port of the Commodore 64. The Interpod features both RS 232C and IEEE interfaces so that both ports of the 64 can be used without any further operation. Apart from this feature, the Interpod is the only one which is completely transparent to the machine and software, according to Oxford Computing Systems. And this is made possible because it's the only interface which doesn't use the 64's cartridge slot. The Interpod costs £125.

Of course, you could also use the printers supplied by Commodore which are also low in price, especially the newly-launched 1526 dot matrix printer. This model has a reversed field facility to allow white characters on a black background, instead of black on white. Programmable characters can also be produced. The new Commodore 1526 costs £345 including VAT.

And if more than just a plain printer is required—Commodore now has a printer/plotter working in four colours, which certainly adds impact for graphics print-outs. Producing black, blue, red and green using four pens, this is a system pioneered by Sharp for its pocket computer. The plotter costs just £169.99 including VAT.

If you own a BBC micro, an Oric or a Dragon, then a Centronics type connector cable will cost around £18. While a BBC 25-way D type for use with the RS 423 costs around £10.

For the Apple, a suitable printer card will be needed for slot one and this can cost from around £70. While the IBM Personal Computer has a parallel and RS 232C socket that can be used.

More than any other peripheral, printers should be seen working before purchase, preferably with your own brand of micro. Otherwise that attractive printer in the window of your local dealer can become a big problem once it has been taken home. Make sure you aren't just sold a printer and told it will work with any computer using a suitable interface. The interface must be bought at the same time as the printer. Or buy the independent interface and try it together with the printer of your choice with the same brand of micro-computer as your own.

Printers have never been cheaper and prices are getting lower all the time. Who would have thought that a printer would be available for under £500 to produce daisywheel quality text? Or that a dot matrix printer could cost under £300, or a daisywheel typewriter/computer printer could cost from just £350.

We have put together a list of typewriters that can be used as printers, daisywheel and dot matrix printers, but they are just the tip of the iceberg as the market is growing all the time.

There has never been a better time to buy a printer for your microcomputer whatever you intend to use it for.■



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Obviously being the most competitively priced 8 & 16 bit business 'CALC' system available today is good news.

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VERY IMPORTANT: Please provide the following particulars: –

Type of micro ..... memory size ..... k

Operating system CP/M ☐ CP/M86 ☐

Floppy disk size: 5¼" ☐ 8" ☐
Single sided ☐ Double sided ☐ Single density ☐ Double density ☐

Please allow 28 days for delivery

Reg. No. 1467831 VAT No. 250078973

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RAIN

SIX MONTHS AFTER IT WAS ANNOUNCED, THE DEC RAINBOW APPEARE

When the massive IBM corporation announced it was going into the personal computer market some two years ago now, the rest of the large computer companies felt they had to follow suit and if possible 'out-do' IBM in this highly competitive market.

Digital Equipment Corporation, the second largest computer company in the world, was one of the first to announce two personal computers and in January this year the Rainbow and the Professional computers were launched in the UK. Six months later the first Rainbows started to arrive, well behind schedule, and we tested one to see how it compares with the IBM machine and the 90 or so other 16-bit computers competing in this crowded market.

So after this long wait what do we have? It seems logical to compare the Rainbow with its major competitor, the IBM PC, so we will take it through point by point.

In looks the Rainbow stands up well. It has a cream and grey processor unit housing the main processor board, power supply and disk drives. Neatly designed, the box does not have the slab-like look of the PC. The same is true of the screen which is raked at an angle so that it can be read comfortably. The keyboard has a full QWERTY layout with a cursor keypad, numeric pad, 20 function keys along the top and a separate pad with FIND, INSERT, REMOVE, SELECT, PREVIOUS SCREEN, NEXT SCREEN, HELP and DO keys.

Staying with the keyboard it has a pleasant feel, though not as good as on the IBM. However, all the keys are where you expect to find them unlike on the IBM. A strange quirk though is that the caps lock light is not on the caps lock key but at the other end of the keyboard.

The screen is neatly designed with a white on black display of 80 characters by 24 lines. The character set is clear but the screen on our system had a disconcertingly unsteady display, which is bad for the eyesight. Users should check that the screen image on their systems is steady. Our problems were probably caused by a duff monitor rather than a system difficulty.

Inside the processor box are the Rainbow's two main advantages over the IBM PC. The first is the modular design. The power supply, disk drives and processors are in separate units that clip into the system.

Unusually, the two 5¼ inch floppy disk drives stand on top of each other in a single unit and there is a space between this unit and the power supply for a Winchester disk as they become available. The advantage with this design is that as a unit breaks down it can be very simply replaced. More of this later when we talk about support and maintenance.



The second scoring point over the IBM machine is that the Rainbow has two processors instead of the IBM's one. These processors are the 8-bit Z80 and the 16-bit 8088 (the same processor as the IBM).

The main operating system of the Rainbow is a combination of CP/M and CP/M-86 called CP/M-86/80. This will run both programs written for CP/M and for CP/M-86. If this sounds confusing, it isn't. All it means is that the user can choose to run 8- or 16-bit programs without having to worry which is which. All he has to do is load the disk, and the Rainbow identifies

BOW

IN THE 16-BIT PERSONAL COMPUTER MARKETPLACE. WAS IT WORTH THE WAIT?



the software and runs it on the 8-bit processor or the 16-bit processor automatically.

The advantage is that this gives the Rainbow a potentially much larger base of established software than the IBM PC. It is not necessary for DEC to produce vast quantities of software because there is already a lot of fairly good quality software running under the CP/M operating system that can be converted to run on the Rainbow.

This being the case, one has to ask why it has taken DEC so long to come up with any software at all, since IBM has managed to establish a much larger base of software for its machine and that is all running on the 16-bit processor.

As it is, the Rainbow has an acceptable choice of software now and users can confidently expect that more will emerge fairly quickly. Incidentally, DEC has set up a software centre in the UK and it is expected that much more applications software (16-bit) will come from there in due course.

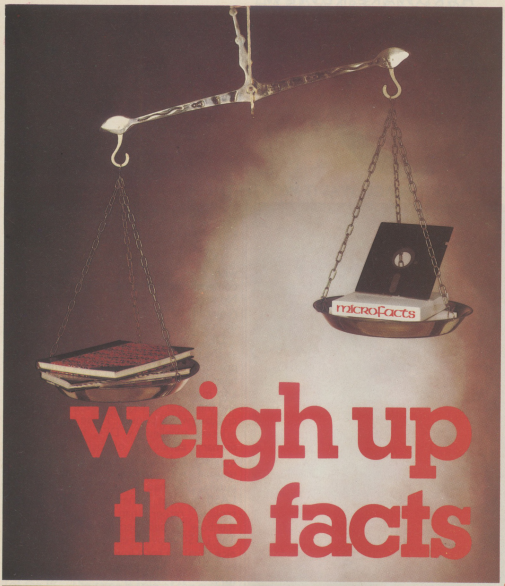
The system is well packaged and comes with good documentation. Setting up is comprehensively explained in a User Kit. No special tools or even screwdrivers are required to attach all of the relevant devices together.

DEC supplies three choices of printer — the LA50 which is a 100 cps dot matrix printer, the Letterprinter 100 which is a near letter quality dot matrix which can also manage a fast 240 cps in draft mode and the letter quality LQP02 which is a 32 cps daisywheel printer. These are the only printers supplied by DEC but have the primary advantage of being simple to connect and to get working — which is unusual with printers for microcomputers. We had some trouble with the LA50 but this turned out to be 'finger trouble' rather than the fault of the Rainbow — but then nobody is perfect. The LA50 proved reliable and has a very nice typeface for a low cost printer, much better than the equivalent printer for the IBM.

The Rainbow comes with an awful lot of documentation but it is well produced and easy to follow in the main. One niggling problem we had was that DEC forgot to include an overlay which gave the names of the function keys so we had great difficulty in finding keys referred to in the manual. If you buy a Rainbow make sure the overlay is included.

Starting the system up is a straightforward procedure. Once the system is switched on it has a self test routine which is a good way of finding problems before you start using the system. There is an easy-to-follow Set-up routine which allows the user to configure the system and the printer and make sure that all the variables allowed for on the system are set properly (eg keyboard click, screen display, keyboard language and so on.).

Once the system is up and working, though, and the user loads the CP/M-86/80 operating system, the problems start. CP/M has proved a very popular operating system in the past, but the fact remains that it is difficult to come to grips with if you are new to computers. Full marks to DEC for providing a manual that is easy to follow, but the user still has to learn a set of commands that are largely built up of hieroglyphics to do the simplest functions. It has to be said that this simply is not good enough. Considering the size of



weigh up the facts

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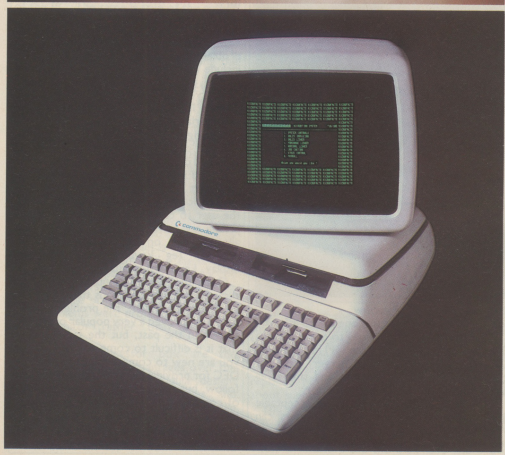

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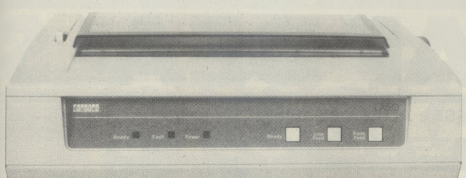


The DEC LA50 100cps dot matrix printer — proved reliable and "much better than the equivalent printer for the IBM"

SPECIFICATIONS

CPUs: Z80 and Intel 8088.

Memory: 64KB RAM as standard, expandable up to 256KB.

Storage: Twin 400KB 5¼ inch floppy disk drives with the option of two more or a 5MB Winchester hard disk.

Operating system: CP/M86-80 as standard, MS-DOS (equivalent to PC-DOS) as an option but will only run the 16-bit processor.

Communications: Serial RS232C (printer) plus asynchronous port up to 9600 baud with modem control plus options for another RS232C and an RS422.

Price: Basic system £2360 excluding VAT. Extra floppy drives are £672 for two, the 5MB Winchester is £2346, extra 64KB RAM is £334, extra 192KB RAM is £739 and a colour monitor is an expensive £894. Maintenance is free for the first year.

