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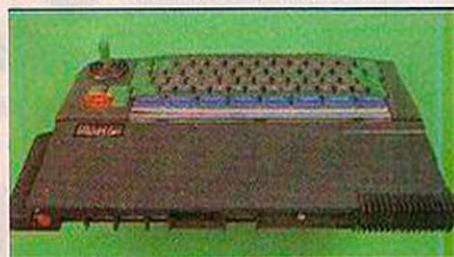
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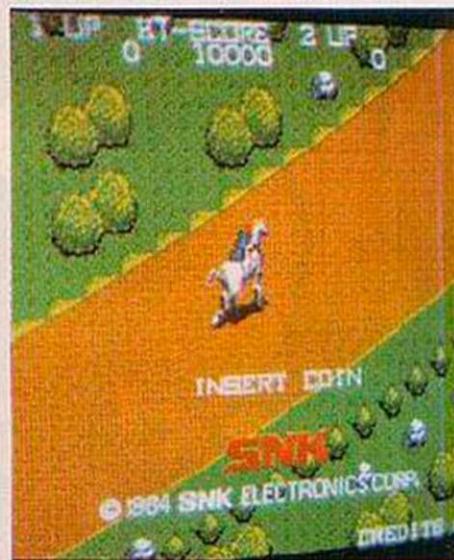
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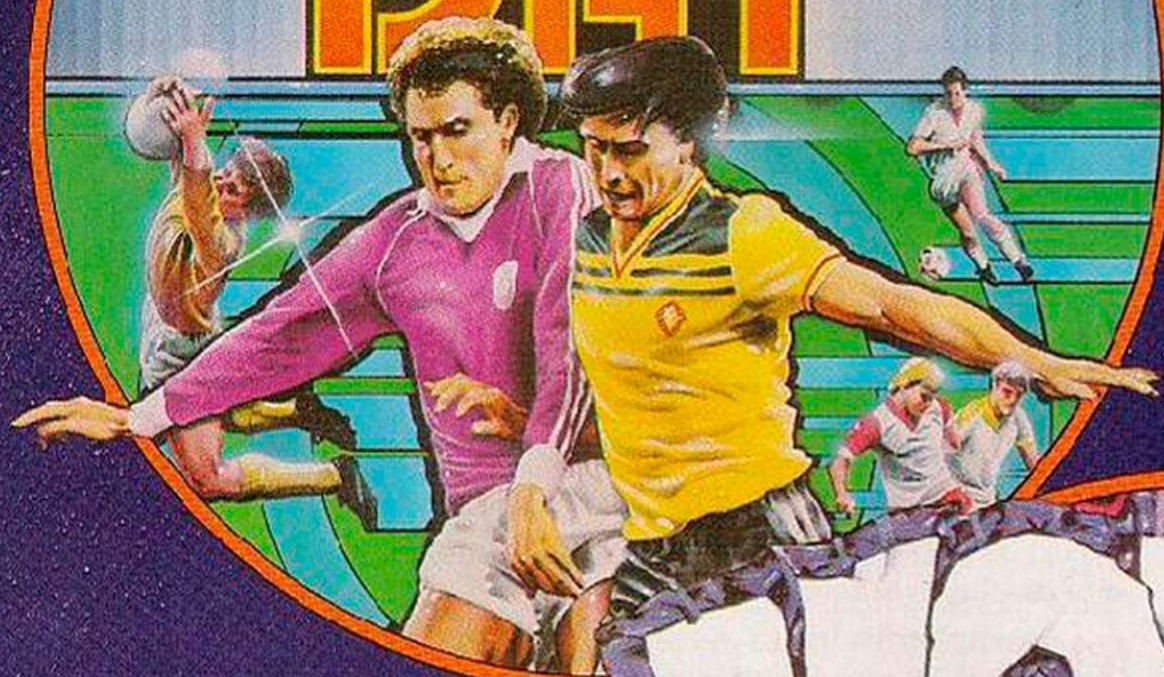
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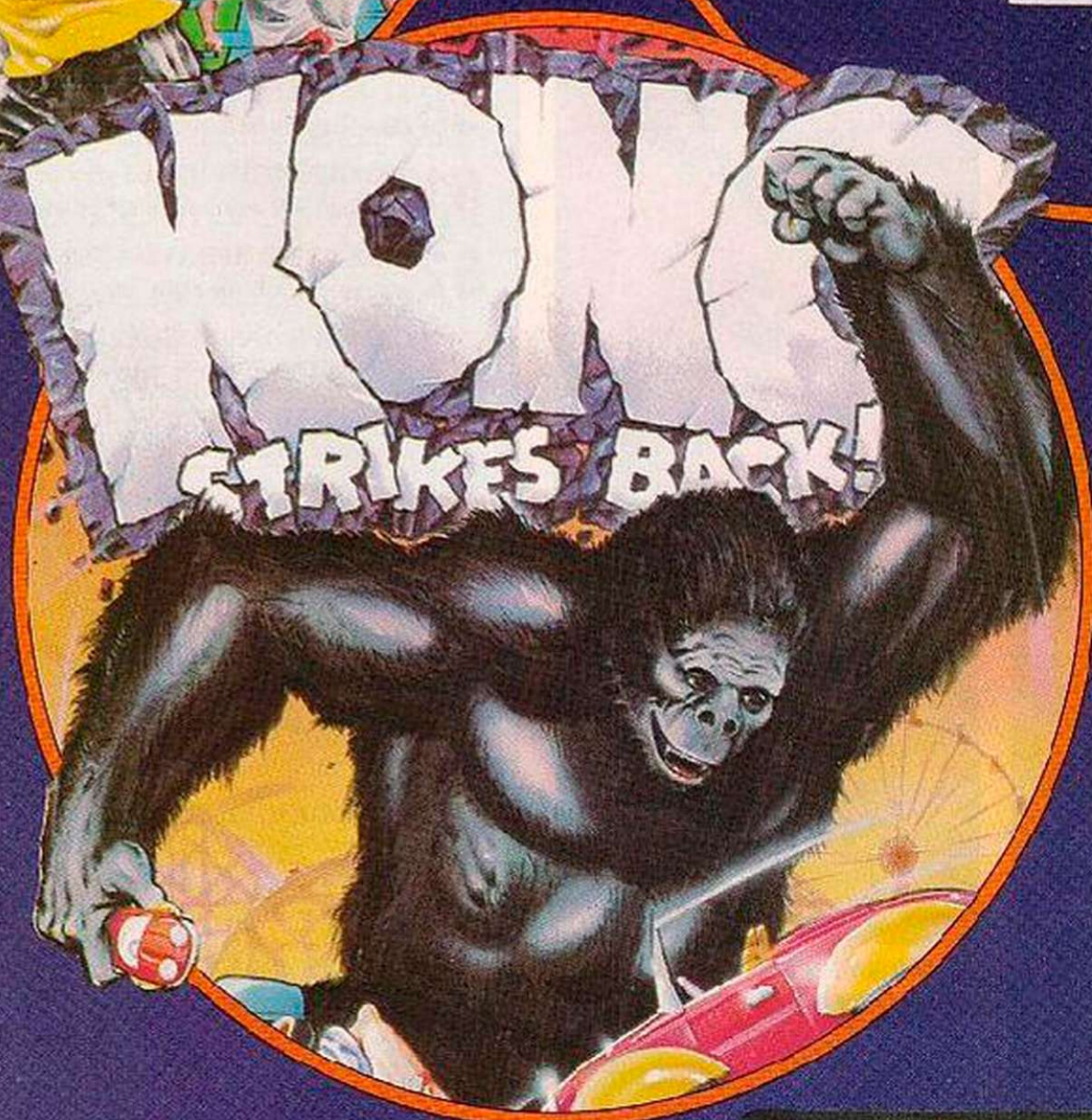


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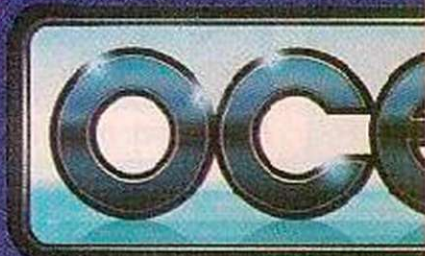
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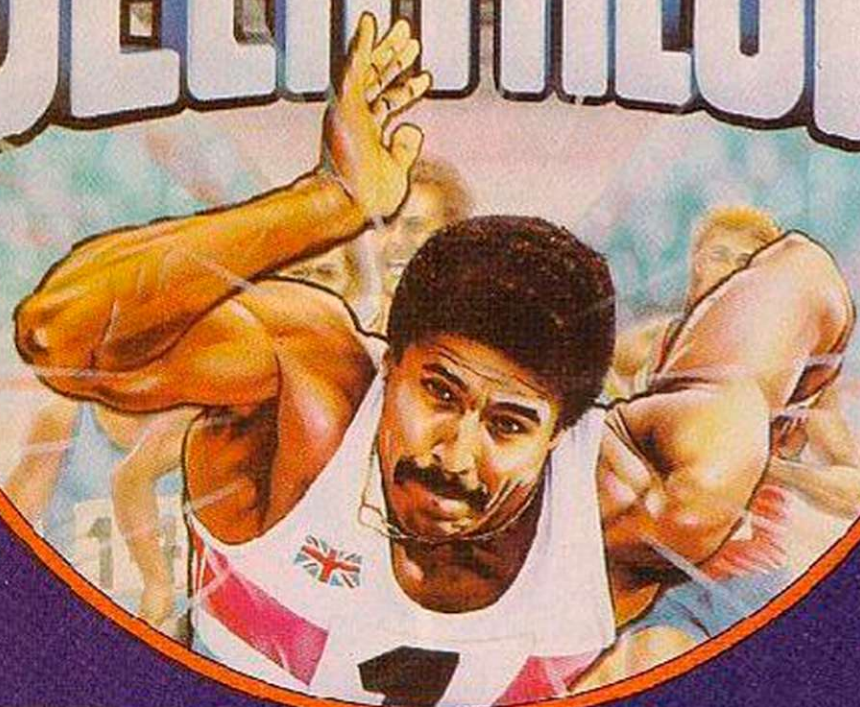


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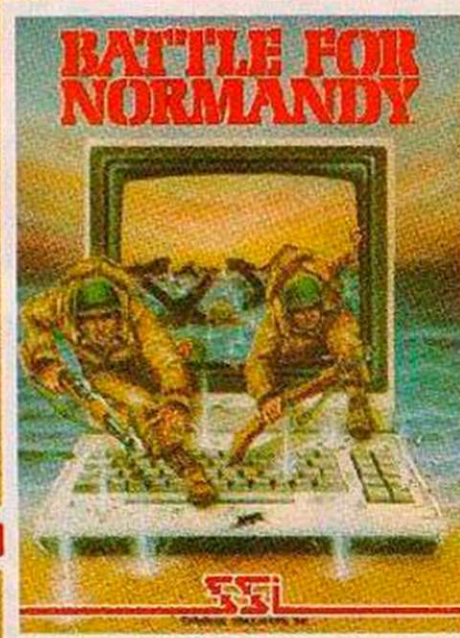
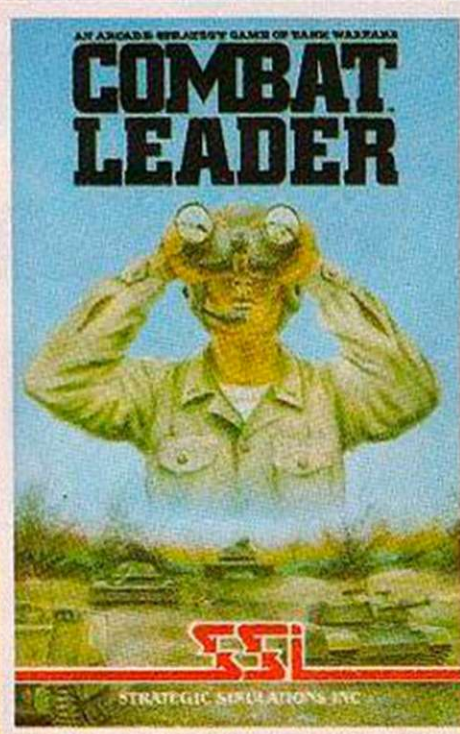
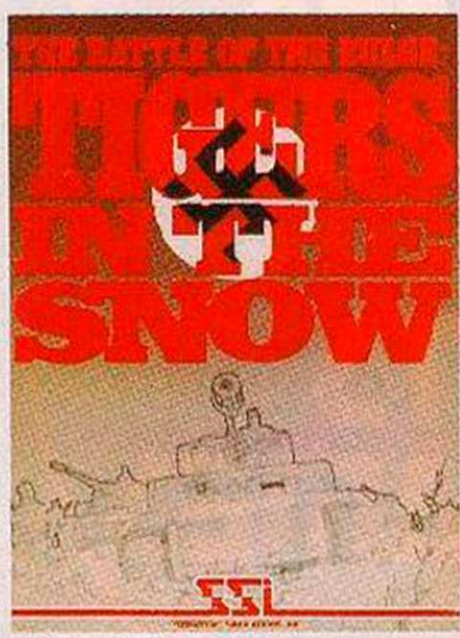
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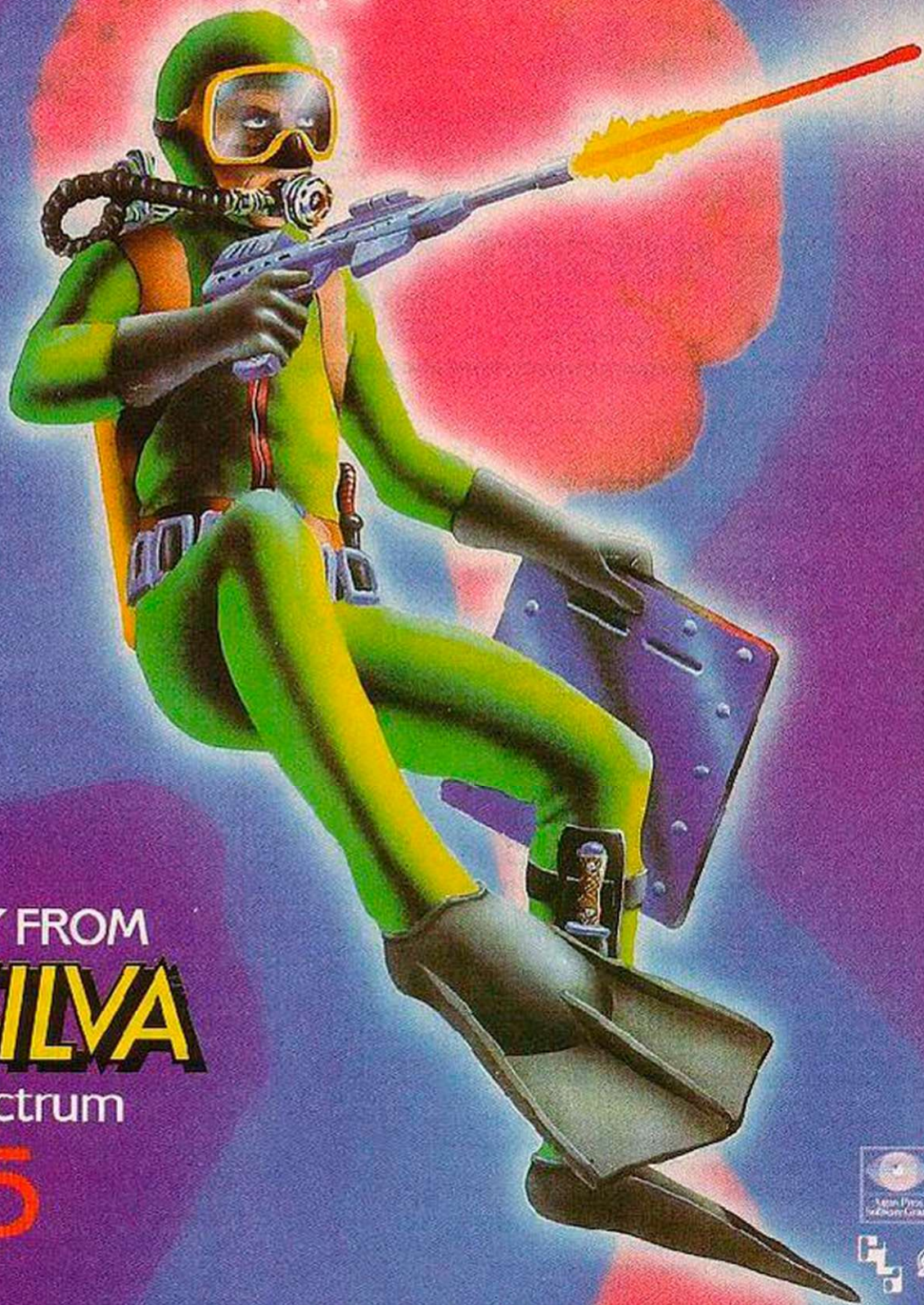
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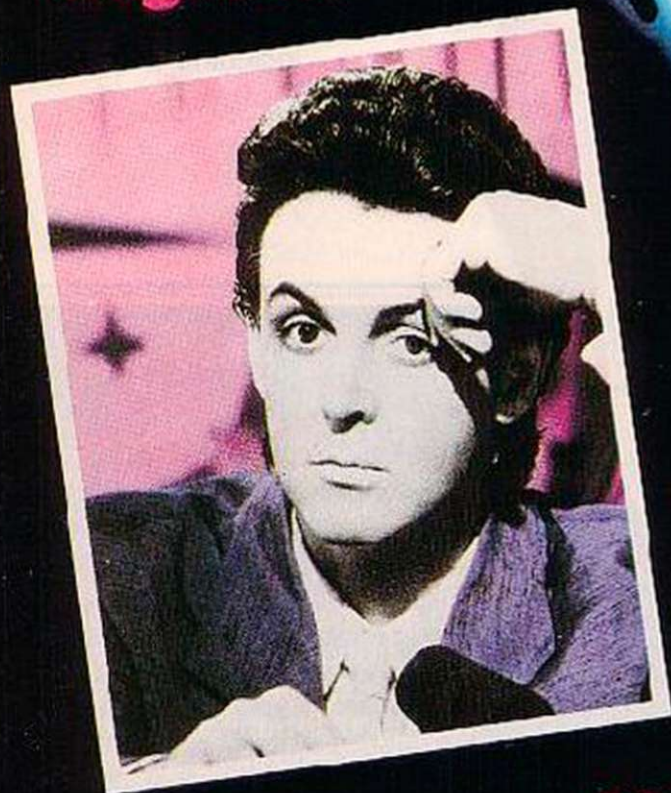
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And if you ask their advice on choosing a home computer for around £200, they're likely to tell you that there's really only one sensible choice.

The £199 Acorn Electron.

Like its £399 stablemate, but unlike any other micro, the Electron speaks BBC Basic. Which means that children can easily carry on with their computer studies at home. And their parents can quickly start catching up, because BBC Basic is such a simple language to learn.

However, language isn't the only thing which makes the Electron outstanding among every other micro in its price range.

A powerful choice.

The Electron is a 64K microcomputer which has 32K of RAM, combined with another 32K ROM.

This simply means that it has more power than most people ever need from a home computer.

Nevertheless, it has been designed to help you make the fullest use of its power.

For example, its graphics have the highest resolution of any home computer bar none.

This is because Acorn specially designed the chip that controls the graphics. And it's among the most advanced chips of its kind.

Indeed, it delivers twice as many characters across the screen as the Electron's nearest rival.

It expands into a system.

With the Electron, even total newcomers have been surprised at how quickly they can find their way into the complex world of computing.

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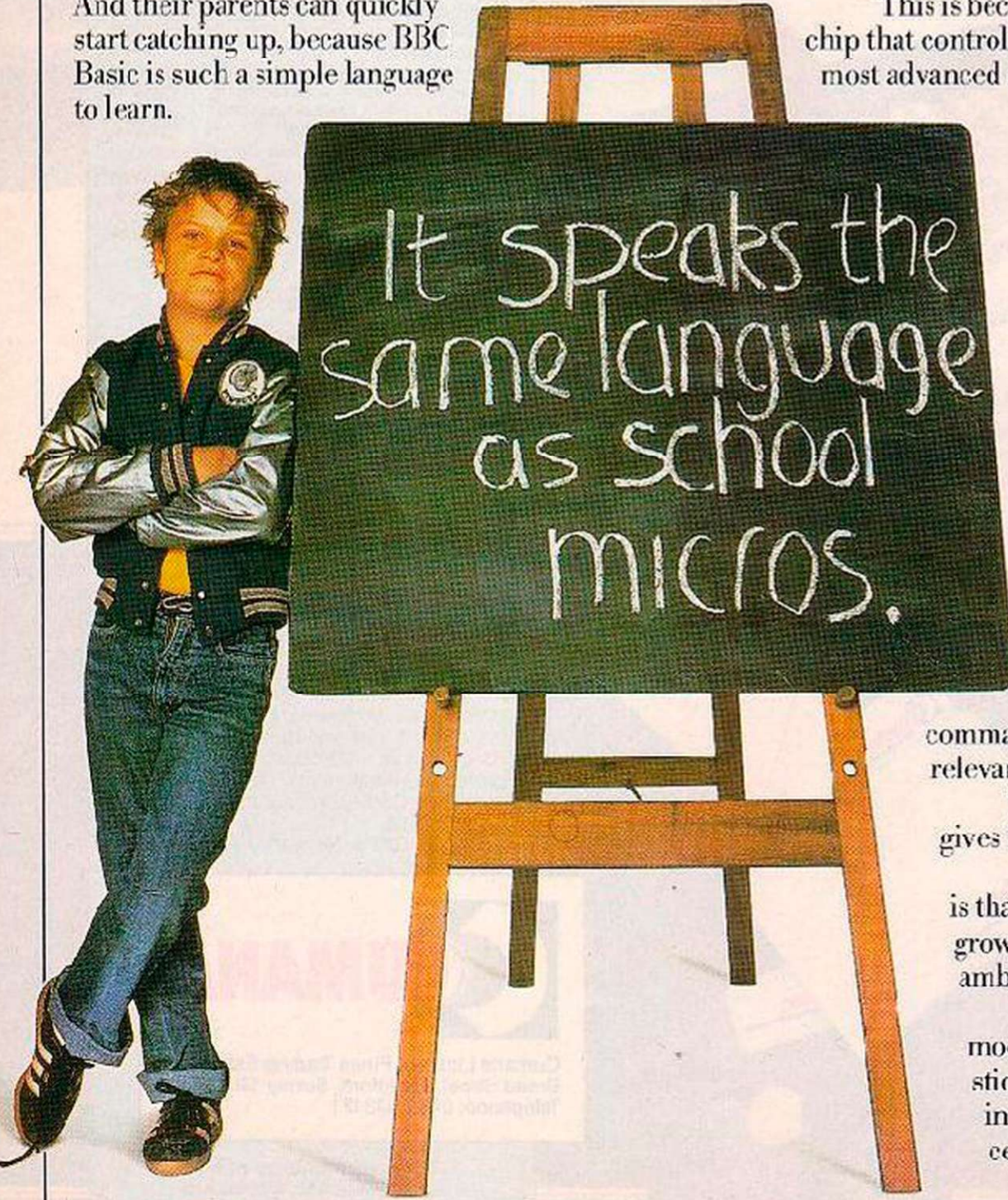
And for issuing main commands, there are single entry keys.

Instead of literally spelling out the command, letter by letter, you just push the relevant key and it's issued.

There's also a built-in loudspeaker which gives high quality sound.

And what is perhaps most exciting is that the Electron has the capacity to grow with your knowledge and ambition.

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It speaks the same language as school micros.

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

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

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

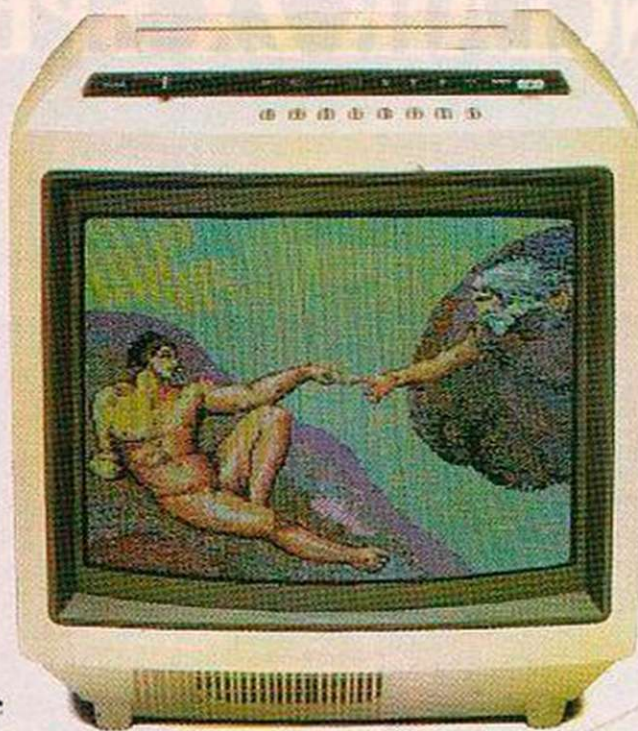
the Electron up with such high fliers as the IBM PC and the Apple III. Both are machines which cost well over £1,000.

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

Your starter for free.

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

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



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

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

Because the potential is as infinite as your own imagination.

No shortage of software.

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

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

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

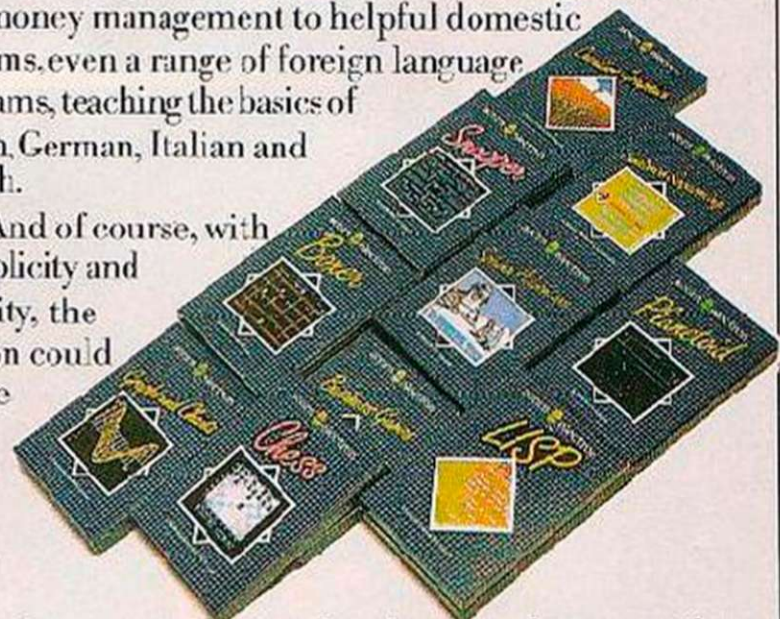
And of course, with its simplicity and flexibility, the Electron could soon be

processing programs created and written by none other than yourself.

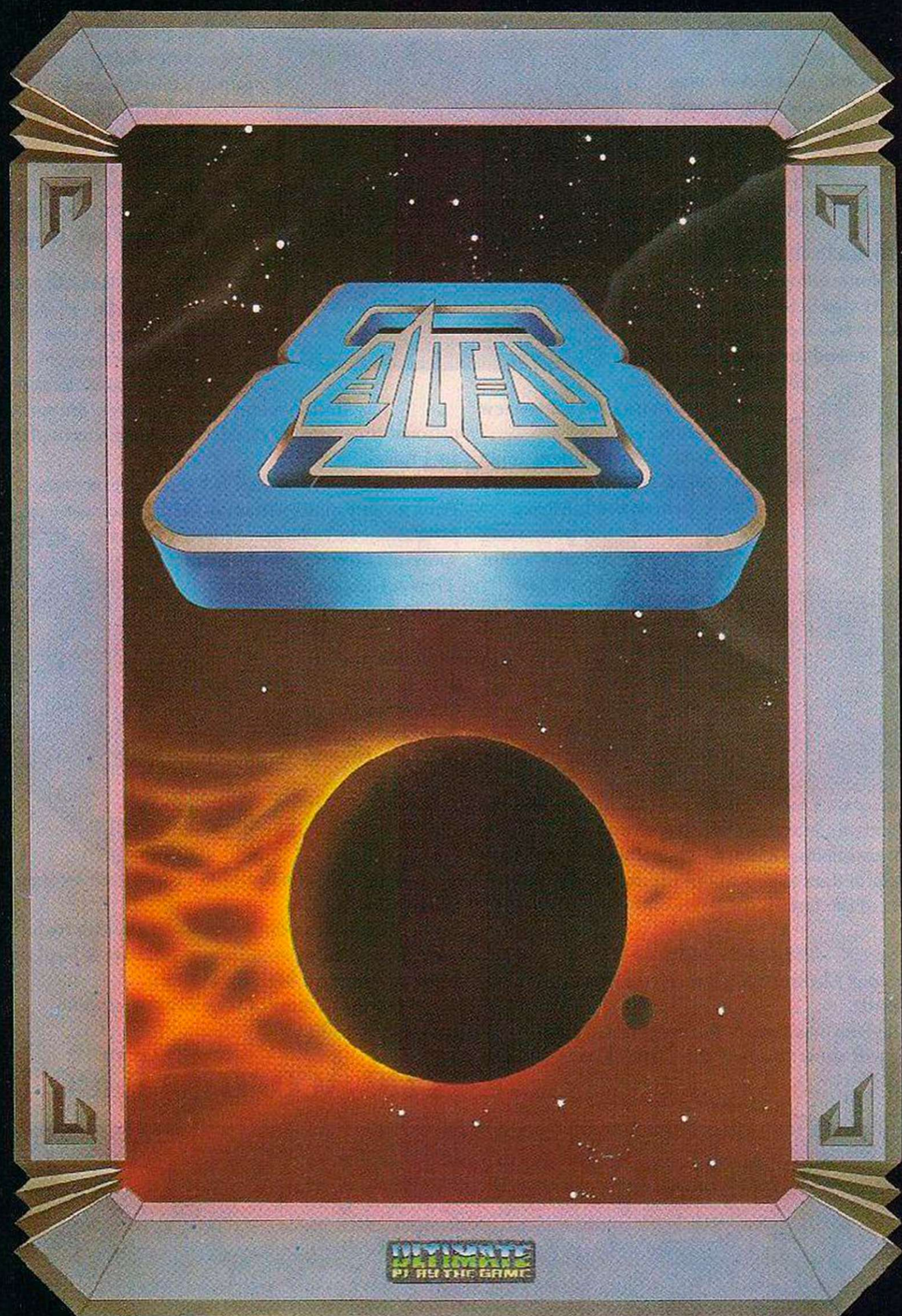
You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

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The Acorn Electron.

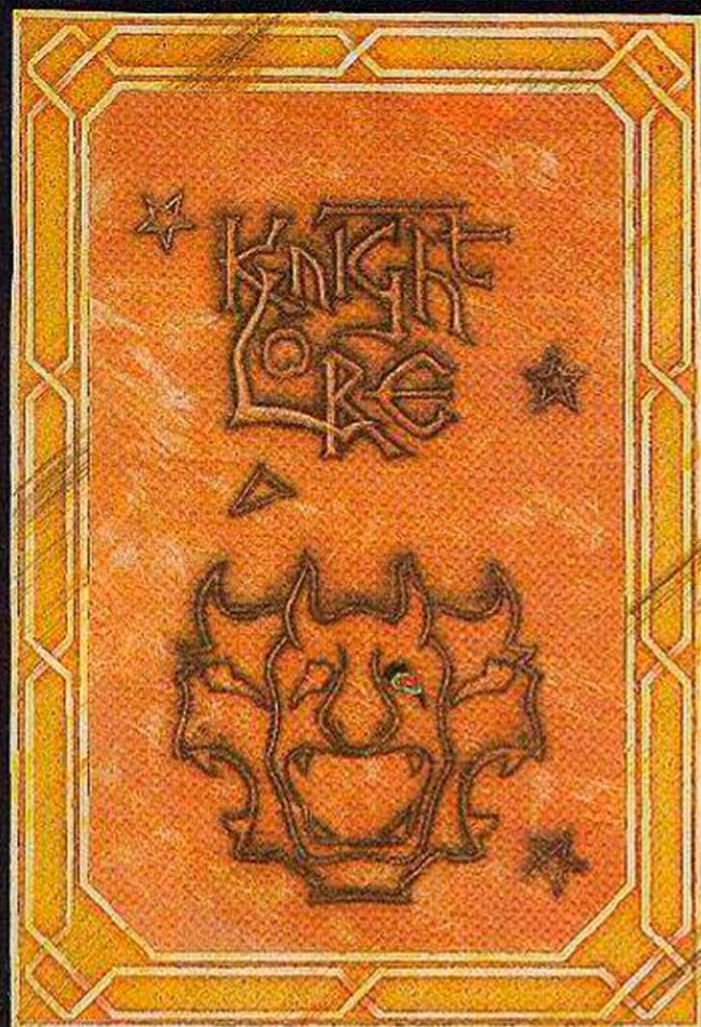


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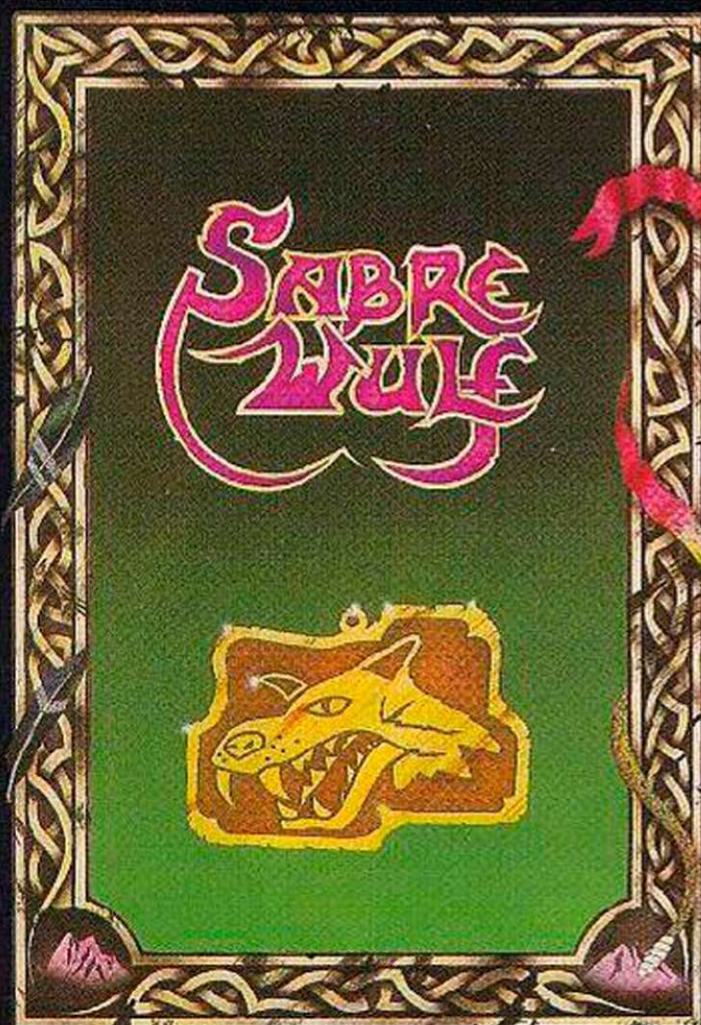
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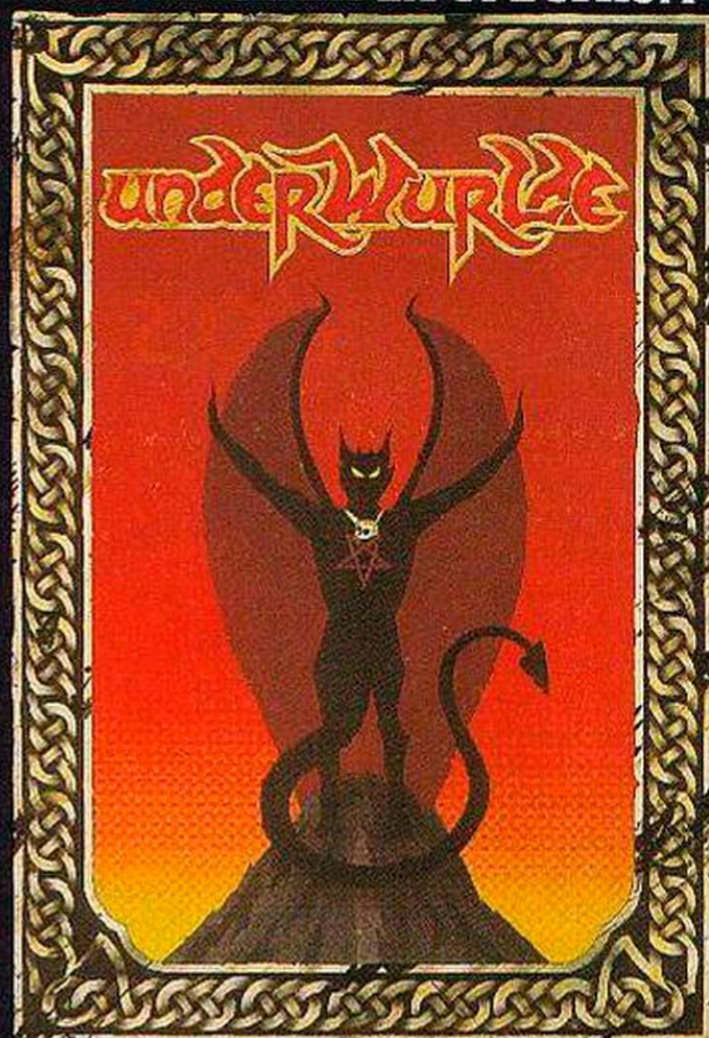


BBC MODEL B 1.2 OS

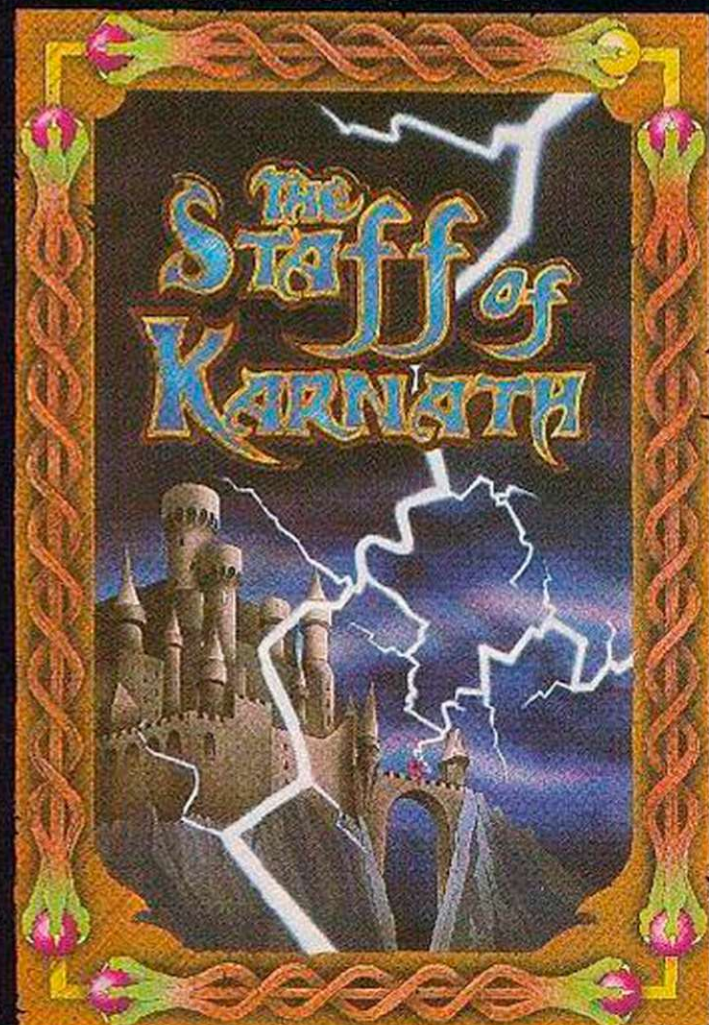
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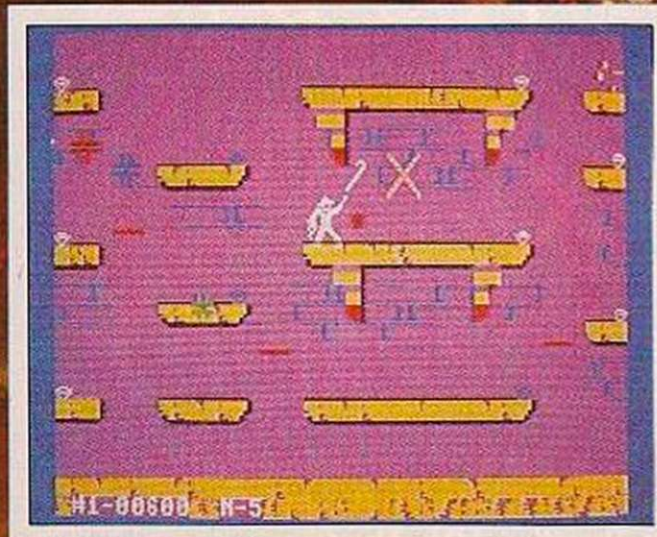
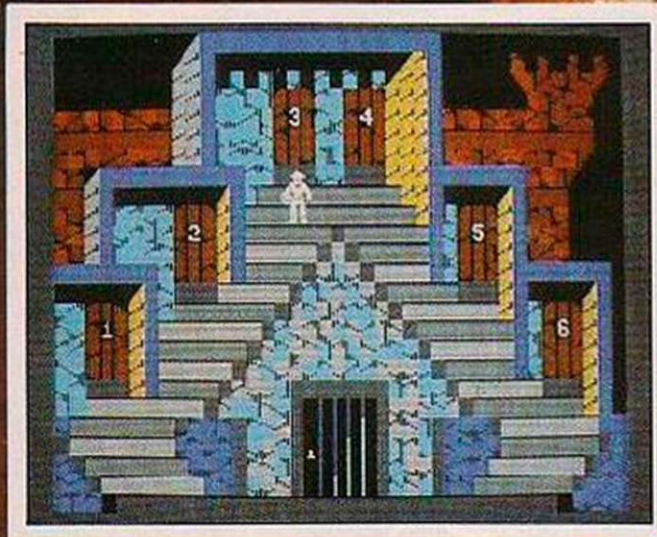
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Herbie Briggs has just destroyed the myth that all floppy discs are created equal.

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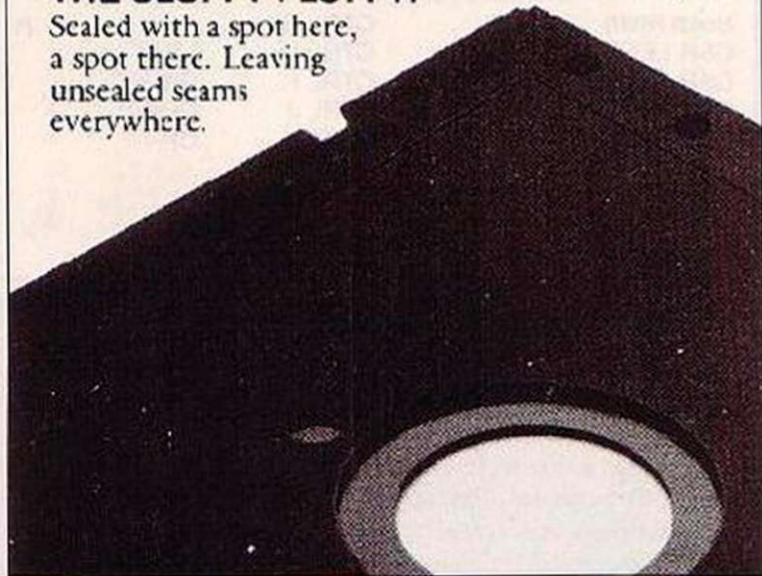
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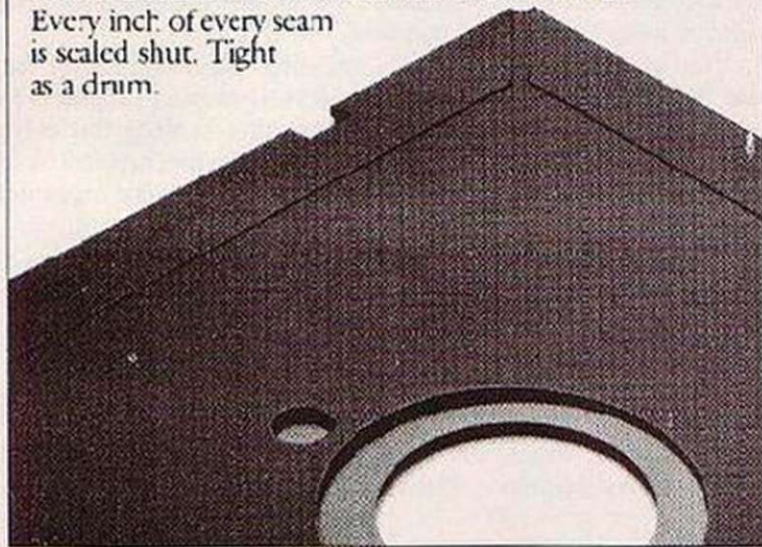
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YOUR LETTERS

EPITAPH FOR ONE OF THE BEST



As a one-time owner of the Vic-20, I feel that I could not let this Granddaddy of computers be put to rest without, at least, a brief eulogy.

Since the Vic-20 was brought onto the market, a lot has changed in the world of computers. Its limited graphical and musical capabilities plus its minute memory did not give it much of a chance against today's 64K hi-res maestros.

Even so, the early days of Vic-computing will always be, for me, the "good old days". These were the days when you struggled to fit a lot of program into a tiny bit of memory — a thing that every computer-programmer ought to have to do. The mega-memories of today's 64K elephants are asking for sloppy and wasteful programming.

I will never forget the hours I spent typing the latest Basic program from the pages of *Your Computer*, because there was nothing else available. Does anyone do this today? Back in the days of Vic, you spent nights poring over hand-assembled machine code. Compilers were things you dreamt of after your trusty Vic-20 had crashed for the fifth time.

Don't get me wrong, the computers of today are a lot better than the Vic-20 but, somehow, all the fun has gone out of computing, as I knew it.

The computers of today and their owners have a lot to thank the Vic for. I am sure that the passing of this Model T of the computer world will squeeze a tear or two from the eyes of many a computer enthusiast.

*Matthew Lingham,
West Germany.*

GREAT SCORES!

Start with the flattery they said so... I avidly read your magazine each month among many other computer magazines and I certainly put it in the first two and I will leave you and the readers to guess what the other title is.

I read with scorn the vast scores claimed by computer gamers, the thousands, hundred thousands and even millions look puny when viewed against the magnificent, astounding 3D, mighty, state of the art achievements that I have obtained. Just read this list and listen to the gasps of wonder from the readers...

In *Raid over Moscow* I have destroyed 10,234 stealth bombers and all of these inside the danger which I have not managed to get out of yet. In *Zexxon* 23,346 jets have hit the wall that scrolls toward you at the very start — I simply cannot find the first opening even. On a flight simulator I have crashed 40,000 times at Gatwick and in *Solo Flight* I actually crashed my CBM-64 by going as high as possible and then diving into Kansas at full speed.