Printers: LA50 is £609, LA100 Letterprinter is £1816, LQP02 is £1960.

investment DEC has already put into this system, there seems little excuse for not making the operating system a little more straightforward to use.

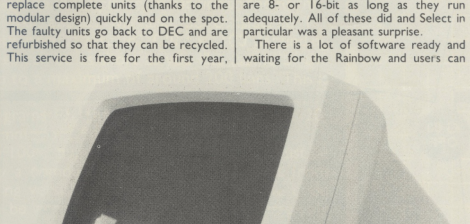
It gets worse. This article is being written on a Rainbow 100 using the Select word processing package. In many respects Select is a dream to use. It comes with a training package that got us up and running in half a day. The package is both easy to use and quick. However, trying to get a working disk sorted out so we could get started proved a nightmare.

Rainbow dealers will throw up their hands at this and say it is all fairly straightforward and a reviewer should be able to cope with the well-described process of formatting and copying the working disk. Our reply would be that if it takes us a day and two calls to the DEC 'hot line' to carry out this simple manoeuvre, what about the user who has never used a computer before?

Which brings us neatly onto maintenance and a chance to say something good about the system. DEC provides two forms of support. The first is a telephone number to a series of experts who will try and answer queries over the telephone. We used this service, got through very quickly and found the DEC personnel friendly, knowledgeable and helpful. They managed to sort out our problems over the phone.

The second level of support is for the hardware. If something breaks down, DEC will send an engineer who will replace complete units (thanks to the modular design) quickly and on the spot. The faulty units go back to DEC and are refurbished so that they can be recycled. This service is free for the first year, anyway since it does not matter with general business packages whether they are 8- or 16-bit as long as they run adequately. All of these did and Select in particular was a pleasant surprise.

There is a lot of software ready and waiting for the Rainbow and users can which is an astonishing offer on a machine that only costs £2,300. IBM only offers six months' maintenance and the user has to return the PC to IBM to get it repaired.



The VDU is neatly designed but had a "disconcertingly unsteady display"

And so onto the software. DEC provided us with a wide range of software including Select word processing, Multiplan and Finar financial modelling, Compsoft's DMS database system and an Inventory Management package. This is a fairly good spread of standard micro-computer packages but it is difficult to tell whether an individual package runs on the 8-bit or 16-bit microprocessor.

This is largely irrelevant to the end user confidently expect a lot more to be written for this system — the name of DEC will attract lots of software companies. ■

The Rainbow should be available from all Digital dealers, some of which are listed below:

Micro Business Systems in London (01-621 1122) and Edinburgh (031-333 1000), Guestel Ltd in London (01-583 2255) and Bristol (0272 277461), Ferrari Software (01-751 5791), Cytek UK (061-872 4682) and South Coast Computers in Dorset (0202 893040).

COMMENT

So how does the Rainbow stand up to the IBM PC? Points in its favour are the two processors, the flexibility this brings to the system and the maintenance offer. The second point in particular is significant. Smaller plus points are the pleasant keyboard (the touch is not as good as the IBM's but the layout is better), general styling of the system, the printer options are very good and the set up is very simple.

On price, the Rainbow gives the user an extra processor and larger disk drives for the same price as the IBM PC.

The minus points are that the operating system is not as good as PC-DOS (which runs on the IBM), and the screen display is not as good. Probably the most significant of these is the operating system. It could be rather a headache for users new to computers.'

Looking at the Rainbow in isolation we can say that it is a pleasant system to look at, some of the software is very good and it compares favourably with many of the 16-bit systems on the market. It is a pity that it has taken DEC so long to get it to the marketplace though, since it is a system that is state of the art circa June 1982, and not August 1983.

CHEAP DEALS



COLOSSAL ADVENTURE

The original classic mainframe adventure is now available for your micro with an extra 70 locations added to the end-game. "You are standing beside a small brick building at the end of a road from the north. A river flows south . . ."

For Atari 400/800 (32K), BBC (32K), Commodore 64, Lynx (48K), Nascom (32K), Oric (48K), Spectrum (48K), & 380Z (48K).

To take advantage of this special offer send cheques or postal orders together with this coupon to Level 9 Computing, 229 Hughenden Road, High Wycombe, Bucks. HP13 5PG. Allow 28 days for delivery. Offer closes September 30th 1983. Please do *not* send them to *Which Micro*.

Please send me a copy of Colossal Adventure at the special offer price of £6.90. I understand that the offer is only valid when accompanied by this coupon.

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ADVENTURE QUEST

The armies of the Demon Lord Agaliarept are marching to conquer Middle Earth. The only hope is for one person to use near-forgotten paths to reach the Black Tower and destroy the source of his awesome power.

For Atari 400/800 (32K), BBC (32K), Commodore 64, Lynx (48K), Nascom (32K), Oric (48K), Spectrum (48K) & 380Z (48K).

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DUNGEON ADVENTURE

The Demon Lord Agaliarept has been defeated and the Black Tower shattered. But in the depths of the earth his dungeons remain: filled with the treasures created at the height of his power. And their guardians remain also.

For Atari 400/800 (32K), BBC (32K), Commodore 64, Lynx (48K), Nascom (32K), Oric (48K), Spectrum (48K) & 380Z (48K).

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Your adventure starts after escaping from prison in a hot air ballon which descends to a small, inhospitable island. Once you've landed there are booby trapped fields, killer bees, hives to raid for energy and natives to be bribed. Enter the caves, negotiate a force field, capture the Nautilus and you're almost home. All successful adventurers can claim a unique personalised award by sending Mr Micro their final surface position at the end of the game.

For the Vic 20 with 16K expansion, by joystick or keyboard.

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PROGRAM COMPETITION

1st PRIZE £200 2nd PRIZE £100 3rd PRIZE £50

We want even more listings for publication in *Which Micro?*, and to boost the incentive we have decided to re-run our immensely popular program competition.

The top three programs received before our closing date will receive one of the three prizes, *in addition* to the normal publication fee. All entries will also be considered for publication at our normal rates of £20 to £100 depending on length. Entries can be as short as you like (some of the best are) and up to a maximum of around 200 lines. This is what we are looking for: entries must be games, utilities, or educational programs for the Spectrum, Dragon, Vic 20, BBC, Oric, Commodore 64, Lynx or ZX81.

They must be 100% bug-free (please . . .!!!), and must be accompanied by a computer listing dumped straight from the final, working version of the program. Machine code programs must be accompanied by a complete assembly listing.

Entries should also be accompanied by complete instructions for entering and using the program. A cassette with at least one copy of the final version of the program on each side should accompany the entry.

Please remember that the cassette, the listing and the covering letter must all bear the competitor's **name, address, and telephone number** along with the name of the program and the **type of computer for which it runs.**

Finally, please do not send us your only copy of the program — we cannot return them.

JUNE COMPETITION RESULT

Winner £100 software voucher

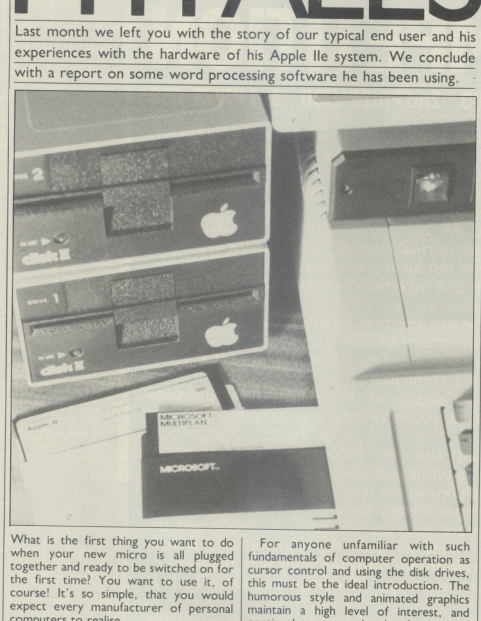
Daniel Mitchell

St Malo Road, Wigan

Lancs

COMPUTER PITFALLS

Last month we left you with the story of our typical end user and his experiences with the hardware of his Apple IIe system. We conclude with a report on some word processing software he has been using.



What is the first thing you want to do when your new micro is all plugged together and ready to be switched on for the first time? You want to use it, of course! It's so simple, that you would expect every manufacturer of personal computers to realise.

Unfortunately, very few of them do — the humble user, fresh from the arduous task of filling out owner registration documents, software licencing agreements and warranty cards, is expected to spend an afternoon grubbing in manuals to work out even the barest basics of how to operate the system.

Apple can't be praised too highly, then, for making the bookworm approach optional. All I had to do after putting the machine together was to insert a disk into Drive 1 and switch on. A suite of programs titled "Apple presents.....Apple" then took me straight into a presentation of the IIe's capabilities, and gave a step-by-step tutorial on how to make everything work.

For anyone unfamiliar with such fundamentals of computer operation as cursor control and using the disk drives, this must be the ideal introduction. The humorous style and animated graphics maintain a high level of interest, and continual tests on what has been learnt ensure that the lessons are not quickly forgotten.

> One of the most dramatic savings in time and effort allowed by *Applewriter* is the word counting sub-program

Once the basics were mastered, I was able to proceed to some real work. Anyone who read last month's issue will remember the priority I gave to word processing in my requirements. Apple's official word processor for my computer is *Applewriter IIe*, a newly improved version of a program which has been around for a number of years.

So far, it has been a great timesaver, but *Applewriter* is still not perfect, and the combination of a number of particular peculiarities led to a disaster on one notable occasion.

One of the most dramatic savings in time and effort allowed by *Applewriter* is the word counting sub-program. It counts words rather slowly, especially in long pieces of text, but even so, I use it almost every day.

An idiosyncracy of the program is that it can only operate on a chunk of text stored on disk, not in memory. If you have just finished a piece of deathless prose you type control S for 'save', enter the name 'pitfalls' for future reference, and hit RETURN. Then you run the word-counter, and tell it which disk file to work upon.

The next peculiarity is that for some mysterious reason the counter removes all the carriage returns from the document — meaning that the whole thing becomes one long shapeless paragraph. So the procedure is to clear the memory with CTRL-N (for 'new') and use CTRL-L ('load') to fetch your material back from the disk into memory, in its original, neatly formatted state.

> It is at this stage that a moment's carelessness can write off hours of hard work

It is at this stage that a moment's carelessness can write off hours of hard work. If your errant fingers type a 'save pitfalls' command instead of 'load pitfalls', the file 'pitfalls' is replaced by the current document in memory. Since the memory is empty, the effect is to wipe out the file.

The first time this happened to me, it was with a short letter, so I put it down to experience and simply bashed the thing out again. The second (and so far latest) occasion was when I lost a whole day's work. I was not at all pleased.

The problem would be avoided if an attempt to save a document with a file-name which already existed gave a warning before overwriting the previous version.

In other respects, *Applewriter IIe* is very good at protecting documents against erasure — the commands to clear the memory and to leave the program altogether both demand positive confirmation. Why, then, does the system allow the replacement of one file with another of the same name, without even the slightest warning?

My only other complaint with *Applewriter* is that it is supplied on disks which are not write-protected. This became a problem only when I used an option provided to format new disks ready to receive data. I made a mistake in telling the machine which disk drive contained the blank disk, and it wiped my program disk clean, leaving me with only one copy.

Apple supplies a disk copying program on the System Master disk, but when I used this in an attempt to reproduce *Applewriter* back on to the wiped disk, the copy would not load. Obviously, the program is designed to be uncopyable.

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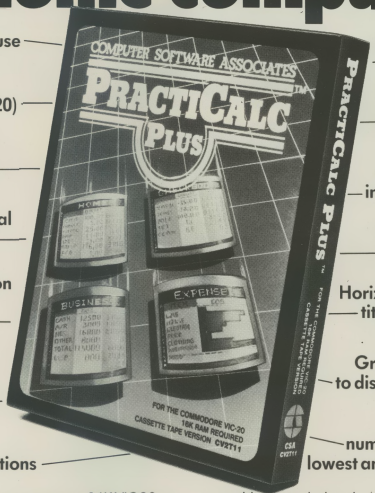

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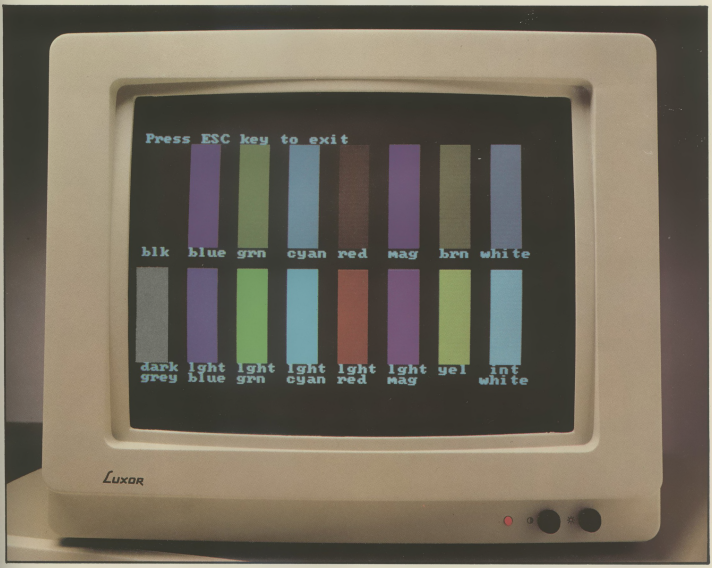

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Computer Crime

So many people now have access to huge computer networks and databases that security has become a real headache for the banks, government departments and corporations that control them. We describe several cases that have recently come to light.

Most of us are becoming more aware of the problems of 'computer crime' thanks to coverage of the subject in the media and drama series such as 'The Consultant' and 'Bird of Prey', both of which have appeared on the TV over the last year.

What's more, many of the multi-million pound bank swindles which have been hitting the headlines involve corrupt programmers (or 'white collar criminals') manipulating files in order to channel money into bogus accounts.

According to a recent report, Dr Ken Wong, manager of BIS Applied Systems' security and privacy division, estimates that computer-related fraud is running at the rate of £2.5 billion per annum and is likely to escalate 100 per cent over the next few years.

The problem — or perhaps blessing — is that computers are not intelligent; they will only do what programmers tell them to do. But no matter how tight the security surrounding a computer system, there is always the fear that someone is capable of cracking it — if he or she really wants to.

This raises the whole question of computer security, a subject many people are concerned about due to the vast amount of potentially harmful data concerning both individuals and institutions held on these systems.

According to Adrian Norman, editor of *Computer Insecurity*, "Computer people must have enquiring minds, which are frequently associated with a taste for mild mischief. They are likely to see a computer system's security measures as a personal challenge, and will set about defeating them. In the course of such an exercise they are likely to find their way through the flaws in the defences and put themselves in a position to exploit them for other reasons than harmless fun".

Now that computers are infiltrating all walks of life, many more people have direct access to computerised systems — Prestel being the prime example.

The information contained on Prestel's computers may not be that vital, but the same principles have been extended to a new scheme called 'Homelink' which is a "home operated Building Society, banking and tele-shopping service". Through their TV sets, subscribers to the service can run a Building Society or bank account, transfer money between accounts, buy groceries, send and receive messages to other users, and even book holidays.

Because subscribers have direct access to the bank's and Building Society's computers, security is going to have to be very tight. Indeed they reassure customers that "every financial transaction you make will be rigorously protected by stringent security codes and passwords". We shall see .....

The following is a selection of some interesting computer crime case studies published in a new book called *Computer Insecurity*.

Mischief

Location/victim: London, UK — Bureau
Perpetrator: Opportunist (schoolboy)
Method: Discovered other users' passwords

A 15-year-old Westminster schoolboy completely cracked the security system of a major London computer timesharing service in 1974, gaining access to the most secret files stored on the computer by other users — able to read and change them at will without anyone noticing. He used no special technical gadgets and started with no special knowledge of the computer's inner workings — instead he relied only on ingenuity and a teletype terminal in his school.

The schoolboy, Joe is part of a new generation of 'computer phreaks' who explore computer systems in the same way that 'phone phreaks' explored the telephone system. Joe worked on the project for only four months, until he was temporarily banned from the computer by his teacher.

Most users of the service have a terminal which is not permanently connected to the computer, and dial into it using the normal telephone system. After reaching the computer, the users must identify themselves by giving an account name and password. The trick Joe used was to listen to the sign-on procedures to learn the account name and password of highly privileged users, and then pretend to be them in order to gain access to secret files. But this required a long series of steps.

First, Joe found by trial and error that there was nothing to stop him from reading the computer's main memory (although not user files). So he wrote a program to provide him with a printout of the operating system — the software which controls users' programs, terminals, etc.

With this listing, a few tips from programmers at the timesharing service and an obsolete systems manual, he wrote a program to print the teletype line number and account name of every terminal using the timesharing system at any given time.

Thus, by printing this out a number of times he could get a full list of account numbers, but he was still missing the critical passwords. The only way to get that was to eavesdrop on users when they first began to use the computer and actually used the password.

For each line, a timesharing computer has a buffer — a small section of memory which stores data coming from the terminals for a short period until the computer can use it. Using his memory reading program, Joe was able to print out on his terminal the content of any other terminal's buffer.

Studying his operating system printouts, Joe found that the computer had a simple rule for assigning the next line. Thus, all he had to do was watch the buffer on that line, and print out its contents as soon as the user signed on.

In common with most timesharing systems, most users on this one were not allowed to read files maintained by other users. But a few users, such as system administrators, have special privileges and can look at all files. It was only a matter of time until a privileged user logged in, and then Joe was away.

He had the power to completely take over the system, cutting off other users, changing passwords, and even altering the bills that customers would have to pay.

In fact, he never did anything much with his privileged account numbers. He wrote to the timesharing service and told them what he did, but he never got a reply. A new version of the operating system was introduced on the computer, and Joe said he planned to check it to see if his method still worked.

Pseudo Fraud

Location/victim: USA — Credit cards
Perpetrators: Students in a contest
Method: Various

Transaction Technology Inc., a subsidiary of First National City Bank of New York, sponsored a student contest at California Institute of Technology. They sought the cheapest and most effective technique for defrauding magnetic-stripe cards. (FNCB had its own system: a card containing aluminium foil with holes in it, to be read by a laser.)

At the time of this article there were 500 million cards outstanding and losses were running at $350 million per annum. ▶

The magnetic stripe on the back of a plastic card contains data encoded at either 200 bits per inch, the IATA standard, or 75 bits per inch, the ABA standard.

There are five basic fraud techniques:

(i) obtain a list of valid cards with their security numbers;
(ii) chemical duplication;
(iii) skimming data from a good card with an electronic pantograph;
(iv) transfer data from a good card to magnetic tape;
(v) iron on a new stripe.

The prizes went to two cheap devices:
1st Prize — $5,000 for a BART ticket duplicator
2nd Prize — £1,500 for a $35 wrist-strap copier

The technique of the winner was shown in the *Business Week* article in a series of six photographs. Using a conventional iron set to the right temperature, the fraudsman 'irons' a piece of magnetic tape over the stripe of a valid card. (The Bay Area Rapid Transit Card is a 'stored fare' card.) The signal from the new card is reproduced on the magnetic tape and this is glued onto the back of an old card whose stored fare has been decremented in normal use to zero. The old card is now 'as good as new'.

Mischief

Location/victim: UK — Heriot-Watt University
Perpetrator: Student
Method: Wrote programs to collect other people's passwords

About 1976, there was a student using the computer centre at Heriot-Watt University who wrote a program to run under timesharing. He left it on disk, knowing that some of the other students would try it out just to see what he was doing. The program started running, and then simulated a systems crash followed by the timesharing sign-on sequence, after which it terminated.

The user number and password entered during the pseudo sign-on were written away to a disk file and subsequently were used as input data to a program that would remove all disk files belonging to the accumulated user numbers.

Altered Data

Location/victim: UK — Thames Polytechnic
Perpetrators: Students; Barry Larrigan *et al.*
Method: Dumped archive files

Students at Thames Polytechnic were asked to break the security routines on the DEC System 10 as part of their course. During 1977, three students managed to prise open a secure file containing their examination results, amend the marks and return the doctored file to its original place.

The computer science course organiser, Tom Crowe, explained:

I was responsible for the lectures on systems security and used published material (*IBM Systems Journal*). I advised my students that no system was absolutely secure and often the weakest point could be recently developed software.

By way of an exercise I set up a file called MARKS in my account on maximum security giving the students zero marks for the coursework. They were invited to alter the marks to a more appropriate grade.

Barry Larrigan, one of the cracksmen, enquired of Software Support what was the latest facility on our DEC10 system. He was told that it was the archiving facility. He played with it for a while and discovered that although my file MARKS had maximum security in my account it did not have the same security in archive. He proceeded from there.