On Flight 737 I cannot even find the damn runway and wander aimlessly about all over the flaming airfield until I go off the edge. In *Blue Max* for some strange reason if you pull back on the stick you crash forward and by reversing the joystick I can now hit the tree at the end of the runway every time. At the Royal Birkdale golf I went round in 18,000 strokes over par and in *International Football* I lost 42 nil to the computer at level one.

I could go on for ever but I don't want to make other readers despondent about their own achievements. I just mention that in the *Hobbit* I have had 14,000 attempts to get the small door open in the very first scene and always end up jumping in the small chest which is always empty. Why do they make these games so easy???

*R. Orlandini,
Seaview,
Isle of Wight.*

NOT A SYNTH

In many articles and adverts the sound facilities on many computers are said to be the same as those found on synthesisers. This is not the case. In fact, on most computers you

can define envelopes, pitches and the noise level, but they are missing a function which sound generators need to have to be called a synth: the ability to change the timbre or amount of harmonics — many harmonics = sharp sound, few harmonics = soft sound. It's usually a low- or high- or bandpass filter that's used to do this.

I'm saying this to warn people who are looking for a synth from making the mistake of buying what they think is a computer-based synthesiser, but which actually is a computer-based sound generator — I've nearly done it myself: advertisers fault!

As far as I know the only machines which have a built-in synth are these: Yamaha CX5, Commodore 64 and Enterprise.

*Johnny Brink,
Elsnore,
Denmark.*

TELISOFT WORKS!

I have just tried two programs, *Darts* and *DataCalc*, since keying in Telsoft on Thursday evening. Both came over well — very few bad blocks and I'm very pleased with the results. *Micromet* is disastrous — I cannot get it to download with anything above a five per cent chance of success.

I have a Universal Modem Adapter which has enabled me to access *Micromet* and *Viewfax* in the past. Unfortunately, they have dropped ZX-81 software altogether. The problem with keying in your log machine-code programs is that it is all too possible to get them wrong. The checksum is no proof against getting values in the wrong sequence or overwriting another area of memory.

Table 1.

FUNCTION	(CHRS) CHARACTER	KEYBOARD	JOYSTICK	SCREEN
Beep (Bell)	7	CTRL G		R
CSR LEFT	8	CTRL H	LEFT	
CSR RIGHT	9	CTRL I	RIGHT	
CSR DOWN	10	CTRL J	DOWN	
CSR UP	11	CTRL K	UP	
CLEAR	12	CTRL L		
WINDOW				
RVS	24	CTRL X		X
CSR HOME	30	CTRL E		

ZX-81 MICROS DESERVE BETTER

The survey conducted by Sharpey among Open University students, November 1984, *Your Computer* may have surprised a few people. The position of the BBC B and Spectrum as the most owned micros was to be expected, but the third place obtained by the ZX-81 ought to — though I very much doubt it will — make a few publishers and software manufacturers think again about so readily ignoring this pioneer of home computing.

That the machine is outdated I do not deny, but this is surely offset by the extremely low price at which it is now selling. Software and books for the ZX-81 have become extremely rare, while publishers of computer magazines seem to have forgotten that it ever existed.

There are, of course, some exceptions. Most notable are Software Farm, who are producing probably the best games ever seen on the ZX-81 and *Your Computer* whose listings are, in the main, superior to most commercial programs. So I appeal to publishers of books and software for the ZX-81. Please continue to publish, and please let us know that you are continuing to do so via advertisements.

*S.P. Kaliszczak,
Lytham, Lancashire.*

If you ignore the intricacies of 40 column display shifting etc to accommodate Prestel on a ZX-81 then your class of downloader is ideal.

Anyway — you may be interested to know that Telsoft is fine on BBC B in Cheshire via an acoustic modem.

*Ray Pearson,
Northwich,
Cheshire.*

AMSTRAD DATA

I would like to clear up a few points about the Amstrad CPC-464, following information given in the January issue:

Pages 145-148: The Sprites article implies the 464 won't scroll its windows. It will scroll, both up and down, any of its text windows. The general form of the required code is: DOWN Locate n,l:print n, "cursor up"

UF Locate n,l,m:print n, "Cursor down"

where n is the channel (window) number and m is the number of rows in that window.

If the whole-screen scrolling is required, the window 0 has not been altered from its start-up definition, then the following is all that is needed: DOWN Locate l,l:print "Cursor Up" — or 2 "(Ctrl) E(Ctrl) K"

UF Locate l,25:Print "Cursor Down". Obviously this technique does disrupt the cursor position.

Page 161: Symbol after 127 would allow re-definition of characters 127-255, not 128-255.

Page 173: The circle-drawing routine given in program 2 takes an unacceptably slow 12 seconds to draw one circle. The following takes less than 2½ seconds, and if Step 2 is

inserted after the For i% = 1 to 45, an acceptable circle is produced in just 1 1/2 seconds.

```
10 MODE 1:CLS:r%=100:x%=320:y%=200:DFG:ORIGN x%,y%
```

```
20 FOR % = 1 to 45 : a% = r% * COS (i%) : b% = r% * SIN (i%) : PLOT a%,b% : PLOT - a%,b% : PLOT a% - b% : PLOT - a% - b% : PLOT b%, a% : PLOT - b%, a% : PLOT b%, a% : PLOT - b% a%
NEXT
```

Table 1 will help new users track cursor up/down control characters as the manual is not particularly helpful on this matter. They can all be used in the same style as CBM's cursor symbols:

The 64 manual fails to give an example of how to print a multicolour character. The following will print a wine glass, and characters high and outlined in black on a white background, filled with red wine, standing on a blue mat.

```
10 MODE 1:INK 0,26:INK 1,0:INK 2,6:INK 3,14:PAPEF 0: BORDER 0:CLS
```

```
20 SYMBOL after 200
30 SYMBOL 200,0,0,254,130,130,130,130,68
```

```
40 SYMBOL 201,40,16,16,16,56,124
50 SYMBOL 202,0,0,0,0,24,124,56
```

```
60 SYMBOL 203,16
70 SYMBOL 204,0,0,0,0,0,254
```

```
80 glass $ = CHR$(200) + " -"
90 wine $ = CHR$(202) + " -"
100 Mat $ = CHR$(204)
```

```
110 PRINT CHR$(22) + CHR$(1): REM turns on transparent mode
```

```
120 FOR x% = 1 to 37 STEP 4: FOR y% = 1 to 21, STEP 4
```

```
130 LOCATE x%,y%:PEN 1:PRINT glass$ " " :PEN 2:PRINT WINE $ " " :PEN 3:PRINT mat $:NEXT: NEXT
```

```
140 PRINT CHR$(22) + CHR$(0): REM reset to normal mode
150 PEN 1
```

Finally, new users will find useful the use of Ctrl and CSR keys to jump from one end to the other of a long line of Basic during editing. Also not mentioned directly in the manual is the possibility of re-executing a simple Basic instruction in a similar way to the CBM computers.

Cursor up to the line required, "wipe" across it with the copy key, over-typing any changes on the way, and press Enter. The command will be obeyed, without the need for re-typing it, or Copying it to a fresh screen line.

F Murfit,
Crawley,
West Sussex.

CORRECTIONS

There is an error in the hex loader for the Spectrum game, Space Evaders, in the January issue. LET = 0 at the end of line 70 should be deleted and re-inserted at line 65.

Before typing in the hex loader in January's Dragon program, Revarsi, you need to reserve space for the machine code by typing PCLEAR 8.

More machine code was given than is necessary in the listing for CBM 64 Tiradians in January. When the hex loader asks you to input the start position, enter 3700 and ignore the code from 3600 to 36F8.

PRICE WAR - HUH! What is it good for? Absolutely nothing. That's what the computer manufacturers would have us believe, but when did the public ever lose out from cut-throat competition in the micro industry?

The last major price battles were fought in 1983 when Sinclair sparked a new conflict by pulling the Spectrum down to £130 and £100 from its original £175 and £125. Commodore answered swiftly with Vic-20 cuts and the whole campaign had fizzled out by that Christmas.

The result? — a lot of satisfied new customers and a body count of computer manufacturers featuring big names like Texas Instruments and Mattel, and several smaller ones such as Grundy and Jupiter Cantab.

All the signs are right for a new round of cuts this year, but this time Atari is the company leading the downward price charge. That may seem ironic — Atari was another of the once-powerful to fall victim in the 1983 wars. It lost \$180 million in the last three months of 1983, and those financial wounds lay directly behind its sale to Jack Tramiel in the spring of last year.

Atari had hoped that the XL range of computers would lead to a return to better fortunes. In 1983 few would have expected that the £250 top-of-the-range 800XL would become Christmas 1984's bargain at £130 — and how there is talk of another cut to take the 800XL below £100.

Alone, that would hardly be enough to spell cheaper computers for everyone. But it is one of several movements which could add up to important changes in pricing this year.

How well computers sold at Christmas is the first key. Although the end-of-year boom couldn't

be described as disastrous for companies like Sinclair, Commodore and Amstrad, it did arrive very late with all the activity concentrated in the last couple of weeks before the 25th.

That has resulted in larger warehouse stocks of unsold machines than expected.

Japanese dreams of an MSXmas failed to become reality, hit first by a lack of interest and then by the weak pound. Toshiba has already dropped its HX-10 to under £200 and the other MSX makers will be forced to follow suit to get their over-priced machines moving.

Even though Sinclair can outsell his competitors with the Spectrum even at its current price, he is well placed to make cuts if he has to. The profit margins in the Spectrum's prices are large enough for him to move them down a long way even if this time it isn't Sinclair who starts the war. The low chip count in Commodore machines will also permit them to rejig prices if they want to initiate the moves to get the market moving again.

It is an open secret that following the Electron principle Acorn is re-engineering the BBC Micro to reduce production costs and increase margins. That in turn could allow for price cuts. Late-comer Enterprise might also be obliged to look at a new price structure.

The final factor that hints at lower-cost computing is the number of new computers in the pipeline. Commodore as well as Atari have unveiled their latest products — see this month's news pages — and the Atari cuts already mentioned are clearly in preparation for the new machines. Commodore may also reposition the computers in its existing range by dropping prices and possibly machines.

How to write for Your Computer

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

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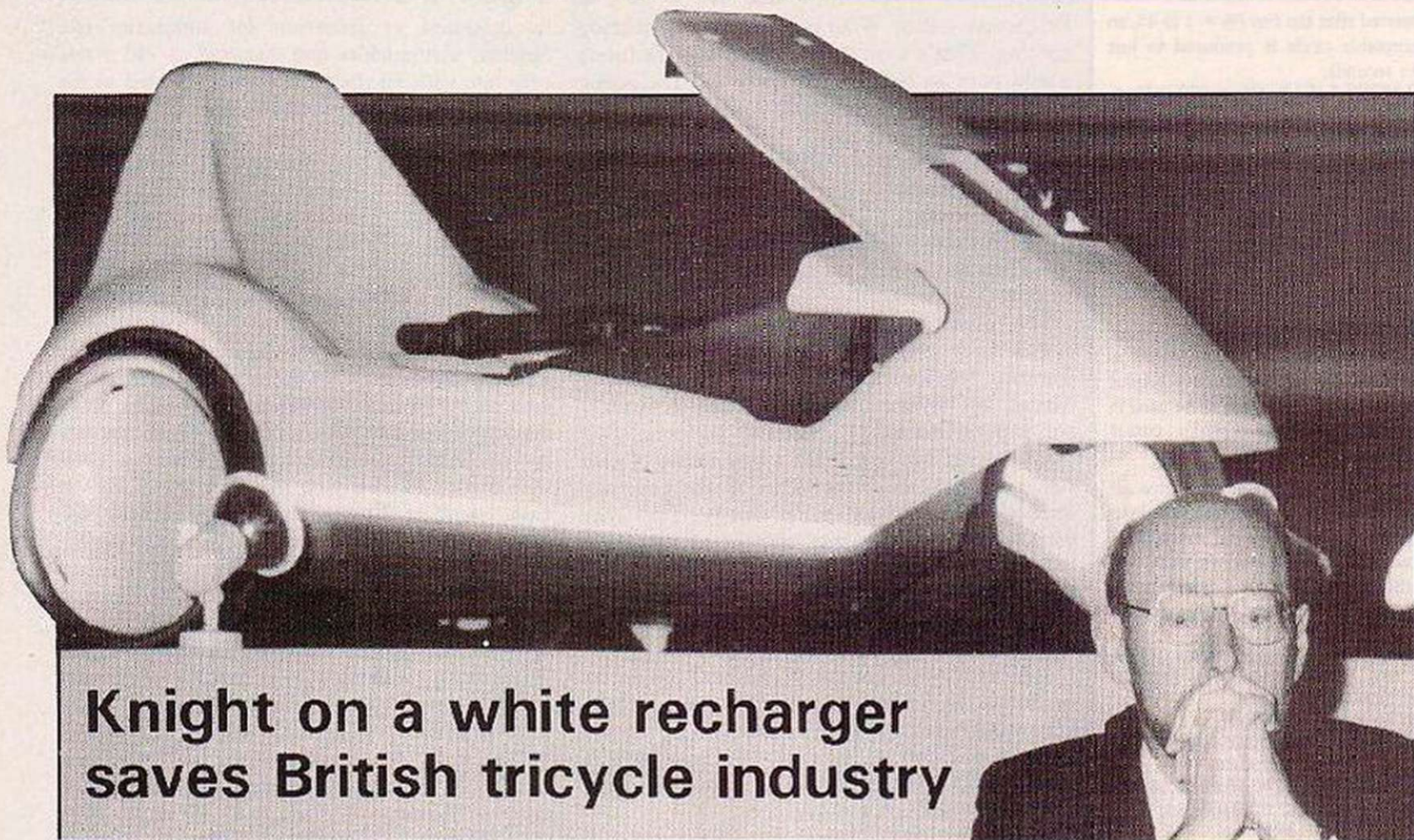
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Knight on a white recharger saves British tricycle industry

SINCLAIR'S £400 ELECTRIC VEHICLE is more of a toy than the "ideal solution for all types of local journey" which the brochure claims although under current regulations anyone over 14 can drive the C5 electric tricycle on the road without insurance, tax or crash helmet.

The C5 looks a little like a small bobsleigh and going down the snow-covered slopes of Alexandra Palace where it was launched it sometimes performed like one. However the 250 Watt electric motor which drives one of the back wheels proved incapable of powering the C5 up even the gentlest slopes without using pedal power. The tricycle soon started making a plaintive "Peep, Peep" noise signalling that the engine had overheated.

On the flat track inside the Alexander Pavilion the C5 showed how much fun a lightweight electric vehicle can be in a controlled environment. The three guiding principles of the Sinclair Vehicle Project as outlined by Managing Director Barry Willis are lightweight materials, good aerodynamics and traditional battery technology with an unconventional approach to design going back to first principles rather than adapting existing vehicles. "We don't take a standard car, van or bus" says Barry "and rip out the engine to replace it with batteries and electric motor."

The C5 is compromised by the need to sneak in under the quaintly named Electrically Assisted Pedal Cycle Regulations 1983. This lays down a maximum power of 250 Watts for the engine which gives the C5 a top speed of 15 mph on the level - less than most cyclists would manage.

With one lead acid battery on board the tricycle has a range of 20 miles before it needs recharging but it can carry a spare battery which doubles its range without exceeding the 60 Kilogram weight laid down in the regulations.

Although the C5 is built by

Hoover at Merthyr Tydfil in South Wales Sir Clive cast doubts on rumours that it is powered by a motor that would be more at home in a domestic appliance. He admitted that the company in Italy which builds the engine "does make washing machine motors" but added

mysteriously that it "also makes torpedo motors".

Be that as it may a periscope would be handy if you intended driving the C5 on busy roads since your head is only at bonnet level. The steering is controlled by a crossbar under your thighs.

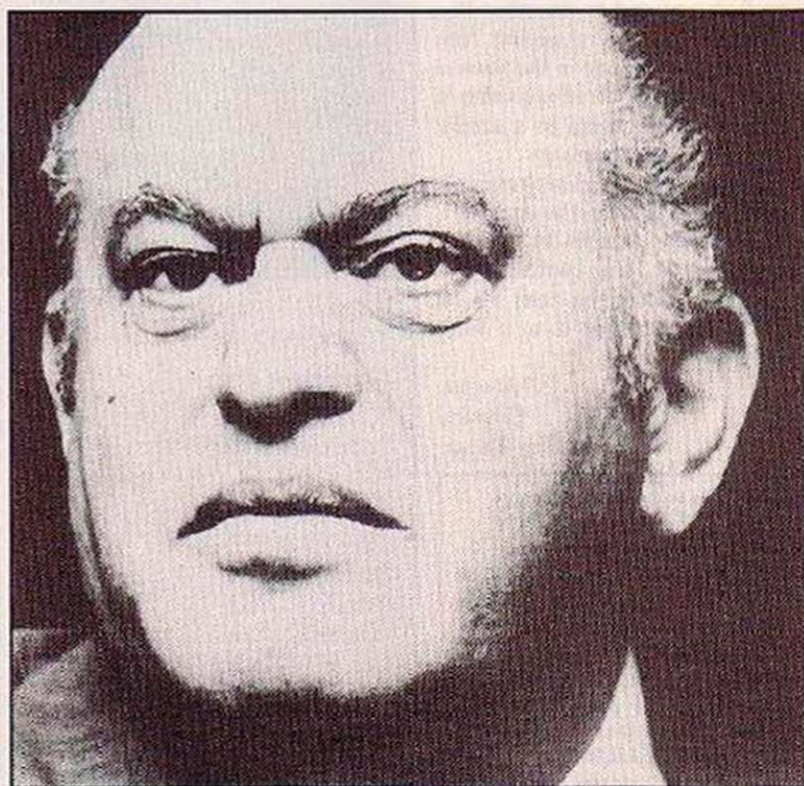
Tramiel stares into infinity as X13 and 5T rangers see the light

TRAMIEL WANTS more blood so the price of the 800XL is to be forced down yet again to £99 as part of a worldwide price war, and meanwhile in Las Vegas Atari's combative chairman showed the new Atari XE and ST ranges, outlined in *Your Computer* January, for the first time.

The XE is what Atari is calling the 8-bit range developed from the 800XL. The standard revamped 800XL will cost \$120 in the United States with the 65 XEM music version incorporating a synthesiser at \$160 and the 128K 150 XE at \$200. The more expensive 65 XEP portable incorporates a 5 inch monochrome screen and 3.5 inch disc drive.

What really impressed visitors to the Atari stand at the Las Vegas Consumer Electronics Show was the software demonstrated on the new machines - especially a package called Infinity which incorporates windows, a friendly Help function and integrated spreadsheets, word processor and relational database.

Atari's new QL bashers based on the 68000 will start at \$500 with the 130ST which has 128K, mouse, icons and all which begins to sound more like a Macintosh than a Sinclair, and



goes up to \$300 for the half-megabyte 520ST. Also scheduled are low priced 250K, and 500K drives with a 10 Megabyte hard disc coming too. Atari

UK is saying nothing yet about when we can expect to see these machines this side of the Atlantic or what the prices will be.

Personal Assistant is undercover BBC B

ACORN HOPES to have the first of its ABC computers, based on a re-engineered BBC-B in the shops by the end of the month.

The Personal Assistant as the bottom of the range model is called

QL helps out gardeners

PATRICIA AND TOBY Hodd want to turn the Sinclair QL from a home computer into a garden computer.

The Shrub Data Bank and Planner is designed to run alongside the Archive data base and it will then answer questions like "shrub, fragrant, hardy" to describe what you want then "complete shade, moist" to describe the habitat it will have to survive in. Back will come the following suggestions "Elder, Privet, Skimmia, Winter Jasmine and Wisteria."

The Hods are keen conservationists — with a history of wild life research in India who now live in Llangatto Nurseries, Llangatto, Tregadon, Dyfed, SY25 6QG which is where you should send your £12 if you want a copy of the program on Microdrive cartridges.

will be a package of a new keyboard containing a slimmed down BBC and built-in View word processor and Viewsheet spreadsheet on rom together with a monochrome screen including a built-in disc drive. The price is likely to be less than £1,000.

The reduced chip count — Electron style — will also be used in the BBC which will be able to offer additional features or dramatically drop in price as a result. A tight-lipped Acorn spokesman would only say "that's one of the ways of making it cheaper to produce".

Price cuts for the BBC are coming



anyhow after a bad Christmas for Acorn. The company admits that Electron sales were "not in the same league as Commodore or Sinclair."

Schizoid Commodore shotgun blasts 64, 128 and CP/M targets

THEY CALL it "The Shotgun" — not because of the war with Atari but because the Commodore 128 hits three target audiences simultaneously.

First it is an important new machine in its own right with 128K RAM and yet another new, improved Basic 7.0. Second it can cut itself in half — the sawn-off shotgun — to run all Commodore 64 software — giving it

an instant software base — and third it can run CP/M using a Z-80 processor in addition to its 6502 derived 8502 processor.

The 128 costs \$250 and was officially launched at the January Consumer Electronics Show in Las Vegas, but with the exchange rate plummeting it is difficult to predict the British price when it arrives in the

early summer. Commodore is also launching an IBM PC lookalike which may eventually come down to home computer prices and a portable called the LCD.

Match day for Amstrad

MATCH DAY from Ocean is likely to spread from the Spectrum to the Amstrad. Despite the problems of programming on the Spectrum Jon Ritman and Chris Clarke have produced a game which looks almost as good as International Soccer on the Commodore 64 as well as giving as good a game.

Ocean Producer Jon Woods claims that in some respects notably price — £7.95 it is better. Also "on the Commodore game players can walk through each other, on ours they can't."

about Acorn's "dishonest" advertising.

Traditionally Sinclair customers in a similar situation have just written to the Advertising Standards Authority to complain that the 28 days advertised has not been complied with — let's hope Sinclair has not set a precedent for more direct action by his customers.

Portable and powerful, Brother's TC-600 is the next development from the EP-44 with more communications ability, more memory and a simple built-in word processor.



Cambridge ain't big enough for both of us

SIR CLIVE'S much publicised Christmas punch up with Chris Curry of Acorn in the Baron of Beef pub in Cambridge is not the only example of an isolated occurrence in the computer industry.

The two multi-millionaires may have been unlucky to have been caught brawling in public after their respective companies end of year parties but similar feuds have been running elsewhere. According to one bruised Imagine refugee "Cambridge" is more mature and civilised than most of the rest of the industry.

Up in the wild North-West Freireon which is supposed to be finishing the megagame Bandersnatch — another Imagine refugee — has been harassed by the arrival of a whole stream of unsolicited goods and services including a rubbish skip, 20 fire extinguishers 6 desks and a flood of junk mail.

Meanwhile Sinclair is supposed to have "made contact again" with "scum" as he called his ex-employee Chris Curry and the pair are supposed to be the best of friends again. The fracas happened on the Friday before Christmas when Sir Clive lashed out with a furled copy of a magazine because he was angry

YOUR COMPUTER TOP 20

Game	Company	Machine
■ Airwolf	Elite	Spectrum
■ Booby	Firebird	Spectrum
■ Bruce Lee	US Gold	CBM 64
■ Combat Lynx	Durell	Spectrum
■ Daley Thompson Decathlon	Ocean	Spectrum
■ Elite	Acornsoft	BBC
■ Eureka	Domark	CBM 64
■ Fall Guy	Elite	Spectrum
■ Ghostbusters	Activision	CBM 64
■ Havoc	Dynavision	CBM 64
■ Hunchback	Ocean	CBM 64
■ Knight Lore	Ultimate	Spectrum
■ Lords of Midnight	Beyond	Spectrum
■ Pyjamasana	Mikro Gen	Spectrum
■ Raid Over Moscow	US Gold	Spectrum
■ Savage Pond	Argus	Electron
■ Tr Na Nog	Gargoyle	Spectrum
■ Travel with Trashman	New Generation SW	BBC
■ Underworld	Ultimate	Spectrum
■ Zaxxon	US Gold	CBM 64

I could do that...

The problem for December's competition was to write a program which played noughts and crosses. Still pursuing the theme of artificial intelligence, we also suggested that you might give the program the capacity to learn from its mistakes.

The winning program — for the BEC — came from S. O'Grady, 29 Linden Gardens, London W2. It does not include a learning facility but then it does not need to — the program never loses. Admittedly, managing to win or draw every time at noughts and crosses is not difficult.

```

20 PRINT "NUGHTS AND CROSSES"
30 DIM A(3,3)
40 FOR I=1 TO 3
50 FOR J=1 TO 3
60 PRINT " ";
70 IF J=3 THEN PRINT
80 NEXT J
90 NEXT I
100 PRINT
110 PRINT "YOUR MOVE"
120 FOR I=1 TO 3
130 FOR J=1 TO 3
140 IF A(I,J)=0 THEN PRINT "0";
150 IF A(I,J)=1 THEN PRINT "X";
160 IF A(I,J)=2 THEN PRINT "O";
170 PRINT " ";
180 IF J=3 THEN PRINT
190 NEXT J
200 NEXT I
210 PRINT
220 PRINT "YOUR MOVE"
230 FOR I=1 TO 3
240 FOR J=1 TO 3
250 IF A(I,J)=0 THEN PRINT "0";
260 IF A(I,J)=1 THEN PRINT "X";
270 IF A(I,J)=2 THEN PRINT "O";
280 PRINT " ";
290 IF J=3 THEN PRINT
300 NEXT J
310 NEXT I
320 PRINT
330 PRINT "YOUR MOVE"
340 FOR I=1 TO 3
350 FOR J=1 TO 3
360 IF A(I,J)=0 THEN PRINT "0";
370 IF A(I,J)=1 THEN PRINT "X";
380 IF A(I,J)=2 THEN PRINT "O";
390 PRINT " ";
400 IF J=3 THEN PRINT
410 NEXT J
420 NEXT I
430 PRINT
440 PRINT "YOUR MOVE"
450 FOR I=1 TO 3
460 FOR J=1 TO 3
470 IF A(I,J)=0 THEN PRINT "0";
480 IF A(I,J)=1 THEN PRINT "X";
490 IF A(I,J)=2 THEN PRINT "O";
500 PRINT " ";
510 IF J=3 THEN PRINT
520 NEXT J
530 NEXT I
540 PRINT
550 PRINT "YOUR MOVE"
560 FOR I=1 TO 3
570 FOR J=1 TO 3
580 IF A(I,J)=0 THEN PRINT "0";
590 IF A(I,J)=1 THEN PRINT "X";
600 IF A(I,J)=2 THEN PRINT "O";
610 PRINT " ";
620 IF J=3 THEN PRINT
630 NEXT J
640 NEXT I
650 PRINT
660 PRINT "YOUR MOVE"
670 FOR I=1 TO 3
680 FOR J=1 TO 3
690 IF A(I,J)=0 THEN PRINT "0";
700 IF A(I,J)=1 THEN PRINT "X";
710 IF A(I,J)=2 THEN PRINT "O";
720 PRINT " ";
730 IF J=3 THEN PRINT
740 NEXT J
750 NEXT I
760 PRINT
770 PRINT "YOUR MOVE"
780 FOR I=1 TO 3
790 FOR J=1 TO 3
800 IF A(I,J)=0 THEN PRINT "0";
810 IF A(I,J)=1 THEN PRINT "X";
820 IF A(I,J)=2 THEN PRINT "O";
830 PRINT " ";
840 IF J=3 THEN PRINT
850 NEXT J
860 NEXT I
870 PRINT
880 PRINT "YOUR MOVE"
890 FOR I=1 TO 3
900 FOR J=1 TO 3
910 IF A(I,J)=0 THEN PRINT "0";
920 IF A(I,J)=1 THEN PRINT "X";
930 IF A(I,J)=2 THEN PRINT "O";
940 PRINT " ";
950 IF J=3 THEN PRINT
960 NEXT J
970 NEXT I
980 PRINT
990 PRINT "YOUR MOVE"

```

We were impressed, however, by how short the program was. It uses the evaluation function described in David Levy's book, *Computer Gamesmanship*. This involves examining each possible move and counting the number of noughts or crosses in each horizontal, diagonal, and vertical row.

Line 230 then works out a score according to the formula: $S = N3 * 128 - C2 * 63 + N2 * 31 - C1 * 15 + N1 * 7$. N3 contains the number of rows of three noughts, C2 the number of rows of two crosses, and so on. The computer, which is playing noughts, makes the move with the best score.

If you do not have a BBC you should be able to convert the program fairly easily. MCD3 in line 50 gives the remainder when a number has by then divided

(continued on page 29)

BEGINNERS

First Bytes

Starting out in home computing? First Bytes is for you. Just write to

Your Computer with any hardware or software problems, no matter how small or simple.

High-level languages

LAST MONTH'S First Bytes showed why operating systems are necessary: they handle all the boring house-keeping functions on a micro, and generally keep it ticking over. Thanks to them, the micro is your obedient slave, just waiting for your commands.

But to get your Spectrum or Commodore 64 to leap through hoops you need some way of telling it exactly what to do. This is where high-level languages come in.

They are called high-level because humans can understand them, more or less, and it is a well-known fact that we are higher beings. Low-level languages are things like machine code that only freaks who think in hexadecimal can cope with.

A high-level language is a computer language that uses a series of statements that look a bit like English, and whose rules — the "syntax" of the language — mirror those of everyday speech. In this way the whole business of programming becomes much more straightforward.

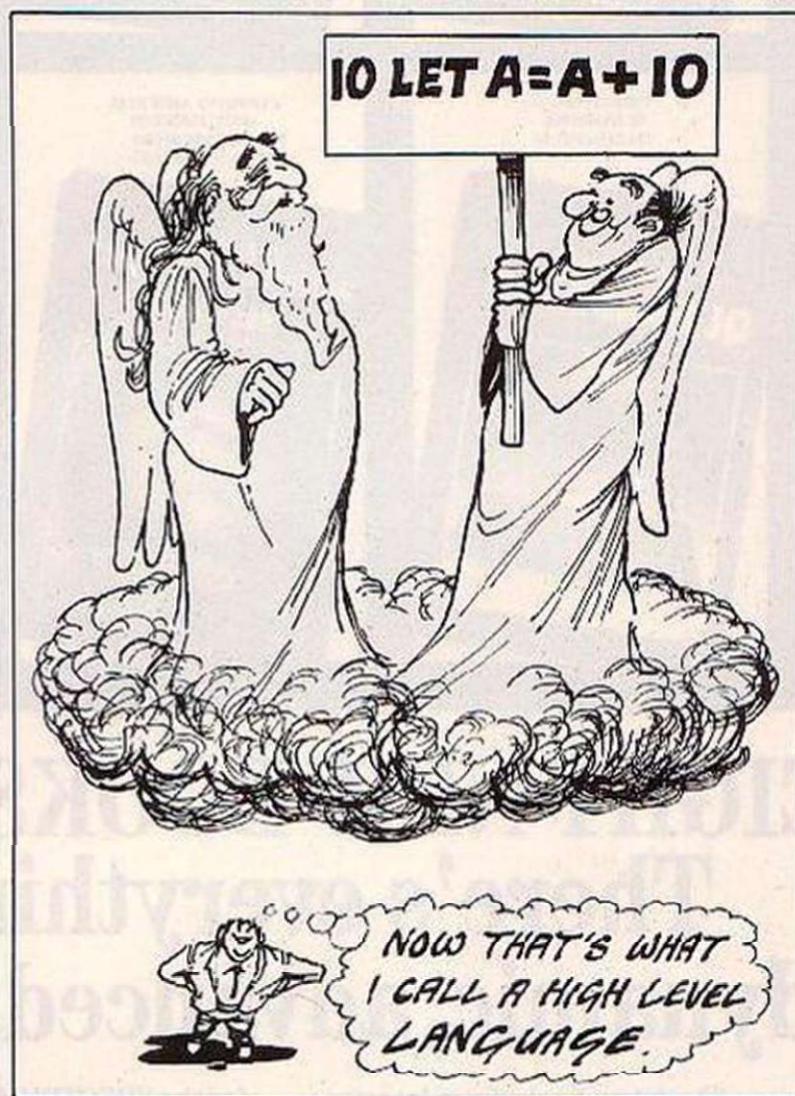
The most famous high-level language is of course Basic. Basic is so common that people tend to forget that it is only one of many ways of talking to your micro. Not only are there numerous other high-level languages, but also a whole range of progressively lower levels you can interact with a machine.

Basic stands for Beginner's All-purpose Symbolic Instruction Code, and was developed 20 years ago with the specific aim of creating a language that was reasonably close to English, and hence could be taught to beginners.

It uses simple words like If, Then, Do, Goto, together with the usual mathematical operators like + and *. Each line of the program contains one or more sets of commands written using them. After a program has been written, it is then run.

The idea of running a program is something else we tend to take for granted, but is a key ingredient in developing advanced and powerful software.

Some high level languages,



including Basic, allow you to enter a command which is obeyed immediately. This is fine for very simple calculations, but does not let you move on to more complicated problems.

In fact, programming languages do not always have this immediate mode of execution. For example Fortran, short for Formula Translation, can only run complete programs after they have been fully built up. In appearance its programs look very similar to ones written in Basic, which is hardly surprising since Basic was partly based on it.

There are minor differences of syntax, but it is easy to move across if you know Basic. Fortran is used mainly for heavy number-crunching applications in science and engineering, and so is not often found on micros.

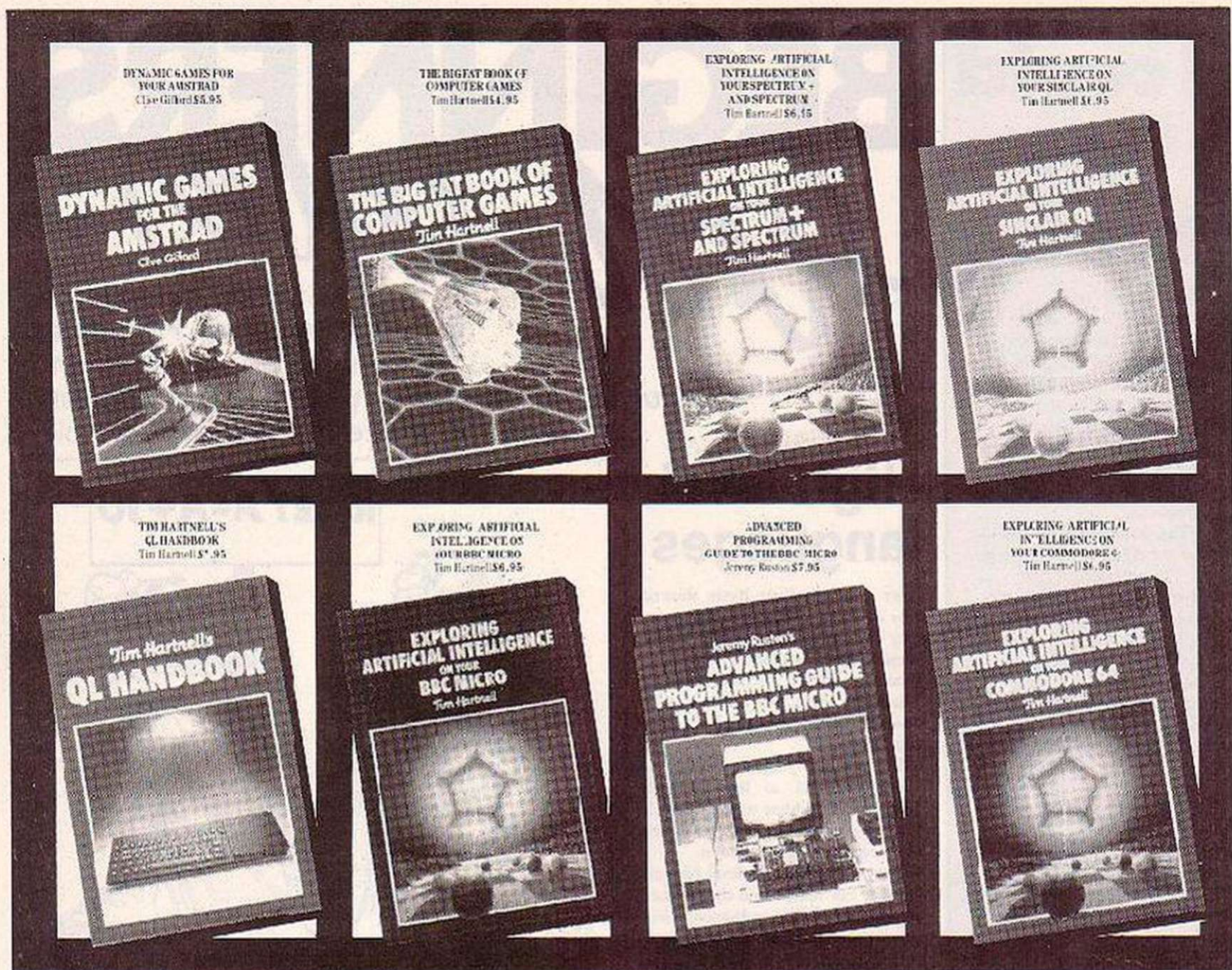
Another language in the Basic stable is Pascal, named after the French mathematician. It came

about from trying to design a high-level language that would have all the advantages of Basic without some of its less desirable features. Advantages included that it was easy to learn and understand. Its less desirable features included the dreaded Basic Spaghetti Syndrome.

Anyone who has written Basic programs knows the temptation. When you find that your program does something unexpected, or has missed out a particular case, or needs modifying, you don't go away and write a whole new program. Instead you add a Goto or two.

This often works very well. Unfortunately it can leave the logic of your program as tangled as a plate of cold spaghetti — hence its name. This means that when you come to look at your program again in a few months' time, you cannot for the life of you work out how it is doing what.

(continued on page 29)



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(continued from page 27)

Pascal aims to stop this sloppy kind of programming. One of its tricks is not to have a Goto at all. Instead you must break up your program into neat and logical smaller units. Pascal is also very strict about saying what kind of variables you are working with — integer, real, and so on — and won't let you pluck them out of the air as in Basic.

All-in-all, Pascal is designed to encourage good clear programming habits in a high-level language. It is becoming available on an increasing number of home micros. So if you feel like a little discipline, it could be for you.

Another language that is beginning to appear is Forth. This was originally designed to control the movements of an astronomical telescope. It is still mainly used today for such control applications, especially things like robot arms.

Like Basic, Forth can respond immediately to a command or to built-up programs. One of its most powerful features is the ability to create new commands in the language as you go along. Whereas in Basic you are stuck with those that the designer thought fit to stick in, in Forth you use the fundamental commands to write new ones for your particular needs.

One slight disadvantage with the language is the way in which you write out mathematical operations. Because it was developed for specialist applications, the designer didn't worry too much about little oddities. One of these is the fact that you use what is called Reverse Polish

Notation.

Effectively this means that all the numbers and functions are bunched together at one end of the line, and all the operators that act on them at the other. The way they interact together requires a certain amount of mental acrobatics.

If you wish to retain the ability to create your own functions and operators without having to sacrifice all the legibility of Basic, you could try something called APL.

This stands for simply A Programming Language. Like Fortran it has a strong mathematical bias to it, and it is very useful for writing one-line programs that carry out complex calculations very quickly.

One problem with most versions of APL is that they use a large set of extra signs that make an APL program look like Ancient Egyptian hieroglyphics. This also means that you really need a special keyboard too. Which is a bit of a joke when you consider that some micros like the Spectrum haven't even got an ordinary keyboard.

Happily a version has recently been launched for the QL that replaces all these symbols by simple words. The combination of the QL

Micros that can talk

MICROS ARE pretty wonderful beasts, but they can be rather antisocial. After all, spending hours beat over a hot keyboard as your eyes go square from staring at the TV is hardly the best way of communicating with your fellow men and women. Yet potentially the micro could be the cause of a communication revolution.

Anyone who has used a mainframe computer at a university or in a big firm knows that much time is spent passing messages from terminal to terminal. Now wouldn't it be great if you could do that with your micros? All you need is a bit of wire to connect you up, except that really you would need bits of wire from you to everybody, and so would they.

Rather conveniently, this network of wires up and down the land already exists. It is called the telephone. All you have to do is to find some way of getting your computer to talk down it. The device used to do this is called a modem.

An obvious way is to convert the signals inside a micro into some kind of audible sound. The telephone can then carry this in the normal way. A modem incorporating something called an acoustic coupler is used for this purpose.

This translates the 0s and 1s that go to make up a computer program into two distinct frequencies. In this respect it is like Basiccode described in October's First Bytes. These are then fed down an ordinary telephone headset by plugging it into special rubber sockets on the acoustic coupler. A similar acoustic coupler is used the other end to decode these

BEGINNERS

first bytes

and APL creates one of the most powerful micro number engines around.

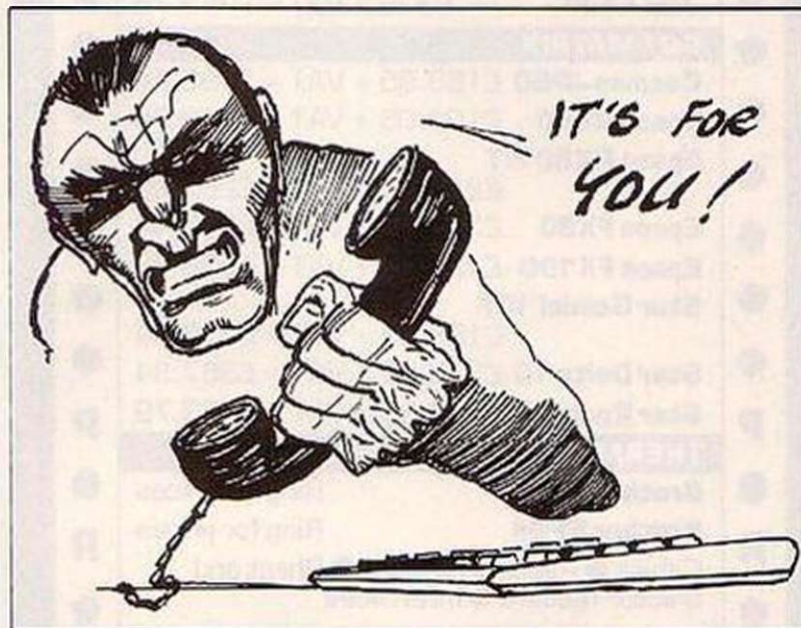
All the languages so far considered have been geared towards the processing of numbers. But another class of high-level languages is concerned with lists and rules.

These are languages that are beginning to produce significant progress in the trendy field of Artificial Intelligence. One that is available on several home micros is Lisp.

Its name comes from LISt Processing. It works by manipulating lists of things rather than simple numbers. Used properly, it can make deductions from associated lists of

information. Another language that is used in this field is Prolog — Programming in Logic. A version called MicroProlog is just starting to come through, and offers the same possibilities of trying out programming in AI.

There are many other high-level languages in use today, and they are still being written. As home micros get more powerful and with bigger memories, so the range of options increases. Memory is an important factor because a language is just like any other program in that it needs space to store it in order to run it. For this reason many home computers put their Basics on a ROM chip. This saves valuable space, and allows the language to be used with the full Ram of the machine.



I could do that...

(continued from page 27)

by three; while DIV3 returns the number of times three divides into another number. X = 8 MCD3 could, for example, be replaced by X = 8 - 3*(INT(8/3)). You may also need to replace the Proc statements by Gosubs.

For this month's competition the £15 prize will be awarded to the program with the most interesting bug or bugs. Quality is more important than quantity here: we are looking for those maddeningly elusive bugs that keep you up half the night. The program should not be more than 20 statements long, and should be accompanied by a note telling us what it is supposed to do.

two tones back into the machine readable binary digits.

Although simple in theory and fine in principle, there are one or two very obvious difficulties with this method. First, if the headset is disturbed while data is being sent there is very likely to be corruption of the audio bleeps and hence the information sent. Secondly, the whole system of using very fast changes of frequency — about 300 per second — is fraught with similar dangers.

Far safer is the direct connection modem. This allows you to plug your micro directly into the telephone system. After the modem has done some discreet preparation of programs to be sent, they can then be downloaded directly. This is both less likely to suffer from data corruption and potentially much faster.

There is the slight problem that British Telecom is understandably concerned about what you might shove down its precious telephone lines in this way. Direct connection

modems are therefore subject to pretty exhaustive scrutiny by the British Approvals Board for Telecommunications.

It is illegal to connect a modem to the network that has not been approved. Approved models carry a round green sticker; models that are not approved must say so by carrying a triangular red sticker.

Naturally, approved modems cost more — the cheapest is about £100 against £50 for an unapproved model. But do not be tempted to cut corners. BT periodically tests telephone lines.

Besides, there is no real point. A few years ago, a modem would have cost several hundred pounds at the cheapest. Today, the £100 barrier is being breached all the time for most popular home micro models, and prices are still dropping. You can even get autodial modems for this sort of price. These are rather civilised devices that will even dial the number for you.

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DO LOOP structure
DPOKE double poke
EDIT specified line
ELSE used with IF... THEN
EXIT leave DO LOOP

FBI enclosed area with specified link or paper
GET waits for keypress
JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LISTLIST line T3 line
USED (used with GOTO, GOSUB)
ON DROP trap errors
PRINT LINE STAT and ERROR!
PLOT a string (may contain cursor control codes)
POKE a string
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PROC, PROC, END PROC (for named procedures)

LENUM variable renamer
ROLL all or part of screen in any direction by specifies number of axes, with or without attributes
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UNTE used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
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CRG, VRG change PLOT scale

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AND bit-by-bit
BASC decimal to binary
CHARS number to 2 characters
CODE fast codes
DEC hexadecimal to decimal
DPOKE double POKE
END END user

HEX decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR bit-by-bit

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TIME current time
USING1 formats numbers
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Local news

Irvine

You can make contact with the Irvine hackers via Ewan Dalton, 21 Berry Drive, Irvine, Ayrshire KA12 0JG or telephone 0294 7657. Membership costs £2.

Whitehaven

The West Cumbria User Group serves the Whitehaven and Workington area. Activities include open evenings, computer courses and working on various projects — including speech synthesis, digitising graphics and a lightpen. Ring P Majid on 0946-62732 or K Purkiss on 0946 66586.

Gravesend

The Gravesend Computer Club now hangs out at the Council Tenants Club, Whitehill Lane, Gravesend, Kent. They meet every Thursday evening. Contact The Club Secretary, 58 Apsledene, Hever Farm Estate, Singlewell, Gravesend, Kent DA12 5EE.

Colwyn

Colwyn Computer Club meets at the Greens Hotel, Colwyn Bay. Contact D Eevan, c/o Abergele Road, Colwyn Bay, Gwynedd LL29 7PA.

COMPUTER

Paul Bond takes a trip to the banks of the Thames to discover what the besieged GLC is doing micro-wise.

club

TO BE OR NOT TO BE? Shakespeare may not have had the Greater London Council in mind when he penned these immortal words — but there is inevitably an element of doubt whenever one writes about a body linked with the GLC, subject as it is to such a withering onslaught from the central government.

David Kimpton put it this way with regard to the GLC Computer Workshop, of which he is head: "No-one has tried to identify functions which should not continue". The functions are certainly many and varied. The famous Room 97 — it is now just called the Computer Workshop — provides a chance for people to try out various types of personal computer. It is occasionally booked by London-based computer clubs like the Association of London Computer Clubs, BASUG, and the Independent Commodore Products User Group (ICPUG) — but it also provides seminars and workshops for voluntary organisations, community groups, trades unions, co-operatives and professional associations.

The premises opened in February 1982, and Mr Kimpton's job was originally to look after information technology (IT — remember that) and the GLC. They kicked off by sending out a survey via the London Voluntary Service Council which has a list of the 5,500 voluntary organisations in the capital. Since then they have built up equipment, expertise and increased staff resources to 10.

Organisations which have received help include Age Concern Greater London, British Sports Association for the Disabled, the National Jazz Centre, the London Union of Youth Clubs, and various Family Service Units. In the last six months they have held 58 seminars, advised over 100 individuals and dealt with over 200

delegates from disabled organisations. These include co-operatives like the Collective Design and Building Co-operative and the Half Moon Theatre.

Systems advised or include everything from dBase II on a Televideo — as used by the Mental Health Foundation to build up a directory of caring agencies — down to the less recherché BBC Micro used by FLAT (Facility for Living & Assessment Together). FLAT is a small registered charity set up to provide training in self-help skills for mentally handicapped people in the London Borough of Southwark. The BBC is used as an administrative tool for budgeting and cash-flow analysis, and providing training sheets — each FLAT trainee has a planned training schedule — and mail. It is envisaged that the computer will eventually become a training aid using basic educational games. A BBC with a database Rom is also being used by Unity 10, an organisation for handicapped children.

The GLC Computer Workshop doesn't just provide help for caring agencies — for example, some advice has been given to Fantasy Factory

Video, a non-profit making organisation which is compiling a database list of all existing commercial and educational videotapes. The Workshop also maintains contact with groups like Microsister and Central London Women & Computing which provide resources for women using computers. The latter organisation can be contacted on 01-430 0112.

During the summer the Workshop developed a Braille word processor at considerably less cost than the £5,000 that existing specialised systems can cost. This was done by the simple expedient of placing a high-quality racing bicycle inner tube over the printer roller. Braille is all based on six dots arranged in pairs like the six on a dice-face. These are printed out by the full stop.

The GLC has put £30,000 into the London Festival of Computing held April 9-21, and hopes that this will go towards making more Londoners aware of what they can achieve with computers. More information about the GLC Computer Workshop is available by phoning 01-633 3592. Enquiries about the London Festival of Computing should be directed to BIPR on 01 734 2937.



Central London Women & Computing's Rachel Sarger using one of the six Apricots that CLWIC have for training purposes. They are funded by the GLC.



Last year the GLC ran a competition for a computer game condemning racism. Here Ken Livingstone is seen zapping away with one of the winners.



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ADD-ON EXTRA

Opus

Disc System
Spectrum
£199.95

Opus have released a disc system for the Spectrum which they claim is totally compatible with the Microdrive operating system. This means that any program which runs on a Microdrive will run on an Opus system, at a much higher speed. The Spectrum sits on top of the metal interface and can be screwed into it, like Interface 1.

Apart from the Shugart disc socket there is a bi-directional centronics type printer port and a continuation of the expansion bus. The full range of Opus drives, three or 5 1/4 inch can be used. The system comes with a utility disc and a manual.

The manual is perhaps its only major failure as it rather assumes you know how to use a Microdrive. Still, you can always buy one of the many "drive your Microdrive" books. It represents excellent value at £199.95 for the complete system and is available from Opus on 01-701 866E or from larger branches of Boots.

Euromax

Joystick Interface
+4 and C16
£4.45

This is a useful add-on for C16 and +4 owners, giving them access to the huge range of Atari-type joysticks available. This includes Euromax's own range.

Interpress

Cassette Storage
£6.00

The Boneco Audio Cassette Safe can store up to 10 cassettes in a sliding draw. Several draws can be clipped together. The cassettes are stored vertically.

Euroelectronics

Printer Interface
Spectrum
£34.95 + cable

For those lucky enough to have one of the new colour printers, this interface allows full colour or four colour screen dumps.

HARDWARE

hit list

AMX mouse

BBC
Advanced Memory Systems
£89.95

BY INTRODUCING paste-over windows, icons and, most importantly, a mouse, Apple's Macintosh almost allows you to bypass the keyboard as a means of operating the computer. When it appeared people predicted that it would only be a matter of time before the same features appeared on an 8-bit micro. Island Logic kicked off by using windows and icons in its excellent music program. And now Advanced Memory Systems has gone one better by adding a mouse to the BBC.

A sensitive joystick

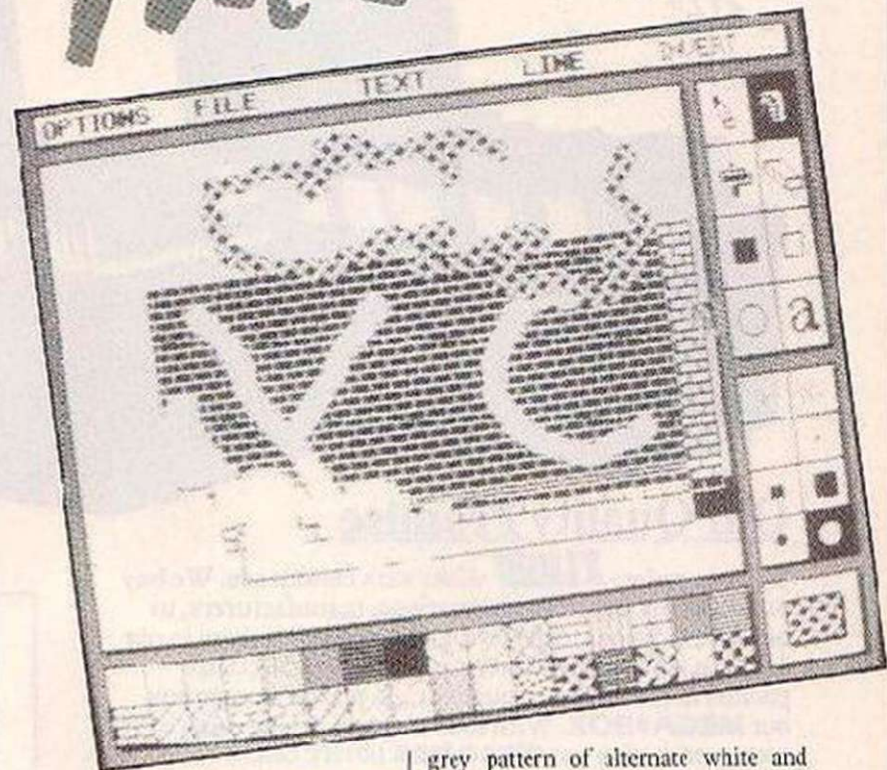
On its own the mouse is not much more than a very sensitive joystick or an upside down trackball, scaled down to fit snugly into the palm of the hand. It connects into the user port and needs a flat surface on which to roll around. What gives it its power is the accompanying software.

The AMX mouse comes with a Rom and several programs on cassette or disc. The Rom provides 15 commands which can be included in Basic or Assembly language programs. Together they allow you to use the mouse to control pointers, windows and icons.

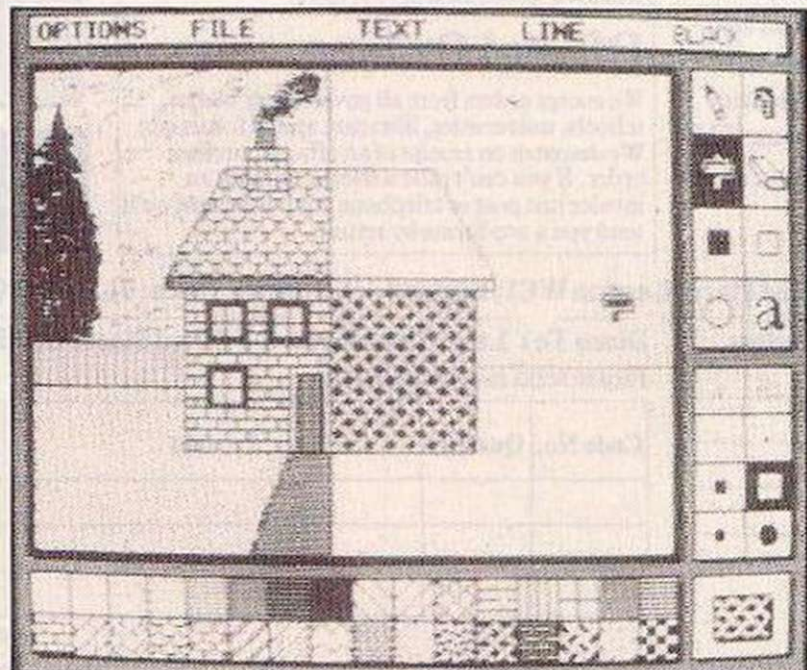
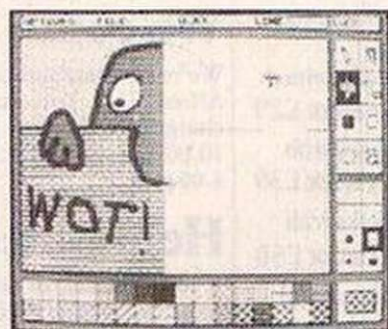
Icons are built in

Sixty four predefined icons, each made up of four characters, are built into the Rom. *Icon places the icon of your choice where you want it on the screen. Alternatively you can assign a particular icon to act as the mouse pointer. Then with the command *Movepointer you can use the mouse to move the icon around.

Among the other commands are



*Window which draws a window with a border and *Button which defines the key codes generated by the three buttons at the front of the mouse. As the commands are only available in the BBC's high-res monochrome modes, 0 and 4, *Desk is handy since it clears the screen with a



grey pattern of alternate white and black dots.

Just how effectively these routines work with the mouse is well demonstrated by the ArtworkX program. It is clearly modelled on the Apple's MacDraw program. Although it is not as powerful it must be one of the most impressive drawing programs yet to appear on a home micro.

To start off you are presented with a blank screen bordered by a number of boxes which show the options available. Eight icons at the right represent such facilities as a spray can, a pencil, a rubber, and a paint roller. If you want to use the spray can, you move the mouse pointer over the icon and highlight it by pressing a button.

Now you can choose a spray size and, from a range of 24 patterns, a spray texture or "colour". The mouse pointer changes into a spray can and by simply rolling the mouse around your desk top you can create the sort of effect favoured by subway graffiti artists.

A window pops up

When you highlight one of the headings along the top of a window pops up giving a further range of options such as dumping the screen to a printer or including text in the picture. The mouse makes all these facilities exceptionally easy to use.

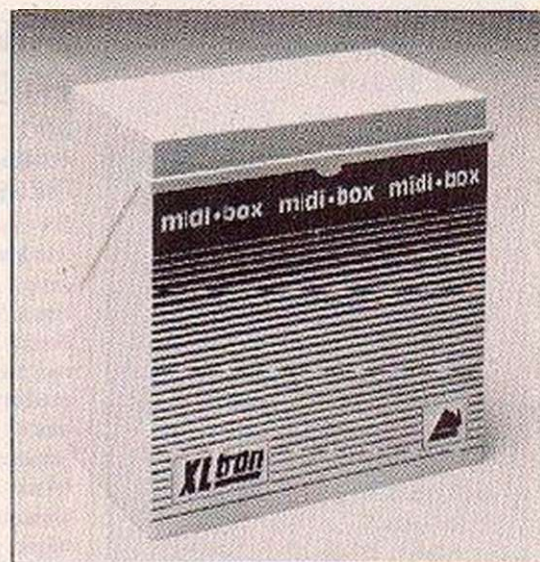
A standard reproach levelled against drawing programs is that they do not improve on pencil and paper. ArtworkX — in conjunction with the mouse — is one program that refutes this charge. Indeed this reviewer was hampered by requests to play with it from people who normally give computers a wide berth.

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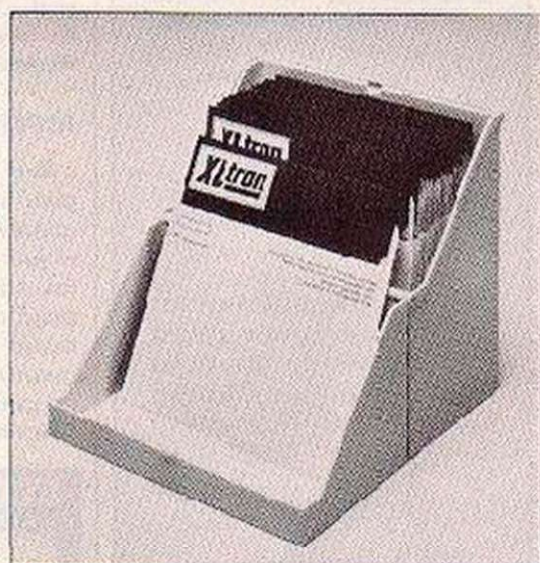


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Star chart

Blue Max

CBM-64
£8.95
Shoot-'em-up
U.S. Gold

★ ★ ★

Blue Max flies again — but this time with Commodore markings. With its impressive graphics, this U.S. import first appeared in Britain for the Atari some 14 months ago. The screen display and sound are not as good as the Atari's.

You have to strafe and bomb ground targets — bridges, factories, boats, and artillery batteries — and shoot down enemy aircraft.

Although the setting is World War I, you are flying for the RAF at a time when only the RFC existed and are pitted against the Axis powers of the 1930s.

Yet those academic objections don't detract from what is a very good game.

New Cylon Attack

Spectrum 48K
£5.75
Shoot-'em-up
A'n'F Software

★ ★

In isometric perspective — 3-D to you, mate. This is what it says on the inlay, but I'm not convinced. No swapping through cosmos like Codename MAT.

You just stooze about left and right, up and down, peppering the oncoming hordes with laser bolts. Not very colourful, not very 3-D.

Zone 00

Spectrum 48K
Blow-'em-up
Allanson

★ ★

One of these games where you have to dodge around planting one bomb at a time to destroy your assailants. These include octopi chasing you round shipwrecks that look like Blue Peter badges, and later on yellow submarines and blue meanies.

SOFTWARE

Shortlist

QL Chess

■ Sinclair QL
■ Psion/Sinclair
■ Board game
■ £19.95

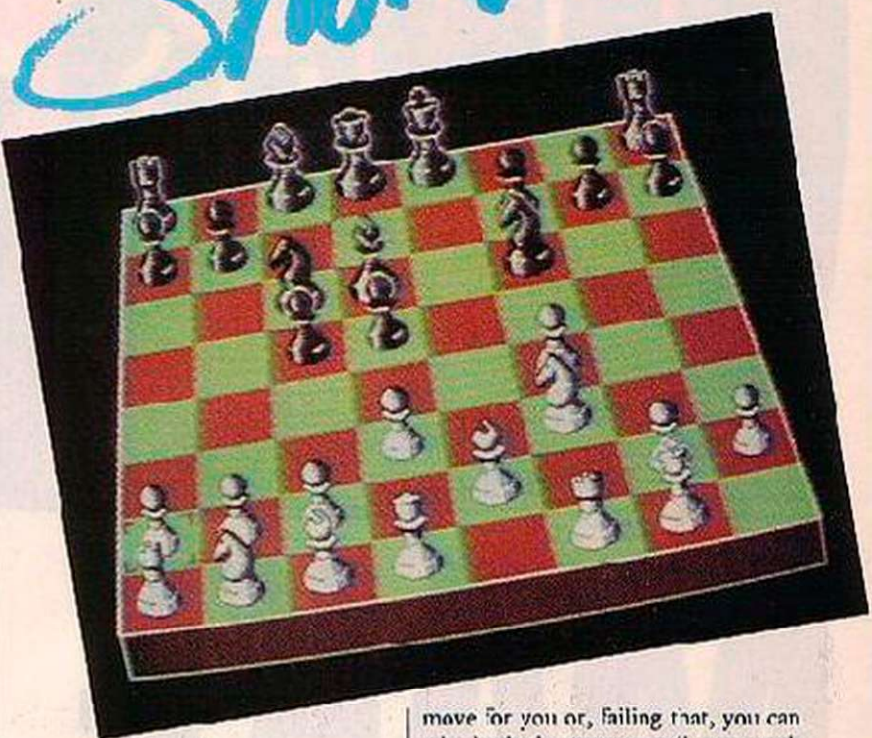
★ ★ ★ ★ ★

AS KARPOV AND KASPAROV, toe to toe under a chessboard, were still slogging it out in what was to become the longest-ever world championship match, Psion was preparing its world-beating chess program for the commercial arena.

Although the Psion program was running on a 8MHz Sage computer when it tied for first place in the 1984 World Microcomputer Championship, its performance on the QL is still very impressive. Its strengths lie a lot deeper than the novelty of the program's three-dimensional graphics.

You should be able to find a level of play from one of 14 that will give you a good game. Those 14 levels can be doubled to 28 with the use of the Easy command — which puts the QL at the disadvantage of not being able to think about its move while you are thinking about yours.

If you really want an easy game, try the novice level 0. The computer will benignly play weakly whenever it looks like beating you. Of course that kind of help may not appeal, so the human can choose a response time from the QL which can vary from a few seconds at the lower levels up to level 12's equal time — it averages out



the time you are taking to move and then matches your pace.

For a game of correspondence chess length, level 13 gives the computer an infinite time to consider its move, and will only make up its mind when you force it to using the M, move now, key. Fans of chess puzzles will savour the Psion program's problem solving ability. It has eight levels.

When things are getting desperate you can ask the computer to suggest a

move for you or, failing that, you can take back the moves until you reach the point where you blundered. If you actually manage to inflict a defeat on the silicon opposition you can call round friends and neighbours and bore them with a full-length action replay of your triumph.

But apart from playing a quality of chess never before seen on a home computer, what makes this program immediately attractive is the astonishingly high quality of its graphics.

Toby Wolpe

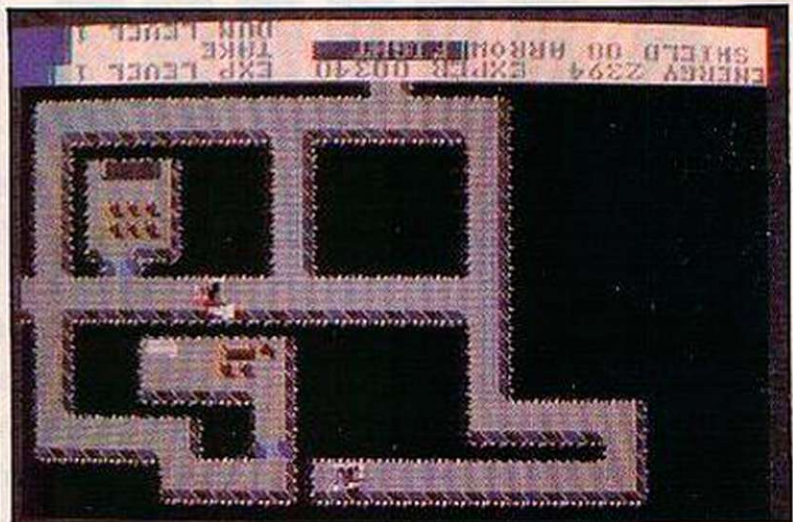
Dungeons of Ba

■ CBM-64
■ Arcade adventure
■ Quicksilver
■ £12.95

★ ★ ★

RECOVER THE FABLED stone of Ba before your energy runs out. This is a maze game with a difference. Norman the warrior has to fight his way through tunnels, pressing secret panels in the corridors to reveal hidden chambers with objects to help him in his quest. This is an arcade adventure which gives you the kind of section through the earth view of the action best exemplified by Dig-Dug — except that there is no digging.

I wouldn't go so far as to describe the graphics as spectacular — this is how they are described on the packaging — but nevertheless you are confronted with a fair range of weird and wonderful opponents from scorpions to assorted bovine boys, presumably the Guardians of the Stone. You can steer yourself around the maze with the aid of a joystick plus the function keys have been redesigned



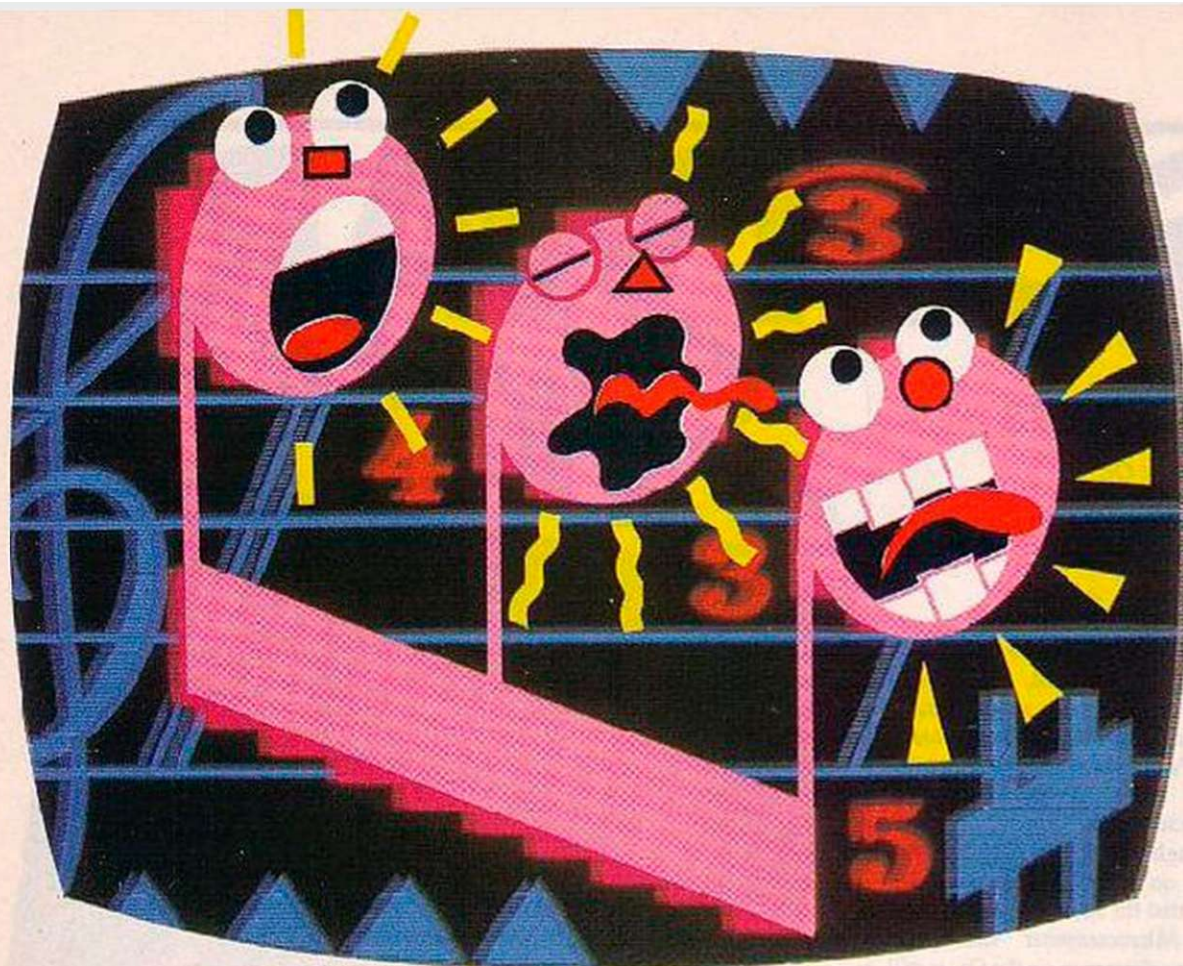
so that you can put up a shield, or fire an arrow, light, or take an object. You simply punch the appropriate key before you squeeze the fire-button.

Shields are necessary because arrows will suddenly zoom down the corridors at Norman, though they don't seem to be much use against the denizens of the maze. If you do enter into fist-cuffs with any of these beings the C-64 emits a realistic thumping and whimpering sound. With each contact your experience rating increases and your energy level drops.

You can pick up things in the most unexpected places. It is worth searching the apparently empty rooms which sometimes appear at adjuncts to the maze because you may discover food and drink, more arrows, or even a vial of unknown. This can make you zip around the maze at terrific speeds, or not do very much for you at all.

There are unexpected pitfalls and teleport traps which cause you to be pitched in with the most unpleasant company, the usual thumping and squeaking resulting. All this kind of

(continued on page 37)



notes all at the same time).

At the press of a button, you can summon up pre-programmed rhythms and bass accompaniments to play along to.

These three rhythm combinations can be speeded up or slowed down.

You can even glissando (so long as you don't hurt yourself.)

That is, make a note slide up in pitch.

You can filter sound: reduce the treble, the bass, or both. You can save, on cassette or disk, a voice or tune for future use.

And, for better sound reproduction, you can connect

MAKE MUSIC YOUR FORTE.

Alright, let's all gather round the computer for a good old sing-song.

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Music Maker has been designed, like all our software, to get the very best out of Commodore hardware.

It's the first in a series of packages which will fully exploit the Commodore 64's outstanding musical capabilities.

Commodore software: it costs no more, even though there's more to it.



Star chart

Cliff Hanger

CBM-64
£7.95
Novelty
New Generation Software

★ ★ ★

Fans of the Roac Runner and the unfortunate wolf who tries to ensnare him using wacky devices in those old Warner Brothers cartoons will love this.

You take the part of Cliff Hanger, an inept cowboy trying to stop a desperado by cropping boulders on him, bouncing weights off trampolines, using magnets to pull anvils over cliff edges and so on.

Crude but attractive graphics, great fun.

Paddington's Garden Game

CBM-64
Collinssoft

★ ★

Butterfly collecting. Paddington the Bear has to zip around his garden collecting butterflies without being electrocuted by the hedgerow or stung by bees or pricked by hedgehogs.

Like the Magic Roundabout game, this does not really make the best use of its famous character. The somrolent music would make this a good game to play last thing at night as you wind down from a winter's evening zapping over the hostile alien lancecape etc.

ATC

Spectrum 48K
£7.95
Simulation
Hewson Consultants

★ ★ ★

Two games for the price of one, though people who bought the previous version of Air Traffic Control are unlikely to rush out and buy this one just for the extra thrill of controlling Schiphol as well as London-Heathrow. It features Concorde and the occasional radio failure and rogue aircraft.

(continued from page 35)

thing results in loss of energy and eventually in your demise. Certainly a competent and enjoyable game, more up to the standard expected of Quick-silver than some other recent releases from that stable.

Paul Bond.

Tir Na Nog

■ Spectrum 48K
■ Arcade adventure
■ Gargoy's Games
■ £9.95

★ ★ ★ ★

SOME OLD HIPPIES might try and persuade you that Tir Na Nog is an Irish folkband that gained prominence along with Planxty and other unpronounceable names. These people will of course know that the phrase is Gaelic for land of youth. So here we have it, a computer game set in the Celtic Other World. There probably are Irish computer jokes but naturally you won't find any of that sort of thing in *Your Computer*.

Based on the great Irish mythological hero Cuchulainn, the game is billed as a "computer movie". Things being what they are today, it is very difficult for a self-respecting computer game to get into the shops without (a) being based on a movie, or (b) going

SOFTWARE

Shortlist

the whole hog and actually pretending to be a movie in its own right.

Tir Na Nog has taken the latter course — the action is presented as though a camera is pointing at Cuchulainn, whom we are assured was known as Cucu to his friends and intimates. Personally, I would not try calling the shambling knee-jerker at the centre of the screen anything other than Sir unless I had bought him at least three pints of Guinness. If he could play the bass guitar, he would certainly give Motorhead's Lemmy a lot to worry about.

He stands 56 pixels tall — that's pixels, not pixies — and is controlled from the keyboard. The animation of the character is very impressive.

As he slouches disconsolately through Tir Na Nog, the detailed scenery in the fore and middle grounds scrolls past him. Birds of ill-omen hover around the castle of King Dhomnuil, flapping their wings con-

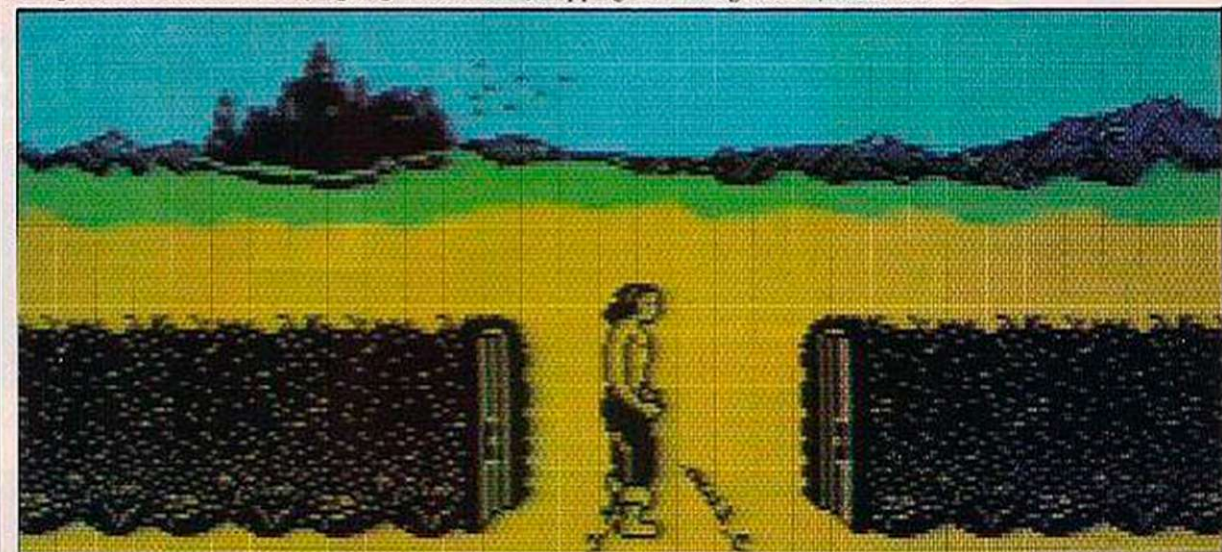
tinuously in the distance. Cuchulainn can carry up to four objects — though you have to check with the status area at the bottom of the screen to see what he is actually carrying.

Since everyone in the Celtic Other World is actually dead all you can hope to do is daunt them a little bit, and should anyone harm Cuchulainn seriously he just re-materialises at the entrance to Tir Na Nog — sans objects.

The purpose of the game is to locate and re-unite the fragments of the seal of Calum. Due to a breakdown in security, the seal was smashed into four bits by a servant of the Great Enemy, which has made life very difficult for everybody, the Great Enemy now being free to carry on business as usual, snuffing out galaxies, vesting pain and misery on mankind in the customary way.

Having located the pieces you have to persuade the owners to give them up.

Paul Bond.



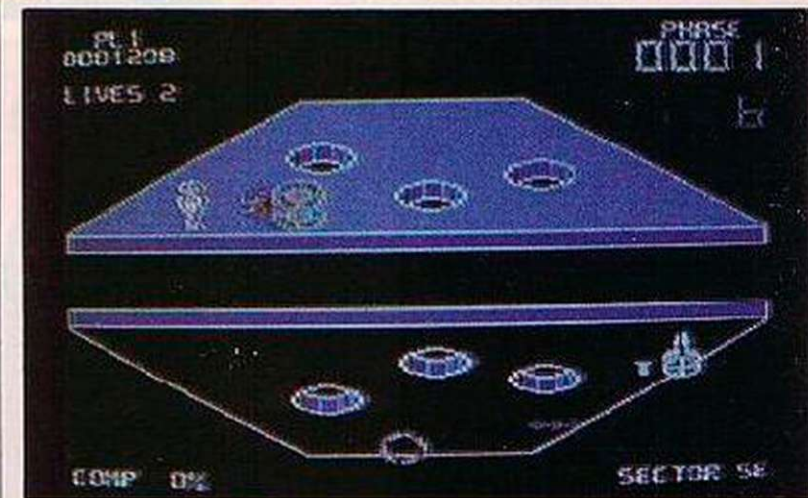
CAD/CAM Warrior

■ CBM-64
■ Taskset
■ Shoot'em-up
■ £9.95

★ ★

NOT A UTILITY program for computer-aided design/manufacture, but a shoot'em-up. Perhaps with the role-merging of computer games that has led to such strange offspring as the arcade adventure and the arcade strategy game, we are now seeing the emergence of the arcade utility? Maybe future vikids zapping away in the arcade will unwittingly be designing more efficient speedboats, aeroplanes or three-wheeled electric cars?

The screen presents you with two sides of a meta-plate: the top and the bottom. There are some holes bored in it. You steer a robot around shoot-



ing a hostile objects. If he passes over a hole, he flips through to the other side of the plate and carries on doing much the same thing, only upside down. As the game progresses, you are presented with different configurations of plate and more holes.

The rather confused introductory pamphlet: to the game warns us that as

more and more of our environment is planned and constructed by machines, it will fall to the machines to interpret the rules by which we want to live.

Life is definitely out of balance in this scenario. The AI-12 is a machine for generating structures in exhibition halls. It is malfunctioning. Luckily

(continued on page 39)

YOU MARVELLED AT BEACH-HEAD...
 NOW ACCESS PRESENT THEIR LATEST MASTERPIECE:
RAID OVER MOSCOW

commodore 64

The most breathtaking
 3-D graphics yet seen on
 the Commodore 64!

Gripping arcade action

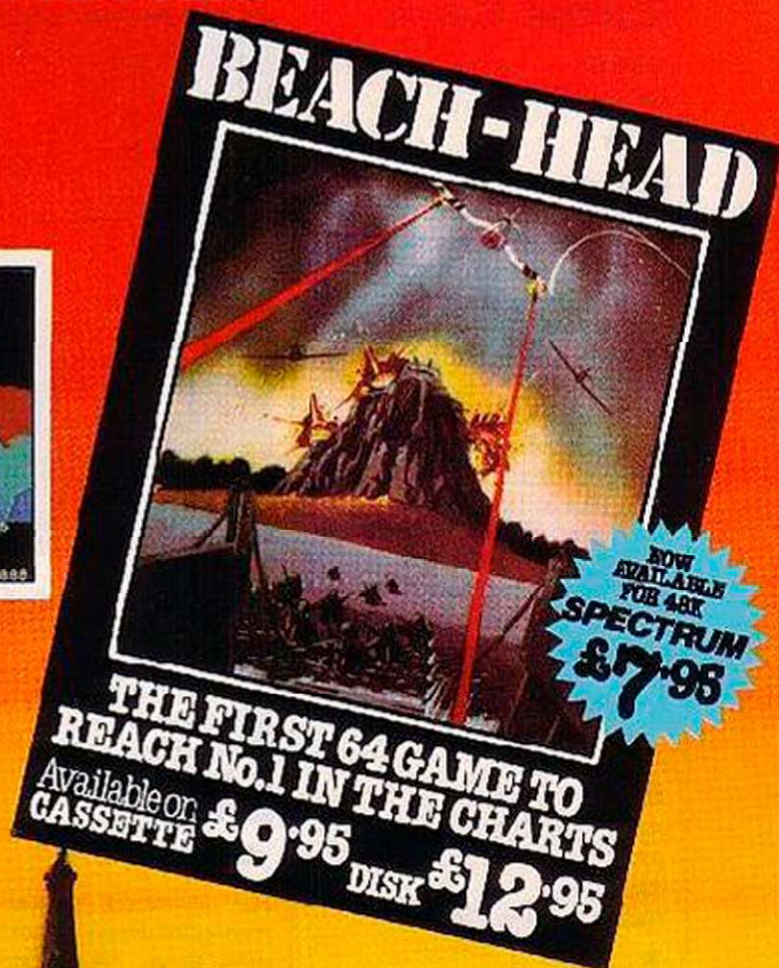
Multiple scrolling
 screens



The Soviets launch a nuclear strike against major cities in the United States and Canada. With our own nuclear arsenal dismantled, in accordance with the Salt IV Arms Agreement, the Soviets believe their treachery will lead to total world domination. Our only hope is our space station equipped with stealth bombers, which can fly undetected in Soviet airspace.

As squadron leader, you must lead your commandos on a virtual suicide mission, knock out the Soviet launch sites, and then proceed into the city of Moscow. Armed with only the weapons you can carry, you must seek and destroy the Soviet defence centre to stop the attack! Top multi-screen action!

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Star★ chart

David's Midnight Magic

Commodore 64
£9.95
Arcade
Ariolasoft

★ ★ ★ ★

This old Brocembund original triumphs over other pinball simulations in its remarkable mimicry of the actual physics of a pinball. You can change the strength with which you pull the launch spring.

Psychedelia

CBM-64
£7.50
Freak-out cats
Llamasoft

★ ★ ★

What wakes Jeff Minter up in the morning? His llama clock, of course.

Psychedelia is not a game — it's a program which generates patterns on a computer screen. Jeff exhorts us to (a) turn off the lights, (b) put on whatever music you like to freak out to (c) pick up the joystick and do it with feeling. There is an auto-demo, or you can define parameters or call in presets, and you can record about 30 minutes of joystick input in memory. Guaranteed to blow your mind, as they say.

Statix

BBC
£7.95
Novelty
Psion
★ ★ ★

A close copy of Atari's unsung classic, Qix, Statix does not quite get the details right. There is no high score table, and not as much variety as in the original. Still, the game has immense appeal — of the sort guaranteed to grab those who disdain shoot-em-ups.

Superficially it resembles a painter-type game, but with the crucial difference that you are not confined to a grid. The idea is to cordon off 75 per cent of the screen while avoiding the Statix as it flutters around the open territory.

(continued from page 37)

there is a MAD-2 droid inside it — you must use this to try and find the missing cryo-wafer module which is the source of the trouble. Of course the AI-12 has intergal defence systems and this is what your droid is shooting at.

You have to work your way through different levels — a maximum of 8.92 screens is claimed but since they are all rather dreary and metallic there is not much to choose between them.

What you have to examine is the actual colour of the plates. All plates on the entry level have a top colour of light blue. There are eight different colour groupings. Different colour groupings have different ways of clearing plates. On some levels you

GO

■ BBC
■ Acornsoft
■ £9.95
■ Board Game

★ ★ ★ ★

ACORNSOFT'S GO program is a considerable improvement on Edge Computer's version reviewed in the December issue. For one thing it plays on a larger board, 13 by 13. It also plays a stronger game.

In Japan Go is the national board game, played by millions including several hundred professional players. But over here it has yet to really catch on, and the problem most Go players have is finding someone to play with. Which is why a competent home computer version is particularly welcome.

The game is far more difficult to program than chess. Recently, computer board game expert David Levy predicted that even in 10 years' time no program will be able to play Go at anything above beginner level. One reason for this is that the game does not lend itself to the brute force approach as easily as chess. On a full 19 by 19 board strict calculation of the

Castle of Terror

■ Commodore 64
■ Melbourne House
■ £9.95
■ Adventure

★ ★ ★

NO MAN HAS EVER returned from the Castle you are informed by an old man in a pub. The reaction of any sensible person to this news would be to put as much distance as possible between him and said Castle. But, adventures being what they are, off you go, pausing only to grab any likely looking objects you find lying around the place.

The game is in two sections, the first is played in the village. When you think you're ready to tackle the castle you have to load the next section.

Success depends on persistence and close examination of the pictures.

There are 40 graphic screens altogether with accompanying eerie

SOFTWARE

Shortlist

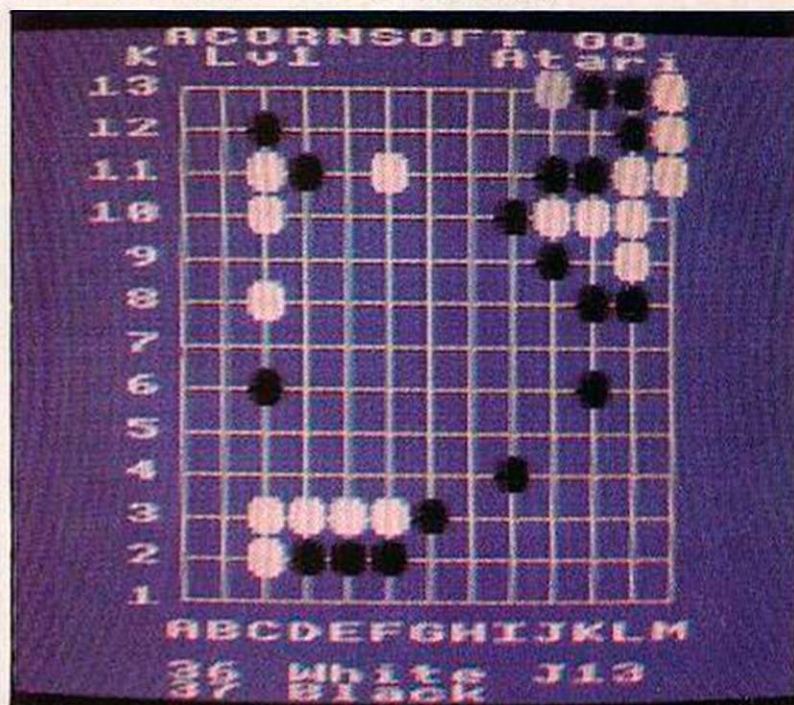
drop time-bombs, on others — shoot to kill.

Every so often you get a chance to jump levels, otherwise the game would be very boring as it admits in the pamphlet.

You are given a rough map, but it covers only one quarter of the entry

level. The solution to the game lies in screen 8152 and a large phase counter is provided at the top right of your screen to mark your progress. You are prohibited from entering certain areas without tokens or passwords. You are told where to find the tokens — occasionally — after each completed screen.

Paul Bond.



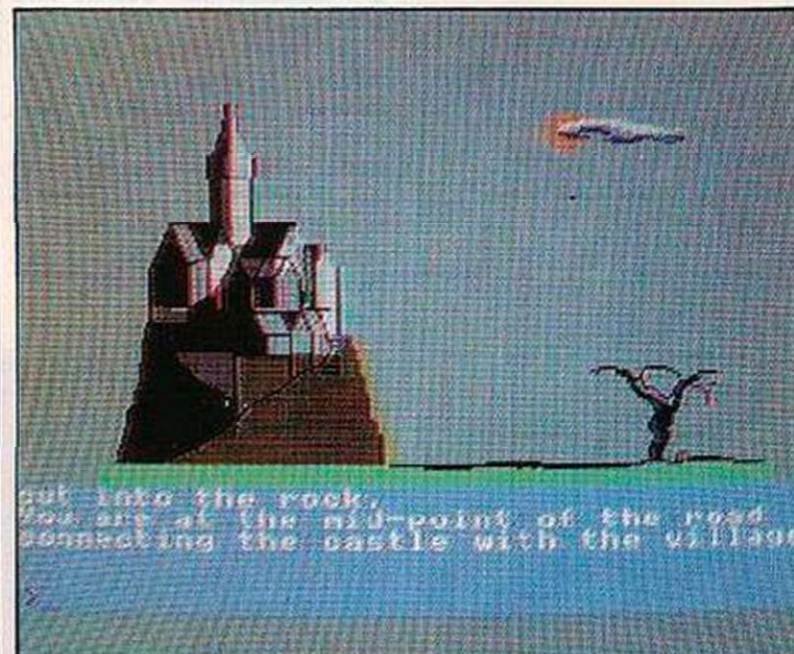
consequences of a particular move is not so important. You could argue that it offers greater scope for intuitive play resting on pattern recognition and a "feel" for the position.

In view of this it is not surprising that Acornsoft Go is better at tactics than strategy. The program tends to

get bogged down in securing a small group of stones when there are larger gains to be made elsewhere.

Nonetheless most beginners will find it hard to handle. As well as a handicap option, there are two levels of play and it is quick to move at both.

Simon Beesley



music. The program is rather fussy about accepting words, but does allow you to enter sentences so that you can skip several screens at once.

Your ultimate quest is to vanquish the evil Count, rescue the beautiful

young maiden and with a bit of luck line your pocket in the process. Instant death — naturally enough — lies around every corner.

Lee Paddon

(continued on next page)

Star★ chart

Tristan and Isolde

CBM-64
£8.95
Arcade adventure
CRL

★ ★

Will they be playing this one in the foyer between acts at Bayreuth? I doubt it. Originally a German game, this may have lost a little in the translation, but when you consider the sort of trouble that people have gone to in actually using real mythology in games like *Tir Na Nog*, this one does little justice to the Ring Cycle. You pilot a little man through rooms and he gets eaten by monsters. Incidentally since the central characters are Kunibert, the hero and Kunigunde the maiden in distress — not to mention the unlikely *Wrumper*, the baddie, where do Tristan and Isolde come in?

The Hellion

Oric 1/Atmos
£6.95
Shoot-em-up
Orpheus

★ ★ ★

With 101 screens, this should keep Oric shoot-em-up fans happy. Your Hellion — mutant wasp — can be moved using the cursor keys, and the baddies fly at you from all directions. A fun game with a nice sense of humour.

MacMan and the Caber Eater

Spectrum 48k
Sinclair
Educational

★ ★ ★

The object of this program is to teach four to eight year olds to add and subtract simple numbers. This is done by multiple choice. It's visually appealing, and the quicker you can come up with the correct answer, the quicker MacMan will build his caber, foiling the dreaded caber eater!

Witch's Cauldron

■ Spectrum 48k
■ £6.95
■ Mikro-Gen
■ Adventure

★ ★ ★

BUMPKINS OF the world unite. You have nothing to lose but your shape — you have been turned into a toad by wicked witch Hazel. Having failed the auditions for Paul McCartney and the Frog Chorus, it's down to you to seek out and concoct some spells and potions to help you regain human shape.

Witch's Cauldron is a graphic adventure game with a vocabulary of nearly 300 words. You can turn around in a room, getting different walls depicted on the screen, and if you examine things like the GRAMOPHONE very closely, you will find a DIAMOND.

You can't pick up anything that a toad couldn't pick up, which basically means that anything large will have to be left behind. How a toad carries a diamond is a mystery to me — I guess it's okay if no-one gives him a hearty slap on the back. The plus side of being a toad in this game is that you can hop onto things like mantelpieces and examine them. While you can't open any doors you can hop up the chimney.

There is plenty of SCOT here and for your first trick you can throw it over your shoulder. Unfortunately one of Hazel's unpleasant creatures generally happens along and devours you, just as you are about to become more socially acceptable. If you can avoid becoming part of a monster's menu, you have a schedule of about 10 metamorphoses to go through. Talk about getting away for a change!

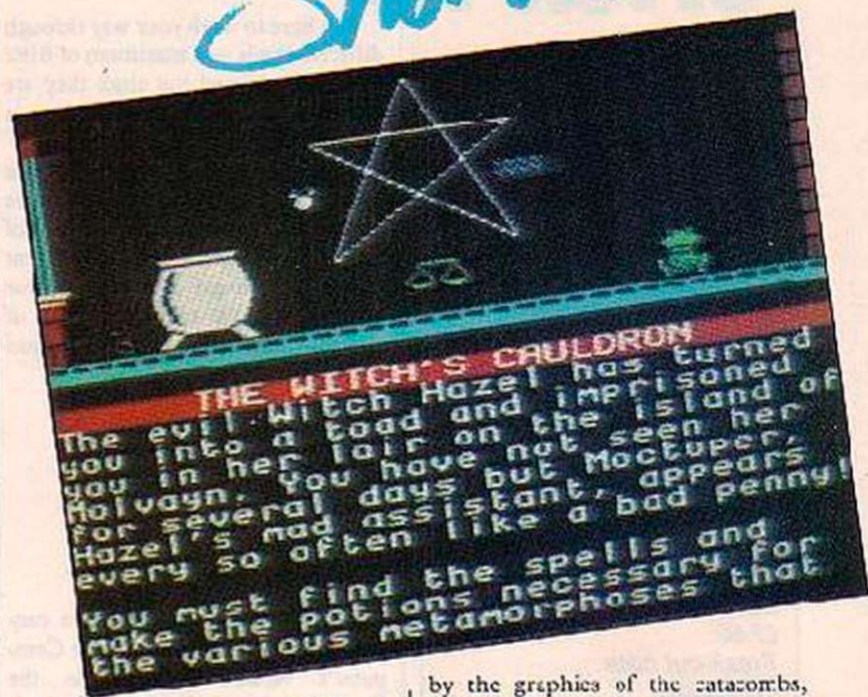
The program understands plain adventure English; it is possible to give commands like "Put the water in the cauldron".