Larrigan also claimed that during his period of industrial experience he was able to put his employer wise to gaps in security on a DEC system the company was considering.

Digital Equipment Corporation's UK software specialist said "the user can select his own degree of protection, up to a maximum number of seven. Every file on the System 10 or System 20 has its own protection number. You can set files so that no one can touch them." He claimed that the security on DEC System 10, which runs under Digital's Total Operating System, is in the hands of the user.

Theft

Location/victim: London, UK — BOAC
Perpetrators: Analyst and programmers
Method: Plagiarised PARS and BOADICEA software

A number of employers of BOAC plagiarised IBM's PARS and BOAC's BOADICEA and offered the information to another software house (or rival international airline?).

The system cost BOAC 300 man years of work and was valued at £2,250,000.

Theft

Location/victim: UK/USA — Telephone carriers
Perpetrators: Phreaks and fiddlers
Method: Electronic tone generators, equipment modification, misuse of codes

On 13 November 1973, nine men were acquitted of conspiracy to defraud the British Post Office telephone systems after an Old Bailey trial that had started on 3 October and cost £100,000. Ten others had already pleaded guilty and been fined from £25 to £100.

All 19 were *phone phreaks;* most of them were in their twenties with university degrees and a profound understanding of the telephone networks of the world. In October 1972, GPO investigators discovered them holding a conference in a Hammersmith flat surrounded by telephone equipment, devices for making calls and computer printouts listing 'secret' Post Office codes. Their attitude was described by the judge who tried them thus: 'Some take to heroin, some take to telephones.' For them phone phreaking was not a crime but a hobby to be shared with fellow enthusiasts and discussed with the Post Office openly over dinner and by mail. Their approach and attitude to the world's largest computer, the global telephone system, was that of scientists conducting experiments or programmers and engineers testing programs and systems. The judge appeared to agree, and even asked them for phreaking codes to use from his local exchange.

The cost of preventing phreaking has been high. Besides the expense of the trial, there has been the need for new equipment and systems to detect and identify attackers, and the time of the investigation branch which would be better spent apprehending real villains. Organised and professional criminals were planning to adopt the amateurs' methods, not only in Britain, but in the United States where serious phreaking began in the mid sixties. The ultimate threat is the complete



seizure of the network, using a computer to send calls back and forth till they fill up all the trunk lines.

In the early sixties, students of the Massachusetts Institute of Technology had experimented with the Department of Defense network. They were not prosecuted, but recruited by the operators of the Bell System, the main US network. In 1967, the *Bell Telephone Journal* published an article describing how the network was controlled by tone signals and giving the frequencies involved. The phreaks soon built 'blue boxes' containining tape recordings of electronic organ notes of the right pitch and duration, and later substituted electronic oscillators controlled by push buttons. Because the same lines in the telephone network carry both the signal and the conversation, anyone with access for speaking can also send control instructions to route his calls and switch on and off the charging mechanisms, merely by putting against the mouthpiece a device which makes the right sounds.

The US phone system offers '800' numbers through which companies receive toll-free calls from customers. By dialling in on these lines, but re-routing the call by fooling the exchange equipment, calls could be made to anywhere for no charge. To avoid detection by telephone-company monitors, which analyse the pattern of calls, phreaks prefer to use pay phones, but always get their money back. The US network uses the same routing codes within the trunk network as the caller dials, unlike the British equipment which has register translators to convert from dialled numbers to routing codes. So all the numbers needed by US phreaks were easily discovered, as well as the tones and their meanings.

Whereas phone phreaks may not be villains, some of those interested in their operations certainly are. The Mafia is reported to have ordered 1,000 black boxes to disconnect the billing mechanism for callers placing bets to bookmakers across the United States. Several phreaks made plans to manufacture boxes by the hundreds at a cost of $25 to $50. The market price would have been $2,500 or more.

In Britain, phreaking goes back to the early fifties, when the technique of 'Toll A drop back' was discovered. Toll A was an exchange near St. Pauls which routed calls between London and nearby non-London exchanges. The trick was to dial an unallocated number, and then depress the receiver rest for half a second. This flashing initiated the 'clear forward' signal, leaving the caller with an open line into the Toll A exchange. He could then dial 018, which forwarded him to the trunk exchange — at that time the first long-distance exchange in Britain — and follow it with a code for the distant exchange to which he would be connected at no extra charge.

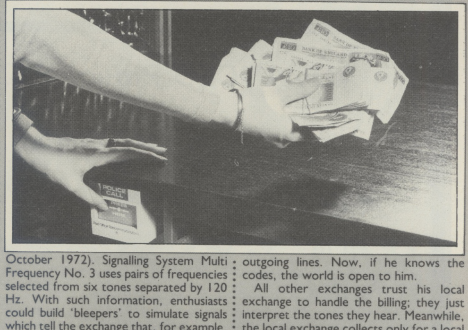
The signals needed to control the UK network today were published in the *Institution of Post Office Engineers' Journal* and reprinted in the *Sunday Times* (15 October 1972). Signalling System Multi Frequency No. 3 uses pairs of frequencies selected from six tones separated by 120 Hz. With such information, enthusiasts could build 'bleepers' to simulate signals which tell the exchange that, for example, a subscriber has hung up, or a call has been answered and charging should begin, or that a call is coming from another exchange. In the early seventies, a simpler system based on different numbers of pulses with the same frequency (2280 Hz) was used. Details could be found in standard textbooks and journals such as Atkinson's *Telephony* and *Systems Technology*.

Before STD was widespread, many 'ordinary' people were driven to occasional phreaking from sheer frustration at the inefficient operator controlled trunk system. This came to a head during a strike about 1961 when operators could not be reached. Nothing complicated was needed. Many operators has been in the habit of repeating the codes as they dialled the requested numbers so people soon learnt the numbers they called frequently. The only 'trick' was to know which exchange could be dialled through to pass on the trunk number. Callers also needed a reasonably quiet location, as timing relative to clicks was important.

Phreaks get most enthusiastic about international calls. The International Telegraph and Telephone Consultative Committee, CCITT, publishes a 'White Book', (which cost £50 or so in the early seventies) with all the details needed to phreak the global network. Using the information in it, phreaks would make calls, for example, from one call box to an adjacent one in New York by way of Russia or Australia, just to demonstrate they could do so.

At the Old Bailey phreak trial, the Post Office explained how such calls had been made from Britain. The phreak first dials a spare number at a local call rate but involving a trunk to another exchange. He then sends 'clear forward' to his local exchange, indicating to it that the call is finished; but the distant exchange does not realise because the caller's phone is still off the hook. He now has an open line into the distant trunk exchange and sends to it a 'seize' signal: '1', which puts him onto its outgoing lines. Now, if he knows the codes, the world is open to him.

All other exchanges trust his local exchange to handle the billing; they just interpret the tones they hear. Meanwhile, the local exchange collects only for a local call.



Theft

Location/victim: West Coast, USA — Bank
Perpetrators: Programmer and wife
Method: Transferred $100 from forty-one accounts to wife's

A debt-ridden, 20-year-old programmer in a small West Coast bank, went to work early one morning and ran the computer for a fictitious day. After he got the system running, he gained access to it either by using an on-line terminal or by writing a program. Through this chicanery he managed to transfer $100 from forty-one different accounts into an account his wife had opened under an assumed name. The couple had planned the swindle for the Memorial Day holiday so they could take the money and run over the long weekend.

Cruising up to a convenient drive-in teller window, the wife began withdrawing the money in $500 chunks. Because of the $500 withdrawal limit, she had to make many return trips over a four day period, wearing an assortment of wigs and driving different rental cars.

The operation went on past the holiday weekend. The bank finally noticed when a man came in to check his savings account balance and found $100 missing. The bank examined the disgruntled man's account and discovered forty other similar $100 transfers. So the bank wrote a program that compared that day's closing balance with the previous day's and thus located all of the accounts. It also pinpointed the wife's suspicious account. The FBI and local police were promptly called in. They staked out the drive-in teller's window and captured the culprits in the middle of another $500 withdrawal.

Computer Insecurity, edited by Adrian Norman, is available from Chapman and Hall at £14.95.

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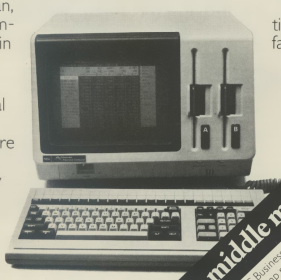

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ELECTRONIC MAIL

Given the phenomenal growth rate of technology and the thousands of people buying computers, it wasn't long before micros could talk to each other. We found out how computers communicate.

Communication lies at the heart of the information technology revolution. It is not enough just to handle and manipulate information, it needs to be communicated and accessible to people in different places. As the number of micros grows, more and more people want to be able to communicate between them and perhaps larger computers.

Not ones to be left behind we decided to try some long distance inter-computer communication of our own when one of our number went off to the USA.

For the experiment we used a couple of Osbornes — although most machines would do — one in the office in London and the new Osborne Executive in Hayward, California.

Once you write something on one computer, like this story, then to send it to another or for you to gain access to information on another computer as in Prestel, the computers must be able to communicate. Easier said than done.

It is a bit like matching up a printer to the computer, there are a number of different protocols used by the computers and several ways of sending the information.

So just what did we do? Well, there are two ways we could have tried to communicate, directly from one computer to another or via some intermediary. For direct communication that would require someone to be at either end at the same time and when you are calling from over 6000 miles away there is quite a time difference. Easier to go through an intermediary — an electronic mailbox.

This is a central computer which acts as a pigeon hole for messages. You are assigned a password for each box you have and can receive or transmit messages from your box to anyone else who has a mail box.

The advantage for long distance work, or to avoid repeated telephone calls until you find someone, is that you can send a message when you want and receive one when you want.

Another advantage is that the message can be sent for the price of a local phone call and retrieved for the same — which at 6000 miles is some saving. The mailbox costs, though, so you have to work out if you will use it enough to justify the standing charge.

Osborne uses an electronic mailbox system, Compuserve, for communication between its various locations in the US and UK. We used another company, BL Systems — yes the people who brought you the Mini Metro from its car division — who operates a mailbox system called Comet. This costs £30 a month per mailbox, with a three month minimum, but there is no storage or access charge.

The use of this intermediary means that almost any teletype terminal, micro or word processor can be linked provided the micro can act as a terminal since the mailbox is on a mainframe computer.