The game contains over 90 different locations — most are illustrated with a full colour hi-res picture. Not all the objects are useful, and there are supposed to be around 700 different possible actions in the game. Good fun, but you have to remember that one small step for a man is a giant leap for a frog.

Faul Bond

SOFTWARE

Shortlist



Gift From The Gods

■ Spectrum 48k
■ Ocean
■ £9.95
■ Arcade Adventure

★ ★ ★

ORIBTES HAS A PROBLEM. Mum ran off with another man and then ran off with his kingdom. The only way he can get it back is to enter the Labyrinth.

The Labyrinth, apart from being a tricky place to find your way around is filled with various monsters trying to sap our hero's energy. Fortunately he has friends in high places: Zeus has given him a Sword and Apollo has given him the Seven Tears of Icarus which can be used to mark chambers within the labyrinth.

Apart from the monsters, you've also got to cope with mum who is busy moving objects around. She'll also kill your sister Electra, given half a chance, which would be a blow as the Gods have revealed the solution of your quest to her.

All this plot detail gives the game plenty of flavour. It is complemented

by the graphics of the catacombs, filled with pillars, columns, and animated monsters. The controls are easy to use using a combination of joystick movements and the fire button to move, fly, fight, pick up and drop objects. There is also a pause key which helps when making a map.

Your task is a long and difficult one. It's a large maze, and even when you find the objects, there are only six real ones among the 64 scattered around. Should Clytemnestra manage to kill Electra, your task will become immensely more difficult, so much of your time will be spent chasing Clytemnestra around so that she doesn't have a chance of getting to Electra.

The Greek legends of heroic quests make great themes for games and this is certainly a well executed example.
Lee Paddon

Star Strike

■ Spectrum 48k
■ Real Time Software
■ £5.95
■ Arcade

★ ★ ★

FOLLOWING UP their successful version of the arcade classic 3D Tank Duel, this is an excellent version of the current arcade hit. There are four screens to battle through: a space battle with the tie fighters, a low level run over the ground defences, the trench, and finally a shot at the reactor.

There are many difficulty levels running from the turkey shoot to the suicide run. All stages are in 3D with your cockpit controls in the foreground. The controls are nice and responsive with climb, dive, roll and fire; a variety of joysticks can be used.

Good meat-and-potatoes arcade action.
Lee Paddon

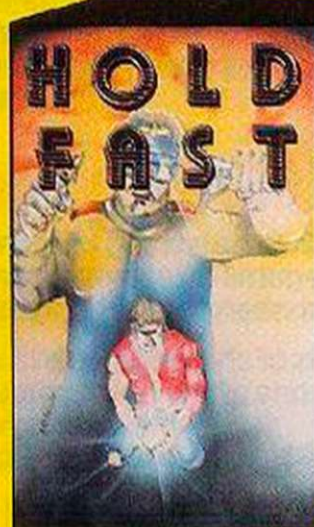


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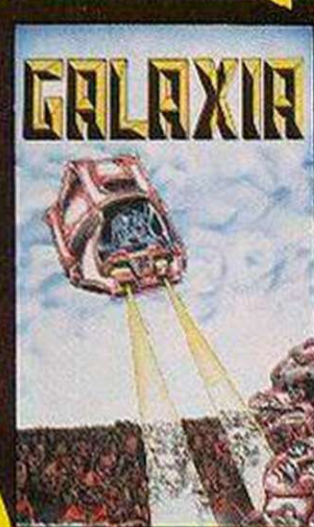
Holdfast



Gems of Stradus



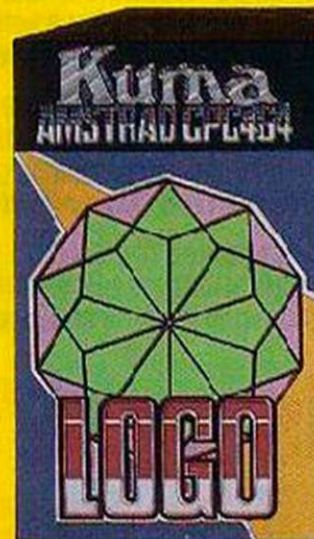
Star Avengers



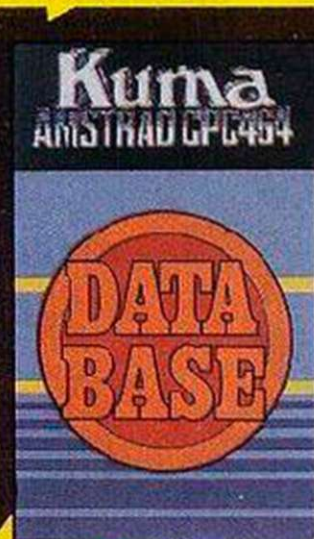
Galaxia



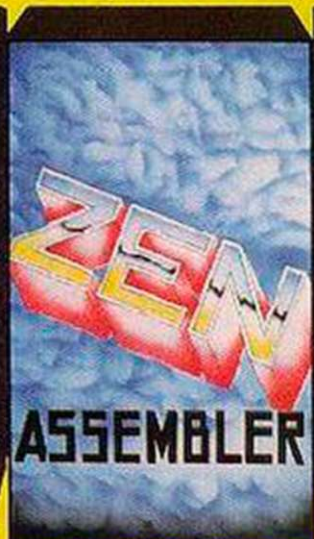
Music Composer



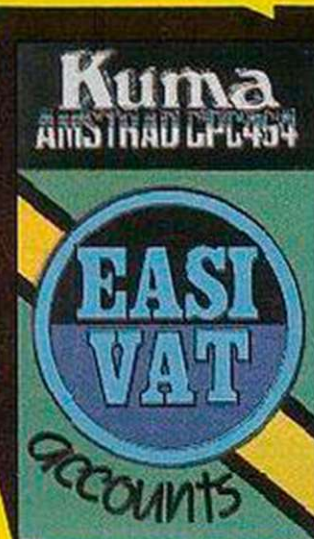
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U.S. Reviews

"... Boulder Dash should be leading contender for anybody's action-game-of-the-year award."
Burt Hochberg **GAMES Magazine**

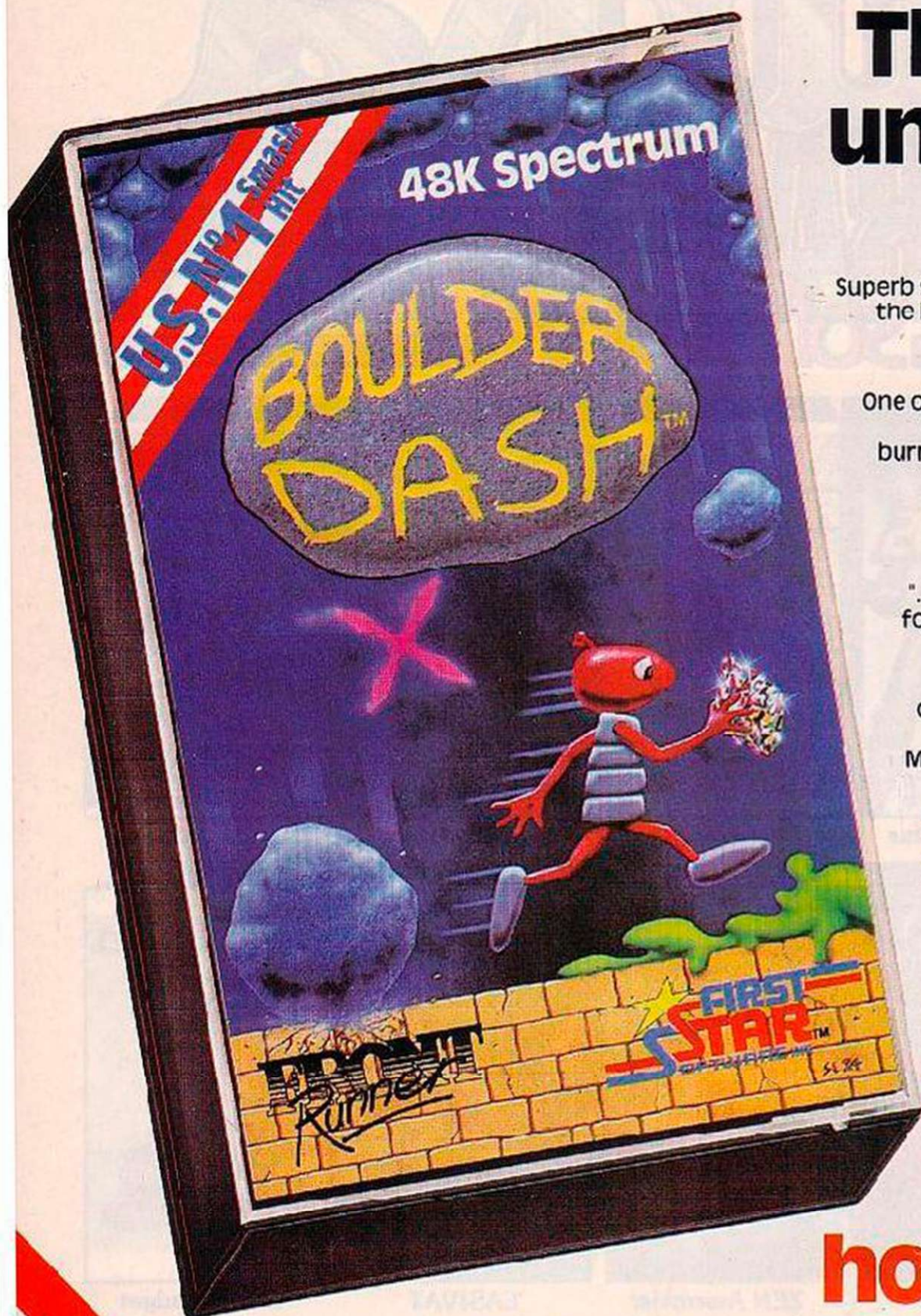
"... a magical mix of challenge, charm and originality ... easily one of the best computer games of the year."
Michael Blanchet **Chicago Tribune Syndicate**

"This game will be mentioned in my will ... what silicon is and integrated circuits were always meant to be ... subtle brilliance and unceasing magic ... in a class by itself ..."
Craig Holyoak **Deseret News**

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The Video Game Update

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NEWS
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The crystal ball

At the time of writing, Doomdark's Revenge, the follow up to Beyond's brilliant Lords of Midnight, has only been on the market a week but already I have heard of one player who has completed it. Astonishingly, David Harvey of Dereham in Norfolk managed to succeed in the new quest after playing it for just six days.

There's still the third part of the trilogy, The Eye of the Moon, to come. We lesser mortals are still gathering our armies in part 1.

If you've got any Christmas cash left, all three parts of The Ket Trilogy from Incentive Software are available in a handsome gift pack at the special price of £12.95, a saving of £3.55 on the set. A splendid bargain for adventurers.

A helping hand

Readers — can you assist with a plea for help from B. Kamphuis of The Netherlands concerning Quicksilver's Smugglers Cove?

He can't cope with the wide trench, oak door, trap door and collapsed tunnel. Can anyone help?

For Aric's Golden Apple players:

■ Shadow a hindrance?
 ELOH OG NEHT FFO PMAL
 NRUT

■ Beggar and crocodile awkward?

CORC DEEF: ENO REHTONA
 HCTAC: RAGGEB OT
 NOMLAS EVIG

Dying of cold on the glacier in Acornsoft's Countdown to Doom?

REICALG FO DNE TA
 RESAHP ERIF

Sorcerer of Claymorgue Castle

Various
 Adventure International
 £7.95

This is the best adventure out of my leather pouch this month. I must confess to liking all of Scott Adams'

QUEST

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

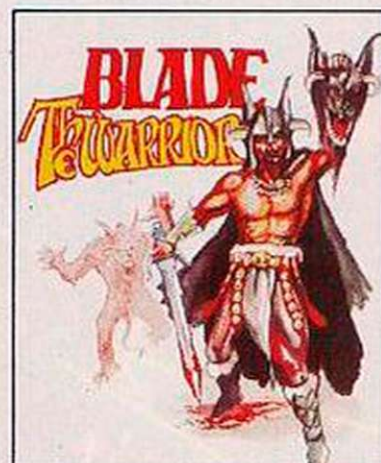
Tower of Despair

Spectrum
 Games Workshop
 £7.95

SPECTRUM OWNERS should keep a sharp eye out for this. It is a text-only adventure with a big difference. For instance, the character set has been immaculately redesigned and decorated so that the text appears like a monastic illuminated manuscript. Very attractive.

The adventure is an enthralling atmosphere and is imaginatively detailed. This is an adventure where examining objects will pay rich dividends. A glossy booklet sets the scene and includes a couple of maps and a number of pictures of the major locations.

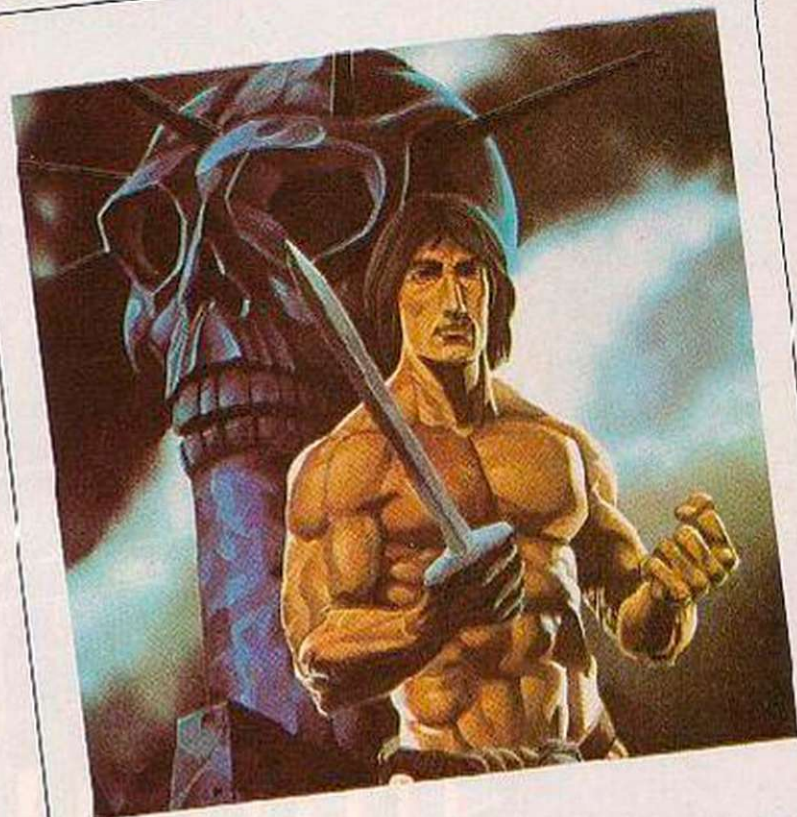
You must first find the Gold Gauntlet before you journey to The



adventures but this is definitely his finest yet.

You play the part of Beanwick, an inexperienced wizard, whose mission is to enter Claymorgue Castle and recover 13 lost stars. When you start, you already have a number of spells and will find more on your travels. Only trouble is, you don't know what these spells actually do.

If you want attractive graphics, you'll find them here.



Tower of Despair, there to overcome the owner of the King of Skulls, the evil Malnor, who once more threatened the land.

Tower of Despair is just the program for those who like thick and rich detail, oodles of atmosphere and plenty of challenge. Games Workshop are perhaps better known for their expertise in other areas of the fantasy game world.

Blade Warrior

Spectrum
 Cable Software

THIS IS A TEXT adventure, written with the aid of Glosf's ubiquitous Quill. The game has a largish vocabulary — over 140 verbs, fast response and an interesting plot. Your job is to hunt down the Black Witch, following in the footsteps of Mazar the Wizard who went before but has not been heard of in many moons.

The game has one of the best openings I can remember seeing in an adventure. You have been chased by a large band of Orcs and in your anxiety to escape have lost all your possessions. You now stand at a dead end, a wall at your back. There is a solid door in the wall but the Orcs are closing in for the kill.

The wall is unclimbable and if you think that simply rushing through

the door is going to help, think again — the Orcs charge through and tear you to pieces. As they say on TV, now get out of that!

Forest of Doom

CBM-64
 Penguin Books
 £4.78 + VAT

THIS IS A computerised version of the best selling Fighting Fantasy gamebook of the same name.

It is mainly a text game, the prose being presented teletype style on a manuscript — a scrolling scroll! You make decisions by selecting from a number of choices given at the appropriate point.

The game remains very faithful to the book but in order to cram the whole thing on to a micro, some of the game's data has to be loaded in at different stages. The program automatically tells you when to do this.

There are a number of options to make the playing enjoyable. You can control the speed at which the text is printed, even pause it, and can return to the start of a section, just like you would turn back a page in a book. You can even store and recall a scroll for your own text — very handy for making notes as you play.

I liked it — a splendid fantasy yarn and a refreshing change from the usual style of adventures.

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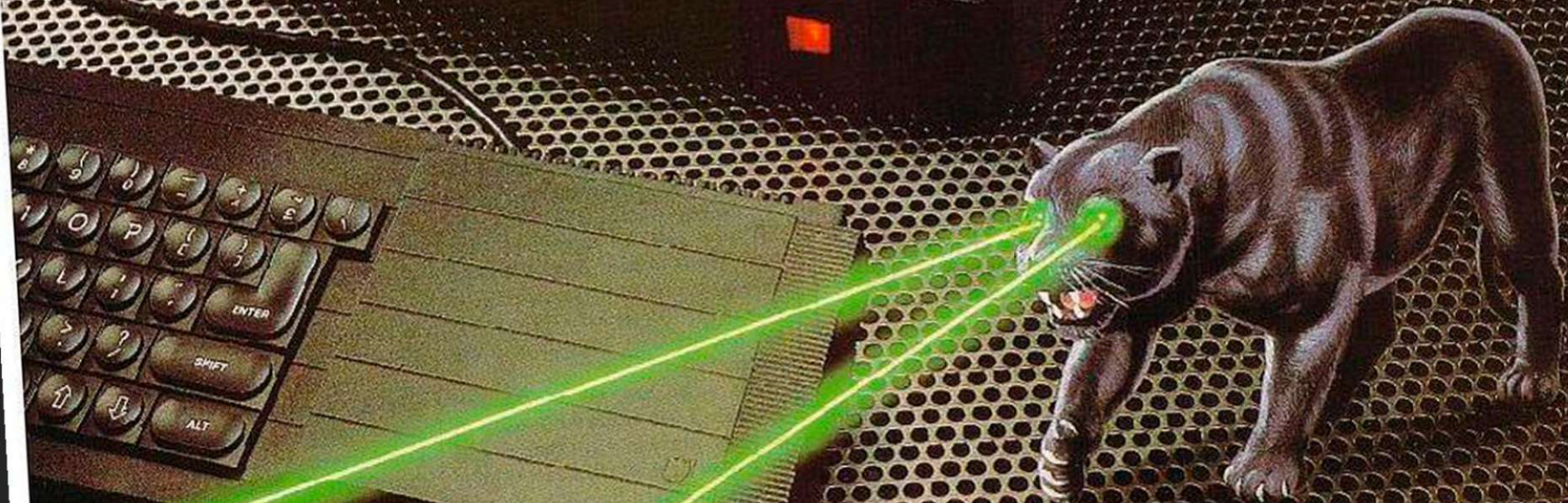
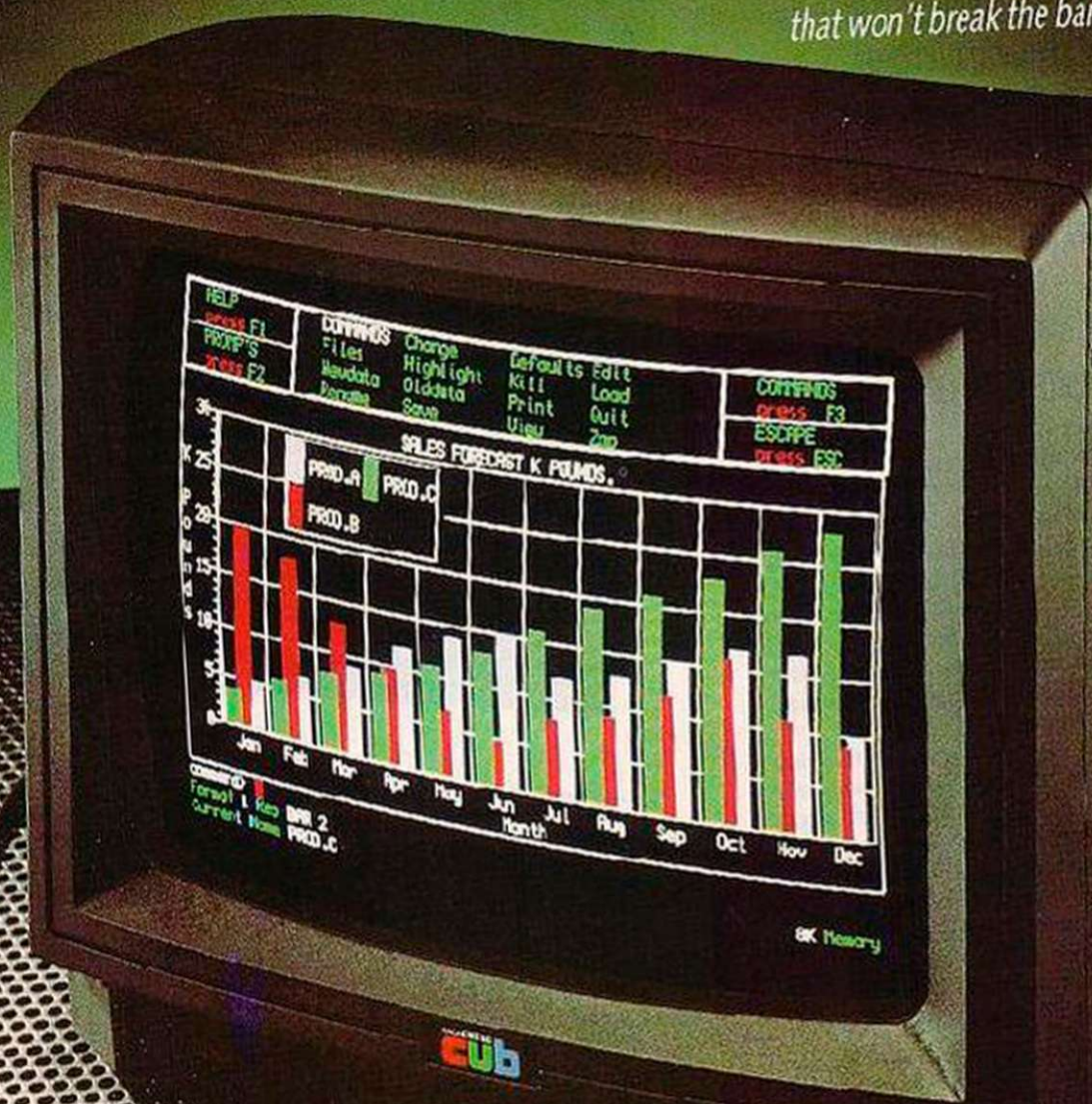
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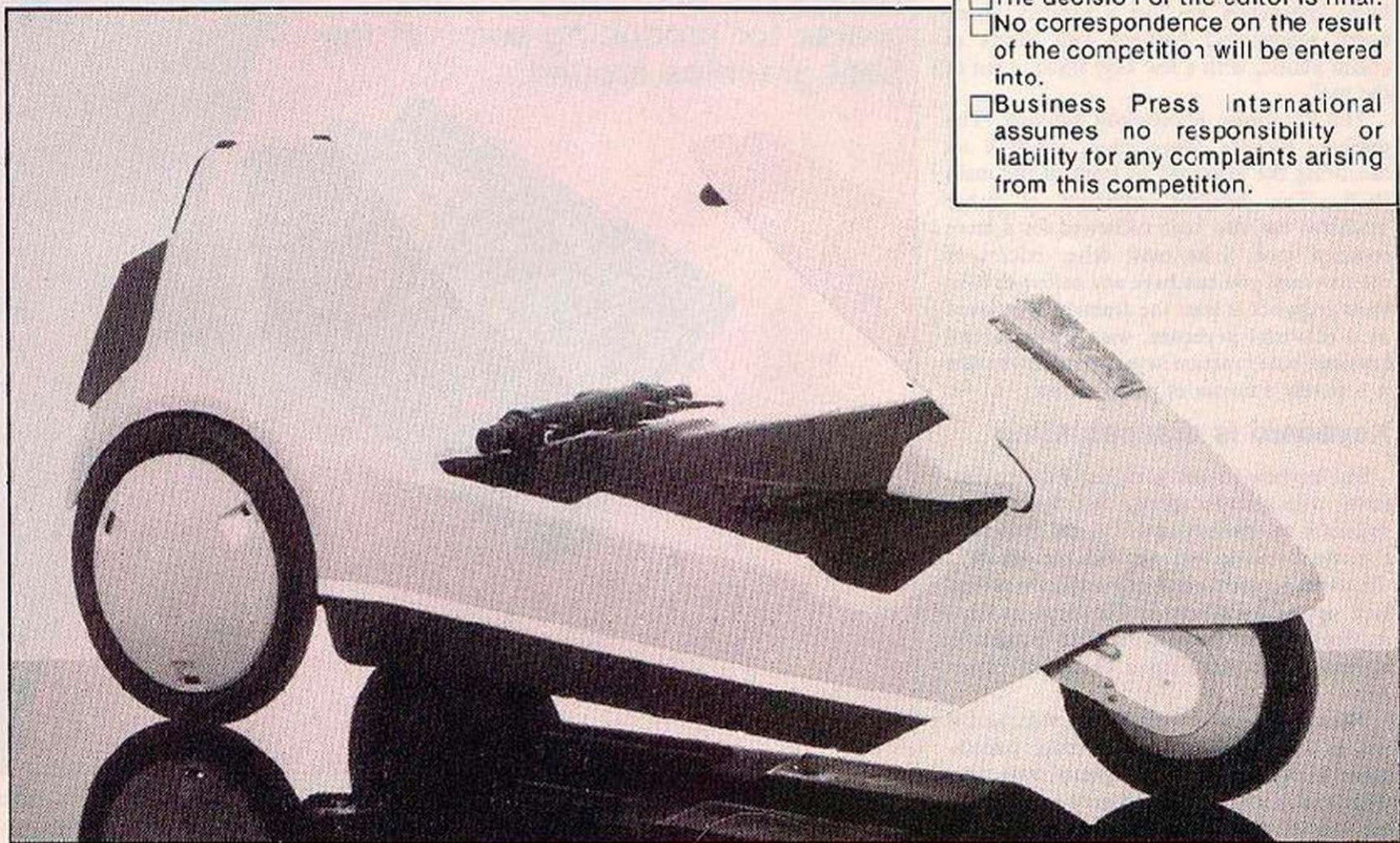
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- The name of the winner will be printed in the April issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in February 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
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IN AN INDUSTRY notorious for broken delivery promises, the Enterprise stands head and shoulders above the competition. First seen in public in September 1983, the machine is only now going into mass production.

When first announced, it seemed to offer a level of performance most micro owners only dreamed about. However, a lot of bytes have flowed under the bridge since then. Several innovative new arrivals have beaten it to the high street, and the industry stalwarts are even more entrenched with huge user bases and software support.

A year or so ago, a machine had to be good to succeed, now it has to be very good to even survive. So how does the new machine measure up to the competition? Geoff Hollington, the designer of the Enterprise's casing, had some hard words to say about the looks of other machines when *Your Computer* interviewed him in January 1984: "Most home computers are just a printed circuit board sandwiched between two sheets of cream plastic, with a few keys sticking out of the top".

The Enterprise is certainly different. The machine is only 33mm high, achieved by mounting the keyboard in front of the main PCB. The box-like contours of other machines has also been eschewed for a more rounded look. Like most other micros of recent years, you can have any colour as long as its grey, but at least the drabness is relieved by a colourful keyboard, with green control keys and blue function keys. Whether you like it is purely a matter of personal taste.

Keyboard is disappointing

The keyboard itself is rather a disappointment, with a rather spongy feel that will not endear it to touch-typists. On the plus side, the keys are nicely laid out, with everything in the usual positions, and any odd keys tucked well out of harm's way. The most striking feature of the keyboard is the built-in joystick, instead of the more usual cluster of cursor keys.

This looks a bit on the flimsy side, and it will be interesting to see how much punishment it can take from the games fraternity. That aside, it is certainly a very easy way to edit text and programs, although the hamfisted might easily knock it by mistake. There are eight function keys, which can be used with the shift and Alt keys to produce 32 combinations.

Around the back of the case are a series of ports. Enterprise seems to have cut costs here and we are left with the old edge connectors, instead of a few proper sockets which cost that little bit extra. There are ports for two joysticks, an RGB monitor, a printer and a serial/network port.

There are also the necessary sockets for a television, a power supply but no on-off switch, and a cassette port. The reset button is usefully positioned at the extreme left of the rear panel. One press for warm reset, two for cold.

The Rom bay on the left of the machine can accommodate Roms up to 64K and on the right is the expansion socket which gives access to not just the main address and data buses, but the audio and video circuitry as well.

ENTERPR REVIEW

Enter the Enterprise, 16 months and several identity crises later. Nick ULA takes the blame for the delays but also Lee Paddon's praise for producing some of the best graphics around.



The internal architecture of the Enterprise is unusual. Bank switching and sideways Roms have been taken to their logical conclusion. The address bus is extended from the usual 16-bit Z-80 bus to 22 bits and hence 4Mbytes. This is achieved by dividing the address bus into two.

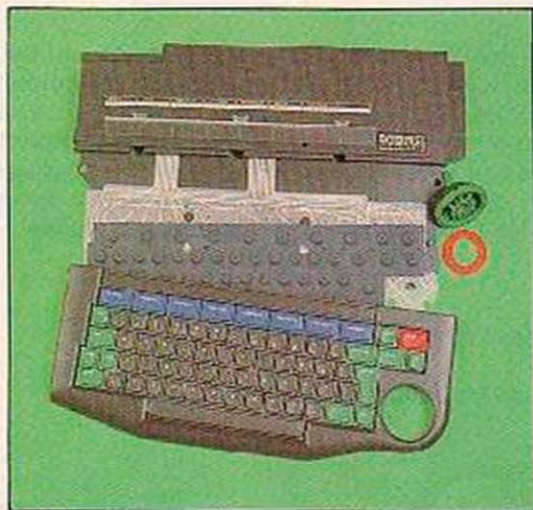
The two most significant bits are used to

select one of four 16K pages. This page address is read from an eight-bit register in Dave, the Enterprise's custom ULA, which also handles sound production. Of these 256 pages, the top four are the video Ram, which can also be shared by programs, and the operating system's scratchpad.

The system Rom sits in the bottom two pages, and the cartridge turns up in pages four to seven. While this is all very clever, it does rather tie up the processor, which has to mess about with page address. Still, when you've got a Z-80A processor cracking along at 4MHz, you've got a little time to spare.

The operating system EXOS has been designed for flexibility. All devices are accessed using channels. This will of course allow simple expansion.

Apart from Dave, the other custom chip in the Enterprise is Nick, apparently the cause of all the delays. Nick handles the screen, and it hardly seems surprising some trouble was encountered with this revolutionary design. Most computers have a certain amount of memory assigned to the display. This might



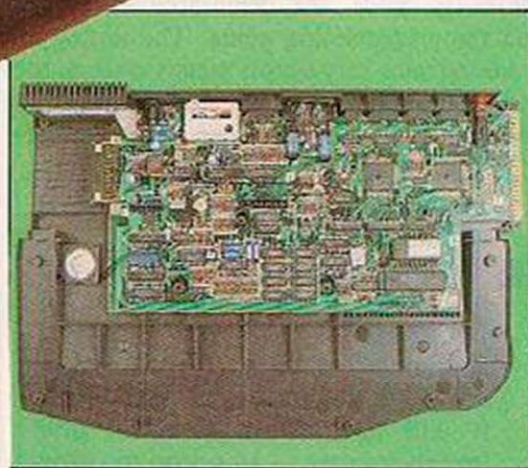
ISE



vary with the video mode in use, but you are always sure where it is.

Nick changes all that. Any part of the 64K of Ram can be assigned to Nick. The user simply defines parameters of mode, width and height, and the operating system assigns the required amount of Ram to it.

It is a similar concept to graphic windows, but these windows can be slid around the screen at will. There are five modes, lo-res graphics, hardware text, hi-res graphics and software — 80 column — text, and attribute mode which mixes the two. On top of that you



also have to specify the number of colours you want. This can be 2, 4, 16 or 256 colours. The more colour, the less horizontal resolution.

Maximum resolution is 672 wide by 512 deep, although this can be doubled using "interlace". The text is on an 8 by 9 matrix, with 25 lines. The versatility of the video display will enable complex graphics to be built up easily, and with a modest memory overhead.

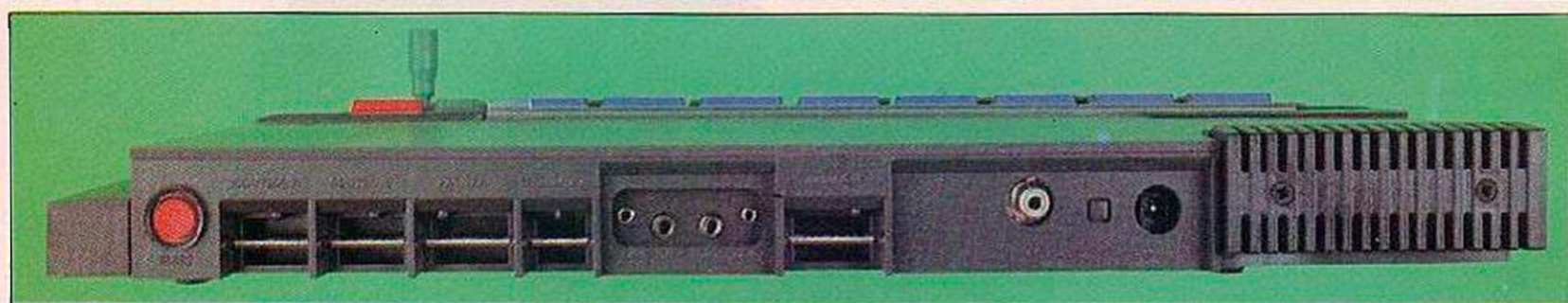
When Dave isn't busy with memory maps, he's producing some very pleasant sounds. There are three sound and one noise channels. The sound is in stereo over eight octaves, and rather wasted on the internal speaker, using external speakers or headphones is a must if you want to appreciate Dave's finer points.

Each sound command can state volume and pitch as a function of time, in stereo. Various special effects can also be produced using distortion, filtering, using another sound channel to determine the cut-off frequency, and ring modulation.

The Basic comes on a cartridge and is another one of the machine's strong points. Whilst retaining all the usual features of standard Microsoft basic, IS-Basic has features which normally only come as Basic extensions.

The central philosophy is obviously to encourage the programmer to think structure, and borrows many features from Pascal. If this sort of language had been the standard when Basic got going, it might not have got

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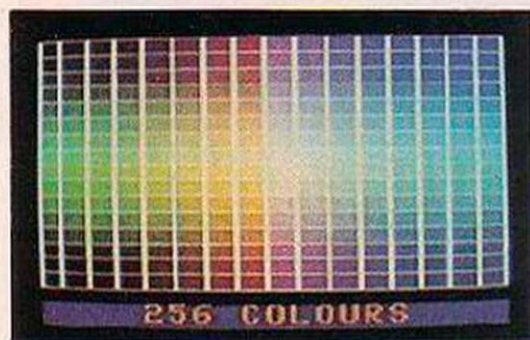
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such a bad name for itself.

Apart from the usual If... Then... Else structures, which can be carried over several lines, it supports Do loops using While or Until conditions at the beginning or end of the loop. There is also an Exit command for further flexibility in structures. The Case statement is rather like setting up a "flag" which is tested to determine if certain statements are executed.

IS-Basic supports the use of "global" and "local" variables. This means that a subroutine can use the same variable as the main program without being affected, merely passing parameters to the main program as needed. This means that subroutines can be translatable from program to program, without having to be rewritten.

An extension of his idea is that several programs can be resident in Ram at the same time, with the same line numbers. Control



and variables can be passed between them when editing programs.

The principal graphics command is Plot, which moves the graphics cursor. If the coordinates are followed by semicolon, a line is drawn between the new and old position in the current ink colour. There is also a set of Logo type graphics commands as well as Ellipse and Fill commands. Ink, Pen and Border colours are selected from a palette of

256 colours. These can be selected by number, or name, or you can specify the amount of red, blue and green you want. Possibly more use to commercial artists and printers than programmers.

Sound commands are simple. The Basic sound command can be followed by a number of parameters stating pitch and volume over time and any special effects. A series of sound commands can be issued to the four channels, and these sit in a queue waiting to be executed. In case you lose all track of the duration of sounds on the various channels, a Sync command will set you straight, or just Clear the queue and start again.

The Basic is generally very comprehensive, and really lets the user get at the guts of the machine without having to resort to machine code all the time. If anything it might be accused of being rather longwinded and unwieldy, but then you don't have to use all of it.

The very wide format of Basic commands means that very little error checking is done when the program is entered. There are also a number of words which can only be entered in immediate mode, although this is really only a minor criticism of a fascinating dialect of the Basic language.

The only reason I can imagine for a programmer wishing to leave Basic is speed. I'm afraid IS-Basic isn't going to keep Beeb owners awake at night. Even the humble Spectrum shows the machine a clean pair of heels on most benchmarks.

Included with the machine is the power supply, UHF lead, two cassette leads, the Basic cartridge, the inevitable demonstration cassette and several booklets. These are the setting-up guide, the demonstration manual and the programming guide. The setting-up guide explains very simply what's what on the machine, so that the terms used in the other books won't mystify even the complete

novice.

It also explains how to load taped software. This is certainly a simple process on the Enterprise, you just hit the button marked start. To make sure you get the playback volume right, there is a blob on the display during loading, and if this flashes green to red, the volume is correct.

As far as the demonstration tape goes, the programs are hardly dramatic. But at least they are short Basic programs which will actually teach you how to write your own rather than the designer's *pièce-de-résistance* in 30K of machine code which teaches you very little.

Finally we come to the programming guide,



which at nearly 230 pages looks fairly daunting for even the seasoned veteran. It is divided up into three sections: getting acquainted, the tutorial and the reference section. Getting acquainted is the standard beginner's introduction, but worth a glance through by experienced programmers. It steers the path between mystification and condescension very well.

The next section introduces the core of IS-Basic. It spends a large amount of time on the structure commands, with plenty of examples, but towards the end rather glosses over several of the more interesting subjects, for instance it barely mentions attribute graphics.

So while the beginner will have something to keep him busy, anyone interested in graphics will be forced to pick up the clues from the demo tape, or wait for the inevitable flood of "Get the most from your Enterprise" type books. The reference section gives a comprehensive list of IS-Basic commands, a glossary of computer jargon and a few more hints on using sound and vision. Not a bad effort all in all.

The Enterprise has a built-in word processor, which although rather crude could save on TippEx if your typing is a bit rough. It lacks features such as "search and replace", block move or block delete. It is, however, easy to use, with helpful on-screen prompts. Another handy idea is that a listed Basic program becomes a word processing file, so you can scroll up and down the whole listing. How many times have you let the line you wanted to edit scroll off the top of the screen and cursed this end-of-the-world effect? ■

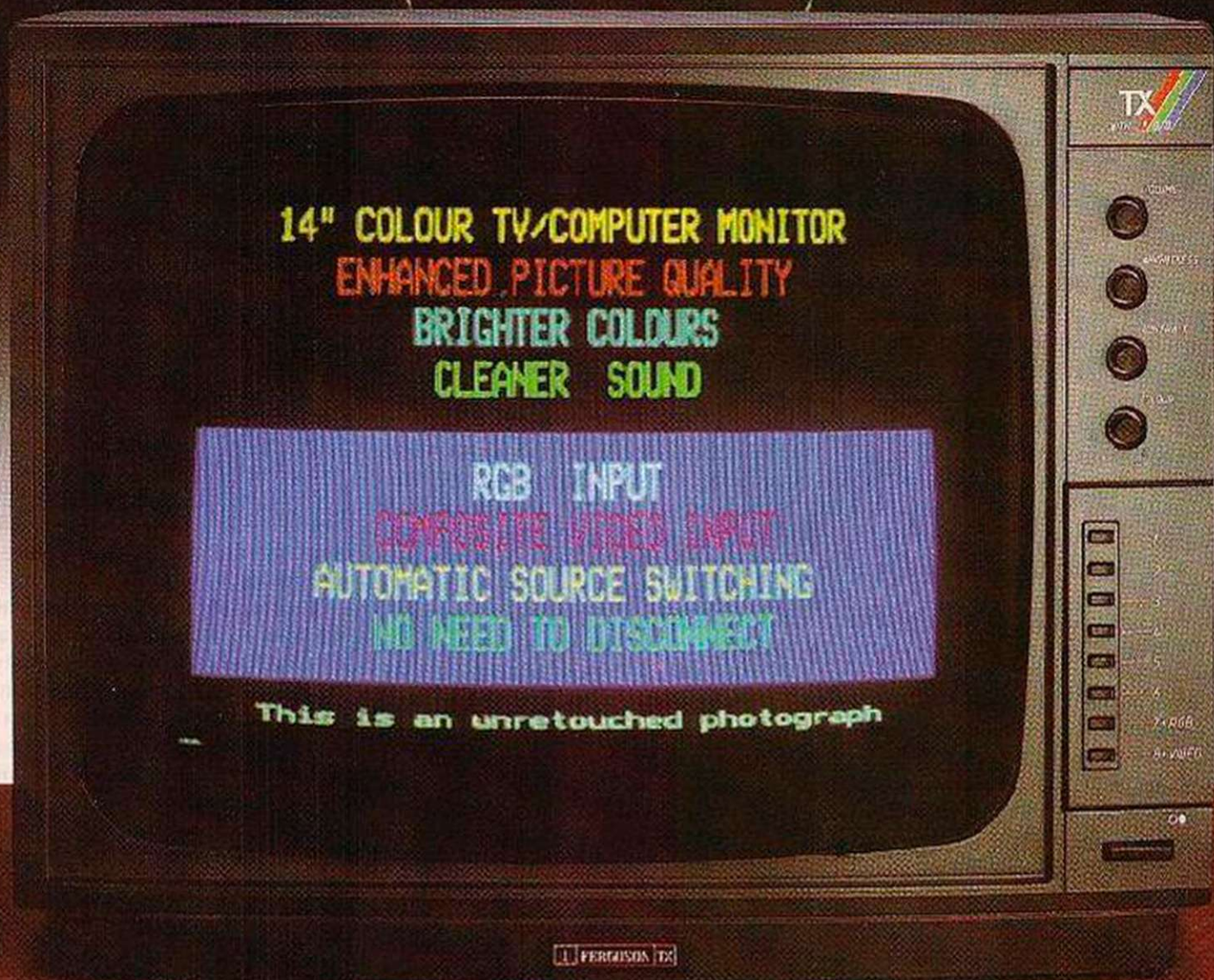
CONCLUSIONS

- For £250, or £350 for the 128K version due out later this year, there is no doubt that the Enterprise offers the best value for money in hardware terms. The Basic is easy to use and will appeal to the beginner. To the more experienced programmer, the completeness of the Basic will be a revelation — no more Peeks and Pokes.
- They will also be able to delve quite easily into the depths of the operating system due to the open nature of the system and its channel based architecture. The hardware buff has also been catered for with the inclusion of

the sound and video lines on the expansion bus.

- Perhaps the only cloud on the horizon is the reaction of commercial software houses. Because of the revolutionary concept the machine embodies, it will take them time — and hence money — to come to grips with the machine, especially if they want to get the most out of Nick and Dave.
- Thus Enterprise may find itself caught in a Catch-22 position where commercial software will not be developed until there is a big user base, and people won't buy the machine until they see that software is available.

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THAT'S DER DOES YOURS DO THAT

VIEW AND SCRIBE

TEXT IS IDEALLY suited for manipulation by a microprocessor. The alphanumeric symbols involved can all be described by the permutations of eight bits — one byte — and many documents are shorter than the 16 bit addressing capability of the 6502 and Z80 CPUs.

VIEW and SCRIBE are word processor programs for the BBC microcomputer. VIEW is the official Acornsoft product and SCRIBE is distributed by Eucon Ltd. in Swansea — Merlin Computer Products, Eucon Limited, 35/36 Singleton Street, Swansea, SA1 3QN — Telephone 0792 467980.

A "word processor" program is comparatively easy to write in Basic provided that you limit yourself to a short text and only a few facilities. These programs are often published in computer magazines but really ought to be put into a different category as they bear little resemblance to a professional piece of word processing software. A good wordprocessor is like a sharp woodworking plane — unobtrusive, effective, versatile, ready to hand and conducive of good results.

There is, however, no single best word-processor because different people use "text" in entirely different ways for different purposes. A journalist will rarely want to handle a document longer than three or four thousand words. Conversely, the ease of operation and the speed at which text can be entered may be terribly important.

The layout of the printed text is likely to follow a simple pattern. On the other hand, a

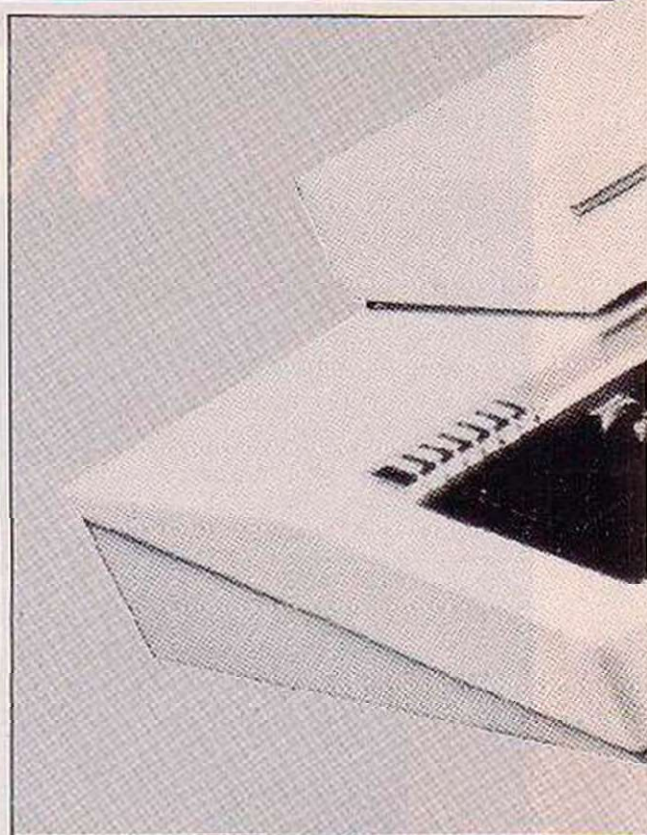
technical author, a mechanical engineer or a biochemist may require more than 80 columns for the production of tables and complex format controls to permit the insertion of diagrams, the representation of mathematical symbols and references to footnotes at the bottom of the page.

A person running a small business may wish to incorporate individual names and addresses into letters, and may want to alter the contents of the letter according to whether or not the recipient has paid a bill recently, enquired after a product or made one of a number of different mistakes in filling out an insurance proposal.

You could write one program that would deal with all these tasks and some people have tried to do this. "Integrated" software packages such as "1-2-3", "Symphony", and "Jazz" aim to offer both word processing and data handling in one package so that text can be mixed with the results from a spreadsheet analysis, or merged with data from the built-in database program.

But it is still very difficult to make the package comprehensive and simultaneously easy to use.

A menu, for example, is a screen display which allows you to choose which operation the program should carry out next. Menu-driven programs are easy to use but tend to become irritating after some time as the user becomes familiar with the range of options available. This problem becomes particularly important when the computer is used with a



serial terminal rather than having a memory mapped display.

It takes longer to clear and then write a screenful of information on a serial terminal. Wordstar solves the menu difficulty by allowing the user to choose any one of four levels of help. At one extreme half the screen is taken up with helpful messages; at the other, you are assumed to know what you are doing and no messages are displayed.

VIEW can be used with either a cassette recorder, or one or two disc drives. It has many attractive features and some important drawbacks. If you use VIEW with the BBC micro set to Mode 3, you will be able to type and display text as it will look on an A4 sized piece of paper. You will be able to hold about 1,500 words of text in memory at any one time. Using a 40 column display VIEW will hold approximately 25,000 characters in memory, about 4,000 words. Secretaries and other professional word processor users will find it very difficult to work with a 40 column display.

The top line of the VIEW screen is reserved for the "ruler" which shows where the left and right margins are set, the position of any tab stops, an optional bell signal, and whether the text will be justified or not. Further information is given about Insert/Overwrite mode and Format mode which is another name for word-wrap. The starting options for VIEW are all fixed as the program is contained entirely in ROM firmware. Figure 1 shows two typical ruler lines.

SCRIBE uses a similar ruler line and is a very friendly program which uses menus and messages to show the choices that are open to you at any stage of processing a document. SCRIBE is supplied as an 8K Eprom and a 40 or 80 track disc holding a number of procedures and utilities. To make sensible use of SCRIBE you will need two disc drives. The first, drive 0, holds the SCRIBE disc while the second is used for the disc holding the text. You could manage with a single disc drive but SCRIBE does use the program disc quite often to call up editing utilities such as "Reformat" so you must keep your documents on the same disc as some of the SCRIBE procedures.

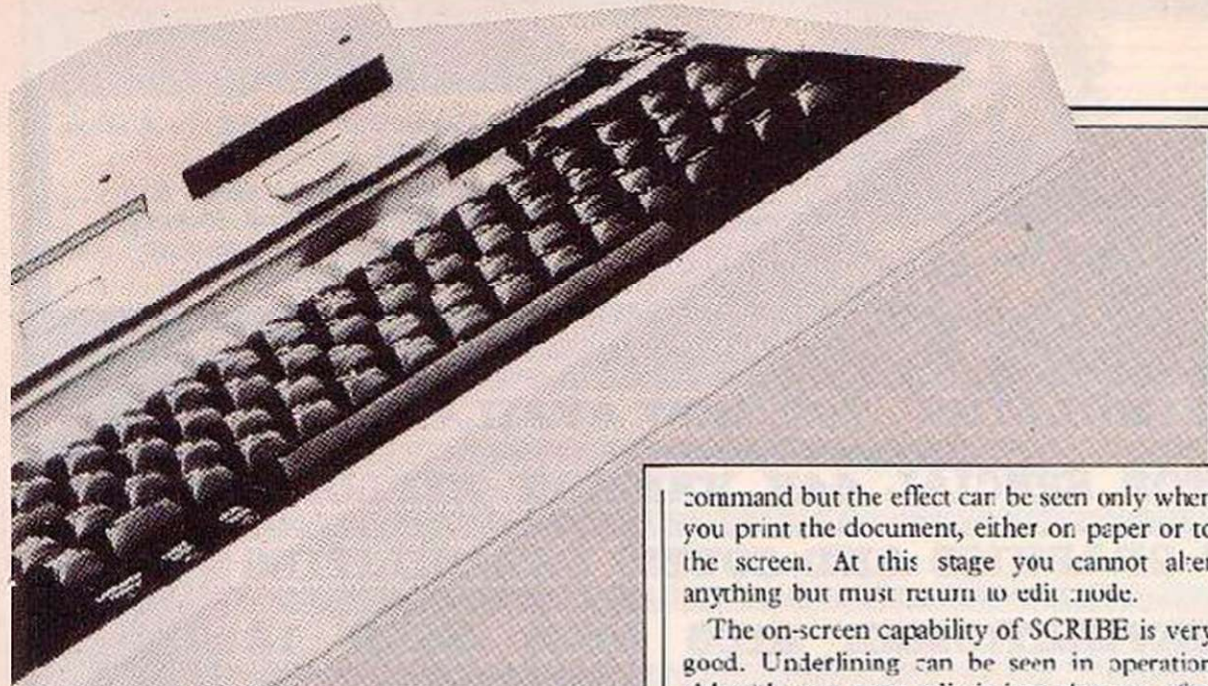
Figure 1. VIEW Format rulers.

```
F |>.....*.....<.....<
      Produces text that lies between the triangular arrow margins. The computer beeps
      when the cursor passes the "b".

F |.....>.....*.....<.....<
      This ruler line shows a wider left margin and two tab stops. Up to 128 ruler lines can be
      set in a document; more than enough for almost any purpose.
```

Figure 2. Onscreen capabilities.

	VIEW	SCRIBE		Yes	No
Enter text 40/80			Wordwrap	Yes	No
ccls	Yes	Yes	ON/OFF		(always On)
Enter text > 80	Yes	No	Tab stops	Yes	Yes
ccls	(max 132)		Decimal tab		
Centre text	No	Yes	stops	No	Yes
Fill & Justify	Yes	Yes	Left and Right		
Right Justify	No	No	margins	Yes	Yes
Underline	No	Yes	Reformat		
Page breaks	No	Yes	paragraph	Yes	Yes
Set page breaks	No	Yes	Global Format	Yes	No
					(automatic)



John Dawson reviews View and Scribe — word processing programs for the BBC.

Unlike VIEW A 2.1 and many other micro-computer based word processors, SCRIBE establishes a number of fixed format "pages" when you create a document. The pages are laid out on the disc and you fill the pages as you type. An 80 track single density disc will hold between 55 and 60 A4 sized SCRIBE pages. The enormous advantage of this approach comes when you wish to move backwards through a document.

The Edit command in VIEW is fine provided that you only want to work your way through the text from the start to the finish. But if you forget to carry out some editing or decide that a couple of paragraphs will read better earlier on, you must save the block of text on to the disc, finish editing the text and start all over again from the beginning. When you come full circle you can set a marker, exit to the command level and read in the block of text from the disc. If the block is longer than the spare capacity in VIEW — about 1,200 bytes in Mode 3 — you will have to change into Mode 7 because VIEW stops reading from the disc when the free space is full.

Using SCRIBE you can move to any page in your text just as you wish. Press function key F7 and the prompt line asks "Page number?". The up and down cursor keys will select the previous page or the next page respectively after saving the current page to the disc.

For longer reports, book chapters, articles, essays and epic poems, this facility cannot be overrated.

If you want to move beyond the adjacent pages you simply enter the absolute page number and the program will move to the page you want. The number of the current page is displayed constantly at the top of the screen. There are two other important commands that will repaginate the document, moving excess material into or out of consecutive pages until all is arranged correctly.

The on-screen editing and display capabilities of the two programs are shown in figure 2. Note that this figure refers to what the program can do to display text on the screen while you are editing it. VIEW A 2.1 can right justify text, for example, by using an edit

command but the effect can be seen only when you print the document, either on paper or to the screen. At this stage you cannot alter anything but must return to edit mode.

The on-screen capability of SCRIBE is very good. Underlining can be seen in operation although you must edit it into the text after writing the document rather than being able to turn it on and off as you go along.

Using SCRIBE I miss the Shift cursor keys in VIEW which allow you to move along a line one word at a time. However VIEW will not move the cursor to the right hand end of the previous line when the cursor reaches the left hand margin and this and other drawbacks create a nagging handicap. Neither program is perfect in terms of the cursor commands. The edit facilities are shown in figure 3.

SCRIBE permits far better control of the printed document than VIEW. The Printer driver generator program that is available for VIEW does make use of the features in a range of printers but the codes for obtaining the commands, although superficially easy to use, are clumsy for out of the ordinary functions such as one and a half line spacing. SCRIBE

Figure 3. Edit commands.

	VIEW	SCRIBE
Move cursor by word	Yes	No
Move cursor by page	Yes	Yes
Top/bottom of text (short text)	Yes	No
Move/copy/delete block	Yes	Yes (limited)
Recover deleted text	No	No
Delete word/sentence	Yes	No
Underline (printer)	No	Yes
Markers	Yes (6)	No
Swap upper/lower case	Yes	No
Search whole/part	Yes	Yes
Search and replace	Yes	Yes
Copy case of search text	Yes	No
Merge files	Yes	Yes
Edit Basic programs	Yes	Yes

presents you with 18 global options to change the format of the text or to switch between a serial and a parallel printer.

Once you have established the conditions that are to apply to a particular document you can save them with the text so that they will come into operation when you access the document again. You can alter the master disc to make the program boot up with a different set of default values — a clever combination of firmware in the Eprom and software on disc.

Figure 4. Printer format commands.

	VIEW	SCRIBE		VIEW	SCRIBE
Left margin offset	Yes	Yes	Two sided headers (looks)	Yes	No
Top margin	Yes	Yes	Set page end	Yes	No (on-screen)
Bottom margin	Yes	Yes	Line spacing	Yes	Yes
Maximum print width	probably 132	80	One and a half spacing	No	No
Printer initialisation	Printer Driver	Yes	Single/continuous sheets	Yes	Yes
Control characters	No	Yes	Print part of text	Yes	Yes
Redefine characters	Printer Driver	Yes	Use form feeds	Printer Driver	Yes
Headers	Yes	Yes	Change pound character	Printer Driver	Yes
Footers	Yes	Yes	Mail merge	Yes (limited)	No (database *)
Automatic page numbers	Yes	Yes			
Additional registers	Yes	No			
Multiple copies	No	Yes			

CONCLUSIONS

- Both VIEW and SCRIBE are more powerful and easier to use than Wordwise. SCRIBE works in much the same way as a commercial word-processor such as the Wordplex series. It is a deliberate, careful program well suited to professional computer users, that is people whose livelihood depends on not making mistakes and getting work done on time.
- If you work under great pressure producing short documents such as press releases then VIEW will be marginally faster to use. You must set against this the continuing errors in the VIEW program such as the failure

- to recognise a full file specification.
- The documentation for VIEW is quite long but curiously incomplete.
- VIEWINDEX and the VIEW Printer Driver Generator program add to the facilities in VIEW but the combination of an Eprom and disc in the SCRIBE package is flexible and powerful. An integrated database package for SCRIBE will be on the market when this article is in print.
- Both VIEW and SCRIBE are good wordprocessors and you should try to test both before deciding which to buy. Probably I shall use SCRIBE for most of my writing — articles and books — but VIEW is no bad choice either.

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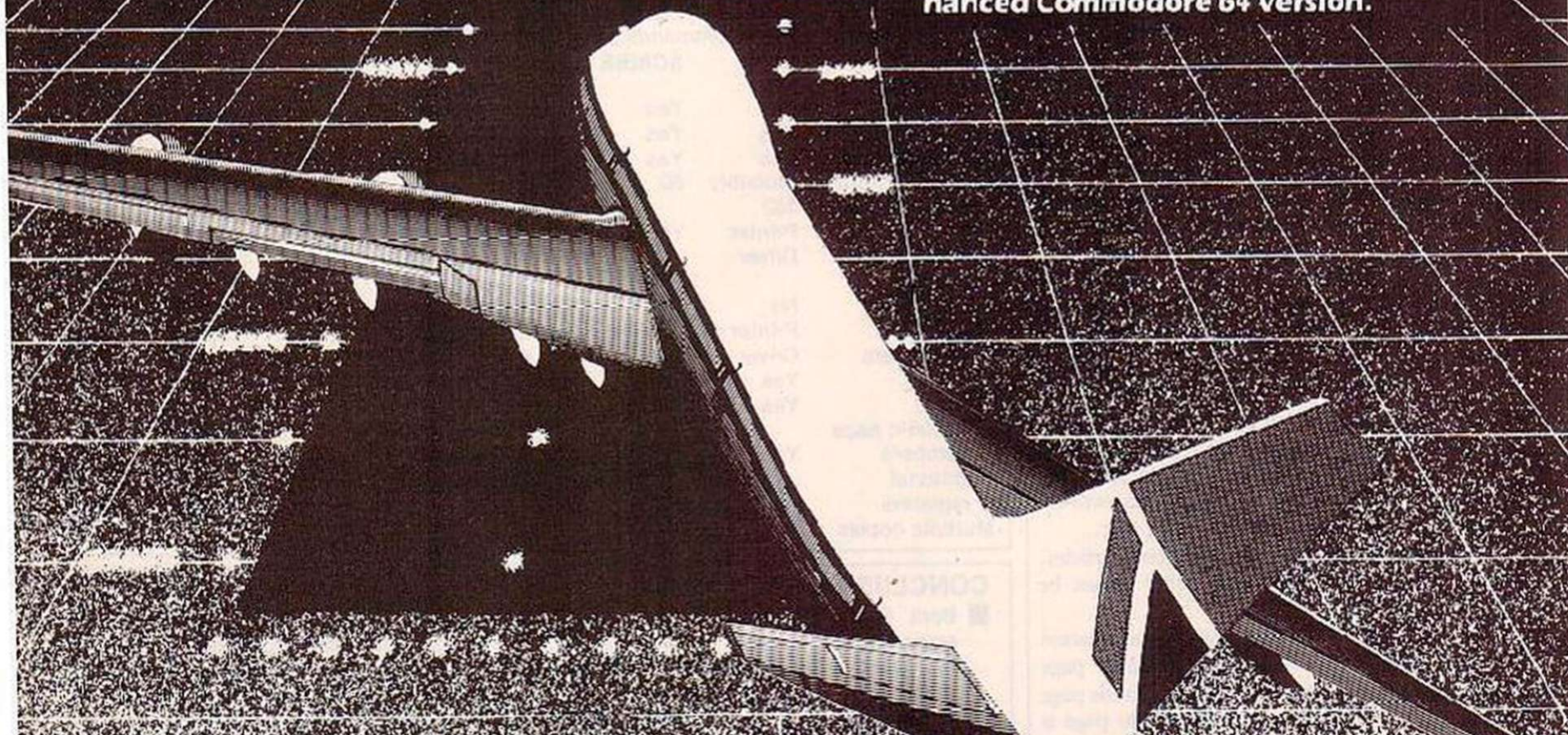
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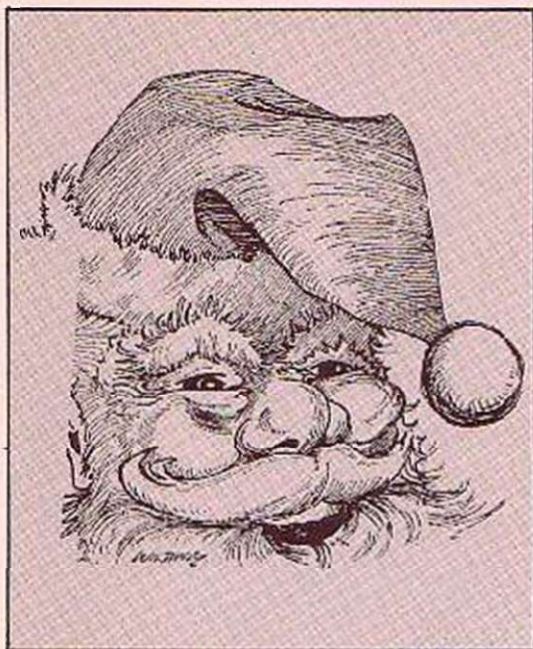
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WHEN WE SET the Competition of the Year we thought you would find it a doddle. Most of the quotations contained a clue to the personalities who said them. The others could be found by a process of elimination. Who else but Acorn supremo, Herman Hauser, could have talked about leapingfrogging Clive Sinclair? And surely Douglas Adams is the only one who makes jokes about computers.

But only a third of the entries matched up the quotations correctly, with more people stumbling at the second quote than any other. This was said about the Spectrum in 1982 by an unusually flippant Clive Sinclair. The correct order of personalities was as follows: 6, 7, 5, 8, 2, 4, 1, 10, 3, 9.

Clive Sinclair's quip was perhaps a little too

COMPETITION

of the Year

close to the bone. A large number of the quotations submitted as tie-breakers were about Sinclair's delays and the claimed unreliability of his computers. Paul Mummery, 48 Woodland Gardens, N. Wootton, King's Lynn, Norfolk had the Queen waiting to knight Clive Sinclair: "What do you mean, Clive Sinclair might be a little bit late?" This wins him a VTX-500 modem for his Spectrum.

The best quote along these lines came from K. Joughir, 32 Woodlea Road, London N16, who wins the Yamaha CX-5M for "Never deliver today what you can deliver in six months' time". Tactfully attributed to A Computer Manufacturer, we felt this struck a suitably sonorous and pithy note. A. Goodsell had the same idea expressed slightly differently and wins a copy of Melbourne House's adventure program, Sherlock Holmes.

D. Walker, 16 Manor Gardens, Hunmanby, Filey, N. Yorks, almost got it right with: "So, Merion, we are agreed, Mr Walker of Hunmanby will take the first prize", attributed to

the Editor. What the Editor actually said was: "Mr Walker shall have a modem".

The other modem goes to BBC owner J. Watmough, A16 Hepburn Hall, St Andrews, Kingdom of Fife, Scotland who had Herman Hauser saying, "Well, has anyone ran a power station with a ZX-81?"

We awarded a day at the controls of a Redifusion flight simulator to M. Burton, 15 Boswall Quadrant, Edinburgh. His inspiration was: "O Romeo, Romeo, wherefore art thou Romeo — Silence, fair maid, I hath nearly scored a million at Pac-Man". P. Aylin's quote was "I never win anything in these bloody competitions". Not in itself original but we were touched by his rather earnest "N.B. this can only be funny if I actually win something" — for which he wins a copy of Sherlock Holmes.

For the rest, copies of Sherlock Holmes to A. Karhamaki, D. Tordoff, B. Allan; and copies of Elite to N. Olnor, S. Cunningham, T. Hunt, C. Fraser, F. Hatten, A. Furness, J. Hammond, M. Simper, and I. Davidson win themselves a binder each.

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EXPORT

INTO THE A

WHEN CHARACTERS like Pac Man sprang from the screens of the expensive purpose-built consoles lurking in pub corners on to home computers everyone was amazed.

Back in 1977 if you wanted to play Space Invaders at home you had to buy a £1,500 monochrome arcade monster. If you were lucky you could even have colour — although the conversion looked as if it had been done by an over-enthusiastic Blue Peter presenter.

"Well all you need for this toy is a black and white video game and three strips, red green and blue, of see-through sticky backed plastic, just stick the plastic on the screen and there you have it. Super. Next week Eugene will be showing you how to build your own software house, and Clive will tell you how to deliver a micro within 28 days. Great."



And when you finally tired of zapping invaders it would cost you another £1,000 to change to a different game. Within two years most arcade games make the transition to the home micro often losing little but price on the way. Machines like Atari's £130 800XL makes a surprisingly good alternative to pumping cash into a coin slot if you want to play Pole Position or Pac Man, and you can have a whole library of different games for a few tens of pounds.

So if we want to look at the action games of the future for our home computers the first place to look is today's arcades. Obviously adventure games which may take hours or days to play are developing faster for the home than they are for the coin machines. There the operators are looking to make a fast buck.

Even so, the graphics are increasingly circulating those of their arcade cousins, despite the advantages that custom video circuitry gives the slot machines. Often they use the same processors — Atari's latest System 1 machine for instance which is introducing Marble Madness to windswept seaside piers and unswept motorway service areas around the country is based around Motorola's 68010 — a chip off the same silicon block as the 68008 in Sinclair's QL.

Even the technological edge which laser-based games such as Firefox and Mach 3 have given the arcades is about to be nibbled away by the likes of Pioneer with its MSX micro plus laser disc home system — *Your Computer* December 1984. The Pioneer will come with the relatively crude Sega Astron Belt which launched the first wave of laser slot machines in 1982.

Astron Belt used a deliberately degraded Star Wars style background film on video in the hope that the relatively crude computer-generated profile of a spaceship which you guide to the death star would not appear too artificial. Its successors had different strengths, Atari's Firefox put more effort into the computer animation while Mach 3's appeal stemmed from its power to convince you that you really were manoeuvring an F-15 hurtling over the tree tops. Even if you occasionally wondered how the enemy attack helicopter managed to fly backwards at 500 miles an hour just so you could get a clean shot at them.

But the latest generation of laser generated cartoon games — like Super Don Quixote — would make Hanna Barbera drool. You can sit and watch the entertainment rather than play yourself as a would-be windmill tiler guides the Don past hazards new fencing off giants or skipping from rock to rock to avoid being swept off in a flood.

Unfortunately the graphics have sometimes outstripped the abilities of the writers to make the games challenging. It is easy to see why Minoru Arakura — the American President of Nintendo, one of the Japanese companies which has been at the forefront of arcade enter-

It seems that what happens in the arcades is a good guide to what will happen on home micros. Meirion Jones investigates.

tainment — says "there are no real games on laser yet; it is just a matter of reflexes and timing. No skill or strategy on the part of the player is involved."

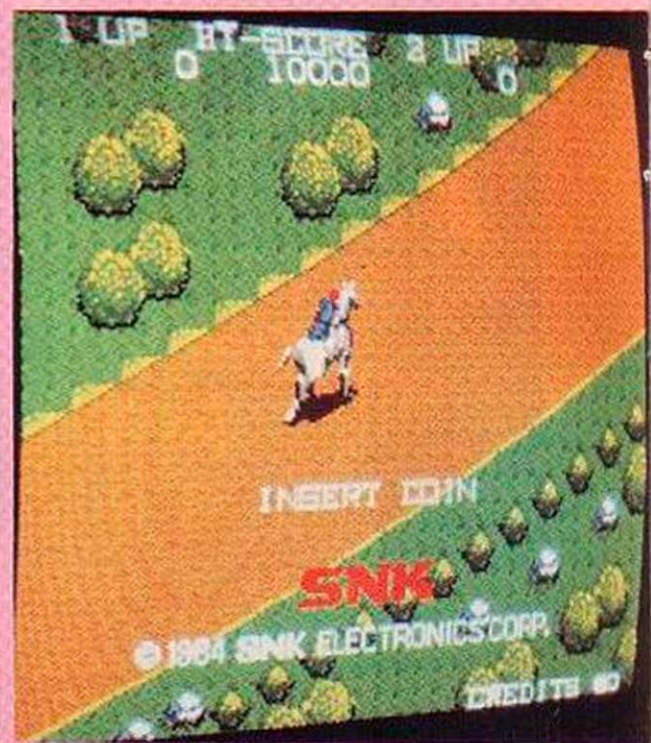
But then again Nintendo has no laser games of its own so perhaps it's just sour rice on his part.

It will be a long time if ever before home systems can hope to compete with rides like Doron's "swear-you-are-there" SR-2 which looks like a squashed micibus on hydraulic rams but is actually a sophisticated simulator designed for amusement parks and big arcades.

It was demonstrated for the first time in this country at the January 1985 Amusement Trades Exhibition International at Olympia. Up to a dozen people can take their seats in the SR-2 and when the doors close and the front screen lights up you soon lose any feeling that you are watching a film as the module you are in starts to tip and sway to complete the illusion of motion.

At the show a bunch of sober suited, cynical sales executives joined me for what was billed as a roller-coaster ride on the SR-2. Everyone was suitably impressed but unenthusiastic when the simulator tipped 45° backwards as the front view showed the first slope when the roller coaster was cranked up.

Then after reaching the top and starting the long descent the speed with which the



ARCADES

hydraulic rams were able to tip us backwards and forwards and side to side as we went through the dips and bands shook everyone out of their complacency. When we hurtled into a shadow and out the other side to find ourselves flying free over a river there were 11 gasps and a cry of "Holy smoke" from an alarmed but polite middle-aged American.

Even more startling was the run down a bobsleigh track which followed it — now we could understand why they asked us to wear seatbelts as the cabin snaked from side to side through the icy bends, before emerging on a race track in severe danger of crashing into a Porsche.

This first SR-2 in this country will go to Bicton Park in Devon — there are already a few of an earlier model in places like Blackpool — but if you want one of your own I am afraid it will cost you £80,000 plus £1,200 for every new film and software module you order.

Money is the name of the game for arcade operators and Paul Moriarty of Taitel, one of the biggest distributors of machines in Britain, which originally brought Space Invaders to these shores has to decide which of the many games he is offered will be the winners. In a typical week he might get three different new arcade games, often from Japan, which come on interchangeable circuit boards or discs if they are for the lasers.

The boards are getting smaller all the time — the latest hatch is notebook sized. All you have to do is slot one in and change the labels to turn your Pacman machine into Pac Land. The TV screen is often on a turntable so you can convert the console to an upright game like Crown Golf in seconds.

He tries them out at a number of test sites — the list is secret and the places are rotated as a

precaution against piracy. If the take is good, an exceptional new game can take as much as £80 a day on one machine. Then Taitel will buy up to 500 boards in one go, and at £500 to £700 a board that can be a lot of money.

Piracy poses the same sort of problems as elsewhere in the computer industry. In the early days the producers were naive about copying but now every board comes with a security chip — although it is only a matter of time before that is broken and then copies are produced by the thousand — often made in Taiwan. When the locations of test sites have leaked out, says Paul "it has been known for an employee of another firm to go in and rob the board."

At least laser-disc based games are much more difficult to copy by like many others in the business Paul still has his reservations about them. "They have to be made cheaper" he says and with price tags of £2,000 to £5,000 for a complete laser system compared with about £1,300 for its conventional equivalent you can see what he means.

Machines are getting bigger — Sega's GP World has two TV screens, Atari's TX-1 three — but not necessarily better. Paul's own favourite game is still Qix which he thinks was ahead of its time "they should re-release it now" but he thinks that the newer "conventional games are getting as good as laser".

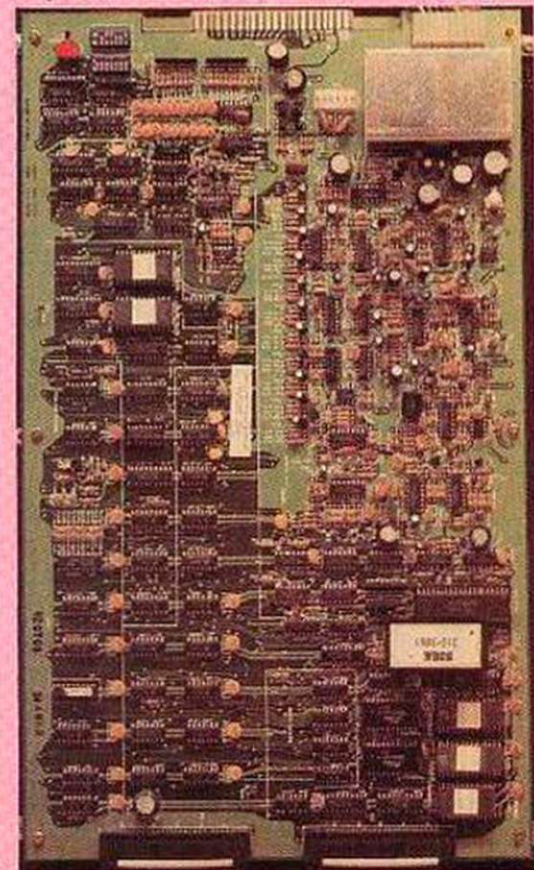
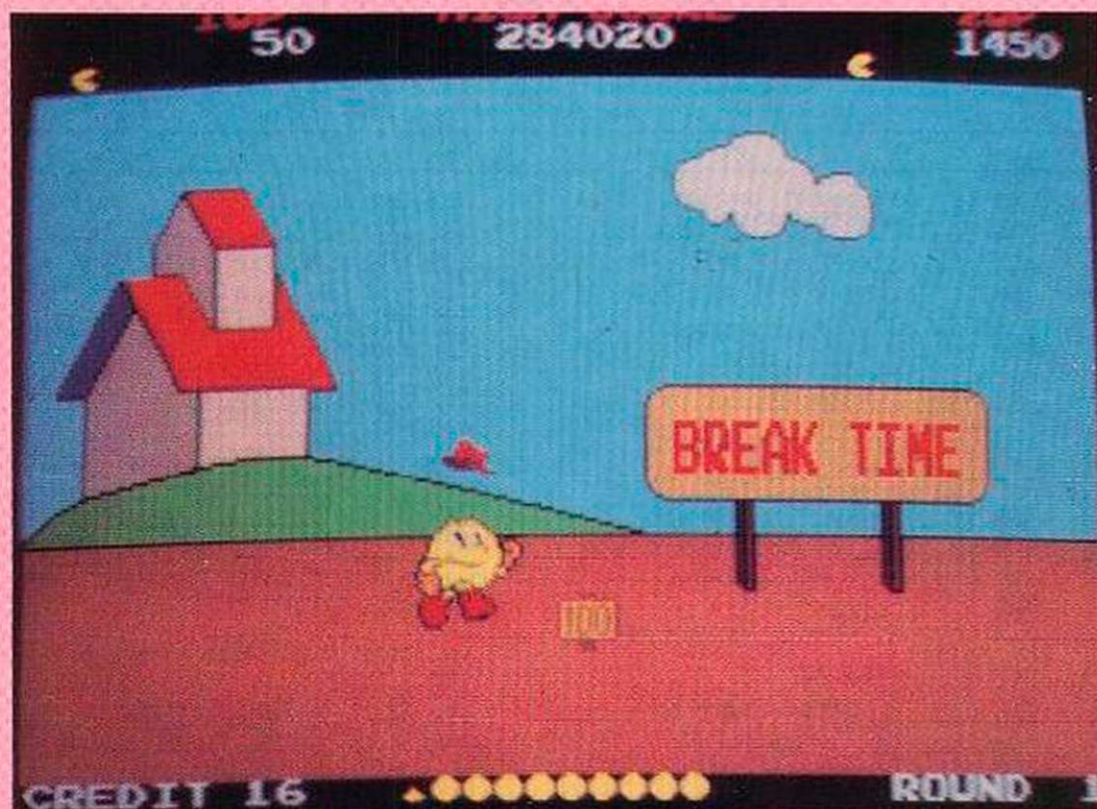
He can point to games like those shown on this spread — Pac Land with its cartoon quality graphics and Future Spy which takes the Zaxxon idea a whole step further. Gladiator, also shown, he is less enthusiastic about because despite some very good graphics in chariot racing sequences it is too much like the racing games which dominated 1984's Olympic



summer

Games like Track and Field and Hyper Sports were astonishingly successful but they caused their own problems as consoles took a hammering from would be sprinters and long jumpers. Those companies that opted for the joystick rather than buttons to control what was happening on screen soon realised their mistake as the sticks took a year's wear in a couple of weeks. Sometimes the strain can be too much — in the case of Buck Rogers Taitel eventually had to fit £100 cast iron joysticks to take the punishment.

Many of the latest Japanese games stress individual combat — like Punch Out and Karate Champ II, while tie-ins with films such as Indiana Jones and the Temple of Doom and television series are still popular sources for inspiration. ■



PINBAT

WE HAVE TRIED to make a game that is different to traditional Pinball but which retains the feeling that skill and judgment, as well as a certain amount of luck, are all involved. Machine code is used for animation effects, score display and the bats, leaving all control of the "marble" in Basic, but using an array system to speed things up.

As with our other ZX-81 programs nearly everything is done by direct Poking and Peeking, to and from the ZX-81's character-mapped screen memory so everything in the game 'actually exists' on screen, not just as co-ordinates. Note that the Demo mode runs at about half speed.

It is possible for the marble to collide with any of 24 different types of object — left wall characters, right wall, gates, bats, etc. — and in most cases a different routine is needed to provide a suitable reaction, such as a bounce, a bonus, a special effect, etc. The most obvious approach is to use a series of If... Then checks to sort out which object the marble has hit and so which routine to call, but even in a fast Basic this would give an uneven response and a noticeably 'sticky' bounce of the marble.

Pinbat uses a more structured system, where the codes of the characters that the marble hits are read directly from off the screen and used to slice out individual elements from an array which in turn contains pre-arranged line numbers to Goto.

An example will make this clearer; Look at line 40; X is the marble's position onscreen, so X+DI — direction — is the marble's next intended position, and the Peek of this gives you the character that the marble is about to "hit".

Now assume that the marble has just hit a 'minus' character. The Sinclair Code for this character is 22, so the 22nd element of the array H gets selected and this contains the line number of the required routine to Goto in this case the "lost marble" routine at line 470. In this way the single line 40 can branch directly to all the necessary routines, most of which will then go back into the main loop.

Line 4280 specifies the line numbers associated with each of the characters that the marble could hit, and is a handy reference. In practice, all the array subscripts are shifted up by one — by line 4300 — because Sinclair arrays do not have a zero element.

A little extra planning-ahead is needed to initially fill up the Goto array with the correct line numbers, but the advantages are more than worth the trouble. The method is practically independent of the number of choices to be made, and so could be expanded even further without loss of speed, but at present only Sinclair Basic allows this particular type of computed Goto. In some ways it is more powerful than an On Goto command.

Note that the first element of the Goto array



contains 10, so that when the marble is hitting Chr\$ zeros — i.e. travelling through empty spaces — line 40 will Goto line 10 to continue the main loop. Also, as a safety precaution in case of typing errors, all those elements of the Goto array that correspond to unused characters have been given a default value of 460, so that if the marble hits something it shouldn't, say a score-digit character, then line 40 branches to line 460 which prints "error" and stops the program before the marble can plough on through addresses that

Disassembly.	4087 13FB	D,JNZ 4034	43F9 56	LD 0 (HL)	4134 77	LD (HL),A
4082 3A2140 LD A,(4021)	4088 07 DEC C	43FA 20 DEC HL,DE	43FB 21 DEC HL,DE	4135 10 ADD HL,DE	4136 10 ADD HL,DE	
4085 2035 JR NZ,408D	4089 23FB JCF NZ,4082	43FC 22 INC HL,DE	43FD 23 INC HL,DE	4137 0000 LD BC,0000	4138 0000 LD BC,0000	
4088 3A3540 LD A,(4035)	408A 13FB JCF A,(4025)	43FE 73 INC HL,E	43FF 28 SEC HL	4139 110CD4 LD DE,049C	413A 1808 LD DE,413E	
408C 208A JR Z,4098	408C 7F JCF Z,40CC	4400 10F7 JNZ 40EC	4401 0C B	413B 115710 LD DE,413F	413C 11110 LD DE,4011	
408E 217D40 LD HL,407D	408D 2318 JR Z,40E0	4402 43 RET C,B	4403 0000 LD HL,4164	413D 11110 LD DE,413F	413E 200C40 LD HL,408C	
4091 207D40 LD HL,407D	408E 03 JCF 00,0000	4404 0000 LD HL,4164	4405 0000 LD HL,4164	413F 010000 LD BC,0086	4140 0000 LD BC,0086	
4092 870000 LD HL,0000	408F 11D862 LD HL,(408C)	4406 0000 LD HL,4164	4407 0000 LD HL,4164	4141 010000 LD BC,0086	4142 0000 LD BC,0086	
4093 09 RET	4090 11D862 LD HL,(408C)	4408 0000 LD HL,4164	4409 0000 LD HL,4164	4143 0000 LD BC,0086	4144 0000 LD BC,0086	
4094 3E34 LD R,34	4091 11D862 LD HL,(408C)	440A 0000 LD HL,4164	440B 0000 LD HL,4164	4145 010001 LD BC,01AD	4146 0000 LD BC,01AD	
4095 3E35 LD R,35	4092 11D862 LD HL,(408C)	440C 0000 LD HL,4164	440D 0000 LD HL,4164	4147 0000 LD BC,01AD	4148 0000 LD BC,01AD	
4096 3E36 LD R,36	4093 11D862 LD HL,(408C)	440E 0000 LD HL,4164	440F 0000 LD HL,4164	4149 0000 LD BC,01AD	414A 0000 LD BC,01AD	
4097 3E37 LD R,37	4094 11D862 LD HL,(408C)	4410 0000 LD HL,4164	4411 0000 LD HL,4164	414B 0000 LD BC,01AD	414C 0000 LD BC,01AD	
4098 3E38 LD R,38	4095 11D862 LD HL,(408C)	4412 0000 LD HL,4164	4413 0000 LD HL,4164	414D 0000 LD BC,01AD	414E 0000 LD BC,01AD	
4099 3E39 LD R,39	4096 11D862 LD HL,(408C)	4414 0000 LD HL,4164	4415 0000 LD HL,4164	414F 0000 LD BC,01AD	4150 0000 LD BC,01AD	
409A 3E3A LD R,3A	4097 11D862 LD HL,(408C)	4416 0000 LD HL,4164	4417 0000 LD HL,4164	4151 0000 LD BC,01AD	4152 0000 LD BC,01AD	
409B 3E3B LD R,3B	4098 11D862 LD HL,(408C)	4418 0000 LD HL,4164	4419 0000 LD HL,4164	4153 0000 LD BC,01AD	4154 0000 LD BC,01AD	
409C 3E3C LD R,3C	4099 11D862 LD HL,(408C)	441A 0000 LD HL,4164	441B 0000 LD HL,4164	4155 0000 LD BC,01AD	4156 0000 LD BC,01AD	
409D 3E3D LD R,3D	409A 11D862 LD HL,(408C)	441C 0000 LD HL,4164	441D 0000 LD HL,4164	4157 0000 LD BC,01AD	4158 0000 LD BC,01AD	
409E 3E3E LD R,3E	409B 11D862 LD HL,(408C)	441E 0000 LD HL,4164	441F 0000 LD HL,4164	4159 0000 LD BC,01AD	415A 0000 LD BC,01AD	
409F 3E3F LD R,3F	409C 11D862 LD HL,(408C)	4420 0000 LD HL,4164	4421 0000 LD HL,4164	415B 0000 LD BC,01AD	415C 0000 LD BC,01AD	
40A0 3E40 LD R,40	409D 11D862 LD HL,(408C)	4422 0000 LD HL,4164	4423 0000 LD HL,4164	415D 0000 LD BC,01AD	415E 0000 LD BC,01AD	
40A1 3E41 LD R,41	409E 11D862 LD HL,(408C)	4424 0000 LD HL,4164	4425 0000 LD HL,4164	415F 0000 LD BC,01AD	4160 0000 LD BC,01AD	
40A2 3E42 LD R,42	409F 11D862 LD HL,(408C)	4426 0000 LD HL,4164	4427 0000 LD HL,4164	4161 0000 LD BC,01AD	4162 0000 LD BC,01AD	
40A3 3E43 LD R,43	40A0 11D862 LD HL,(408C)	4428 0000 LD HL,4164	4429 0000 LD HL,4164	4163 0000 LD BC,01AD	4164 0000 LD BC,01AD	
40A4 3E44 LD R,44	40A1 11D862 LD HL,(408C)	442A 0000 LD HL,4164	442B 0000 LD HL,4164	4165 0000 LD BC,01AD	4166 0000 LD BC,01AD	
40A5 3E45 LD R,45	40A2 11D862 LD HL,(408C)	442C 0000 LD HL,4164	442D 0000 LD HL,4164	4167 0000 LD BC,01AD	4168 0000 LD BC,01AD	
40A6 3E46 LD R,46	40A3 11D862 LD HL,(408C)	442E 0000 LD HL,4164	442F 0000 LD HL,4164	4169 0000 LD BC,01AD	416A 0000 LD BC,01AD	
40A7 3E47 LD R,47	40A4 11D862 LD HL,(408C)	4430 0000 LD HL,4164	4431 0000 LD HL,4164	416B 0000 LD BC,01AD	416C 0000 LD BC,01AD	
40A8 3E48 LD R,48	40A5 11D862 LD HL,(408C)	4432 0000 LD HL,4164	4433 0000 LD HL,4164	416D 0000 LD BC,01AD	416E 0000 LD BC,01AD	
40A9 3E49 LD R,49	40A6 11D862 LD HL,(408C)	4434 0000 LD HL,4164	4435 0000 LD HL,4164	416F 0000 LD BC,01AD	4170 0000 LD BC,01AD	
40AA 3E4A LD R,4A	40A7 11D862 LD HL,(408C)	4436 0000 LD HL,4164	4437 0000 LD HL,4164	4171 0000 LD BC,01AD	4172 0000 LD BC,01AD	
40AB 3E4B LD R,4B	40A8 11D862 LD HL,(408C)	4438 0000 LD HL,4164	4439 0000 LD HL,4164	4173 0000 LD BC,01AD	4174 0000 LD BC,01AD	
40AC 3E4C LD R,4C	40A9 11D862 LD HL,(408C)	443A 0000 LD HL,4164	443B 0000 LD HL,4164	4175 0000 LD BC,01AD	4176 0000 LD BC,01AD	
40AD 3E4D LD R,4D	40AA 11D862 LD HL,(408C)	443C 0000 LD HL,4164	443D 0000 LD HL,4164	4177 0000 LD BC,01AD	4178 0000 LD BC,01AD	
40AE 3E4E LD R,4E	40AB 11D862 LD HL,(408C)	443E 0000 LD HL,4164	443F 0000 LD HL,4164	4179 0000 LD BC,01AD	417A 0000 LD BC,01AD	
40AF 3E4F LD R,4F	40AC 11D862 LD HL,(408C)	4440 0000 LD HL,4164	4441 0000 LD HL,4164	417B 0000 LD BC,01AD	417C 0000 LD BC,01AD	
40B0 3E50 LD R,50	40AD 11D862 LD HL,(408C)	4442 0000 LD HL,4164	4443 0000 LD HL,4164	417D 0000 LD BC,01AD	417E 0000 LD BC,01AD	
40B1 3E51 LD R,51	40AE 11D862 LD HL,(408C)	4444 0000 LD HL,4164	4445 0000 LD HL,4164	417F 0000 LD BC,01AD	4180 0000 LD BC,01AD	
40B2 3E52 LD R,52	40AF 11D862 LD HL,(408C)	4446 0000 LD HL,4164	4447 0000 LD HL,4164	4181 0000 LD BC,01AD	4182 0000 LD BC,01AD	
40B3 3E53 LD R,53	40B0 11D862 LD HL,(408C)	4448 0000 LD HL,4164	4449 0000 LD HL,4164	4183 0000 LD BC,01AD	4184 0000 LD BC,01AD	
40B4 3E54 LD R,54	40B1 11D862 LD HL,(408C)	444A 0000 LD HL,4164	444B 0000 LD HL,4164	4185 0000 LD BC,01AD	4186 0000 LD BC,01AD	
40B5 3E55 LD R,55	40B2 11D862 LD HL,(408C)	444C 0000 LD HL,4164	444D 0000 LD HL,4164	4187 0000 LD BC,01AD	4188 0000 LD BC,01AD	
40B6 3E56 LD R,56	40B3 11D862 LD HL,(408C)	444E 0000 LD HL,4164	444F 0000 LD HL,4164	4189 0000 LD BC,01AD	418A 0000 LD BC,01AD	
40B7 3E57 LD R,57	40B4 11D862 LD HL,(408C)	4450 0000 LD HL,4164	4451 0000 LD HL,4164	418B 0000 LD BC,01AD	418C 0000 LD BC,01AD	
40B8 3E58 LD R,58	40B5 11D862 LD HL,(408C)	4452 0000 LD HL,4164	4453 0000 LD HL,4164	418D 0000 LD BC,01AD	418E 0000 LD BC,01AD	
40B9 3E59 LD R,59	40B6 11D862 LD HL,(408C)	4454 0000 LD HL,4164	4455 0000 LD HL,4164	418F 0000 LD BC,01AD	4190 0000 LD BC,01AD	
40BA 3E5A LD R,5A	40B7 11D862 LD HL,(408C)	4456 0000 LD HL,4164	4457 0000 LD HL,4164	4191 0000 LD BC,01AD	4192 0000 LD BC,01AD	
40BB 3E5B LD R,5B	40B8 11D862 LD HL,(408C)	4458 0000 LD HL,4164	4459 0000 LD HL,4164	4193 0000 LD BC,01AD	4194 0000 LD BC,01AD	
40BC 3E5C LD R,5C	40B9 11D862 LD HL,(408C)	445A 0000 LD HL,4164	445B 0000 LD HL,4164	4195 0000 LD BC,01AD	4196 0000 LD BC,01AD	
40BD 3E5D LD R,5D	40BA 11D862 LD HL,(408C)	445C 0000 LD HL,4164	445D 0000 LD HL,4164	4197 0000 LD BC,01AD	4198 0000 LD BC,01AD	
40BE 3E5E LD R,5E	40BB 11D862 LD HL,(408C)	445E 0000 LD HL,4164	445F 0000 LD HL,4164	4199 0000 LD BC,01AD	419A 0000 LD BC,01AD	
40BF 3E5F LD R,5F	40BC 11D862 LD HL,(408C)	4460 0000 LD HL,4164	4461 0000 LD HL,4164	419B 0000 LD BC,01AD	419C 0000 LD BC,01AD	
40C0 3E60 LD R,60	40BD 11D862 LD HL,(408C)	4462 0000 LD HL,4164	4463 0000 LD HL,4164	419D 0000 LD BC,01AD	419E 0000 LD BC,01AD	
40C1 3E61 LD R,61	40BE 11D862 LD HL,(408C)	4464 0000 LD HL,4164	4465 0000 LD HL,4164	419F 0000 LD BC,01AD	41A0 0000 LD BC,01AD	
40C2 3E62 LD R,62	40BF 11D862 LD HL,(408C)	4466 0000 LD HL,4164	4467 0000 LD HL,4164	41A1 0000 LD BC,01AD	41A2 0000 LD BC,01AD	
40C3 3E63 LD R,63	40C0 11D862 LD HL,(408C)	4468 0000 LD HL,4164	4469 0000 LD HL,4164	41A3 0000 LD BC,01AD	41A4 0000 LD BC,01AD	
40C4 3E64 LD R,64	40C1 11D862 LD HL,(408C)	446A 0000 LD HL,4164	446B 0000 LD HL,4164	41A5 0000 LD BC,01AD	41A6 0000 LD BC,01AD	
40C5 3E65 LD R,65	40C2 11D862 LD HL,(408C)	446C 0000 LD HL,4164	446D 0000 LD HL,4164	41A7 0000 LD BC,01AD	41A8 0000 LD BC,01AD	
40C6 3E66 LD R,66	40C3 11D862 LD HL,(408C)	446E 0000 LD HL,4164	446F 0000 LD HL,4164	41A9 0000 LD BC,01AD	41AA 0000 LD BC,01AD	
40C7 3E67 LD R,67	40C4 11D862 LD HL,(408C)	4470 0000 LD HL,4164	4471 0000 LD HL,4164	41AB 0000 LD BC,01AD	41AC 0000 LD BC,01AD	
40C8 3E68 LD R,68	40C5 11D862 LD HL,(408C)	4472 0000 LD HL,4164	4473 0000 LD HL,4164	41AD 0000 LD BC,01AD	41AE 0000 LD BC,01AD	
40C9 3E69 LD R,69	40C6 11D862 LD HL,(408C)	4474 0000 LD HL,4164	4475 0000 LD HL,4164	41AF 0000 LD BC,01AD	41B0 0000 LD BC,01AD	
40CA 3E6A LD R,6A	40C7 11D862 LD HL,(408C)	4476 0000 LD HL,4164	4477 0000 LD HL,4164	41B1 0000 LD BC,01AD	41B2 0000 LD BC,01AD	
40CB 3E6B LD R,6B	40C8 11D862 LD HL,(408C)	4478 0000 LD HL,4164	4479 0000 LD HL,4164	41B3 0000 LD BC,01AD	41B4 0000 LD BC,01AD	
40CC 3E6C LD R,6C	40C9 11D862 LD HL,(408C)	447A 0000 LD HL,4164	447B 0000 LD HL,4164	41B5 0000 LD BC,01AD	41B6 0000 LD BC,01AD	
40CD 3E6D LD R,6D	40CA 11D862 LD HL,(408C)	447C 0000 LD HL,4164	447D 0000 LD HL,4164	41B7 0000 LD BC,01AD	41B8 0000 LD BC,01AD	
40CE 3E6E LD R,6E	40CB 11D862 LD HL,(408C)	447E 0000 LD HL,4164	447F 0000 LD HL,4164	41B9 0000 LD BC,01AD	41BA 0000 LD BC,01AD	
40CF 3E6F LD R,6F	40CC 11D862 LD HL,(408C)	4480 0000 LD HL,4164	4481 0000 LD HL,4164	41BB 0000 LD BC,01AD	41BC 0000 LD BC,01AD	
40D0 3E70 LD R,70	40CD 11D862 LD HL,(408C)	4482 0000 LD HL,4164	4483 0000 LD HL,4164	41BD 0000 LD BC,01AD	41BE 0000 LD BC,01AD	
40D1 3E71 LD R,71	40CE 11D862 LD HL,(408C)	4484 0000 LD HL,4164	4485 0000 LD HL,4164	41BF 0000 LD BC,01AD	41C0 0000 LD BC,01AD	
40D2 3E72 LD R,72	40CF 11D862 LD HL,(408C)	4486 0000 LD HL,4164	4487 0000 LD HL,4164	41C1 0000 LD BC,01AD	41C2 0000 LD BC,01AD	
40D3 3E73 LD R,73	40D0 11D862 LD HL,(408C)	4488 0000 LD HL,4164	4489 0000 LD HL,4164	41C3 0000 LD BC,01AD	41C4 0000 LD BC,01AD	
40D4 3E74 LD R,74	40D1 11D862 LD HL,(408C)	448A 0000 LD HL,4164	448B 0000 LD HL,4164	41C5 0000 LD BC,01AD	41C6 0000 LD BC,01AD	
40D5 3E75 LD R,75	40D2 11D862 LD HL,(408C)	448C 0000 LD HL,4164	448D 0000 LD HL,4164	41C7 0000 LD BC,01AD	41C8 0000 LD BC,01AD	
40D6 3E76 LD R,76	40D3 11D862 LD HL,(408C)	448E 0000 LD HL,4164	448F 0000 LD HL,4164	41C9 0000 LD BC,01AD	41CA 0000 LD BC,01AD	
40D7 3E77 LD R,77	40D4 11D862 LD HL,(408C)	4490 0000 LD HL,4164	4491 0000 LD HL,4164	41CB 0000 LD BC,01AD	41CC 0000 LD BC,01AD	
40D8 3E78 LD R,78	40D5 11D862 LD HL,(408C)	4492 0000 LD HL,4164	4493 0000 LD HL,4164	41CD 0000 LD BC,01AD	41CE 0000 LD BC,01AD	
40D9 3E79 LD R,79	40D6 11D862 LD HL,(408C)	4494 0000 LD HL,4164	4495 0000 LD HL,4164	41CF 0000 LD BC,01AD	41D0 0000 LD BC,01AD	
40DA 3E7A LD R,7A	40D7 11D862 LD HL,(408C)	4496 0000 LD HL,4164	4497 0000 LD HL,4164	41D1 0000 LD BC,01AD	41D2 0000 LD BC,01AD	
40DB 3E7B LD R,7B	40D8 11D862 LD HL,(408C)	4498 0000 LD HL,4164	4499 0000 LD HL,4164	41D3 0000 LD BC,01AD	41D4 0000 LD BC,01AD	
40DC 3E7C LD R,7C	40D9 11D862 LD HL,(408C)	449A 0000 LD HL,4164	449B 0000 LD HL,4164	41D5 0000 LD BC,01AD	41D6 000	



Dave Rogers and Colin Hogg challenge you to become a pinball wizard on the ZX-81.

shouldn't be Poked!