This story was written using WordStar. For transmissions you can either write the whole story in the non document mode or use one of the PIP utilities, PIP <file name> Z, to strip away the most significant bit in the data byte which removes the various control functions used in WordStar to indicate soft spaces, soft returns etc.

If your message is long, this latter approach is easiest since it saves putting in carriage returns at the end of every line. It is also advisable to transmit in upper case. It is possible to transmit text files generated by some spreadsheet programs, like SuperCalc, and incorporate them into the text.

Once the story was written we used a piece of software which enables the Osborne to act as a terminal. In the US the story was written on the new Osborne Executive which professes to be a 'universal terminal emulator' capable of acting as a terminal with both asynchronous and synchronous computers.

At the end of the first week on the market Osborne reported orders for 25,000 which suggests a lot of interest in the communications capabilities.

The software program we used in the US was called Amcall while in the UK on the Osborne I we used Microlink. These and other programs basically allow the information held in one system to be transmitted to another system.

Information is transmitted either synchronously or asynchronously depending upon the computer. In synchronous communication the data and clock are transmitted on separate wires and transmitted together in timed sequence. This makes transmission faster and decoding easier but is more expensive as it needs more critical circuitry.

This is the way large IBM computers transmit data. In the asynchronous mode the time and data information are mixed together and the characters can be transmitted asynchronously, which tends to be the normal for micros. It is also easiest for marginal quality telephone lines.

Once the story was written and on disk file the next thing to do was to call the mailbox and send it. You do not have to put it on disk in a file but this is easier and quicker than writing it directly into the system.

In Britain there are a number of telephone numbers in different areas which give access to electronic mailboxes, like Comet, locally.

There are far more in the US for the different data transmission networks — at least 34 in the San Francisco Bay area according to Roy Robinson in technical support here at Osborne in Hayward.

In order to get data from the computer into the phone lines a modem — modulator/demodulator — is necessary. The modem converts the binary information in the computer into tones which can be transmitted across the phone lines. The Osborne modem plugs directly into the back of the phone and the number can be dialled directly from the computer keyboard provided the phone system will allow it.

In the UK, where there are more difficulties about attaching things to the phone lines, many people use an acoustic coupler which is a simpler way of connecting the modem to the phone system without any electrical connection to the phone lines.

It is also more portable and can be used to plug into any standard phone, although normally not trimphones.

The signals sent over the phone go to a local packet switching centre where they are processed by sophisticated equipment and transmitted over high quality circuits to avoid any loss of quality. Then at the other end they are transmitted back over the local phone lines to the receiving computer.

That's the theory, if you're reading this then we know it works.

Once the local access number is dialled there is a tone which indicates there is a connection to the data transmission lines. Then you enter in a series of codes to enable you to get access to the particular mailbox you are using.

In our case this meant getting into the Tymnet system in the USA which required having an identity number (problem number one), going through that to get to Comet in the UK, entering a personal password finding out if there were any messages for us and then sending the story.

The transmission rate is 300 baud which means it takes about one and a half minutes to transmit a full page of A4 typed text.

We also used the mailbox system Osborne uses and sent the story to a mailbox owned by Osborne via Compuserve. Then from London we dialled into this and retrieved the story and got it onto disk in the computer in the office.

Once the story is transmitted there is a confirmation message that it has been received. Then it is up to the recipients to call into their mailboxes regularly to see if there is a message for them.

If there is, they can access it and either read it on their VDU or transfer it onto disk or print it out or all three.

This, however, is really just a simple example of electronic data transmission. Its impact — in publishing, banks, offices, even in the home — is only just beginning.

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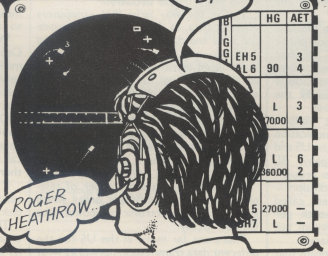

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BUYER'S GUIDE

September

This month has been a busy one for our Buyer's Guide team. The main news is the introduction of the Acorn Electron into the most competitive part of the market — at under £199 it will mean real trouble for the main rivals.

This month's other news includes an attractive deal on the ZX81. A "starter pack" is now available for £45 which includes the ZX81, a 16K RAM pack and one software cassette. One new micro comes from Sharp — the MZ-700 series. At prices of £240 for the basic version and £420 including the integral cassette unit and four-colour printer-plotter, it is a worthy competitor to the Commodore 64 and BBC Micro.

After last month's bout of price cuts, the trend continues this month with a reduction on the Colour Genie, from £199 to £168 and on the CGL M5 from £189 to £150.

Every effort is made to keep the Buyer's Guide up-to-date, but please send any additions to Buyer's Guide Editor, *Which Micro?*, Scriptor Court, 155 Farringdon Road, London EC1R 3AD.

Acorn Atom	£175
Apple 11e	£845
Apple 11 Plus	£699
Aquarius	£80
Atari 400	£150
Atari 800	£299
BBC B	£399
Casio FX702P	£135
Casio PB100	£80
Colour Genie	£168
Commodore 64	£230
Commodore Vic 20	£140
Commodore 700 Series	£995
Comx 35	£120
Dragon 32	£175
Electron	£199
Epson HX20	£411
Jupiter Ace	£90
Lynx	£225
NEC PC-8001	£397
Nascom 1/2	£125
Nascom 3	£376-£506
Newbrain A/AD	£233-£267
Orange	£595
Oric 16K	£100
Oric 48K	£140
Sharp PC1251	£80
Sharp PC1500	£169
Sharp MZ700	£240
Sharp MZ80A	£477
Sharp MZ80B	£899
Sord M5	£150
Spectrum 16K	£100
Spectrum 48K	£130
Tandy Model 100	£500
TRS-80 PC2	£179
TRS-80 Colour	£299
Texas TI99/4a	£150
Texas CC40	£170
ZX81	£ 40

NEW



Acorn Electron

Price: **£199**
Use: **Home/education**
RAM: **32K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Acorn Computers 0223 210111**

For: Most of the attributes of the BBC Micro, including class-leading graphics and easy-to-use sound. The structured BBC Basic makes programming easy to understand, and compatibility with most BBC software (with many special Electron versions on the way) makes the Electron a machine you can use right now.
The typewriter keyboard makes serious use possible with Electron versions of Acorn's ROM-based word processor and spreadsheet under development.
Against: Some cost-cutting evident, especially in the power supply (no switch).
Conclusion: Guaranteed to cause severe headaches for all competitors.
See Here at Last on page 34.

NEW



Sharp MZ-700

Price: **£240-£420**
Use: **Home/business**
RAM: **64K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Tandy 0922 648181**

For: Launched this month, the MZ-700 is well-made, well-documented and good value for money at £240. £420 buys you the model with a built-in cassette recorder and printer/plotter. Makes the BBC look over-priced.
Against: Limited graphics capability and you need to load Basic from cassette.
Conclusion: This is Sharp's latest assault on the home micro market, and looks its best bet yet. But the imminent appearance of the £200 Electron looks like being the nut it will have to crack.
See Sharp Move on page 42.

Price — The costs quoted for each micro are based on the lowest common retail price prevailing at the time of going to press.

But when budgeting for a system remember that the machines will usually require extras to perform their required function. This ranges from access to a television set and cassette recorder, to spending several hundred additional pounds on a printer if the computer is going to be used for serious business purposes.

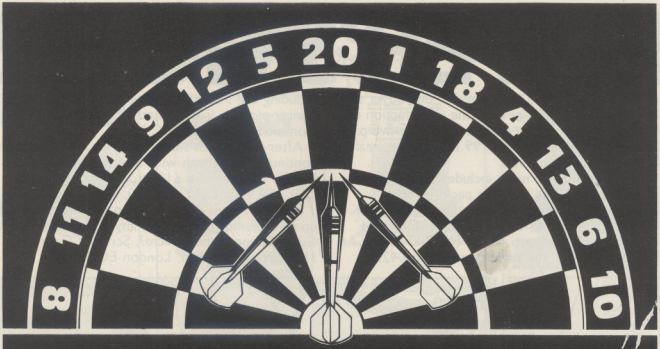
Use — This gives an idea of what most machines are best suited for — though price tends to be the overriding factor as few non-millionaires would spend £3000 on a computer to play games with. But additionally some micros have large amounts of software and special features that are tailored for a particular market.

RAM — The size of the RAM memory in a computer defines how large and how sophisticated a program can be run. It's generally true that the larger the memory the better the computer — and the more expensive.

Colour — Micros that show colour when plugged into a colour television are becoming increasingly popular in the home market as price fall. For many business applications, however, colour is not considered that important.

Languages — Nearly all micros offer the Basic computer language which, at the moment, is the easiest and simplest language for those wanting to learn how to program. Other languages tend to offer more powerful facilities or are specially suited for particular applications.

Interfaces — These are the sockets on a micro which allow such peripherals as printers and modems to be connected and controlled by the computer. The most common is the RS232C interface and a wide range of equipment can be connected to it. Less well-known interfaces may give a more limited choice.



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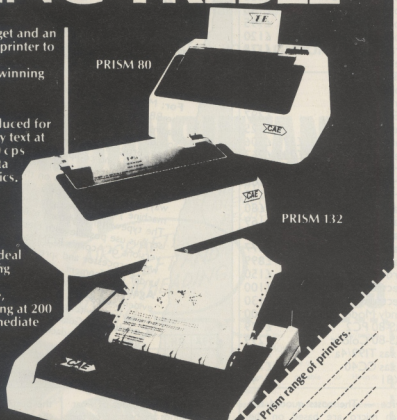

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Sinclair ZX81

Price: **£45 — special offer "starter pack" which includes 16K RAM.**
Use: **Home**
RAM: **1K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Sinclair Research 0276 685311**

PRICE CUT

For: Sinclair's celebrated ZX81, the computer which broke open the home market, is still available, though for how long this will continue is anyone's guess.

But in recognition of the declining appeal of a black and white computer that costs over £70 — by the time the virtually obligatory 16K of extra memory is purchased — Sinclair has now introduced a £45 starter pack. For this reasonable sum purchasers can acquire a ZX81, a 16K RAM pack and a software cassette.

Against: That membrane keyboard! It's like typing with a sheet of cardboard over the keys.

Although the software is plentiful and cheap, there is virtually no new material coming out, since programmers prefer the Spectrum. It's also worth remembering the speed at which the ZX81 loads programs from cassette — everything happens v-e-r-y s-l-o-w-l-y.