This includes the ZX-81's dreaded Newline characters, lurking unseen down the side of the screen, the Poking of which invariably results in irretrievable crashes.

Something else that can't be seen onscreen is a "character 90" just above the launch channel. It is Poked there by line 670 — it can't be printed — and it is not seen because there is no bit-pattern for it in the ZX-81 Rom so it just looks like a space character, but it is used here as an invisible trigger. When the marble hits it then line 40 branches to line 440, printing a 'lid' over the launch channel to seal it off.

Line 230 looks odd, but it is the shortest way of selecting one of nine different directions at random, by using the Codes of

various Chr\$ sliced out of a string to yield values rather than doing calculations.

Note that when any of the machine-code sub-routines return to Basic their value is 0, so wherever you see "+USR" in the listing this is just a short way of calling a machine-code subroutine, it does not affect the numerical value of whatever calculation it was included in.

Usr 16514 Scrolls screen line 22 — columns 1 to 28 — sideways by one space, with wrap-around — this moves the various bats — either under Inkeys control when in play mode, or in response to an automatic routine when in Demo mode. All the other m-code subroutines return to Basic via this bat-move routine, thereby giving more continuous bat control.

Usr 16588/Usr 16608 (Separate entry points into the above routine). Scrolls line 22 left/right respectively. This is done simply by swapping adjacent pairs of display file bytes and then moving in sideways increments of one, repeating 28 times in all. Wraparound is achieved automatically when using this method since after a complete line of swaps the line itself will have moved one way but the end character will have been 'bucket-brigaded' across to the opposite end — work it out!

The "autobat" routine starts at 16536. It scans the screen to find the bat and the marble, works out their relative column positions and then calls whichever of the above scroll routines is needed to move the bat to catch the marble.

Usr 16694 Scans the screen (lines 4 to 16) for "asterisk" and "plus" characters, and wherever one is found swaps it for the other giving an animation effect. The next time it is called it will swap the characters back to their originals.

Usr 16689 As above, but scans for left and right brackets characters.

Usr 16698 Same again, but for characters whose Codes are held in addresses 16690 and 16691 i.e., redefinable by Poking those addresses.

Usr 16638 Adds one to the score (which is held in a permanent store area, see below) then copies this into the screen.

Usr 16652 Copies the score onto the screen but without adding anything to it.

Poke 16660 Spacing between digits when score is copied onto the screen.

16734 to 16740 Score store area. Before each game, lines 860-880 in the Basic reset these bytes to "zero" characters.

First enter 'Fast' mode then type in, as line one, Rem plus exactly 230 of any characters. Now type in the whole listing and, resisting the temptation to Run it straight away, Save and label two backup copies!!

When first Run, the machine code gets Poked into the Rem and is sum-checked as it goes in. Having corrected any errors, as indicated, and checked that the program works, you can then erase all lines from 7000 onwards and Save a few working copies using the Autosave (goto 3000). Always Clear before Saving otherwise you will Save the array on tape, making loading unnecessarily long — the array — is 1k in actual size, since each number = 5 bytes — also select "slow" mode.

Please check carefully the following lines — "gas" indicates characters obtained using graphic mode and Shift: All greys are gsH.

- 230 gsW, gsR, gs6 inverse 7, 8, 9, keywords Code, Val, Len, No extra spaces.
- 360 inverse right bracket, 30 spaces, inverse left bracket.
- 370 inverse left bracket (gsI), 980 gs2, gsR, gsH, gsW, gs4.
- 2460 (all inverse) Q, -, Q. Second string, Y.
- 42E0 (This line is so important it is checksummed), gsQ, gs7, gsW, gs2, gsR, inverse Y, inverse Q, inverse space, gsN, gsJ, gsM, gsF, gsG, gsH, gs0, gsI (rest are normal characters).
- 1010 gsF, gsJ and inverse zeros are used.
- 2040 one space between the brackets.
- 4090-4100 gsN and gsM are used.
- 4410-4430 gsD and gs6 are used. Type exactly as shown, some words 'contain' marbles for use on their screen.
- 5110 2 inverse spaces, inverse 0, 2 inverse spaces, inverse 0, inverse space, 7* gsF, inverse space, inverse 'hogrog', 7* inverse spaces, gsJ's and gs B's.
- 440 inverse left bracket, 2 inverse spaces.

When playing, use two fingers of one hand (continued on next page)

```

AND NOT DEM)+(" " AND DEM)
530 PRINT AT 21,0;
-----
: TAB 31; AT 22,14; BS
600 REM -----NEW-MARBLE-----
A10 LET D=" "
620 LET X=VAL "790+PEEK 16396+2
56+PEEK 16397+USR 16552"
630 LET M=M-1
640 PRINT AT 23,1;M$(M-29 TO M)
650 IF M$(M)="" THEN GOTO 700
660 IF M$(M)(">") THEN GOTO 630
670 POKE X-363,90
680 POKE X,CODE "0000"(4-RND*3)
690 IF INKEY="" AND NOT DEM TI
EN GOTO 630
692 FOR N=1 TO 15 STEP 3
694 PRINT AT 10,29; "U U U U U
U U"(N TO 1) ( TO 2)
696 NEXT N
698 GOTO 100
700 REM -----NOW-WHAT?-----
NEI.-SCREEN/GAMEOVER/RESTART/DEMO
710 IF SN=6 THEN GOTO 900
720 IF DEM THEN GOTO 600
730 PRINT AT 13,2;"F TO PLAY AG
AIN/D FOR DEMO" AT 22,16; "GAME
OVER"
740 POKE 16691 USR 16588+USR
16689+USR 16699+USR 16694
750 POKE 16690 (8 AND RND)RND)

```

```

750 LET DS=INKEY$
770 IF DS<>"D" AND DS<>"R" THEN
GOTO 740
800 LET DEM=(DS="D")
810 POKE 16417,DEM
820 IF DEM THEN PRINT AT 22,1;
"DEMO MODE: ANY KEY TO ESCAPE"
830 LET SN=0
840 LET M=LEN M$+1
850 LET B=40
860 FOR Z=16734 TO 16740
870 POKE Z,CODE "0"
880 NEXT Z
900 REM ---DRAW-EMPTY-TABLE---
910 LET SN=SN+1
920 PRINT AT 0,0;
"SCORE:"
930 LET ANG=VAL "1+(33 AND (SN=
1 OR SN=3 OR SN=4))"
940 POKE 16660,ANG
950 FOR N=2 TO 20
960 LET P$=""
970 IF N=13 THEN LET P$(30)=" "
980 IF N<9 THEN IF ANG=34 THEN
LET P$(23+N TO 31)=" "
990 PRINT P$
1010 NEXT N
1020 IF ANG=1 THEN PRINT AT 2,25;
"//////";TAB 25; " ";TAB 30;
" "

```

```

1030 REM -----SCREENS-DATA-----
1010 LET P$=( " " AND (SN=1 OR
SN=4))+( " " AND (SN=2 OR
SN=3))+( " " AND (SN=
2))+( " " AND (SN=5))+( " "
AND SN=5)
1020 LET S$="C1008,C1018,T1110,T
1310,T1120,T1320,T1115,T1315,P05
03,P1203,P0509,P0514,P0514,P0520
,P0925"
1030 IF SN=2 THEN LET S$="P0504+
P0512+P0903+P1003+P0925+P1404+P1
412"
1040 IF SN=3 THEN GOTO 2400
1050 IF SN=4 THEN LET S$="P0404/
P1109/P0414/P0509/P1324/C0913/C0
610/C1115/C0003,T0913/T1105/T151
0/T1115/T1518/T0721"
1050 IF SN=5 THEN LET S$="P0504+
00516,G0905,G0917,R1302,51318
1070 IF SN=6 THEN LET S$="P0703,
P0721,P0725,P1304,P1315,C0523,C0
515,C1009,C1021"
1100 REM -----DRAW-SYSTEM-----
1110 FOR N=1 TO LEN S$ STEP 6
1120 LET X$=S$(N TO )
1130 LET D=VAL X$(2 TO 3)
1140 LET F=VAL X$(4 TO 5)
1150 GOSUB 2000+(30 AND X$(1)="C
")+(70 AND X$(1)="T")+190 AND X$

```

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```

(1) * T
2150 NEXT N
2170 IF SN< THEN PRINT AT 12,05
2180 TAB 25
2190 GOTO 500
2200 REM ---BRAW-SUBROUTINES---
2210 PRINT AT D,A,P$
2220 RETURN
2230 FOR D=0 TO D+5
2240 PRINT AT D,A,(1) (1)
2250 NEXT D
2260 RETURN
2270 PRINT AT D,A,(1) * TAB A:++
* TAB A:
2280 RETURN
2290 PRINT AT D,A,CHR$(1574*ND)
2300
2310 RETURN
2320 PRINT AT 5,5:
2330
2340 FOR A=4 TO 22 STEP 8
2350 LET D=VAL 12+2 AND (A-10)
2360
2370 FOR N=0 TO D+5
2380 PRINT AT N,A:
2390 NEXT N
2400 PRINT AT D-1,0: (1) TAB A:
* TAB A:
2410 NEXT A
2420 GOTO 500
2430 REM ---AUTOSAVE---
2440 OPEN "MS" BY J.DAVE.ROGERS
AND COLIN HOGG
2450 PRINT AT 9,7:
2460
2470 STOP TAPE: PRESS ANY K
* IF INKEY$="" THEN GOTO 2000
2480 REM ---INITIALISE---
2490
2500 IF PEER 16743=VAL "90" THEN
N,RUN 7000
2510 LET D=VAL "0"
2520 LET X=0

```

```

4050 POKE 16417,D1
4060 POKE 16418,D1
4070 DIM T$(14,25)
4080 LET T$(1)=
4090 LET T$(2)=
4100 LET T$(3)=
4110 LET T$(4)=
4120 REM ---GOTO-ARRAY---
4130
4140 DIM F(1200)
4150 FOR N=1 TO 200
4160 LET F(N)=60
4170 IF N=154 AND N=167 THEN LET
F(N)=200
4180 NEXT N
4190 LET H(1)=10
4200 LET H(2)=440
4210 LET H(3)=340
4220 LET H(4)=340
4230 LET H(5)=340
4240 LET H(6)=340
4250 LET H(7)=340
4260 LET H(8)=340
4270 LET H(9)=340
4280 LET H(10)=340
4290 LET H(11)=340
4300 LET H(12)=340
4310 NEXT H
4320 FOR C=1 TO 600
4330 LET X=X+H(C)+C
4340 NEXT C
4350 IF X<800000 THEN PRINT "E
RROR CHECK LINES 4200-4300" JDR
4360
4370 REM ---M+M-RACK---
4380 REM ---MESSAGES-AND-MARBLE---
4390 LET M$=" YOU HAVE LOST YOU
R MARBLE"
4400
4410 LET G$="
4420 LET M$="
4430 LET M$=MSG$+4TH FRAME
4440 STRV=CODL+MSG$+
4450 LET M$=MSG$+4TH FRAME
4460 STRV=CODL+MSG$+
4470 LET M$=MSG$+4TH FRAME
4480 STRV=CODL+MSG$+
4490 LET M$=MSG$+4TH FRAME
4500 STRV=CODL+MSG$+

```

```

5000 REM ---ANIMATED-INTRO---
5010 LET X=2
5020 LET B$="
5030 PRINT AT 0,0:MS,AT 0,0:BS
5040 FOR N=1 TO 22
5050 PRINT
5060 NEXT N
5070 SLOW
5080 PRINT AT 0,10: TAB 11:
5090 TAB 10: TAB 11:
5100 TAB 12: TAB 11: TAB 12:
5110
5120 LET T=1 TO 42 STEP 7
5130 LET T=1
5140
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```

7000 REM ---N-CODE---
7010 IF PEER 16744=118 THEN PPT
7020 POKE 16810,0
7030 LET D$="3A21403E.203E3A2E.1
CC280A.2170482E.20400100.0003E
34.00A94000.3EB1C0A8.4078BA98.20
1E072A.0C4801F5.T=18714"
7040 LET D$="00000000.00000000
8.2010FB00.20F6093A.2040FFFE.200
8FE7F.28180100.00028A00.40110802
1.00000000.203E7225.T=20107"
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rather than two hands, it's much easier to control the bats. The wraparound can sometimes be used to advantage to quickly reach marbles on the opposite side of the screen. You score points by hitting stars or rollover targets — inverse numerals.

At sidewalls the marble obeys simple laws of reflection, but at stars or grey blocks the marble gets thrown off at a random angle. At "triboosters" the marble is deflected whichever way the tribooster characters are pointing at the time, and then a new tribooster, of random type, gets printed, this being essential to prevent the marble from ever getting stuck in an infinitely recurring pattern of bounces.

Physicists may like to note that with few exceptions marble motion is assumed to be Newtonian, frictionless, perfectly elastic and in zero gravity(!).

- Main variables.
- H(N) 'On Hit Goto array.
 - X Position of marble on screen (start of display file plus an offset).
 - DI Direction of marble — 1 = right, 33 = down, etc.
 - M\$ Messages and Marbles Rack.
 - M Pointer, keeping track of progress along MS.
 - BS Bats.
 - SN Screen number.
 - DEM Demo mode if set to one, Play mode if zero.
 - DS Demo select, input by player.
 - ANG Angle of score display.
 - P\$ Printing strings.
 - S\$ Screen storage strings.
 - D, A Down/Across printing co-ordinates.
 - JDR Undefined variable to stop program on errors.

Typed copies of this program are available for £2.50 from:

11 Carrarvon Road, Walton, Liverpool, L9 1EB. The cassette also includes two of our other ZX-81 games.

- Line-by-line.
- 7 New direction is 33 or -33 to 'channel' marble straight up or down.
 - 8 Reverses the newly picked

- 10-40 direction in the case of the marble hitting the channeller directly from underneath. Main loop. Line 40 is particularly efficient (see text).
- 50-110 Tribocosters. Three entry points for three different tribooster directions, but all return via 110 which prints a new tribooster of random type over the old one.
- 13C-150 Dropgates. 130 swaps characters 137 and 138 to animate gate.
- 16C-190 Sidewalls. Simple laws of reflection are obeyed e.g., at left wall, if collision is in south-west direction then DI = 32, rebound is south-east with DI equal to 34.
- 200-280 Flingers. Marble is thrown off at any of eight directions. To choose these at random a string is sliced which contains characters that will yield the required numbers — after 164 removed from them.
- 260 If chosen direction takes marble into a clear space then go back to main loop, if not, then stay in flinger routine until a clear route is chosen.
- 290-330 Rollover targets. Line 310 peeks the character and adds one to it thus incrementing the rollover number each time marble passes over it. The bracketed function resets nines to zeros.
- 420-430 This caters for the occasions when the marble hits the edge of the score display, causing the marble to run diagonally across it. Bounces off bat. Bats are made from three different characters, each causing the marble to bounce off at a different angle.
- 400-418 Bonus routine.
- 460 Stops the program if marble hits an unspecified character, this especially

- 440-450 Prints "lid" over launch channel when marble hits the — invisible — character 90 present onscreen just above the channel.
- 470-492 Marble lost. "Twinkles" marble where it hit the baseline.
- 600-620 Start new marble.
- 630-660 Moves the string MS, which contains "messages and marbles" across the bottom of the screen until either a marble character is detected whereupon the 'ready to launch' routine at 680-690 operates or: a fullstop character is detected, which is used as a trigger for jumping to the "next screen" routine.
- 692-696 Slides a gate open at top of launch tube.
- 700-800 Miscellaneous decisions.
- 730-770 Game-over routine. Calls all the animation scans at once, until player decides to play again or go into demo mode. Demo decisions.
- 800-820 Pokes "score store" bytes to character zeros.
- 900-992 Draws over and thereby erases old screen with a new one.
- 1000-1070 Select different strings containing draw instructions for screens 1-6
- 1100-1160 Extracts print co-ordinates from strings and passes these to draw subroutines.
- 2000-2480 Draw routines: 2010 draws whatever is in P\$, 2030 draws a "channeller", 2060 draws a "rollover target", at 2400 there is a separate routine to draw all of screen 3 — bonus screen.
- 3000-END Autosave /Initialisation/ presentation screen/machine code data, and loader.

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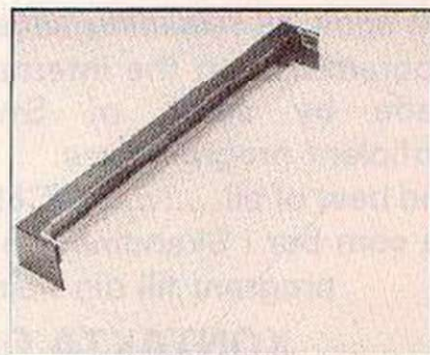
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Julian Wood, with
the help of an STS,
rids the Spectrum of
bugs — the creepy
crawly kind.

SPRAYMAN

SOMETHING I'VE always wanted is my very own Spray Test Simulator or STS. Having waited for over two years for one to be released on the Spectrum, I decided to write one myself.

This particular STS is equipped with three different sprays designed to eliminate three different types of creature, plus another spray which disintegrates TNT. Your aim is to give these sprays the fair test they deserve. Your score will indicate whether you have the skill to become a professional STS operator — a score of a million is just about good enough! Spraymania runs on any ZX-Spectrum, and features smooth, colourful animated graphics and a lot of sound.

To enter Spraymania, first type in the Basic header program in listing 1, and save it using:

SAVE "SPRAYMANIA" LINE 0

In case you were wondering the

RANDOMIZE 51707

statement is essential. Also, the Border 1 statement is important.

Then type in the machine-code loader program in listing 3 and Run it. Enter each byte as shown in listing 2, taking care to check the checksum after entering each line. If you make a mistake in a line, enter 999, and a beep will sound, and you can enter that line again. If you enter a byte which is obviously wrong (less than 0 or greater than 255 — another tone will sound, and you can then enter the correct byte. When you have entered all the machine-code, and the checksum is correct, save the code after the loader program, using

SAVE "C" CODE 25000, 3400

Rewind the cassette and load the game.

On running, the program goes into demo mode, during which brief instructions — including the control keys — scroll smoothly

across the screen. On pressing a key, the game starts with your spray-can appearing at the centre of the screen. At the bottom of the screen are the various sprays, and a bonus box in which the bonus appears every so often. To collect a spray, or the bonus, simply move your can over the relevant box.

- Whirlers (bounce around the screen like balls) = 50
- Gruesomes (vertically-moving faces) = 10
- Globules (move horizontally) = 25
- TNT = 100
- Bonus = 250

Unlike the moving creatures the TNT doesn't kill on touch but gradually changes colour until it becomes white and explodes.

For a copy of Spraymania on cassette, send a cheque or postal order for £1.90, to: Mr J.R. Wood, 22 Derver Hill, Downham Market, Norfolk, PE38 9BE.

Listing 2.

```

25000: 007CC6C6C6C67C00 = 1040
25008: 001838781818FF00 = 502
25016: 007C86067CC0FE00 = 834
25024: 007C863C06867C00 = 582
25032: 00C0D8D8FE181800 = 924
25040: 00FEC0FC06867C00 = 962
25048: 007CC6C6C6C67C00 = 1088
25056: 00FE060C18303000 = 392
25064: 007CC67CC6C67C00 = 966
25072: 007CC6C67E067C00 = 776
25080: 7CFEC6C6FEFEC6C6 = 1678
25088: FCFEC6FCFEC6FEFC = 1914
25096: 7CFEC6C0C0C6FE7C = 1536
25104: F8FC0C0C6C0CFCF8 = 1808
25112: FEFEC0FC0C0FEFE = 1904
25120: FEFEC0FC0C0C0C00 = 1780
25128: 7CFEC0DEDEC6FE7C = 1590
25136: C6C6C6FEFEC6C6C6 = 1696
25144: FEFEC18181818FEFE = 1112
25152: FEFEC181818D8F870 = 1156
25160: C6C0D8F0F0D8CC06 = 1716
25168: C0C0C0C0C0C0FEFE = 1660
25176: C6EFED6C6C6C6C6 = 1696
25184: C6E6F6FEFEDEDEC6 = 1808
25192: 7CFEC6C6C6C6FE7C = 1540
25200: FCFEC6FEFCC0C0C0 = 1786
25208: 7CFEC6D6DECEFE7C = 1596
25216: FCFEC6FEFCC8CC06 = 1828
25224: 7CFEC0FC7E06FE7C = 1332
25232: FEFEC181818181818 = 652
25240: C6C6C6C6C6C6FE7C = 1566
25248: C6C6C6C6C6C63810 = 1170
25256: C6C6C6D6D6D6FE6C = 1598
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25312: 7E01E0B1B1B0D817E = 1242
25320: 000000000000C1830 = 96
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25344: 0000183C3C180000 = 168
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25488: B9CDB9CDF18FFFFF = 1674
25496: B7EDAE753A5C324C = 987
25504: 381C1C380FF003C0 = 618
25512: 07C00C701FF0310C = 025
25520: 35ACB5ADF18FFFFF = 1473
25528: BE7D37EC2E74381C = 852
25536: 3C3C1FF80FF003C0 = 849
25544: 07E00F301FF8318C = 762
25552: 339C339CF18FFFFF = 1308
25560: 3E7C3E7C37EC2C34 = 759
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25576: 3FFC3FFC334C0340 = 824
25584: 03400340FFFC183 = 968
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25616: 334C0340FFFC663 = 1001
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25664: EDB7FFFC183FFFF = 1764
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25680: 069006880EC01F60 = 625
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25696: 1FA01FA01FA01FE0 = 828
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25712: 00602A90FFFE924A = 1019
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25992: 5F78E618F6405706 = 872
26000: 087E12142310FAD1 = 682
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26016: 360023BC20AC921 = 793
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26032: 0620732C10FC0926 = 704
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26136: 01CD74650CC92A04 = 682
26144: 5B3A06580E001911 = 302
26152: 1027CD5230063C32 = 546
26160: 065B18011922045B = 276
26168: E56F2600CD0166E1 = 911
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26192: 0F0F4F3E100878A7 = 482
26200: 1F371FA71FA8E6F8 = 961
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26224: AE771304083D20DD = 638
26232: C9CD686511E1FF78 = 1228
26240: 0602E6073A005B28 = 434
26248: 0104772D771910FA = 579
26256: C93A07580E0CCD0D = 601
26264: 66C92A0358260016 = 504
26272: FF0E13C00766C92A = 845
26280: 095B3A08580E19CD = 504
26288: 3866C9111756CDA7 = 857
26296: 65CDC865110000CD = 829
26304: 1E66CD9166CD9A66 = 1045
26312: CDA766C91D0D191C = 770
26320: 0F2A2A2A2A161320 = 256
26328: 0F1D2A2A2A1E1317 = 242
26336: 0F2A2A2A12131D0D = 720
26344: 191C0F00251D1A1C = 188

```

(continued on page 65)

Listing 1.

```

10>PAPER 1: INK 1: BORDER 1: C
LEAR 24999: PRINT AT 11,5: FLASH
1: PAPER 7:"SPRAYMANIA IS LOAD1
NG": LOAD ""CODE : RANDOMIZE 517
07: PRINT USR 28187

```

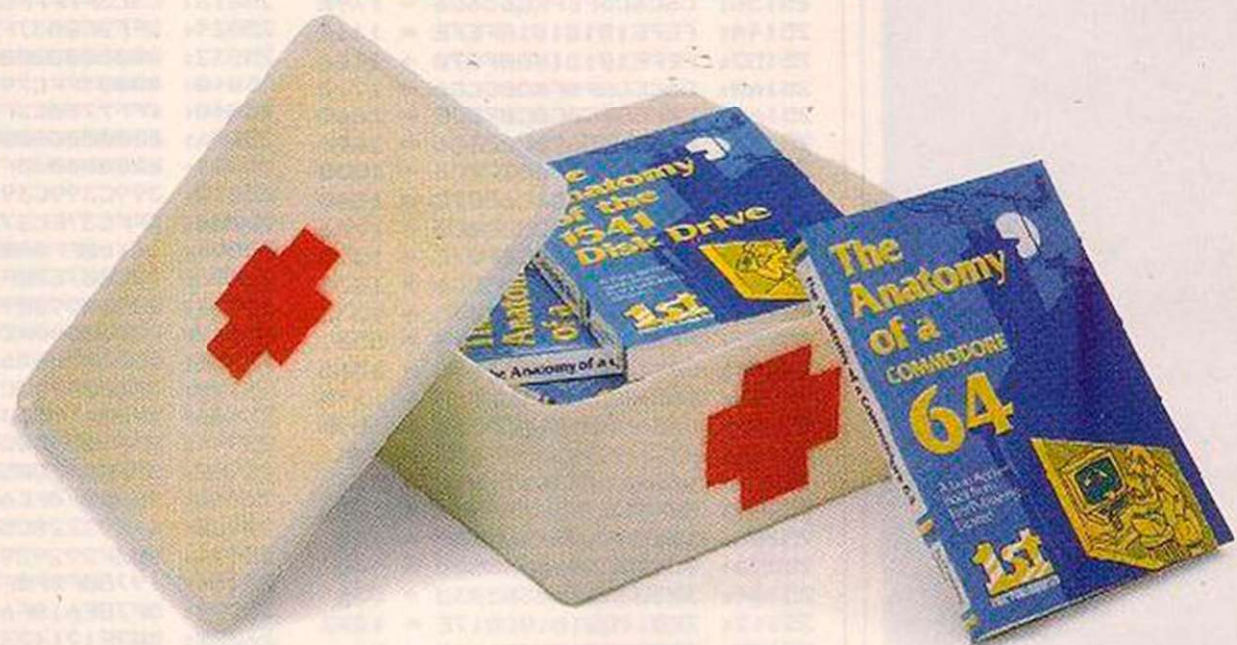
Listing 3.

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10300: 0000000000000000

```

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(continued from page 63)

26352: 0B23170B18130B26 = 172	27024: 4B68E60F07774F23 = 664	27704: 4B4DE9F1C0CBBE37 = 1300
26360: 272A2B2A020A0906 = 190	27032: 36B1C3CB6B3E0132 = 801	27712: C921155B35C03604 = 649
26368: 292A141F16130B18 = 210	27040: 015B32125B32205B = 424	27720: 23CD506CCD2D68C9 = 983
26376: 2A1C0F2A2119190E = 224	27048: 21EC6622025BCDB8 = 887	27728: 343E04BEC03600C9 = 755
26384: 2C0D19181E1C1916 = 211	27056: 69110907CDA765C9 = 812	27736: 2346234E23CB7EC9 = 783
26392: 2A150F231D27251B = 245	27064: AF320C5D21115D36 = 523	27744: 21675B0602C5CD58 = 725
26400: 262A1F1A29252426 = 289	27072: 3223233601237723 = 364	27752: 6CC44B6BCD586CC4 = 1083
26408: 2A0E192118292519 = 241	27080: 360123772377321D = 442	27760: 876ACD586CC4D76A = 1159
26416: 262A160F101E2925 = 241	27088: 5B21215B772B7EE6 = 766	27768: CD586CC4B26BC110 = 1091
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26472: 232A191E120F1C2A = 235	27144: 47ED5EFC921045B = 982	27824: 4B653A205BCB5728 = 684
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26632: 241310F3C1C97100 = 741	27304: 0CC8B61808053E10 = 464	27984: 1077E610F609D3FE = 1101
26640: 0055C5E5D5CD426D = 1104	27312: BB2002CBC62B2B70 = 817	27992: C971FE7ED782FE6 = 1337
26648: D1E1E5D57D2F6FCD = 1364	27320: 23233E0532005B3A = 336	28000: 1FC00A5FFFD7A7FFA = 1102
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26672: 7E32145B3A205BCB = 671	27344: C1E11E01C3246BE5 = 1016	28024: 577D000FACE6C7AC = 1015
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26720: 79E607CA4A66680F = 855	27392: CBC5E2B71233E0632 = 718	28072: 5DCD4A6D0CD06065 = 1156
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26768: 076F04C51A47131A = 461	27440: 1E58B8C0CB76C0ED = 1250	28120: 6F24221C5B8D6A6D = 720
26776: 13D558ED4B0F5B0F = 753	27448: 5B1C5B7E913CFE04 = 796	28128: 212058C9AECB56C8 = 1022
26784: 0FCB0BCB0B10F857 = 794	27456: D07A90FE10007EF6 = 1324	28136: CBEEC93A1F5BB7C8 = 1205
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26816: 20D0DCC7CA7966CD = 1230	27488: 00DA44662031CB46 = 742	28168: 32005B3A1F5B2148 = 426
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26832: 606211E2FF280104 = 551	27504: CB861808053E02B8 = 622	28184: D467C9CDF569CD9D = 1433
26840: 772D772D771910FB = 736	27512: 2002C8C6CB4E280A = 766	28192: 693A205B1F76300E = 497
26848: C921C05A36162C20 = 668	27520: 0C3E1EB92009C80E = 675	28200: AFD0FE2FE61FC2D7 = 1365
26856: FB0516CDEF68040E = 845	27528: 18050D2002C8CE2B = 528	28208: 6ECDDB651825DCD8 = 1098
26864: 00CD72651E040C0C = 478	27536: 712B7023233E0432 = 454	28216: 6CCD9A663A085BA7 = 893
26872: 16050CCD72651520 = 512	27544: 005BE5C52108633A = 715	28224: CAC76ECDBC6DCD87 = 1353
26880: F91D20F20C0C0CCD = 793	27552: 165BCD7E6ACDD467 = 1070	28232: 6DCD596D280DCD59 = 859
26888: 7265C9C5CDD467CD = 1338	27560: CDDC67C1E11E00C3 = 1171	28240: 6D20FBAFDFE2FE6 = 1317
26896: DC67C179C6074F21 = 954	27568: 1F6BE5C521E863CD = 1133	28248: 1F28FBCD416CCD25 = 939
26904: 005B34C93E043200 = 460	27576: 7B6ACDD467C1E1CB = 1370	28256: 6ACD606C3A205B1F = 727
26912: 5B010116110863CD = 444	27584: 76CBBE116400C244 = 890	28264: 38B71F30B4010A01 = 510
26920: 0B6911A863CD0B69 = 721	27592: 66CBFEE5C53A115B = 1151	28272: 1E05CD0E6821075B = 489
26928: 112B65C10B6911E8 = 728	27600: 3D7E200D3CFE8820 = 714	28280: 352064CD9166210B = 681
26936: 63CD0B69364721FD = 831	27608: 083DEB21205BCBCE = 869	28288: 5B3A065BBE38172A = 557
26944: 5ACDE067C9061070 = 957	27616: EB77E60732005B3A = 790	28296: 045B2009ED5B095B = 564
26952: 23CD4B68E60F0777 = 790	27624: 0C5B21E863CD7E6A = 904	28304: ED5219380922095B = 543
26960: 2336814FC3BA6AC9 = 985	27632: CDD467CDDC67C1E1 = 1466	28312: 320B5BCDA76621CA = 861
26968: CD4B68E6073C0777 = 807	27640: 78070707471E03C3 = 440	28320: 67010B0BCDCE6506 = 644
26976: 230E007123368247 = 452	27648: 2F6BED5B1A5B7A90 = 865	28328: 07C52168593E0890 = 647
26984: C3056BC9CD4B68E6 = 1122	27656: 30012FFE10D07B91 = 842	28336: 0609772C10FC0164 = 547
26992: 073C0777230E1E71 = 385	27664: 30012FFE10D03A20 = 664	28344: 0A1E01CD0E68C110 = 573
27000: 47233600FE0AD295 = 911	27672: 5BCBCF32205BC97E = 1001	20352: 07610FDC31E6E01 = 955
27008: 6B34C3956BCD4B68 = 994	27680: 0F0FE607C8ED5B11 = 812	28360: 05081E00CD0E6821 = 399
27016: E60FC603774723CD = 876	27688: 5BCB43C03DF50707 = 873	28368: 125B3528081808CD = 447
	27696: 5F7EE6C3B377EBDC = 1384	28376: 0D4A21125E3605CD = 525
		28384: 8B69CDB366061E76 = 929
		28392: 10FDCD8E6CC3216E = 1062

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"G.S.T."	"IRLVG"	"DKTRONICS"	"CST"	"AC COMPUTER"
"DATA VIEW"	"SARTSTONE"	"TV SERVICES"	"JRS"	"ABC ELECTRONICS"
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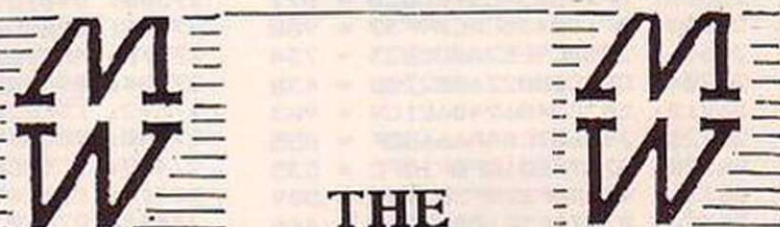
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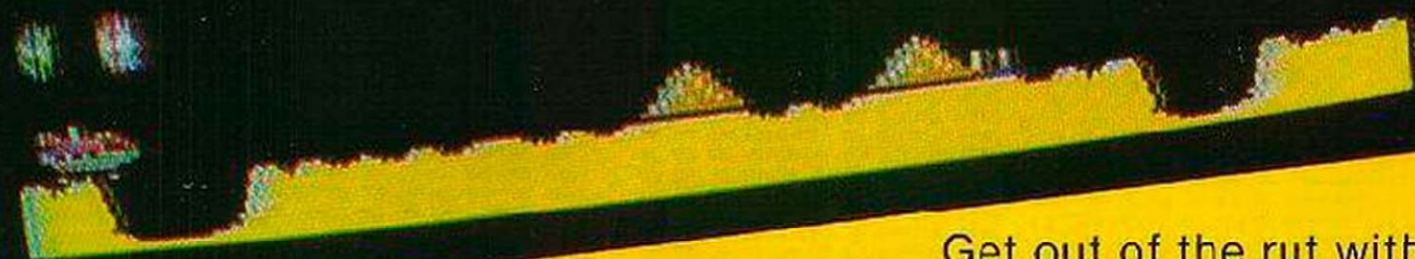
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MARS BUGGY



Get out of the rut with Vahid Azodi's machine code ride.

MARS BUGGY is a totally machine-code written game for the Commodore 64 and includes the following features:

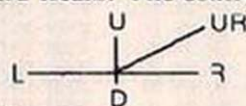
- Raster interrupt driven smooth scrolling.
- Multi coloured sprites.
- Very fast and flexible control of buggy — space ship.
- Score and high score feature.

If you have not seen the game in the arcades here is a brief description. You control a buggy which can jump and fire bullets in horizontal and vertical directions.

The game is played on a scrolling screen which scrolls from right to left you have three lives at the beginning of the game and one life is deducted every time you fall into a ditch or hit a rock or get hit by a bullet from the space ships — enemies. The object of the game is to

stay alive as long as possible.

You control your ship with a joystick only. Sorry keyboard freaks. The controls are:



- F1 Pause the game.
- F2 Restart game from the middle of another game.
- When the game is paused you restart the game by moving the joystick.
- U Makes the buggy jump upwards.
- UR Makes buggy jump up and forwards.
- R Keeps buggy steady on the screen.
- L Makes buggy go quickly to the left.

If the buggy is made to jump it will not be able to jump up again straight away so don't panic.

So always bring the joystick to the neutral

position — n — after every jump. If you don't, the buggy's wheels will lock and will not be able to jump.

Entering the game is very simple, just type in the program like a Basic game. Then remember to save it before you run it. When run the program displays the title screen and asks you to wait a while for the game to load. Be patient because it's a long wait. The instructions on the screen telling you to wait will change to — press fire to start. Put the joystick into port 2 and press the fire button and hey presto — the game starts.

If you don't want to type in the program there is a cassette available for £3.00 inc. postage and packing from: Mars Buggy, 22 Lorton House, West End Lane, London, NW6.

```

10 POKE 53280,0:POKE 53281,0:PRINT"HI"
20 PRINT"*****"
30 PRINT"*****"
40 PRINT"*****"
50 PRINT"*****"
60 PRINT"*****"
70 PRINT"*****"
80 PRINT"*****"
90 PRINT"*****PROGRAMMED BY VAHID AZODI"
100 PRINT"*****FOR"
110 PRINT"*****YOUR COMPUTER (C)1984"

2000 DATA0,00,00,14,00,00,00,00
2001 DATA0,3E,00,28,E3,30,00,22
2002 DATA0,7C,EE,81,C7,50,00,44
2003 DATA14,01,7D,00,00,00,00,00
2004 DATA28,00,00,00,00,00,00,00
2005 DATA00,00,00,00,00,00,00,00
2006 DATA00,20,00,00,00,00,00,20
2007 DATA00,00,00,00,00,00,00,00
2008 DATA00,00,00,00,00,00,04,00
2009 DATA28,55,00,00,3E,00,7C,00
2010 DATA81,C7,63,00,C0,00,01,7D
2011 DATA55,00,00,14,00,28,00,00
2012 DATA00,00,00,00,00,00,00,00
2013 DATA00,00,00,00,00,00,00,00
2014 DATA00,00,00,00,00,00,00,00
2015 DATA00,00,00,00,00,00,00,00
2016 DATA00,00,00,00,00,28,00,00
2017 DATA00,00,00,7C,28,81,C7,1F
2018 DATA00,C4,71,C1,7D,31,00,00
2019 DATA5F,40,28,30,00,00,00,00
2020 DATA00,00,00,00,00,00,00,00
2021 DATA00,00,00,00,00,00,00,00
2022 DATA00,00,00,00,00,00,00,00
2023 DATA00,00,00,00,00,00,00,00
2024 DATA00,00,00,00,00,00,FE,00
2025 DATA00,04,81,40,00,00,00,00
2026 DATA55,14,00,00,00,00,00,00
2027 DATA5F,FF,FF,17,FF,FC,0F,FF
2028 DATA00,00,00,00,00,28,00,00
2029 DATA00,00,00,00,00,00,00,00
2030 DATA00,00,00,00,00,00,00,00
2031 DATA00,00,00,00,00,00,00,00
2032 DATA00,00,00,00,00,00,00,00
2033 DATA00,00,00,00,00,00,00,00
2034 DATA00,00,00,FF,00,00,FF,00
2035 DATA00,00,00,00,00,00,00,00
2036 DATA00,00,00,00,00,00,00,00
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2039 DATA00,00,00,00,00,00,00,12
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2041 DATA00,00,C0,00,00,C0,00,00
2042 DATA00,00,00,00,00,00,00,00
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2047 DATA00,00,00,00,00,00,00,00
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2049 DATA00,00,00,00,00,00,00,01
2050 DATA42,00,00,24,00,00,18,00
2051 DATA00,00,00,00,7E,00,03,FF
2052 DATA00,1F,FF,00,7E,00,0E,7E
2053 DATA1B,6E,1F,FF,00,03,FF,00
2054 DATA00,7F,00,00,00,00,00,01
2055 DATA00,01,00,C0,07,00,70,10
2056 DATA00,FF,00,FF,00,FF,00,FF
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2067 DATA00,00,00,01,24,00,00,00
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2070 DATA00,00,00,00,00,00,00,00
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2072 DATA00,00,00,01,00,00,00,00
2073 DATA00,10,00,00,00,00,10,00
  
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(continued on next page)

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2076 DATA00 00 00 00 00 00 30 00
2077 DATA00 00 40 00 02 10 30 00
2078 DATA00 00 10 10 00 00 30 00
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2082 DATA00 00 31 00 00 31 17 00
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2107 DATA29 72 FF 09 00 A2 18 9D
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2324 DATA00 3A 4E 09 49 4E 43 29
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(continued on page 71)

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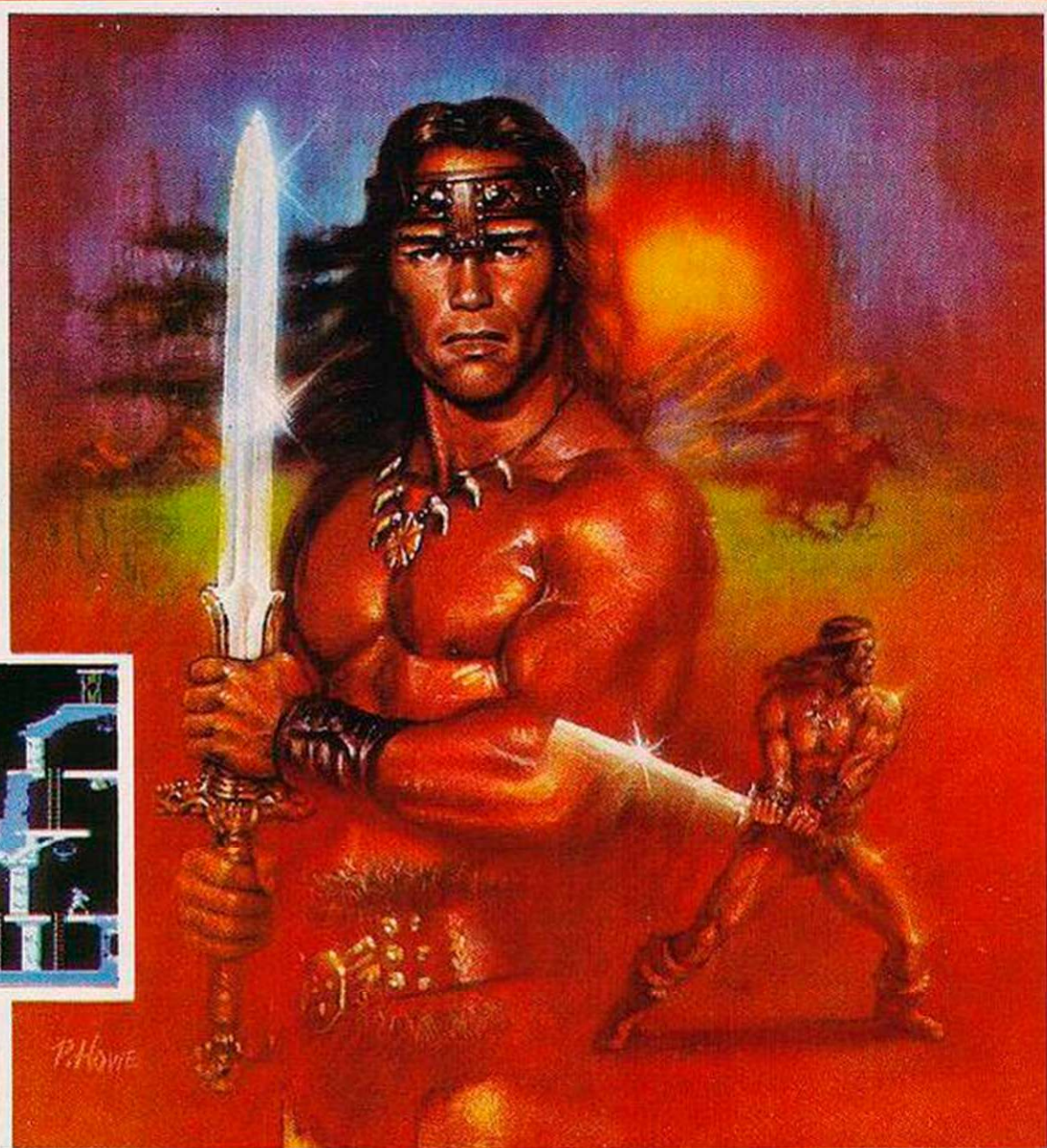
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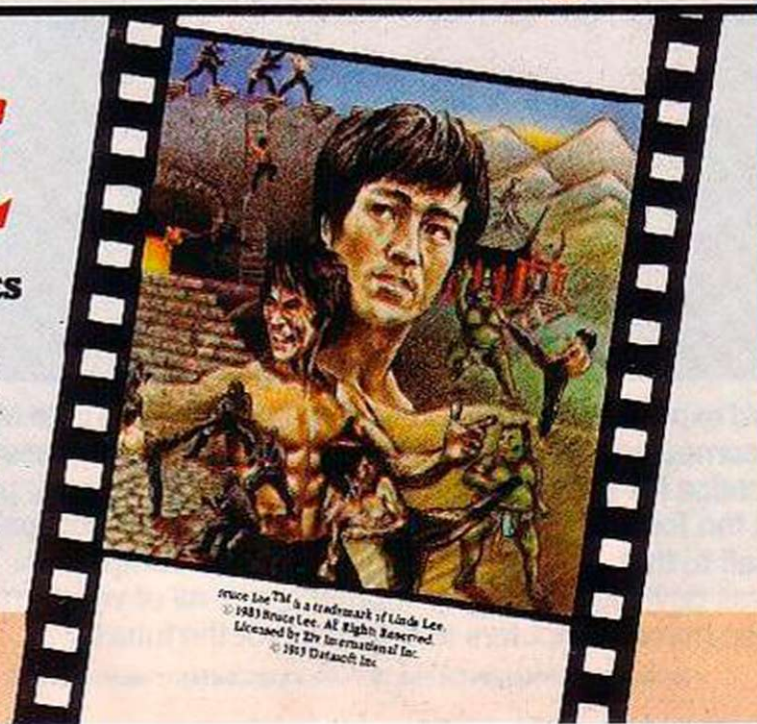
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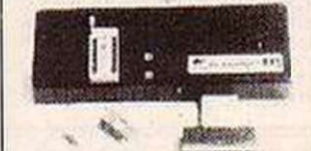
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JOB LENGTH — 4000
TASK — CHECK

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R) READ THE CONTENTS OF EPROM INTO RAM
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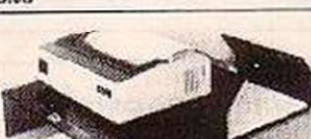
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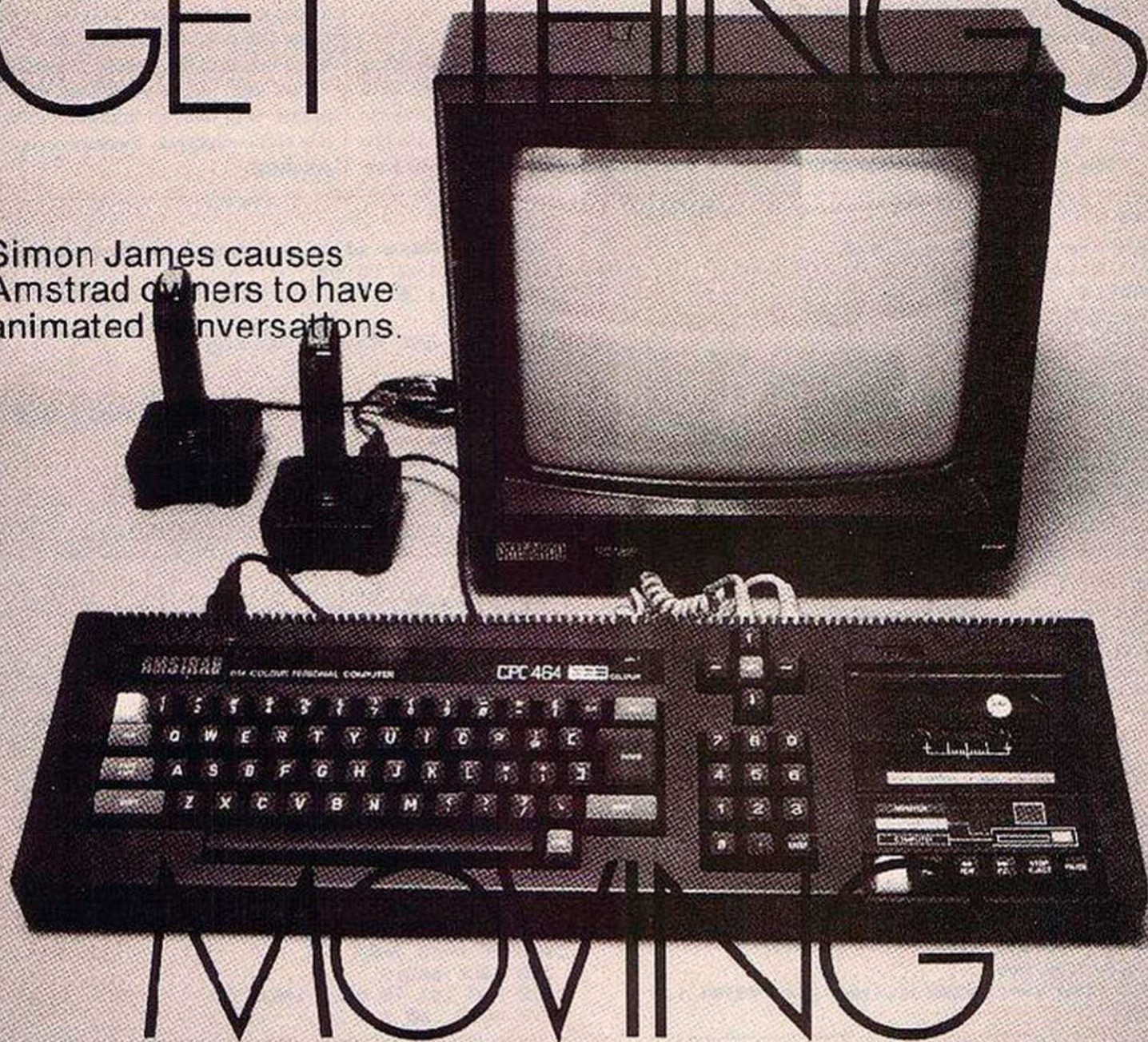
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GET THINGS

Simon James causes Amstrad owners to have animated conversations.



MOVING

AN INTERESTING and very useful feature of the new Amstrad computer, is its Ink command. This enables you to redefine the colours available in any mode to those which suit you. The User Guide explains it by reference to pens and ink. For instance, in mode 0 there are 16 colours available, from a palette of 27 colours. This is like having 16 pens and 27 ink pots available and the ink in any pen can be changed. It is something like VDU 19 command on the BBC micro. As an example type in:

```
Reset (Press 'Ctrl' and 'Shift' and then  
'Esc', holding all three down) INK 1,9  
(Enter)
```

You will see that all the writing on the screen has changed colour — or shade if you have a green monitor. This is because when you switch on or Reset the computer, pen 1 is being used, and is set to colour 24, bright yellow. The above Ink command told the computer to change the ink in pen 1 to number nine, green. Try other numbers, for instance,

```
INK 1,15 (changes the ink in pen 1 to
```

```
orange) until you get the hang of it.
```

This command can be used to produce animation — movement — on the screen. It is done by redefining all the available colours to the background colour, and making one colour at a time visible. Type in listing 1 and run it. You will see at the start, the screen being filled up with multi-coloured vertical lines. Then most of them disappear, and a few start to move across the screen.

In actual fact, nothing is really moving. What happens is that lines are drawn using the 16 different pens. These pens are defined as various colours after a Reset or switch on. You can see what these colours are by reference to pages F3.2 and F3.4 in the manual. The program then changes the ink in all of these pens to black — the background colour — so the lines appear invisible. Then each pen in turn is filled with bright white, and the effect of movement is achieved.

Program 2 is the part of the program that actually changes the colours. Study carefully how it works and then type it in and save it. It

can then be merged — see Ch.8 page 27 — into any programs you write which use this technique.

Program 3 shows the spectacular effects that can be produced by this usage of the Ink command. 15 circles are drawn — using Sin and Cos, see page F2.13 — using different pens, and each one illuminated in turn.

This method can also be a lot faster than other ways of animating, because all that is required is a few lines of Basic, and several objects at once can move, whereas other methods would have to deal with each in turn — and would therefore be slower. Program 4 is a good example of this. Pens 2 to 15 are used for the movement, pen 0 being the background colour, and pen 1 the pen used for the writing, and the boxes. If pen 1 was used in the animation sequence, the boxes would flash on and off. Note that this effect could be quite useful, but was unnecessary in this program.

Another point to note is that in programs 1, 3 and 4, if you break, using (Esc) (Esc), and Run them again, the initialisation sequence

(continued on next page)

(continued from previous page)

where the multicoloured lines are drawn, will be invisible since all the pens have been filled with black ink, and are being written onto black paper. So do not assume something has gone wrong with the program, if nothing happens for a few minutes. This is most noticeable in program 3 with the circles, in which the circles take a while to draw.

In programs 3 and 4 I have included a delay loop which can be altered by changing the variable 'delay' defined at the beginning of the programs. If you remove the loop altogether,

you will get some idea of the speed that can be achieved by this method. And don't forget that no matter how many moving objects you had on the screen, the speed would be the same!

Another thing that was put into the programs was:-

CALL &BD'9

This is a call to the machine operating system which makes the computer pause until the next frame, — i.e. until a full sweep of the screen is finished by the mechanism inside the monitor. Each frame takes about 1/50 of a se-

cond, so this does not slow down the program noticeably, but prevents some strange effects taking place. As an example of what can happen without this instruction, remove line 205 from Program 1, by typing:

205(Enter)

and run the program. You will see that sometimes there are two vertical lines close to each other crossing the screen, sometimes just one.

You can now try writing your own programs — if you feel confident enough! — using this technique, because it has enormous potential. ■

Program 1.

```
10 REM *** PROGRAM ONE ***
15 REM Initialise
20 MODE 0
30 INK 0,0
40 PAPER 0
50 col=1
55 REM Draw multicoloured lines
60 FOR x=10 TO 639 STEP 10
70 MOVE x,5
80 DRAW x,395,col
90 col=(col+1) MOD 16
110 IF col=0 THEN col=1
```

```
120 NEXT
125 REM Make all the pens black except pen 1
130 FOR i=2 TO 15
140 INK i,0
150 NEXT
155 REM Get things moving
160 x=1
170 INK x,26
180 IF x=1 THEN INK 15,0 ELSE INK x-1,0
190 x=x+1
200 IF x=16 THEN x=1
205 CALL &BD19
210 GOTO 170
```

Program 2.

```
3000 REM ROUTINE TO SWAP COLOURS
3001 REM Use for merging into your own programs
3002 FOR i=2 TO 15
3003 INK i,0
3004 NEXT
```

```
3005 x=1
3006 INK x,26
3007 IF x=1 THEN INK 15,0 ELSE INK x-1,0
3008 x=x+1
3009 IF x=16 THEN x=1
3010 CALL &BD19
3011 GOTO 3005
```

Program 3.

```
10 REM *** PROGRAM THREE ***
20 MODE 0
30 delay=20
40 INK 0,0
50 DEG
60 FOR i=1 TO 15
70 FOR j=1 TO 360 STEP 1
80 ORIGIN 320,200
90 PLOT (180-12*i)*COS(j), (180-12*i)*SIN(j),i
100 NEXT
```

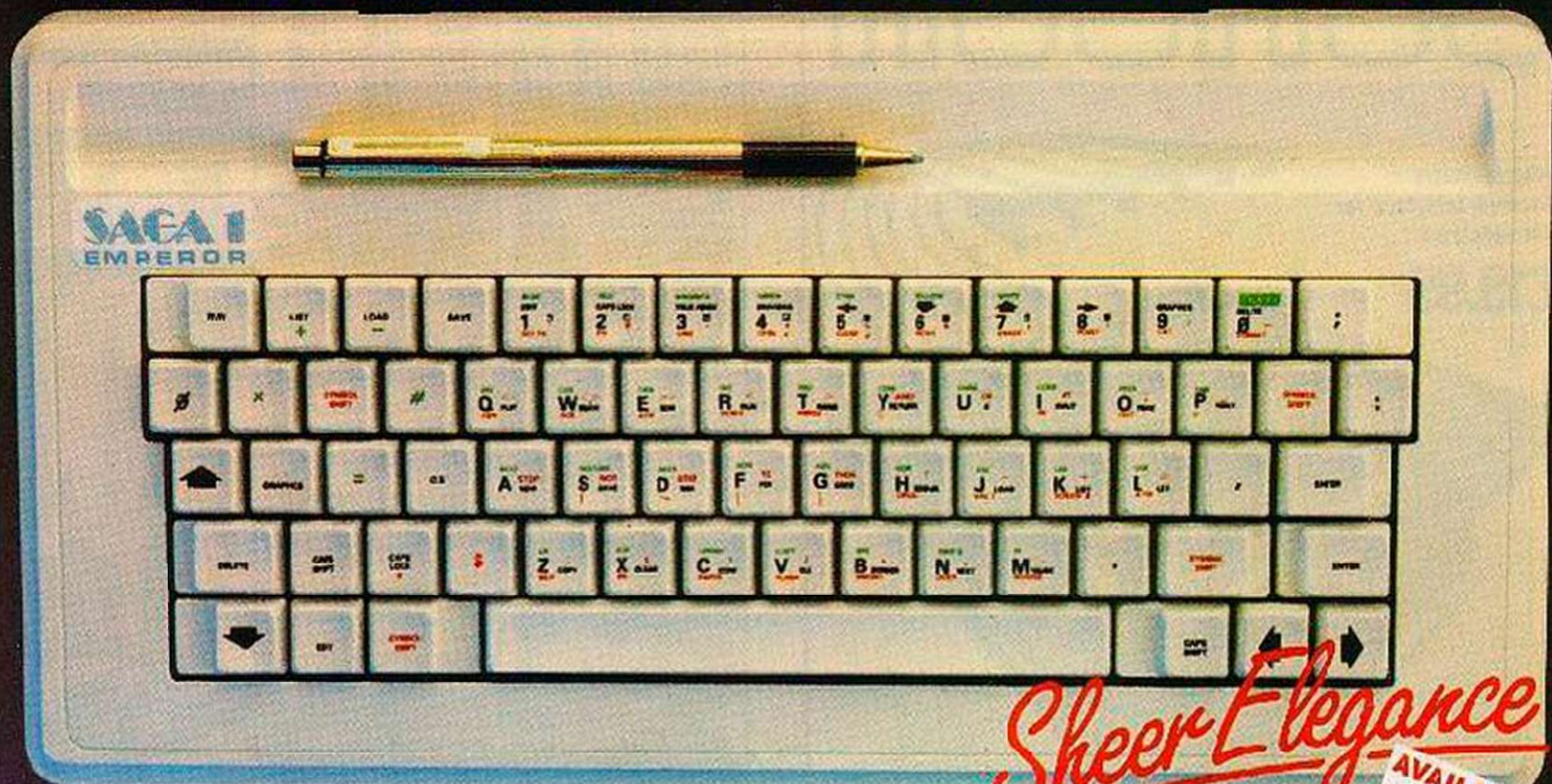
```
110 NEXT
120 FOR i=2 TO 15
130 INK i,0
140 NEXT
145 REM FIRE AWAY!
150 x=1
160 INK x,26
170 IF x=1 THEN INK 15,0 ELSE INK x-1,0
180 x=x+1
190 IF x=16 THEN x=1
200 CALL &BD19
210 FOR i=1 TO delay:NEXT
220 GOTO 160
```

Program 4.

```
10 REM *** PROGRAM 4 ***
20 MODE 0
30 RESTORE
40 delay=100
50 PEN 1
60 LOCATE 8,2:PRINT "BOXES"
70 FOR i=1 TO 4
80 READ x,y
90 GOSUB 290
100 NEXT
110 DATA 100,300,100,50,500,50,500,300
120 RESTORE
130 FOR a=1 TO 4
140 READ x,y
150 GOSUB 430
160 NEXT
170 FOR i=3 TO 15
180 INK i,0
190 NEXT
200 x=2
210 INK x,26
220 IF x=2 THEN INK 15,0 ELSE INK x-1,0
230 x=x+1
240 IF x=16 THEN x=2
```

```
250 CALL &BD19
260 FOR q=1 TO delay:NEXT
270 GOTO 210
280 END
290 REM SUBROUTINE TO DRAW BOXES
300 MOVE x,y
310 DRAWR 0,-50,1
320 DRAWR 65,0,1
330 DRAWR 0,50,1
340 DEG
350 MOVE x,y
360 FOR z=1 TO 360 STEP 20
370 ORIGIN x,y
380 DRAW 5*COS(z),5*SIN(z),1
390 NEXT
400 ORIGIN 0,0
410 RETURN
420 REM SUBROUTINE TO DRAW LIDS
430 DEG
440 col=2
450 FOR z=1 TO 90 STEP 6.9
460 ORIGIN x,y
470 DRAW 60*COS(z),60*SIN(z),col
480 col=col+1
490 NEXT
500 RETURN
```

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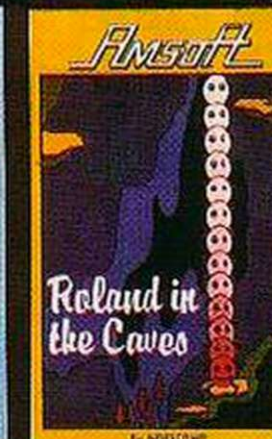
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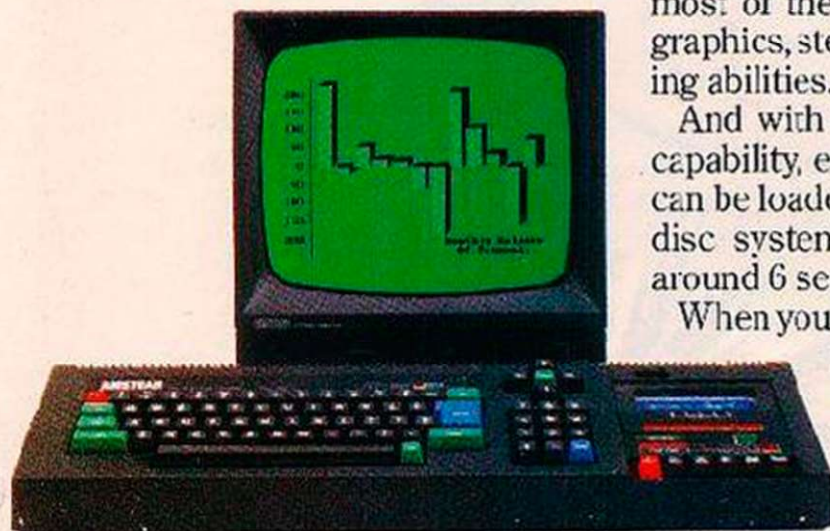
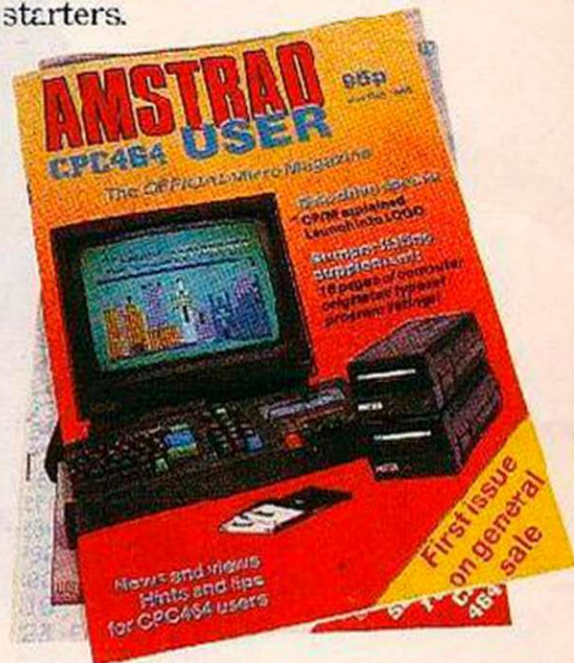
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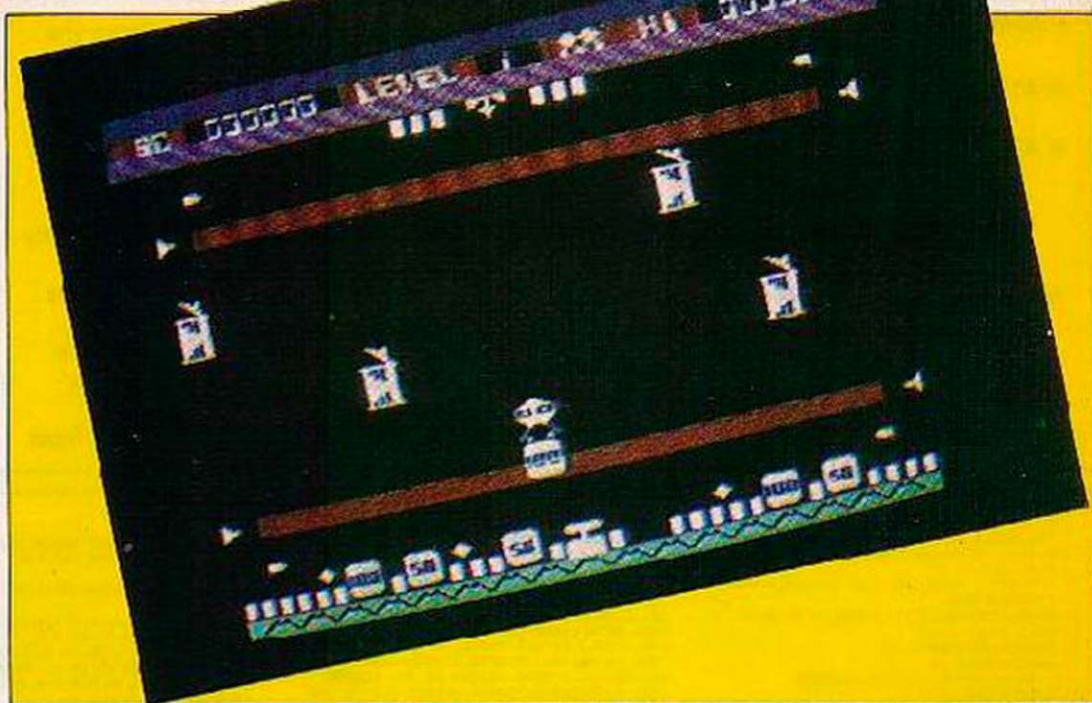
LIFE IS HARD at the spaceport, especially if you're the pilot of a balloon hopper, and especially now the spaceport has had a refit. What with the new intake of cargo and new processing techniques, it's a wonder I don't bite the spacedust more than I do.

Way back in September 1983, there was a short program published in *Your Computer* called Balloon Hopper, by Andrew Foord. This well-presented little game had lots of potential and all it needed was someone to expand and develop the game. This all machine-code version for the Oric-1, called Hero-Zero, is the result.

Anyway, the control keys are Z and X — left and right — and ' and / — up and down. Drifting from left to right are various objects ranging from dustbins to ice-creams. At the bottom of the screen are cargo boxes sitting on swampy ground — yes, I know, there's no ground in space, but remember this is only a game. Located at each side of the screen are two sets of pods or conductors. These "arc" across at regular intervals and remain on for the same amount of time as they are off.

At the centre of the top of the screen is a type of homebase. This is where Hero-Zero needs to go in order to collect the points from the cargo. In each corner of the screen are spikes which deter movement around the perimeter. In the centre of the swampy ground is a button. The idea is that you can stop the arcing of the pods by picking up a seed from the cargo area, taking it up to the homebase then pressing down the button. On levels 1 to 4 this gives 17 seconds relatively free movement and on level 5, 10 seconds and level 6, eight seconds.

Just to remind you, the idea of the game is that you control Hero-Zero around the screen picking up cargo and taking it to the top of the screen.



HERO ZERO

Hard times at the space port. Float off with Jonathan Richards.

16K Oric owners cannot use the program unless serious modifications are carried out. Even so, a 16K version is available on tape if you specify this.

The hexdumps shown consist of the data code — # 8000 to # 9050 — and the game code — # 9F00 to # AC30. To start entering in the

hex you can use the hexloader shown or alternatively, you can use what I used. This was to enter the disassembler and save it to tape, then add the following lines:

```
20000 FOR I = start TO finish
20010 PRINT HEX$(I), INPUT A:POKE A
20020 NEXT I
```

I would then Run 20000, and then start or continue typing in the hex, stopping at regular intervals to check for errors using the hexdump or disassembler.

Once the data has been typed in you can save it to tape using:

```
CSAVE"DATA" A#8000,E#9050
```

Again, once the code has been typed in you can save it to tape using:

```
CSAVE"CODE" A#9F00,E#AC30
```

If you think it's relatively bug free now, then you can start the game by typing:

```
CALL#8FF5
```

As usual, tapes are available for £3.00 which contain Hero-Zero, the disassembler and the hexloader. A leaflet is also supplied giving details of the Oric Rom routines and how to use them.

Make cheques or postal orders payable to Jonathan Richards, and send them to Prosoft, 12 Mendip Close, Great Sutton, South Wirral, Cheshire L66 4SE.

Table 1. Zero Page Variables.

Note: All values are given in hexadecimal

67 — HZ Horiz Counter.
68 — HZ Vert Counter.
69 — No of aliens on screen (NOAS).
6A — NOAS Replica.
6B — Toggle Location.
6C — Cargo Screen add. LSB.
6D — Cargo Screen add. MSB.
6E — Cargo Data add. LSB.
6F — Cargo Data add. MSB.

70 — Aline one screen add. LSB.
71 — Alien one screen add. MSB.
72 — Alien two screen add. LSB.
73 — Alien two screen add. MSB.
74 — Alien three screen add. LSB.
75 — Alien three screen add. MSB.
76 — Alien four screen add. LSB.
77 — Alien four screen add. MSB.
7E — Alien Data add. LSB.
7F — Alien Data add. MSB.
80 — HZ Screen add. LSB.
81 — HZ Screen add. MSB.

Table 2. Hero-Zero data breakdown.

Address Range	Description	Bytes	Address Range	Description	Bytes
# 8000-# 8438	Titlescreen	1080	# 8CB2-# 8E08	Icecream chars	47
# 8440-# 8878	Gamescreen	1080	# 8CE1-# 8D10	Cup chars	47
# 8900-# 8BF0	Character set	752	# 8D11-# 8D61	Level 1 Cargo	80
# 8BF1-# 8C20	Dustbin chars	47	# 8D62-# 8DB2	Level 2 Cargo	80
# 8C21-# 8C50	Tardis chars	47	# 8DB3-# 8E03	Level 3 Cargo	80
# 8C52-# 8C81	Clock chars	47	# 8E04-# 8E54	Level 4 Cargo	80
# 8C82-# 8CB1	Balloon chars	47	# 8E55-# 8EA5	Level 5 Cargo	80
			# 8EA6-# 8EF6	Level 6 Cargo	80

```
1 REM *** HEXLOADER ***
2 REM (C) PROSOFT 1984
3 REM
4 REM USE ' / ' TO DECREMENT ADD
5 REM USE ' Z ' TO END
6 REM
10 CLS:PAPER#:INK7
15 GOSUB1000
20 PRINT:PRINT"      HEX-LOADER"
25 PRINT:PRINT:INPUT" ENTER START ADDRESS
S " :S:IFS(BORS) #FFFF THEN GOTO10
40 PRINT:INPUT" AND THE END ADDRESS " :I
E:IFE(SORE) #FFFF THEN PRINTCHR$(7) :GOTO40
45 CLR:PRINT:PRINT"START - " :HEX$(S)
46 PRINT:END - " :HEX$(E) :PRINT:PRINT
47 DOKE621,48162:POKE623,23:CLS
50 FORX=STOE
60 PRINTHEX$(X) : " " :INPUTHX#
70 DTA=0
75 IFHX#="" THEN ENX=X
76 IFHX#="" THEN PRINT:PRINT:PRINT"COMPLE
TE" :DOKE621,48000:POKE623,27:END
80 IFLNCH(4) > 2 THEN GOTO60
100 L#-LEFT$(HX,1) :R#-RIGHT$(HX,1)
110 FORJ=8TD15
111 B#=#(J)
115 IFB#<L THEN DTA=DTA+16+J
120 IFB#<R THEN DTA=DTA+1
130 NEXTJ
140 POKEX,DTA:NEXTX
150 DOKE621,48000:POKE623,27:END
1000 DIMA#(15)
1010 FORN=2TOS:AS(N)=RIGHT$(STR$(N),1):N
EXT
1020 FORN=10T015:AS(N)=CHR$(N+55):NEX
T
1030 RETURN
```

Table 3.

8FF5-Startup — Loads the character set and the titlescreen. Waits for space bar to be pressed and starts initialisation, then jumps to main routine loop.
9F00-Mainloop — Calls service routines and monitors timing for aliens and arcs.
9FE1-Movement — Detects key press and moves HZ around the screen.

(Table 3 continued on next page)

(Table 3 continued from previous page)

- Uses # 208 for reading keyboard.
A15E-Pickup - Checks to pickup something and prints it below HZ.
A25F-Movealien - Prints four aliens in 2 by 3 format at various positions around the screen.
Collects data for characters from HZ buffer - # BFE0 - # BFFF.
A450-Window - Checks for HZ moving off the screen in the four directions. Copes for HZ with cargo.
A600-Printarc - Prints arcs onto the screen.

- # A60D-Wipearc - Wipes arc from the screen.
A640-Setup - Initialisation routine that puts HZ variables and characters into memory locations.
A723-Arckill - Checks when HZ crosses the arc boundary.
A742-Inc50 - Increments the score by 50.
A752-Inc100 - Increments the score by 100.
A762-Plus1 - Increments the score variables by 1 in BCD. Used by Inc50 and Inc100.
A77EE-PrintSC - Converts score from

- BCD to ASCII code and prints this to the screen.
A7C4-Compare - Determines whether current score is higher than the high score.
A804-PrintHI - Prints high score onto the screen and uses the same techniques as PrintSC but for a different part of the screen.
A8CA-Dwnlchr\$ - Down loads the new character set.
A8E6-Dwnldtitle - Down loads the title screen.
A902-Dwnldgme - Down loads the game screen.

Assembly code listing for the game, including instructions like CALL, MOV, and PRINT, along with comments and labels.

Hex dump. Game data.

Table with 10 columns of hex data. Each row contains a sequence of 10 hexadecimal values, representing game data.

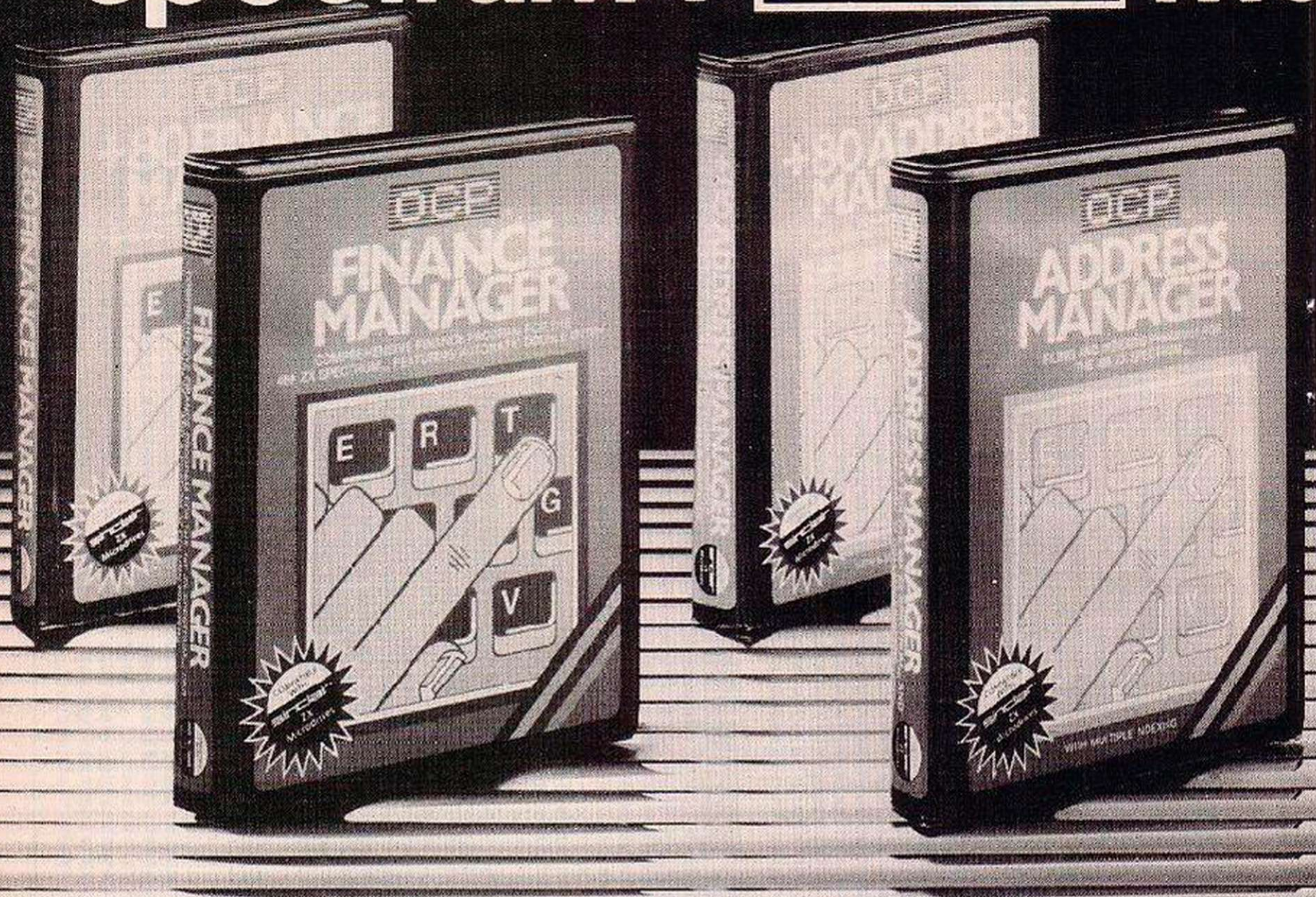
(continued on next page)

(continued from previous page)

Table with 10 columns of alphanumeric characters (e.g., H470S, H470T, H470U, etc.) and corresponding numerical values (e.g., 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92).

Main code.

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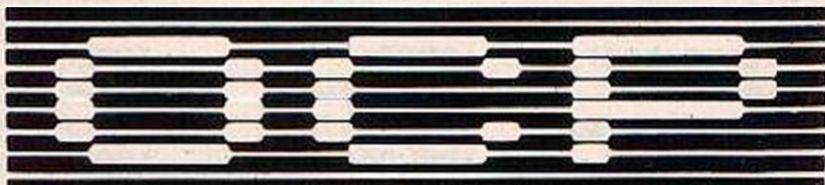
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DEATH CHASE STARTED as a straightforward conversion attempt on a Spectrum program published by *Your Computer* some time ago. In the process some of the internal workings of the Amstrad were revealed and the result is a playable and colourful game. This article gives the finished program and also details of screen display configuration and how to add extra commands to your Basic — lateral scrolling, enlarged printing and screen character reading.

In converting Spectrum Cross to Amstrad Death Race there were three fundamental problems to be faced. First the different size of the text screen, second the way the screen start moves around in memory, and third the way colour is mapped.

The Amstrad has three screen modes. Mode 2 is the high definition, two colour mode.

Mode 1 is medium resolution with 40 columns of text in four colours. Mode 0 is the multi-colour mode with 20 column text. I decided to reduce the number of cars and lorries on the road to enable me to make the most of the colours.

Although the number of columns would be less than the Spectrum's, the number of lines available was more — 25 instead of 22. Since a double height printing routine has long been one of my favourites, the answer was obvious.

The screen display occupies the area of memory from hex &c000 up and is composed of 25 lines each with eight rows of 80 bytes. Some arithmetic tells you that there is a little memory left over at the end of the screen.

This fact, coupled with hardware scrolling of the screen when for example listing a program, means that the byte with address &c000

may not in fact be expected top left-hand corner. It could be anywhere, even off the screen altogether. However, after a mode change the screen is reset so that solves many of the problems.

Now supposing the top left hand corner is &c000 then we might expect the byte underneath to be &c050, but as on the Spectrum that is the top byte of the second line — pixel row nine. Thinking again and given that 25 lines times 80 bytes = &7d0 we might expect that second byte down to be &c7d0. In fact it is &c800. This tidy figure is arrived at by simply tagging roughly half a line on after the bottom of the screen.

Colour mapping is at its simplest in Mode 2. Here the eight pixel width of a character is matched by the eight bits in one byte. Hence 80 characters per line means 80 bytes across

```

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980 .....
990 .....

```

```

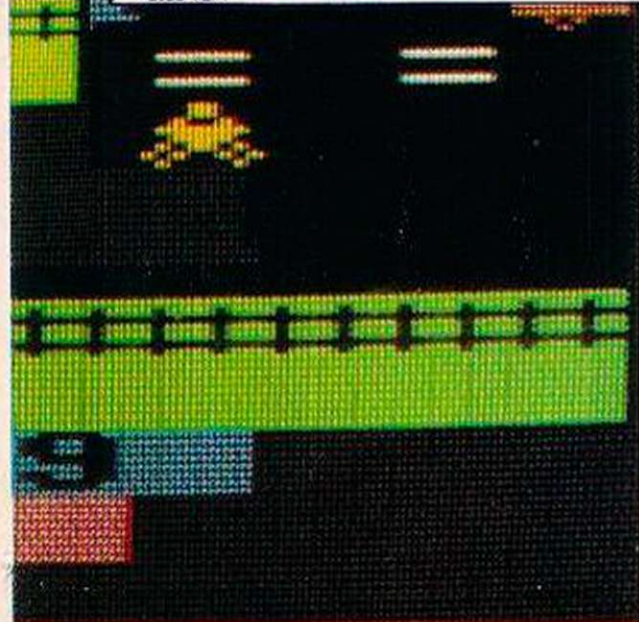
2090 IF home>16 THEN home:=home+2
2100 score:=score+5
2110 GOTO 210
2200 REM *****
2300 RESTORE 2000
2400 DATA 255,1,255,1,198,0,255,05,198,05,255,05
2500 FOR n=1 TO 10000: A:=RND(10000): G
2600 NEXT
2700 REM *****
2800 REM *****
2900 RESTORE 2000
3000 NEXT
3100 DATA 69,54,62,61,50,51,52,44,75,45,57,56,38,46,34
3200,27,67,58,68,51,42
3300 RESTORE 2000
3400 FOR n=1 TO 2: REPEAT: A:=KEY: DEF A,1,56
3500 NEXT
3600 REM *****
3700 REM *****
3800 INK 2,15:INK 7,7:INK 6,11:INK 7,4:INK 8,15:INK 5,1
3900 INK 12,19:INK 13,9:INK 11,5
4000 MOVE: A:=KEY: A:=A+80
4100 PAPER 5:PRINT "***** AMSTRAD DEATH RACE *****"
4200 LOCATE 1,4:PAPER 1:PRINT 5
4300 PAPER 1:PRINT "YZ" :PRINT "YZ"
4400 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
4500 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
4600 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
4700 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
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5900 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6000 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6100 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6200 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6300 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6400 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6500 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
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6700 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6800 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
6900 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7000 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7100 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7200 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7300 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7400 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7500 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7600 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7700 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7800 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
7900 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8000 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8100 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8200 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8300 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8400 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
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8700 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8800 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
8900 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9000 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9100 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9200 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9300 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9400 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9500 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9600 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9700 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9800 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"
9900 LOCATE 1,4:PRINT "YZ" :PRINT "YZ"

```

```

'across a road and river, avoiding'
6040 PEN 2:PRINT "HI INK 0:XYZ IN"
6050 PEN 1:PRINT "A" :PEN 2:PRINT "VA":PEN 1:PRINT
6060 PRINT:PRINT " patrol the central island."
6070 PRINT:PRINT "There are four HOMES to be filled, i
6080 e. caps in top fence."
6090 PEN 2:PRINT "HI LI"
6100 PEN 1:PRINT:PRINT "Once all 4 HOMES are filled th
6110 e speed will increase, an extra "
6120 PEN 2:PRINT "VM":PEN 1:PRINT "will be added and t
6130 he HOMES will empty."
6140 PRINT:PRINT "Use the cursor keys, but not jack!"
6150 PRINT:PRINT "Press any key to continue."
6160 IF INKEY="" THEN B120
6170 IF INKEY="" THEN B120
6180 IF INKEY="" THEN B120
6190 RETURN
6200 REM *****
6300 SYMBOL 220,12,10,54,127,233,233,46,10
6400 SYMBOL 221,120,64,32,254,254,255,40,16
6500 SYMBOL 222,1,2,4,127,127,255,20,8
6600 SYMBOL 223,240,72,60,254,255,255,20,8
6700 SYMBOL 224,127,127,127,127,127,255,21,8
6800 SYMBOL 225,254,254,254,254,255,255,44,120
6900 SYMBOL 226,0,240,196,196,254,254,40,16
7000 SYMBOL 227,24,24,36,126,68,98,165,66
7100 SYMBOL 228,50,40,146,124,56,50,40,100
7200 SYMBOL 229,0,31,35,32,127,127,20,8
7300 SYMBOL 230,127,127,127,127,127,255,21,8
7400 SYMBOL 231,254,254,254,254,255,166,16
7500 SYMBOL 232,10,41,199,0,50,0,0,8
7600 SYMBOL 233,0,60,255,60,60,255,60,8
7700 SYMBOL 234,0,54,49,143,151,167,168,0
7800 SYMBOL 235,0,60,70,141,233,197,5,0
7900 SYMBOL 236,15,16,16,254,65,51,15,"
8000 SYMBOL 237,0,0,0,0,79,255,255,255
8100 SYMBOL 238,0,124,84,120,127,255,254,252
8200 SYMBOL 239,0,0,3,2,15,65,255,8
8300 SYMBOL 240,6,12,52,248,224,85,255,0
8400 SYMBOL 241,15,16,16,254,65,51,15,"
8500 RETURN
8600 REM *****
8700 SYMBOL AFTER 32:MEMORY 163FF
8800 INK 0,8:INK 1,15:25:SPEED INK 30,30:FOOD 0
8900 LOCATE 1,3:PRINT "PLEASE WAIT A MOMENT"
9000 RESTORE 1000
9100 FOR n=5000 TO 5040
9200 READ A:POKE n,VAL "5"+A
9300 NEXT:COL 1:400
9400 REM *****
9500 DATA 01,00,04,21,00,04,0d,01,0c,c9,00,00,00,00,1
9600,04,c3,47,04,c3,70,04,c3,9c,04,c3,bd,04,c3,49,4e,d
9700,4,c,53,43,52,4f,1c,cc,52,53,43,52,4f,4c,cc,43,4b,d2,0
9800,0
9900 DATA 0c,00,00,0d,23,0c,23,20,26,00,21,29,27,27,c
0000,5,d1,29,29,15,c7
0100 DATA cc,55,54,11,00,0b,19,0b,21,30,00,19,0b,0,0
0200,25,06,04,c2
0300 DATA 00,02,06,06,06,05,05,0e,12,23,3,18,1a
0400 DATA 41,7e,4e,00,57,0e,00,00,00
0500 DATA 7e,06,00,07,01,10,05,01,06,20,0e,c9
0600 DATA 0c,0d,33,04,11,00,0d,19,00,00,c5,05,d1,25,0
0700,1,4f,00,1a,0c,00,12,01,50,00,09,01,10,0e,11,3d,20,0b,c
0800,9
0900 DATA 0c,0d,33,04,11,4f,0d,19,00,00,c5,05,d1,25,0
1000,1,4f,00,1a,0c,00,12,01,50,00,09,01,10,0e,11,3d,20,0b,c
1100,9
1200 DATA 0c,0d,33,04,11,4f,0d,19,00,00,c5,05,d1,25,0
1300,1,4f,00,1a,0c,00,12,01,50,00,09,01,10,0e,11,3d,20,0b,c
1400,9
1500 REM *****
1600 SPEED WHITE 1:SAVE "death race"
1700 SPEED WHITE 0:SAVE "death race"
1800 PRINT "***** end of game *****"
1900 END

```



DEATH RACE

C J Leigh with a very colourful version of Frogger for the Amstrad.

the screen. Each bit reset is paper colour — usually pen 0 — and each bit set is usually pen 1.

In Mode 1 things are more difficult since the character width covers two display bytes with each pixel pen being represented by the state of two bits, so giving the four colours available. These bits are not consecutive but the byte is split in two with the most significant bit of each half representing the leftmost pixel of the byte.

In Mode 0 the same general idea is followed. The character width covers four bytes, each byte representing two pixels. The byte is split into four with the most significant bit of each quarter representing the left hand pixel of the pair. Each of the quarters contributes a bit to a 4 bit number with the bits weighted 1,4,2,8 indicating the pen number used.

Extensions to Amstrad Basic can be made very easily by setting up a name table and jump table as in listing 1 along with a four byte buffer and the log on routine at &400. Each command must be preceded by a bar character available on the @ key.

The scrolling routines are straightforward whilst the double height printing routine is used after the Rom has printed to the screen. The machine code reads the bytes of colour off the screen and doubles them up. Screen character reading is done using a Rom system call.

Using machine code in this way is very attractive and is made even easier since it is possible to pass parameters from Basic to your own code and back again. These parameters are pointed to by the IX register pair with the number of parameters given in the A register.

In fact, the IX pair point to the low byte of the last parameter passed and is the base address of a parameter buffer set up for you by the system. If there is only one parameter it is available in the DE register pair and if the parameter is an integer variable preceded by @ then it is the address of the variable that is passed to the machine code. That allows values to be transferred back to Basic.

The graphics characters in the program listing may be entered most easily by entering and running the short routine at line 6000 first. This copies the Spectrum system of making the keyboard produce the appropriate graphic character when Control is pressed with one of the keys A to U.