Conclusion: At its new "all inclusive" price of £45 the ZX81 may well have been given a new lease of life. It still won't do half the things you can do on an Oric or Spectrum but it is half the price. As an entrance to Basic (in both senses of the word) it is unique and those on a tight budget can do no better.

May/June 1982 — Inside the ZX81
April 1983 — IBM PC v ZX81
May 1983 — Add-ons for ZX81

Sharp PC1251

Price: **£80**
Use: **Home/office**
RAM: **4.2K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Sharp 061 205 2333**

For: When equipped with the optional printer/plotter/micro-cassette unit (about £100), an extremely compact complete system.

Against: You have to write 99% of your software.

Conclusion: The same company's PC1500, though more expensive, is probably better value for most applications.

Casio PB100

Price: **£80**
Use: **Home/office**
RAM: **0.5K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Casio 01-450 9131**

For: Cheap memory expansion to approx. 3K; Basic respectable.

Against: A little expensive compared to its Sharp rival. Small screen size (12 chars) an irritation.

Conclusion: Like the PC1211, more a super powered calculator than a "real computer".



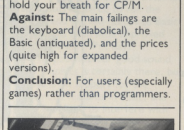
Mattel Aquarius

Price: **£80**
Use: **Home**
RAM: **4K**
Colour: **Yes**
CP/M: **Not yet**
Language: **Basic**
Interface: **Own**
Supplier: **Mattel Electronics 01-235 7060**

For: Excellent documentation and a wide range of games cartridges will attract beginners. The potential for expansion is good, with cheap peripherals such as the printer (£135) available, but don't hold your breath for CP/M.

Against: The main failings are the keyboard (diabolical), the Basic (antiquated), and the prices (quite high for expanded versions).

Conclusion: For users (especially games) rather than programmers.



Jupiter Ace

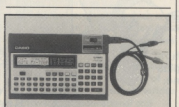
Price: **£90**
Use: **Home**
RAM: **3K**
Colour: **No**
Language: **Forth**
Interface: **Own**
Supplier: **Jupiter Cantab 0954 80437**

For: The cheapest way to get into any language other than Basic.

Against: Virtually no software about, no sound, no colour, poor graphics resolution, Forth language no longer unique since it is now available for most home micros.

Conclusion: An inexpensive curiosity, but of little value to most home micro buyers. Since its launch several colour computers have come down in price to under £100 and the Forth language is now available as an optional extra for many other micros.

November 1982 — Fastest Micro in the Universe?



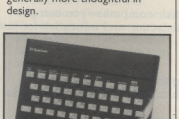
Casio FX700P

Price: **£90**
Use: **Home/office**
RAM: **3K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Casio 01-450 9131**

For: Cheap add-on memory; free program listing library goes some way towards curing software woes.

Against: Same 12 character screen as PB100.

Conclusion: No real moans, but Sharp/Tandy machines seem generally more thoughtful in design.



Sinclair Spectrum

PRICE CUT

Price: **16K £100 48K £130**
Use: **Home**
RAM: **16K-48K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Sinclair Research 0276 685311**

For: As one of the most popular computers, the Spectrum has a very large amount of software support. This means you can get a top-quality version of almost any game or utility, and pay less for it than you would if you had any other computer.

A similar situation exists on the hardware front. The Sinclair printer is now down to only £39.95, and with the recent launch of the Microdrive (£70) high speed tape access should soon be available.

However, this has not stopped a rush of cheap peripherals from independent manufacturers — digital tracers and interfaces to connect the Spectrum to office-quality printers, among others. These make it possible to build up a very complete system at a very low price.

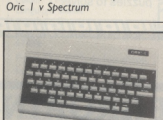
The carefully-timed price cut will probably improve the support situation, as it is bound to increase the user base.

Against: We just wish the man would fit decent keyboards to his computers. At least it keeps the manufacturers of add-on keyboards in business.

The single-key Basic entry is often rather frustrating, especially for beginners.

Conclusion: At the new price of £100 it is hard to beat the Spectrum if you are a newcomer to home computing.

July/August 1982 — Sinclair's Spectrum v The BBC Micro
February 1983 — Comparison: Oric 1 v Spectrum



Oric 1

PRICE CUT

Price: **16K £100 48K £140**
Use: **Home**
RAM: **16K-48K**
Colour: **Yes**
Language: **Basic**
Interface: **Parallel**
Supplier: **Oric International 0990 27641**

For: On paper, the Oric is a strong competitor to the Spectrum. Its specifications include useful pre-programmed sounds and high resolution graphics, and the buyer may well prefer the Oric's keyboard and conventional entry of program statements.

The Basic included is a near-standard Microsoft with many powerful extensions, so when software houses have had time to catch up on the recent surge of new machines, programs for the Oric should appear quickly.

Against: The 16K version is still hard to get hold of, lengthy production delays having held up its appearance.

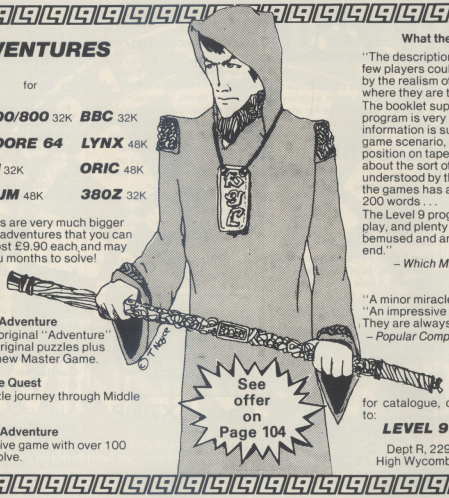
A worrying, but persistent rumour about the Oric is that of problems in the cassette handling area — certainly, ours have never

ADVENTURES

for

ATARI 400/800 32K **BBC** 32K
COMMODORE 64 **LYNX** 48K
NASCOM 32K **ORIC** 48K
SPECTRUM 48K **380Z** 32K

These games are very much bigger than normal adventures that you can buy. They cost £9.90 each and may well take you months to solve!



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– Which Micro & Software Review, August

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worked properly, and we have received numerous phone calls mentioning difficulty in loading from tape.
Conclusion: The Oric is a difficult computer to sum up, outshining the Spectrum in some areas, but (as yet) behind in the vital areas of software support and complete documentation. If you want a tried and trusted computer, it might be wise to check the competition first.
February 1983 — Oric 1 Review
February 1983 — Comparison: Oric 1 v Spectrum
May 1983 — Oric 1 v Vic 20



Comx 35

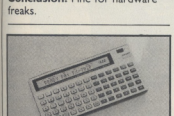
Price: **£120**
Use: **Home**
RAM: **35K**
Colour: **Yes**
CP/M: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Computers for All 0268 418414**

For: The Comx has many advanced and unusual features including a built-in joystick, an easy-to-use Basic and lots of memory for the money.
Against: The use of the weird RCA 1802 processor makes the software supply uncertain at best. The Basic is very slow, making games programming virtually impossible without machine code.
Conclusion: In many ways a strong machine — provides interest for the jaded expert.

Nascom 1/2

Price: **£125+**
Use: **Home/education**
RAM: **1-2K**
Colour: **No**
Language: **Basic**
Interface: **RS232C**
Supplier: **Lucas Logic 0926 497733**

For: Very versatile and easy to upgrade as long as you know your way around the insides.
Against: Too old-fashioned for most home users.
Conclusion: Fine for hardware freaks.



Casio FX702P

Price: **£135**
Use: **Home/office**
RAM: **3K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Casio 01-450 9131**

For: Built-in statistical and mathematical functions. Display better than on lesser stablemates.
Against: Awkward keyboard.
Conclusion: Mainly of interest to scientific/engineering types.



Commodore Vic 20

Price: **£140 (with starter pack)**
Use: **Home**
RAM: **5K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Commodore 0753-79292**

For: Since the Vic is very widely used, it is well supported by software houses and specialist magazines. Apart from that, it has few advantages over its arch-rival, the Spectrum, except for the keyboard.

It is nice to see a decent keyboard on a cheap computer, indeed, the Vic shares this item with its big brother, the 64. And it is easily available with a huge choice of software.
Against: The standard user memory of 3.5K is far too small for any self-respecting computer these days, and it shows just how much the Vic has dated since its introduction.

Other signs of encroaching obsolescence are the bizarre display with its jumbo character set, the untidy jumble of external apparatus required to run the thing, and the old-fashioned Basic which has been little improved since the early Pet days.

The potential for good sound and graphics is certainly there, but there is no support for the advanced features in Basic, and one is obliged to interfere with memory by means of clumsy POKE statements in order to get anywhere.

The manual is a bit of a joke, but then it does mean healthy sales for the (almost essential) Programmer's Reference Guide.
Conclusion: A good cartridge games machine, but memory expansion is essential for any serious purpose. And the cost of additional memory makes the Commodore 64 a far better buy for those wanting a Commodore machine.

Sept/Oct 1982—Dragon 32 v Vic 20
May 1983 — Oric 1 v Vic 20



Atari

PRICE CUT

Price: **400 £149 800 £299**
Use: **Home**
RAM: **400 16K 800 48K**
Colour: **Yes**
Language: **Basic**
Interface: **RS-232C**
Supplier: **Atari (01-900 0511)**

For: Atari produced an excellent games machine in its 400 and 800 home computers, which is no surprise given its background in arcade machines and home games consoles.

What did surprise many industry observers was the readiness of software houses to supply serious software for educational and business purposes, especially on the 800 version with its typewriter keyboard and disk interface.

The software is one of the main reasons for buying an Atari, its quality being consistently high.
Against: There are several drawbacks to becoming an Atari user, including the irritating need for a special cassette recorder at the inflated price of about £45. The touch-sensitive keyboard of the 400 is also rather off-putting, and limits the practical uses of the machine.

Software prices for the Atari seem to be rather high compared to those for rival machines.
Conclusion: The Atari is one of the older machines to enjoy a place in the Top Ten, but still holds up well in any comparison with its rivals.

Recent price cuts and specification improvements have made it more competitive.

CGL M5

Price: **£150**
Use: **Home**
RAM: **20K**
Colour: **Yes**
CP/M: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Computer Games Ltd 01-508 5600**

For: Even before most of us have actually seen it on the shelves, Sord has cut the price of the M5 by £40. (Could it be they read our review in the July issue?) This makes it more of a potential winner; it's well made, well documented and takes three different Basics in its cartridge slot.



Against: Limited memory is the major drawback. Of the 20K RAM, 16K is used for video, which doesn't leave much space and really makes extra memory in the shape of an expansion box essential for any serious programming. Trouble is, it's not available yet.
Conclusion: The M5 has the potential to become a popular home micro, especially since the price cuts. But the competition is tough: you can now get a 48K Spectrum complete with printer for £170 — and excellent support.
July 1983 — M5 — A double-edge Sord

Texas TI 99/4a

Price: **£150**
Use: **Home, Education**
RAM: **16K**
Colour: **Yes**
Language: **Basic**
Interface: **Own**
Supplier: **Texas Instruments 0234 67466**

For: The TI99/4a has many features lacking in the competition, yet it has never sold in the numbers of the Vic or Spectrum.

The heart of the computer is its 16-bit processor, Texas Instruments' own, which is reflected in the ease with which the machine can be expanded.

Since the TI is one of the most widely used computers in American schools, it comes as no surprise that a wealth of excellent educational software is available on cartridge.

Graphics and sound facilities are more than adequate, and a wide choice of programming languages is available, though some (like LOGO) require hardware expansion.

The keyboard is particularly pleasant to use, with a light and positive feel.
Against: Despite recent price cuts, it costs a lot to expand the system. The computer itself was very expensive when first introduced, and very little independent software is available.

TI's own software is excellent, but quite expensive.
Conclusion: The TI99/4a is a fundamentally good machine, but recommended only if you know you can get the software you need.
Sept/Oct 1982 — Solid State from Texas

Wizard Software

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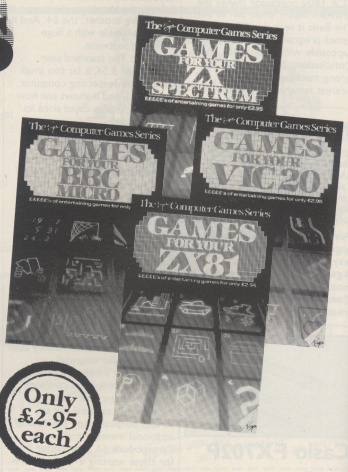
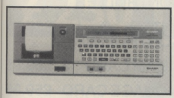


Colour Genie

Price: **£168**
Use: **Home**
RAM: **32K**
Colour: **Yes**
Language: **Basic**
Interface: **RS232C**
Supplier: **Lowe Electronic 0629 4995**

For: Full size keyboard with proper keys, good graphics and sound facilities.
Against: Not as compatible with the TRS-80 as earlier Genies, and there isn't much software.
Conclusion: A lot of micro for the money, but check what programs you will be able to buy.
December 1982 — The Lynx and The Colour Genie



Sharp PC1500

Price: **£169**
Use: **Home/office**
RAM: **3.5K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Sharp 061 205 2333**

For: Typewriter format keyboard with space bar at centre; memory expandable to 11.5K. A genuine pocket computer with a full Microsoft style Basic. Slightly cheaper than identical Tandy PC2.
Against: Not much software, although independents such as Kuma are beginning to support Sharp's pocket machines.
Conclusion: Well above the programmable calculator level in everything except size.



Texas CC40

Price: **£170**
Use: **Business**
RAM: **5.5K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Texas Instruments 0234 67466**

For: Offering real computer power in a box small enough for one-handed use, the CC40 has a low starter price with a range of accessories and ROM based software on the way. It is easier to use than the Epson if your task is simple, and the keyboard (although small) is acceptable for typing short documents.
Against: Expansion of the system will be necessary for some applications — in particular, the "wafertape" floppy tape will be almost essential for permanent data storage at about £150.
Conclusion: It may be all the computer power you actually need for some business applications.
June 1983 — Computing in the lap with the Texas CC40



Dragon 32

Price: **£175**
Use: **Home**
RAM: **32K**
Colour: **Yes**
language: **Basic**
Interface: **Parallel**
Supplier: **Dragon Data 0656 744700**

For: After a fairly slow start, the Dragon really took off over Christmas, selling out completely in most shops. This surge of interest seems to have spurred the independent software producers into supporting the machine, since there is now a fair amount of good games material available.

The Dragon's users are typically very enthusiastic about their machine, mentioning the useful extended Basic and typewriter keyboard as strong points. No special tape recorder is necessary, and the machine offers a reasonable display on a domestic TV.

Against: It is disappointing that the Dragon has not inspired a family of cheap peripherals in the same way that the Spectrum has. The addition of a cheap printer in particular would be a real boost.

There is a rather old-fashioned feel to the Dragon which can be pinned down to its lack of a lower case display and crude Microsoft line editor. The latter must be responsible for a lot of wasted time in program development.
Conclusion: The Dragon has many features in its favour, including its British manufacture and fine value for money. A small amount of development on the system software would make it a world beater. But take a look at the comparably priced Electron as well.
Sept/Oct 1982 — New Dragon 32 v the Vic 20
April 1983 — Dragon 32 v Lynx

Acorn Atom

Price: **£175+**
Use: **Home**
RAM: **2.12K**
Colour: **Optional**
Language: **Basic, Lisp, Forth**
Interface: **Own**
Supplier: **Acorn 0223 245200**

For: Versatile old faithful from the true hobbyist days with a loyal user base.

Against: Outclassed by more recent machines, especially Acorn's new Electron. Software support mainly for basic versions.

Conclusion: Like the Nascom 1, mainly of interest to those who like to tinker.
May/June 1982 — Acorn's Atomic Fusion

TRS-80 PC2

Price: **£179**
Use: **Home/office**
RAM: **3.5K**
Colour: **No**
Language: **Basic**
Interface: **Own**
Supplier: **Tandy 0922 648181**

For: Identical to Sharp PC1500.

Against: Costs more.

Conclusion: Draw your own.



Lynx

Price: **48K £225 96K £299**
Use: **Home**
RAM: **48K-96K**
Colour: **Yes**
Language: **Basic**
Interface: **Serial**
Supplier: **Computers 0223 315063**

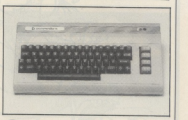
For: Whatever else you can say about the Lynx, it must be said that it is an *interesting* machine. £225 buys a compact box with a typewriter keyboard, an unusual structured Basic and 48K of RAM (though only about 13K is available for program storage).

The real interest, however, must be in the potential for turning the Lynx into a business machine.

Camputers say that massive amounts of memory expansion will shortly be available, along with a disk operating system (probably CP/M).

If their plans are fulfilled, this will make the Lynx a rival to the Apple II as a realistic small business computer, yet with all the features the home user wants.
Against: As the machine stands, however, it suffers from a lack of software and a somewhat quirky display with no scrolling and slow screen handling.

The first games software for the Lynx is now becoming available, but it is too soon to say whether or not these programs will overcome the display limitations.
Conclusion: The Lynx could well be a rising star, but at the moment there are surer bets for the home user.
December 1982 — The Lynx and The Colour Genie
April 1983 — Dragon 32 v Lynx



Commodore 64

PRICE CUT

Price: **£230**
Use: **Home, Business**
RAM: **64K**
Colour: **Yes**
Language: **Basic**
Interface: **RS-232C**
Supplier: **Commodore 0753 79292**

For: The Vic-20's most obvious failing is its puny memory size, and the lookalike 64 certainly makes up for this with a useful 38K of Basic program space.

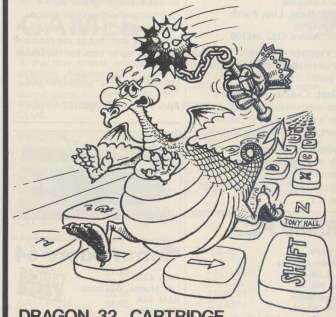
The ability to switch out the Basic ROM and overlay it with RAM has been exploited by a number of software houses who have brought out word processors, financial planning packages and other business programs, and a large amount of games software is now becoming available.
Against: Unfortunately, Commodore has not learned from all its mistakes with the Vic.

The documentation supplied is down to their usual standard, and anyone wanting to write his own programs is pretty much on his own. The sound facilities are impressive in hardware terms, but there is no Basic or system support, and all sound modulation is via a clumsy series of POKEs.

Although the infamous 22 column Vic display is replaced by a more readable 40 column display, there is no 80 column option, unusual in what Commodore obviously intends to be an entry-level business system.

The Basic interpreter has improved little since the early Pet days, and now looks dated beside that of the BBC Micro.
Conclusion: The 64 is a great improvement over earlier offerings, but in some ways it represents a missed opportunity for Commodore. And the Electron is worth considering first.
March 1983 — Commodore 64 Review
Benchmark test with BBC Micro

MACE
EDITOR/ASSEMBLER/MONITOR
by Graham Trott



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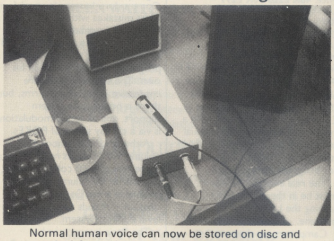

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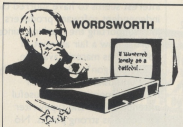

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Newbrain A/AD

Price: **£233-£267**
Use: **Business**
RAM: **32K+**
Colour: **No**
Language: **Basic**
Interface: **RS232C**
Supplier: **Grundy Business Systems 01-997 1171**

For: Compact size and optional battery pack make the Newbrain the first 'lap computer'. If the long-promised CP/M ever arrives, it will turn it into a potentially very useful system.
Against: Until that glorious day, users will have to put up with a severe shortage of software. The whole idea of lap computers has been vastly improved upon since the inception of the Newbrain.
Conclusion: Ahead of its time, but out of date. Such is progress in the micro world.
July/August 1982 — Newbrain Review
December 1982 — Microwriter v Newbrain

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Micro Professor MPF II

Price: **£270**
Use: **Home/business/education**
RAM: **64K**
Colour: **Yes**
Language: **Basic**
Interface: **RS232C**
Supplier: **Sirtel (UK) 0733 236010**

For: Seems to be quite well built, and should be widely available through retail outlets.
Against: Since it is likely to be less useful than a 48K Spectrum, but costs £100 more, it does not seem to be very good value for most home users.
Conclusion: It is difficult to see the attraction of becoming an MPF II owner.
June 1983 — MPFII — An Apple for half price?

Genie I-2

Price: **£299**
Use: **Home**
RAM: **16-48K**
Colour: **No**
Language: **Basic**
Interface: **RS232C**
Supplier: **Lowe Electronics 0629 4995**

For: Complete compatibility with the worthy but elderly TRS-80 Model I makes Genie a well documented and supported machine. It is a well designed and easy to use machine, with a number of thoughtful touches like the built-in cassette recorder.
Against: The price now looks high against that of the Electron or Commodore 64. Poor graphics and lack of colour will deter home buyers, and the age of the origin design means that the Genie may not have much life left.
Conclusion: Another old favourite from when PCW was new, but now obsolescent.

TRS-80 Colour

Price: **£299**
Use: **Home**
RAM: **16K**
Colour: **Yes**
Language: **Basic**
Interface: **RS232C**
Supplier: **Tandy 0922 648181**

For: Very popular in America, so there is plenty of software if you know where to look (e.g. Molimerx).
Against: Overpriced, especially when compared to the Dragon, which is effectively the expanded TRS-80 Colour at about half the price.
Conclusion: Look at the Dragon first.
November 1982 — Tandy in Transition

Nascom 3

Price: **£376-£506**
Use: **Home/education**
RAM: **8-48K**
Colour: **No**
Language: **Basic, Pascal**
Interface: **RS232C**
Supplier: **Lucas Logic 0926 497733**

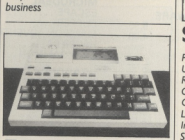
For: A versatile revision of the earlier Nascoms, particularly good for interfacing with the real world in scientific or industrial applications.
Against: Not really suitable for mainstream home/business use, especially at that price. The British Apple II, but not as well developed or supported.
Conclusion: It doesn't seem long since Nascom was the name for advanced British personal computers. Whatever happened?



BBC Micro

Price: **Mod. B £399**
Use: **Home/education**
RAM: **Mod. A 16K Mod. B 32K**
Colour: **Yes**
Language: **Basic**
Interface: **RS-423**
Supplier: **BBC Micro Systems, PO Box 7, London W 6XJ**

For: Acorn's BBC Micro, is one of the most advanced and user-friendly computers on sale.
The long-term expansion potential is unrivalled by any home micro.
The Basic makes the BBC an excellent device on which to learn programming, and the best of the software exploits the machine fully, to make it outshine its rivals.
As one of the most sophisticated micros, the BBC lends itself to use with new computing ideas.
Against: Though technically excellent recent price cuts on other machines now make it look very over-priced at £400.
However, Acorn's new Electron, selling at £199, may offer the ideal solution to most home buyers, retaining the essential sophistication of the BBC Micro, but making many of the interfaces optional extras. Its launch also means the instant demise of the BBC Model A.
Conclusion: An extremely versatile and impressive computer but expensive.
May/June 1982— Auntie's Attractive Features
March 1983 — Comparison: BBC Micro and Commodore 64
May 1983 — BBC: Can it work in business



Epson HX20

Price: **£411**
Use: **Business**
RAM: **16-32K**
Colour: **No**
Language: **Basic**
Interface: **RS232C**
Supplier: **Epson UK 01-900 0466**

For: Remarkably efficient design gives you a 4 × 20 character LCD screen, a mini printer and an optional micro-cassette drive in a package the size of a large paperback. The keyboard is a joy to use, and a versatile range of software is available from Epson and others.
Against: The lack of inbuilt arithmetic logic is annoying, all simple calculations having to be done through Basic. The Basic itself is nothing special.
Conclusion: The first truly useful micro to be portable rather than merely transportable. A crop of imitators is on its way with Tandy Model 100 worth a look.
March 1983 — Epson HX20 Review



Link 480Z

Price: **£450**
Use: **Education**
RAM: **32K**
Colour: **Yes**
Language: **Basic**
Interface: **IEEE 488**
Supplier: **Research Machines 0865 49866**

For: The 480Z is a low-cost version of the 380Z designed to be used in a network, and provides a cheap way to expand a school's system.
Against: Acorn's Econet with BBC Micros is set to make the RM systems look very old-fashioned and expensive.
Conclusion: OK for those who already use the 380.



Sharp MZ80A

Price: **£477**
Use: **Home/business/education**
RAM: **48K**
Colour: **No**
CP/M: **Extra**
Language: **Basic, Pascal**
Interface: **Other**
Supplier: **Sharp 061 205 2333**

For: Neat all-in-one design is appealing to home or business users — you get a good keyboard, a built-in monitor and an integral cassette drive. Quality of manufacture is very high, and various peripherals (printers, disk drives etc.) are available.
Against: Small user base means that only a few independents provide software.
Conclusion: If you know you can get the software you need, the Sharp could be a good buy.

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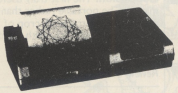

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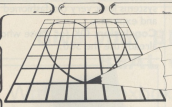

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Tandy 100

Price: **£500**
Use: **Business/home**
RAM: **8K-32K**
Colour: **No**
CP/M: **No**
Language: **Basic**
Interface: **RS232C**
Supplier: **Tandy 0922 648181**

For: Superbly compact design brings together true portability and desktop micro power, with excellent built-in software, documentation and LCD display making this the easiest machine to use in its class.
Against: More memory would be useful for storing documents and data files.
Conclusion: One of the very few micros which is genuinely easy for even a raw beginner to use profitably.

Apple II+

Price: **£600**
Use: **Business/education/home**
RAM: **48K**
Colour: **Extra**
CP/M: **Extra**
Language: **Basic**
Interface: **RS232**
Supplier: **Apple UK 1442 60244**

For: Despite being overshadowed by the new IIe, the Apple II+ is still a competent machine available at good discount from many dealers.
Against: Lacks the refinements necessary in a modern business system. Almost all new Apple software has extra features for IIe users.
Conclusion: Comparing specifications, the new IIe is probably a better buy for most potential users.

Andromeda Alpha

Price: **£695-£3695**
Use: **Business**
RAM: **64K**
Colour: **No**
CP/M: **Yes**
Language: **Most**
Interface: **RS-232C**
Supplier: **IT Computer Services 0784 63211/2/3**

For: Pricing is keen with Andromeda's unusual "buy the software, get the machine free" deal.
Against: This means less choice of software than you might like, however.
Conclusion: Check very carefully that your needs will be completely met by the software on offer.



Hewlett-Packard HP75C

Price: **£695**
Use: **Business**
RAM: **16-20K**
Colour: **No**
CP/M: **No**
Language: **Basic**
Interface: **RS-232C, HP-IL**
Supplier: **Hewlett-Packard 03446-3100**

For: Almost pocket size makes this the machine with the best power/portability combination. Hewlett snob appeal is strong.
Against: Since it is made by HP the price is pretty hefty, especially compared to machines like the new Tandy 100 and Texas CC40. It is unlikely to achieve similar sales success.
Conclusion: The sort of thing you buy to prove that you can afford one.

Prophet

Price: **£795**
Use: **Business**
RAM: **32K**
Colour: **No**
CP/M: **No**
Language: **Basic**
Interface: **RS-232C**
Supplier: **Busicomputers 0832 72052**

For: Essentially an Acorn Atom with a spreadsheet program built in, the Prophet makes a cheap way of getting into financial modelling.
Against: Loading and saving models on tape takes a long time, and it is difficult to use the machine for other serious business functions.
Conclusion: Even if financial modelling is all you want, it would be better to buy a less limited machine.

Apple IIe

Price: **£845**
Use: **Business, Home, Education**
RAM: **64-128K**
Colour: **Yes**
CP/M: **Extra**



Language: **Most**
Interface: **RS-232 choice**
Supplier: **Apple UK 0442 60244**

For: This new version of the old faithful Apple II is well made and well supported with all kinds of extras available from Apple and independent manufacturers. It is compatible with software written for the Apple II+, but most reputable suppliers are producing new versions to exploit the more advanced design of the new model.
Against: The cost of the IIe is rather high, especially when the US pricing structure is taken into consideration.
Conclusion: A fine machine, worth consideration against many newer designs.
March 1983 — Apple IIe Review

Sharp MZ80B

Price: **£899**
Use: **Home, education, business**
RAM: **64K**
Colour: **No**
CP/M: **Extra**
Language: **Basic, Assembler, Pascal**
Interface: **RS-232C**
Supplier: **Sharp 061-205 2333**

For: Very high build quality typical of Sharp makes the MZ80B a pleasure to use.
Against: The cassette drive fitted needs to be supplemented by disk drives. The range of software available is disappointingly small, so check the availability of what you want with great care.
Conclusion: Never a great seller; unremarkable in most respects.



Andromeda Zita

Price: **£995-£2895**
Use: **Business**
RAM: **64K**
Colour: **No**
CP/M: **Yes**
Language: **Most**
Interface: **RS-232**
Supplier: **IT Computer Services 0784 63211/2/3**

For: This portable business machine, a rival to the Osborne 1, beats the earlier machine in several ways. The main superiority is in the capacity of the disk drives and the size of the built-in monitor. There is even a Zita with a 12MB winchester disk available.
Against: Actually attempting to carry the thing is guaranteed to stretch your arms. It weighs even more than the Osborne. The usual Andromeda scheme of 'buy the software, get the computer free' applies, so check that you are getting the best programs for the job.
Conclusion: Works fine on a desk-top, as long as your desk is reinforced.
March 1983 — Portability the world over: Zita



NEC PC8001

Price: **£997**
Use: **Business**
RAM: **64K**
Colour: **Yes**
CP/M: **Yes**
Language: **Basic**
Interface: **RS-232**
Supplier: **NEC 01-388 6100**

For: Although it looks like just another CP/M system, the NEC has some nice extra features including an excellent colour monitor and a three processor heart which improves graphics and input/output.
Against: Not much.
Conclusion: A refined option for the small business buyer.

Commodore 700

Price: **from £995**
Use: **Home, business, education**
RAM: **128-256K**
Colour: **No**
CP/M: **Extra**
Language: **Basic**
Interface: **RS-232C, IEEE 488**
Supplier: **Commodore 0753 79292**

For: Less obselescent than a Commodore 8096, and much prettier. The option of various second processors will let the 700 into the CP/M world.
Against: Not really widely available yet, nor is there much software. Why no 16-bit processor capability?
Conclusion: Worth considering if you know the right software is available.

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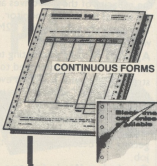

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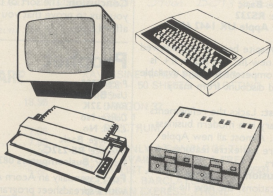

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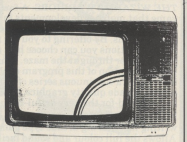

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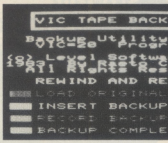

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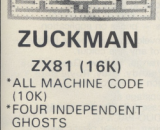

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