The routine at 6040 returns the keys to normal if required. Follow the guidance of the (continued on page 91)



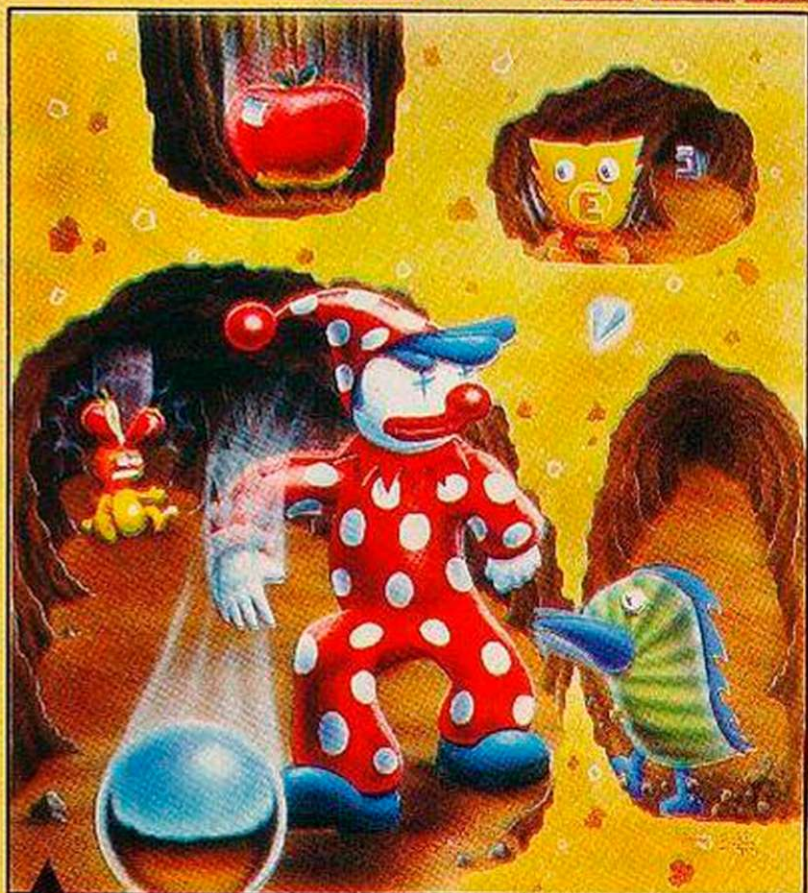
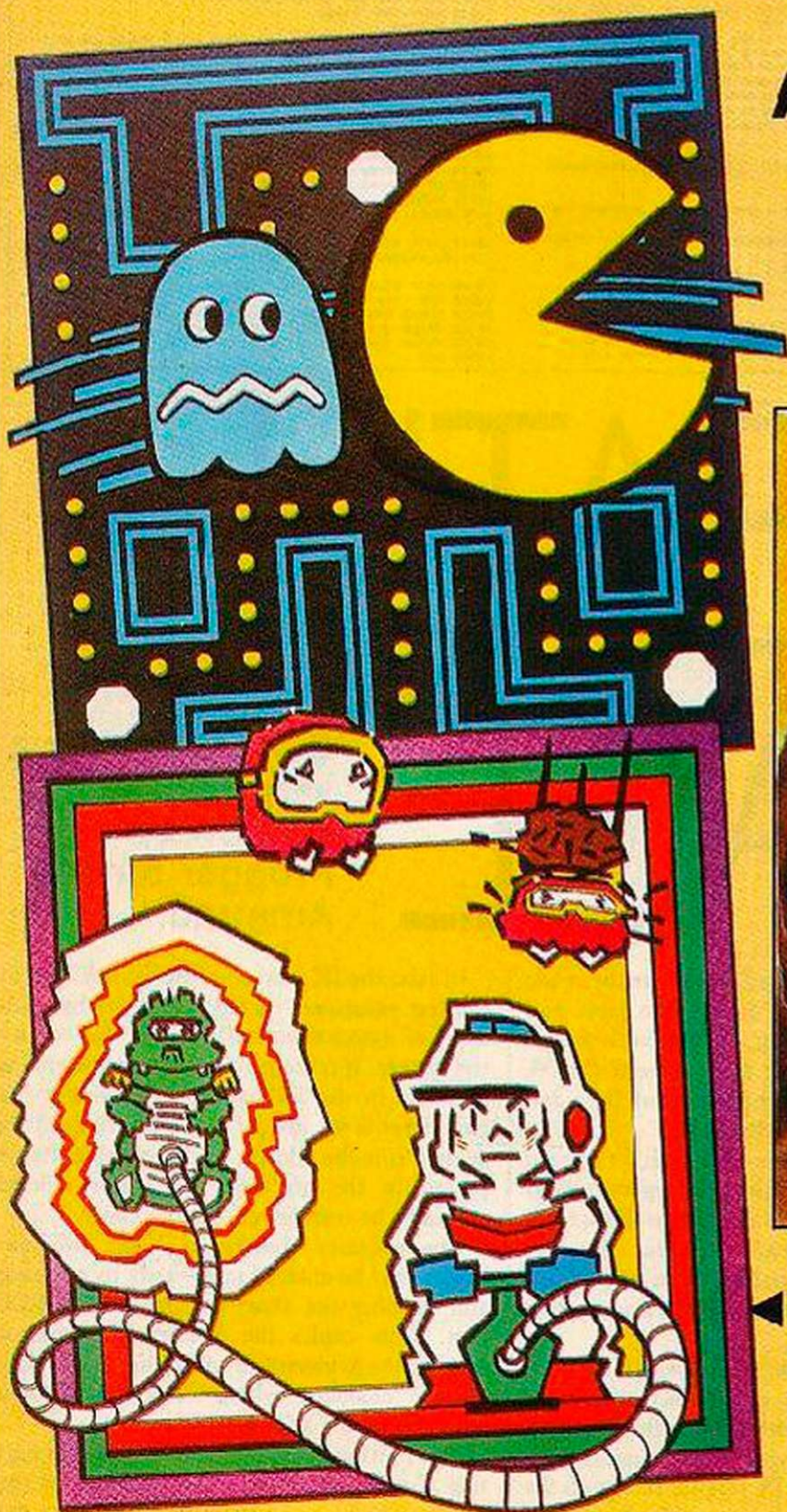
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(continued from page 89)

Rem statements when typing in the graphics. In addition you may find it easier to enter the machine code if you first enter Key 138," to change the decimal point on the numeric pad to a comma.

Finally, since the user graphics do not allow you to make the most of the Amstrad's colour,

three different ways of going this have been introduced in the screen construction routine. They may be omitted if preferred since they slow down the screen printing.

To slow down the game increase the value of the pause used at the end of the main loop — set at line 160 — or to make it much easier remove some of the traffic. Every time you ge:

four men home you will find extra spiders added and the speed will increase.

You can avoid the chore of typing in the program by sending £3 with your name and address to Death Race, 12 The Bassetts, Cashes Green, Stroud, Gloucestershire GL5 4SJ. Please make cheques payable to C J Leigh.

Listing 1.

```
ORIGIN A400H
0103A4 INITIAL LD BC,COMTAB
210A04 LD HL,BUFFER
CDD1BC CALL BCD10 ; tell the system
C9 RET
00000000BUFFER DEFS 4 ; system work space
1CA4 COMTAB DEFW NMETAB ; command table
C347A4 JP PRINT
C37BA4 JP LSCROLL
C39CA4 JP RSCROLL
C3EDA4 JP CHE
505249 NMETAB DEFW PRI ; command names
4ED4 DEFW N,T+80H
4C534352 DEFW L,S,C,R
4F4CCC DEFW C,L,L+80H
52534352 DEFW E,S,C,R
4F4CCC DEFW C,L,L+80H
4348D2 DEFW C,H,R+80H
00 DEFB 0 ; end marker
DD6E00 ADDRESS LD L,(IX+0) ; calculate screen start
DD23 INC IX
DD23 INC IX
2D DEC L ; start at line zero
2600 LD H,0
29 ADE HL,HL ; multiply by two
29 ADE HL,HL
29 ADE HL,HL
29 ADE HL,HL
E5 PUSH HL
D1 POP DE
29 ADE HL,HL
29 ADE HL,HL
19 ADD HL,DE ; times eighty
C9 RET
CD33A4 PRINT CALL ADDRESS
1103F8 LD DE,F800H ; bottom of first line
19 ADE HL,DE
EB EX HL,DE ; source
215000 LD HL,50H ; move to next line
19 ADE HL,DE
EB EX HL,DE ; destination in DE
0R02 LD C,2 ; two lines
E5 HALF PUSH HL
0604 LD B,4 ; four pixel rows
C5 ROW PUSH BC
0E02 LD C,2 ; one row becomes two
0650 STRETCH LD B,50H ; length of line
E5 PUSH HL
D5 PUSH DE
7E NEXT LD A,(HL) ; read byte
12 LD (DE),A ; write byte
23 INC HL
15 INC DE
10FA DJNZ NEXT ; next character
D1 POP DE
7A LD A,D
D608 SUB B ; up a pixel line
57 LD D,A
E1 POP HL ; recover read start
0D DEC C
20ED JRNZ STRETCH ; do it again
7C LD A,H
D608 SUB B
67 LD E,A
C1 POP BC
10E3 DJNZ ROW ; next read row
E1 POP DE ; destination = source
0D DEC C
20DC JRNZ HALF ; top half
C9 RET
F5 LSCROLL PUSH AF ; save parameter count
CD33A4 CALL ADDRESS
110CC0 LD DE,C000H ; start of top line
19 ADD HL,DE ; screen address
C608 LD E,B
C5 BACK PUSH BC
E5 PUSH HL
D1 POP DE
23 INC HL ; HL to DE
014F00 LD EC,4FH ; line length less one
1A LD A,(EE) ; save first byte
EDB0 LDIE ; move line
12 LD (DE),A ; wraparound byte
01B007 LD EC,7B0H
09 ADD HL,BC ; next pixel row
C1 POP BC
10EE JRNZ BACK
F1 POP AF
3D EDC A ; reduce parameter count
20E0 JRNZ LSCROLL ; next line?
C9 RET
F5 RSCROLL PUSH AF
CD33A4 CALL ADDRESS
114FC0 LD DE,C04FH ; end of top line
19 ADD HL,DE
0608 LD E,B
C5 AGAIN PUSH BC
E5 PUSH HL
D1 POP DE
2B EDC HL ; HL to DE
014F30 LD BC,4FH
1A LD A,(DE)
E0BB LDDR
12 LD (DE),A
015038 LD BC,850H
09 ADD HL,BC
C1 POP BC
10EE DJNZ AGAIN
F1 POP AF
3D DEC A
20E0 JRNZ RSCROLL
C9 RET
D5 CHE PUSH DE ; save parameter address
CD60BB CALL BB60H ; read screen character
E1 POP HL
77 LD (HL),A ; put value in variable
C9 END RET
END A4C3H
```

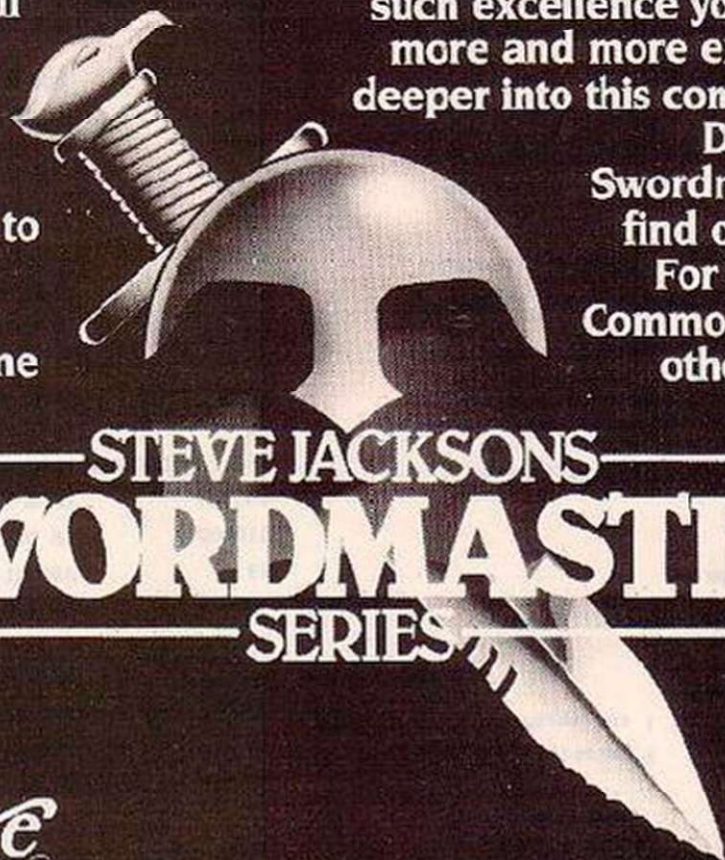
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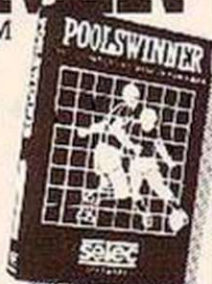
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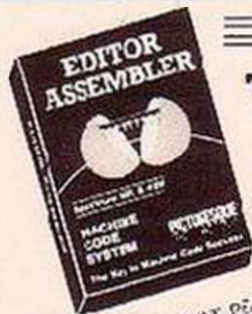


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TELSOFT



A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via Your Computer's Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2.

On the BBC you call the service by entering CALL 86A00 while Spectrum owners must type RANDOMIZEUSR 60000. So far OE Ltd's Telemod 2 and VTX 5000

modems have been tested by the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8066. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's

speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```

10 REM EBC HEX CODE LOADER
15 HEXCODE=60000
20 CLS:PRINT
30 INPUT "START ADDRESS (Hex)";A$
40 A=VAL("0"+A$)
50 IF A=6000 THEN 200
60 IF A<2000 OR A>6000 THEN 20
70 PRINT "A=";A
80 INPUT "B=";B$;C$
90 IF LEN(B$)<2 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X=B$+MID$(B$,2*N+1,1):GOSUB 300
130 IF E=1 THEN 250
140 X=C$+MID$(C$,2*N+1,1):GOSUB 300
150 IF E=1 THEN 250
160 B=EVAL("B"+MID$(B$,2*N+1,2))
170 C=EVAL("C"+MID$(C$,2*N+1,2))
180 NEXT
190 FOR M=1 TO LEN(B$)
200 X=B$+MID$(B$,M,1):GOSUB 300
210 IF E=1 THEN A=A+1:GOTO 260
220 NEXT
230 IF E=VAL("B"+C) THEN 50
240 PRINT "CHECKSUM ERROR!"
250 A=A+1:GOTO 50
260 PRINT "TYPING ERROR!"
270 A=A*(A DIV 8):GOTO 50
280 SAVE "DOWNLOADED" G000 G007
290 END
300 E=0:IF ASC(X)<48 THEN E=1:RETURN
310 IF ASC(X)>58 THEN RETURN
320 IF ASC(X)<65 THEN F=1:RETURN
330 IF ASC(X)>71 THEN E=1
340 RETURN
  
```

Figure 2. BBC.

```

5A00 :A9CB00FA20120F4,4C6
5A0E :FF20616C2048D0C,3BA
5A12 :3F00BC914F0E9C9,4CB
5A18 :35F0064C0C6A1C4,280
5A22 :6AA90C20E3FF39EE,4D2
5A2E :A000A2FF20E4FFA5,4E0
5A32 :83A20020F4FFA902,363
5A36 :A20220F4FFA920A,4C0
5A42 :FEA20020F4FFA9A,4DC
5A46 :8C20E3FF20F75BA5,439
5A52 :15A20120F4FFA900,3E9
5A56 :A9FF009985AF009A,5B7
5A62 :A915A20120F4FF20,394
5A66 :8C6C00F0200C5C00,340
5A72 :FB0000A770470B4,41a
5A76 :790470B470B57020,388
5A82 :D560A570279C0900,409
5A86 :D0E2200C6C007095,460
5A92 :7700CB20056C0005,364
5A96 :D0F0A000A5742900,422
5AA2 :0000A51C0057610A,354
5AA6 :1D65730572200C6C,209
5AB2 :000520E3FFC8200C,524
5AB6 :60C010D0F0A57320,435
5AC2 :B7A0D200C6C0000C,3CC
5AC6 :17A000A95020E3FF,478
5AD2 :20E7FF4C676A200C,34F
5AD6 :6C00CC57DF000A,48C
5AE2 :5B20E3FF2077F4C,44C
5AE6 :676A0D7300B9506F,43E
5AF2 :D00E20E7FFA90B20,3B0
5AF6 :E3FF4CB36A4C676F,469
5B02 :A000A7A8A7B200C,2C9
5C2E :496CC6BF000238A0,374
5C32 :A50A000200062075,367
5C36 :6E00C60A91A201,447
5C42 :20F4FF98A47E300F,55C
5C46 :600A02D2CA0E0A00,59A
5C52 :F000A98000047EAE,458
5C56 :2049C00000AA47E,449
5C62 :60A980A000A2FF20,452
5C66 :F3FF000050A090C,460
5C72 :20E3FF20006DA984,3E4
5C76 :20006DA980002A5,2F0
5C82 :A0F00000020F06C,39C
5C86 :1F760A471C000B905,305
5C92 :42F011C973F0174C,3A2
5C96 :676A0D7300B9506F,43E
5CA2 :FF4CB36A4C676A20,34F
5CA6 :20F4FF4C676A200C,34F
5CB2 :A020A20E4FF60A5,4CE
5CB6 :7C20E3FFA47620A0,460
5CC2 :60A980A000A2FF20,452
5CC6 :60A980A000A2FF20,452
5CD2 :F017A7616CA987A2,372
5CD6 :020F4FF4C676A200,34F
5CE2 :07A20E3FFA47620A,460
5CE6 :E0A980A000A2FF20,452
5CF2 :E0A980A000A2FF20,452
5CF6 :E0A980A000A2FF20,452
5D02 :E0A980A000A2FF20,452
5D06 :E0A980A000A2FF20,452
5D12 :E0A980A000A2FF20,452
5D16 :E0A980A000A2FF20,452
5D22 :E0A980A000A2FF20,452
5D26 :E0A980A000A2FF20,452
5D32 :E0A980A000A2FF20,452
5D36 :E0A980A000A2FF20,452
5D42 :E0A980A000A2FF20,452
5D46 :E0A980A000A2FF20,452
5D52 :E0A980A000A2FF20,452
5D56 :E0A980A000A2FF20,452
5D62 :E0A980A000A2FF20,452
5D66 :E0A980A000A2FF20,452
5D72 :E0A980A000A2FF20,452
5D76 :E0A980A000A2FF20,452
5D82 :E0A980A000A2FF20,452
5D86 :E0A980A000A2FF20,452
5D92 :E0A980A000A2FF20,452
5D96 :E0A980A000A2FF20,452
5DA2 :E0A980A000A2FF20,452
5DA6 :E0A980A000A2FF20,452
5DB2 :E0A980A000A2FF20,452
5DB6 :E0A980A000A2FF20,452
5DC2 :E0A980A000A2FF20,452
5DC6 :E0A980A000A2FF20,452
5DD2 :E0A980A000A2FF20,452
5DD6 :E0A980A000A2FF20,452
5DE2 :E0A980A000A2FF20,452
5DE6 :E0A980A000A2FF20,452
5DF2 :E0A980A000A2FF20,452
5DF6 :E0A980A000A2FF20,452
5E02 :E0A980A000A2FF20,452
5E06 :E0A980A000A2FF20,452
5E12 :E0A980A000A2FF20,452
5E16 :E0A980A000A2FF20,452
5E22 :E0A980A000A2FF20,452
5E26 :E0A980A000A2FF20,452
5E32 :E0A980A000A2FF20,452
5E36 :E0A980A000A2FF20,452
5E42 :E0A980A000A2FF20,452
5E46 :E0A980A000A2FF20,452
5E52 :E0A980A000A2FF20,452
5E56 :E0A980A000A2FF20,452
5E62 :E0A980A000A2FF20,452
5E66 :E0A980A000A2FF20,452
5E72 :E0A980A000A2FF20,452
5E76 :E0A980A000A2FF20,452
5E82 :E0A980A000A2FF20,452
5E86 :E0A980A000A2FF20,452
5E92 :E0A980A000A2FF20,452
5E96 :E0A980A000A2FF20,452
5EA2 :E0A980A000A2FF20,452
5EA6 :E0A980A000A2FF20,452
5EB2 :E0A980A000A2FF20,452
5EB6 :E0A980A000A2FF20,452
5EC2 :E0A980A000A2FF20,452
5EC6 :E0A980A000A2FF20,452
5ED2 :E0A980A000A2FF20,452
5ED6 :E0A980A000A2FF20,452
5EE2 :E0A980A000A2FF20,452
5EE6 :E0A980A000A2FF20,452
5EF2 :E0A980A000A2FF20,452
5EF6 :E0A980A000A2FF20,452
5F02 :E0A980A000A2FF20,452
5F06 :E0A980A000A2FF20,452
5F12 :E0A980A000A2FF20,452
5F16 :E0A980A000A2FF20,452
5F22 :E0A980A000A2FF20,452
5F26 :E0A980A000A2FF20,452
5F32 :E0A980A000A2FF20,452
5F36 :E0A980A000A2FF20,452
5F42 :E0A980A000A2FF20,452
5F46 :E0A980A000A2FF20,452
5F52 :E0A980A000A2FF20,452
5F56 :E0A980A000A2FF20,452
5F62 :E0A980A000A2FF20,452
5F66 :E0A980A000A2FF20,452
5F72 :E0A980A000A2FF20,452
5F76 :E0A980A000A2FF20,452
5F82 :E0A980A000A2FF20,452
5F86 :E0A980A000A2FF20,452
5F92 :E0A980A000A2FF20,452
5F96 :E0A980A000A2FF20,452
5FA2 :E0A980A000A2FF20,452
5FA6 :E0A980A000A2FF20,452
5FB2 :E0A980A000A2FF20,452
5FB6 :E0A980A000A2FF20,452
5FC2 :E0A980A000A2FF20,452
5FC6 :E0A980A000A2FF20,452
5FD2 :E0A980A000A2FF20,452
5FD6 :E0A980A000A2FF20,452
5FE2 :E0A980A000A2FF20,452
5FE6 :E0A980A000A2FF20,452
5FF2 :E0A980A000A2FF20,452
5FF6 :E0A980A000A2FF20,452
  
```

Figure 1. Spectrum.

```

5 REM SPECTRUM 40K
10 REM Hex Code Loader
15 CLEAR 50000
20 POKE 23500,0:CLS:PRINT
30 INPUT "Star Address";A$
50 IF A=61135 THEN GO TO 200
60 IF A=60000 THEN GO TO 20
70 PRINT A;
80 INPUT "B=";B$;C$
90 IF LEN(B$)<2 THEN 50
100 LET T=256*INT(A/256)
110 FOR N=0 TO 7
120 LET X=B$+MID$(B$,2*N+1,1)
130 IF E=1 THEN 250
140 LET X=C$+MID$(C$,2*N+1,1)
150 SUB 300:LET Y=Y+16*X
150 IF E=1 THEN GO TO 260
170 POKE A,Y:LET A=A+1
180 LET C=C+Y:NEXT N:LET Y=0
190 FOR M=1 TO 3
200 FOR N=17+M TO 17+M
210 IF E=1 THEN LET A=A+1:GO TO 260
220 NEXT N
230 IF T=Y THEN PRINT "B";B$:GO TO 50
240 PRINT "CHECKSUM ERROR"
250 LET A=A+1:GO TO 50
260 PRINT "Typing Error"
270 LET A=A*(A DIV 8):GO TO 50
280 SAVE "DOWNLOADED" CODE 60000,1136
290 POKE 23500,0:STOP
300 LET E=0:LET X=CODE X$-48+*(X$>"9")
310 IF X=0 OR X>15 THEN LET E=1
320 RETURN
  
```

Figure 2. Spectrum.

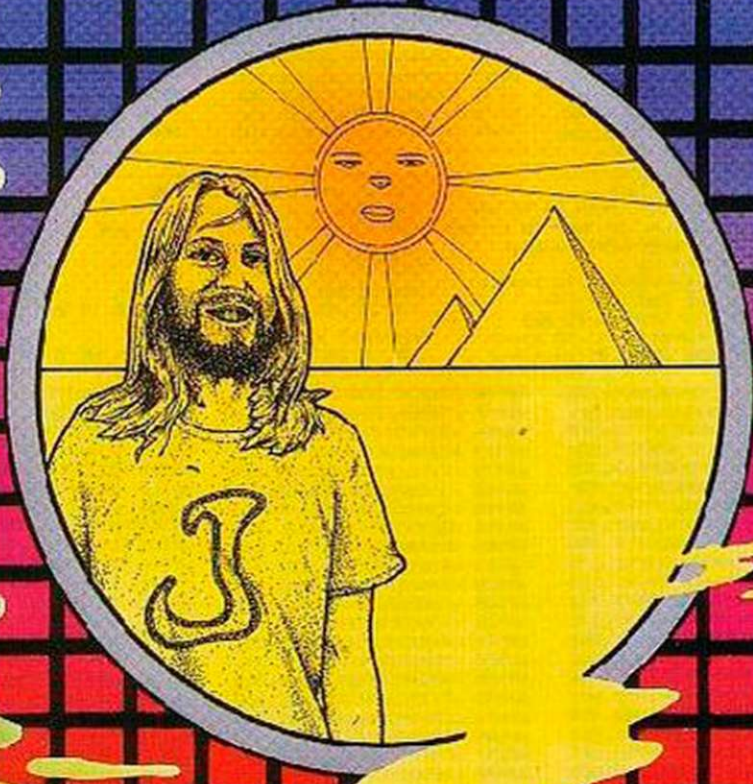
```

60200 :CD15E0C307ECCD15,4C7
60208 :ED2D34CC066CCDD,631
60216 :50EDCD47E38FBCD,5AF
60224 :8BEDF031CA99EAF,694
60232 :55CAB7EAC366EACD,50E
60240 :15ED3EAC0B4FDCD,5F7
60248 :15ED3EAC15ED3E66,553
60256 :EACD66ED11E5EE06,58C
60264 :80E5FF121510FCDD,45E
60272 :15EE11CD0E06173E,3D7
60280 :20121310F2CDD1FED,3D0
60288 :30F0C050EDCC1FED,5BE
60296 :30F03265E3E0032,3E5
60304 :6CE326FE3270EF,544
60312 :3060FCDE3ECC3A63,504
60320 :EFA6F0E8B20E0E,627
60328 :091165EFC1FEDDA,501
60336 :AAEA1312C0BEC00,552
60344 :20F23769E3ECC00,51A
60352 :002145C3A6E00E,36C
60360 :0047052263E00E,10A
60368 :11CDEECD1FED09A,47F
60376 :121300CD9ECC79FE,45C
60384 :102F03A6EFCDB1,447
60392 :ECCD1FEDDA0A21,574
60400 :6FEFBE2B133E5B11,32E
60408 :E0EE12133E0012CD,340
60416 :D7ECCDA0ECC3AAEA,6B1
60424 :CD1FEDDA0A2170,518
60432 :E0FE20E121E5EE0A,524
60440 :00F0D0F03E000C7,3CC
60448 :3E00BE200BCDD07,40F
60456 :3E2132085CC3FEF,462
60464 :3E00326FEF3270EF,3C7
60472 :E05E60E0E000C1F,90C
60480 :E0DDAAEA327FECD,634
60488 :E0E3A60E0FE0020,586
60496 :0E5A69E0FE003A73,432
60504 :E012130C3A6E0F9,3FC
60512 :20DCCD1FEDDA0A,50B
60520 :216FEFBE2C2DEBCD,584
60528 :1FEDDA0A2170EF,5A2
60536 :E0C22DE83E4F3E2,589
60544 :EE3E6D32E3E3E00,490
60552 :32E4EE3A0B50E21,501
60560 :2003CD15ECCD7EC,553
60568 :CDA6EC2:E5EE3A6,525
60576 :E0036FE000E06736,422
60584 :0021E5EED40E66EF,561
60592 :0C7E00C20E0A23,4FC
60600 :0D20F63EACDB4ED,589
60608 :F0A103ECC366EACD,50C
60616 :FED30EBC30E0AF3,594
60624 :06B3AFD3FF10F03E,5DB
60632 :40D3FF3E00D3FF3E,56F
60440 :3D3FF3E0F32BF5C,305
60448 :320DSC3240C3E01,250
60456 :D0FE2191S0009E0,540
60464 :C50E0C366EACD15,52F
60472 :E0D66E03E0D3FE,556
60480 :216EE3E00C0DFEC,442
60488 :C0B4ECCDA3ECCDA,624
60496 :EC23CD77ECCD77EC,58F
60504 :C0B0ECC0E0E000A,601
60512 :EC233E000E0E0C,40F
60520 :01EC23CDA3ECC00,490
60528 :C0B0ECC0E0E0C,600
60536 :A3FC0707000000,561
60544 :04ECC23C97E000C,520
60552 :C0B0E03C30B4E0FE,651
60560 :00C0F53E200000E,520
60568 :F13DC09FECCD00E,630
60576 :CA3ECCDA6ECC00,540
60584 :C0B0E03E0F320C0,574
60592 :C9F513E6F0C01FC,600
60600 :1FCB1FCB.FF630FE,40C
60608 :3A066ECC6071213,490
60616 :F.E00FF630FE3AFA,600
60624 :D4ECC007:2132921,46C
60632 :C0B0E03E0F320C0,574
60640 :173E2072310C3C,337
60648 :0077C9E52170EFAE,530
60656 :77C0E00E7EA70B17,449
60664 :300D7EE00773A0F,3C9
60472 :E0EE10326FEF3721,3D5
60480 :6FEFCB1623CB1000,350
60488 :20E2C1E1C9110001,394
60496 :216A00C000003C93E,32F
60504 :06327FE0047E00A,529
60512 :2EEDF1C366EACD0AC,5C0
60520 :ED70E01F602D3FE,540
60528 :AF2177E3E200237,2FC
60536 :C7CD77CD3E00C00,0F0
60544 :47E0D0E0E0C037C9,5E6
60552 :F5E0FF5A01E000,5C7
60560 :20R43E3610023E37,107
60568 :D3FF007FF109E5A,674
60576 :01E0E0020043E36,376
60584 :03FFCD50E0FC93E,644
60592 :00D0FFE60037C000,59
60600 :FFFA0237C000FFA,674
60608 :302004007FA7C93A,3E0
60616 :01E0E0020043E37,397
60624 :10023E36D3FF007F,452
60632 :C9CD47ED3A73E0FD,5DE
60640 :F1C366EAF53ED23D,5EE
60648 :20FDF1C9CDACED3D,62A
60656 :20FAC9C05E05E5FE,700
60664 :7F2013CDF9E0FE0C,537
60672 :200E00D20003E20,20A
60680 :0077C9E52170EFAE,530
60688 :D73E0073A0050FE,4E0
60696 :2120033E0ED73E5F,2E6
60504 :073E0073A0050FE,4E0
60512 :4E54552204E5540,309
60520 :202020000000000,1C1
  
```



PSYCHEDELIA

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Figure 2.

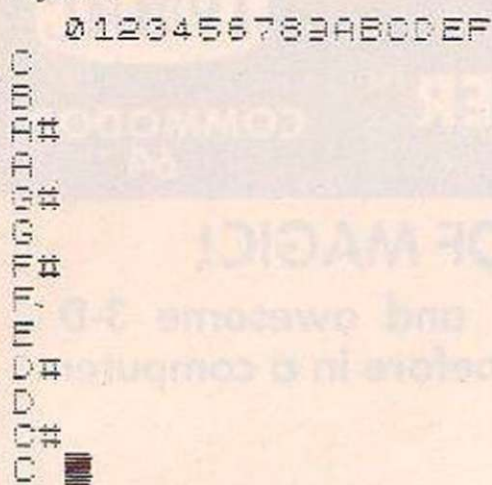


Figure 3.



SYNSOUNDS

THIS PROGRAM converts the 48K Sinclair ZX Spectrum into a versatile electronic keyboard. Up to 100 different sound effects can be synthesised by the user, any 10 of which can be accessed instantly while playing a piece of music. In addition, seven riffs can be stored in the memory and incorporated into the performance at the touch of a key.

Facilities on a main menu

All the facilities offered are obtainable from a main menu displayed at the start of the program:

- Play.
- Synthesise sound effects.
- Assign sound effects.
- Compose riffs.

Play: When this option is selected the screen is cleared and the computer keyboard is arranged as in figure 1. The labelled keys in the middle two rows are set out like a piano and can be played in a similar manner. However, three octaves are available since pressing Octave Down will lower all notes by one octave and Octave up will raise them. Hours of fun can be had from this basic electronic keyboard, even if your musical

talent is strictly limited. But there's much more to come.

Synthesise sound effects: The essence of a synthesiser is to alter the kind of sound produced without altering the musical pitch of the notes themselves. On the Spectrum this can be achieved by causing a rapid change of frequency as the note is played: the particular "frequency waveform" governs the character of the sound emitted. In this program the user is able to invent as many as 100 unique frequency waveforms as follows.

On choosing menu option 2 you are first required to enter the number of the sound effect you are about to synthesise. This should be within the range 0-99. Having done this two axes will appear on the screen — see figure 2. The horizontal time axis covers the duration of the note, and is divided into 16 sectors, while the vertical axis represents frequency.

Beep returns you to menu

To draw out your frequency waveform keys 6 and 7 are used to move a bar up and down each sector and key 0 enters the desired level

(continued on page 97)

Tim Cross provides a useful facility on a machine not noted for its sound potential — the Spectrum.

Code 1.

31965	21003005007E230B	=	560
31973	FEA628042313F6C9	=	1000
31981	3E7FD8F8E6012811	=	1050
31989	3EFED8F8E6012810	=	1076
31997	3E06001010F04318	=	494
32005	075800181013F043	=	0460
32013	0E482AF8F0510AF	=	0200
32021	5E054E892800C841	=	0700
32029	1C10F0013E33B8D0	=	1000
32037	4E7D050B23C323E5	=	1000
32045	211A80480600ED4A	=	7000
32053	5E83582346234E68	=	0307
32061	61C08503E101D120	=	1140
32069	12CF091E30C90000	=	7030
32077	00000021E480060A	=	408
32085	7E23D8F8F6230523	=	6600
32093	1CF61812C50B2068	=	540
32101	2E0001F880ED4A8E	=	020
32109	2C55ED537E7F2170	=	1095
32117	8706077E80DBF8A8	=	940
32125	2E042310F8C905CB	=	750
32133	2C8220CB190B2048	=	800
32141	0E00217E87ED4A06	=	617
32149	203EFF8E084EE508	=	1027
32157	000F7D01E12310F1	=	1055
32165	0000 = 001		

Code 2.

32768	BF048F08DF08BF12	=	832
32776	DF10FD10FB10FD08	=	1036
32784	FD04FB04FD02F802	=	1020
32792	F0010100F20C0102	=	510
32800	360C020085080202	=	0014
32808	DE0002004000020C	=	0010
32816	AB0902001F090202	=	0204
32824	9A0802001D080202	=	0203
32832	A607020036070302	=	0300
32840	CE0C0000CA0C0002	=	0300
32848	0C060300E4050302	=	0200
32856	6005030011050402	=	130
32864	C704040080040402	=	0200
32872	3E0404007F030502	=	0300
32880	C40305008C030502	=	0300
32888	5803050026030602	=	140
32896	F7020500CB020602	=	466
32904	H10E07007H020702	=	301
32912	5402050031020802	=	153
32920	10020500F1010902	=	278
32928	D0010A0087010A02	=	416
32936	4E010B0084010B02	=	314
32944	6C010C0086010C02	=	291
32952	41010E002E010E02	=	142
32960	16010F000A011002	=	70
32968	F9001100E9001202	=	517
32976	DA001300CD001502	=	483
32984	BF001500B3000002	=	392
32992	00000000E002E004	=	434
33000	EF08EF10F710F708	=	1022
33008	F704F702F701EF01	=	986
33016	40813081 = 370		

Code 3.

34672	7F027F047F087F10	=	538
34680	FE10FE08FE040102	=	793
34688	0004 = 7		

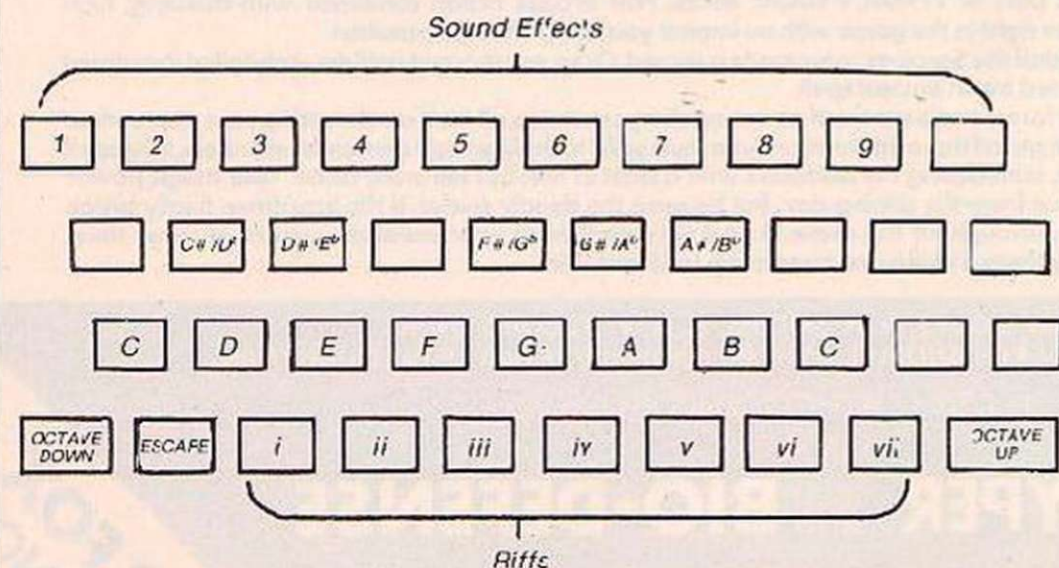


Figure 1.

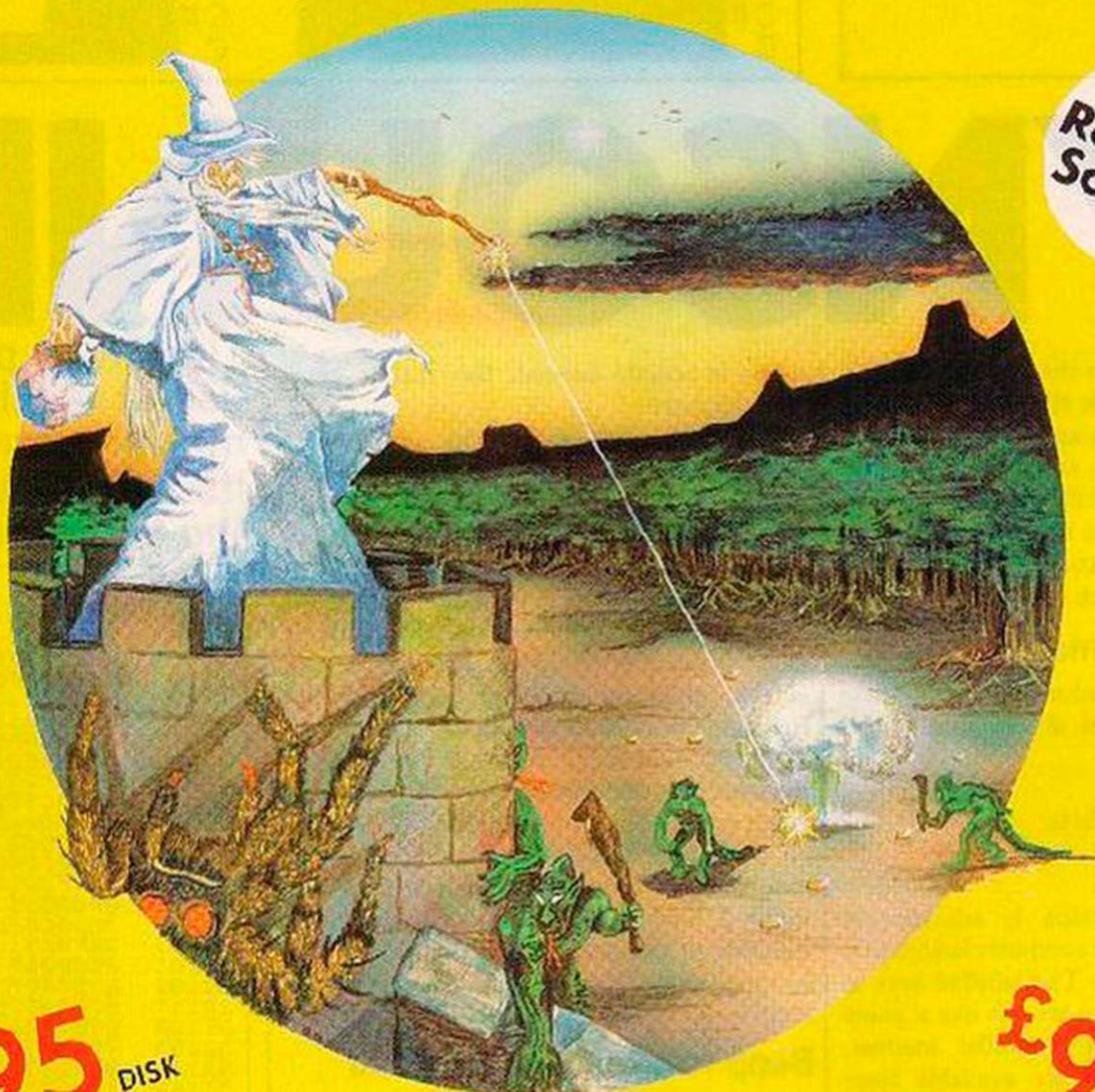
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Listing 1.

```

5 LOAD ""CODE : LOAD ""CODE :
POKE 65535,129: POKE 65534,48:
GO TO 100
6 POKE 23658,8
100 CLS : PRINT "-----SYNSOUNDS-----"
PRINT "MAIN MENU-----"
110 PRINT : PRINT "(1) PLAY": P
RINT : PRINT "(2) ASSIGN FUNCTIO
N KEYS": PRINT : PRINT "(3) DEFIN
E SOUNDS": PRINT : PRINT "(4) D
EFINE PROGRAMS"
120 IF INKEY$="1" THEN GO TO 20
0
130 IF INKEY$="2" THEN GO TO 40
0
140 IF INKEY$="3" THEN GO TO 60
0
145 IF INKEY$="4" THEN GO TO 80
0
150 GO TO 120
200 CLS
210 LET A=USR 31965: LET A=USR
32080: IF INKEY$="Z" THEN GO TO
100
220 GO TO 210
400 INPUT "FUNCTION KEY ? (1 TO
10) ";K
405 IF K=10 THEN LET K=0
410 INPUT "SOUND NO. ? (0 TO 99
) ";E
420 LET H=33072+(E*16)
430 POKE 33016+(K*2)+1,INT (H/2
56): POKE 33016+(K*2),H-((INT (H
/256))*256)
440 GO TO 100
600 CLS : INPUT "SOUND NO. ? (0
TO 99) ";N
610 LET H=N*16+33072
620 CLS
625 FOR G=9 TO 21: READ S$ PRI

```

```

NT AT G,0;S$: NEXT G
626 DATA "C","B","A#","A","G#","
"G","F#","F","E","D#","D","C#","
C"
627 RESTORE
628 PRINT AT 8,2;"0123456789ABC
DEF"
630 FOR X=0 TO 15
640 LET Y=21
650 PRINT AT Y,X-2;"█"
655 PAUSE 0
660 IF INKEY$="6" AND Y<21 THEN
PRINT AT Y,X+2;" ": LET Y=Y+1:
GO TO 650
670 IF INKEY$="7" AND Y>3 THEN
LET Y=Y-1: GO TO 650
680 IF INKEY$="0" THEN POKE H+X
,(21-Y)+12: GO TO 689
685 GO TO 650
689 NEXT X
690 BEEP .5,10
700 GO TO 100
800 CLS : INPUT "PROGRAM NO. ?
(0 TO 6) ";P
803 PRINT AT 4,0;" PROGRAM LENG
TH - 0 TO 15 NOTES"
804 PRINT AT 7,0;" [LOW] [MID] [HIGH]"
805 FOR G=9 TO 21: READ S$: PRI
NT AT G,0;S$;AT G,8;S$;AT G,16;S
$;AT G,24;(21-G);AT G,32;(21-G)+1
2;AT G,40;(21-G)+24;: NEXT G
806 RESTORE
807 PRINT AT 15,23; INVERSE 1;"
TYPE 255";AT 16,23;" TO END"
810 LET H=P*15+34686
820 FOR G=H TO H+15
825 INPUT 0: IF 0<0 OR (0>36 AN
D 0<>255) THEN BEEP .25,20: GO T
O 825
826 IF 0=255 THEN POKE G,0: GO
TO 100
830 POKE G,0: NEXT G
840 GO TO 100

```

(continued from page 95)

when it is reached. After levels in all 16 sectors have been defined in this way, a short beep returns you to the main menu.

Some examples of waveforms are depicted in figure 3, but you will obviously want to experiment with your own ideas.

Assign sound effects: From your bank of frequency waveforms produced in menu option 2 any 10 can be chosen for instant recall at the touch of a button. Simply type in a number from 1-10, followed by the number of the waveforms. When you now play the piano keyboard, each note will take on the "flavour" of the sound effect chosen. Pressing another of the keys 1-10 will change to a new sound effect without interrupting the flow of music.

Play sequence of notes

Compose riffs: It is often necessary to play a short riff — sequence of notes — which is repeated many times and may be complicated or fast. Synsounds allows up to seven riffs to be stored simultaneously and then replayed by pressing a single key. It is thus possible to give a creditable musical performance with a minimum of stamina and skill. On the computer keyboard in figure 1 the keys labelled (i) to (vii) in the bottom row refer to

these pre-programmed riffs.

After entering the number of the riffs you wish to compose (0-6), the Spectrum will draw up a chart of all the notes playable — three octaves. Each note has a number 0-36 — 0 for the lowest C and 36 for the highest, and it is this number that you must enter to place the desired note in the memory. Up to 16 notes can be entered in a single program, but if less than this number are required then typing 255 will complete the riff and return you to the main menu.

Longer notes can be entered by repeating the note several times.

Listing 2.

```

5 REM spectrum hex loader
10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2)
)-48-(7 AND h$(2)>"9"))
20 INPUT "start " ;s
30 INPUT "finish " ;f
40 FOR n=s TO f STEP 8
50 LET tot=0
60 PRINT n;" "
70 INPUT h$: PRINT h$:
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$): LET tot=tot+z
100 POKE n+b,z
110 LET h$=h$(3 TO )
120 NEXT b
130 PRINT " = ";: INPUT t: PRIN
T t
140 IF tot<>t THEN PRINT "input
error - try again": GO TO 50
150 NEXT n
160 REM Enter STOP to stop

```

Note that the riff will be played in the current waveform, so the 'flavour' of the riff can be altered by pressing any of the keys 1-10.

Sound produced only by the Spectrum's internal speaker will rarely be of sufficient volume, so amplification can be achieved by connecting the mic socket on the tape recorder to the mic socket on the Spectrum and push down the record button on the recorder.

Entering synsounds

To enter Synsounds, I advise the following method:

1. Enter the Basic program from listing 1. Save it by typing: SAVE "SYNSOUNDS" LINE 5.
2. NEW the program.
3. Type in the Basic program from listing 2. Type in Run.
4. Enter the code from listing 3—work from left to right and from up to down.
5. Save the code directly after the first Basic program by typing: SAVE "CODE 1" CODE 31965,204: SAVE "CODE 2+3" CODE 32768,1922.
6. New the program.
7. Load the finished program by rewinding the tape and typing: LOAD "SYNSOUNDS".

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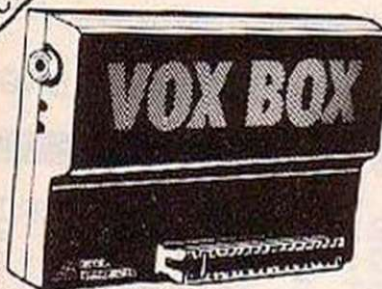
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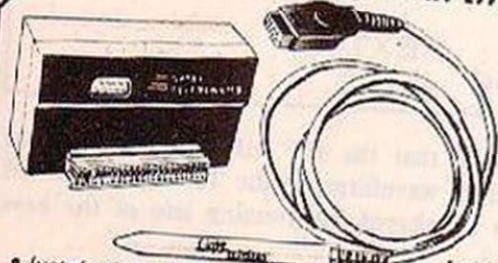
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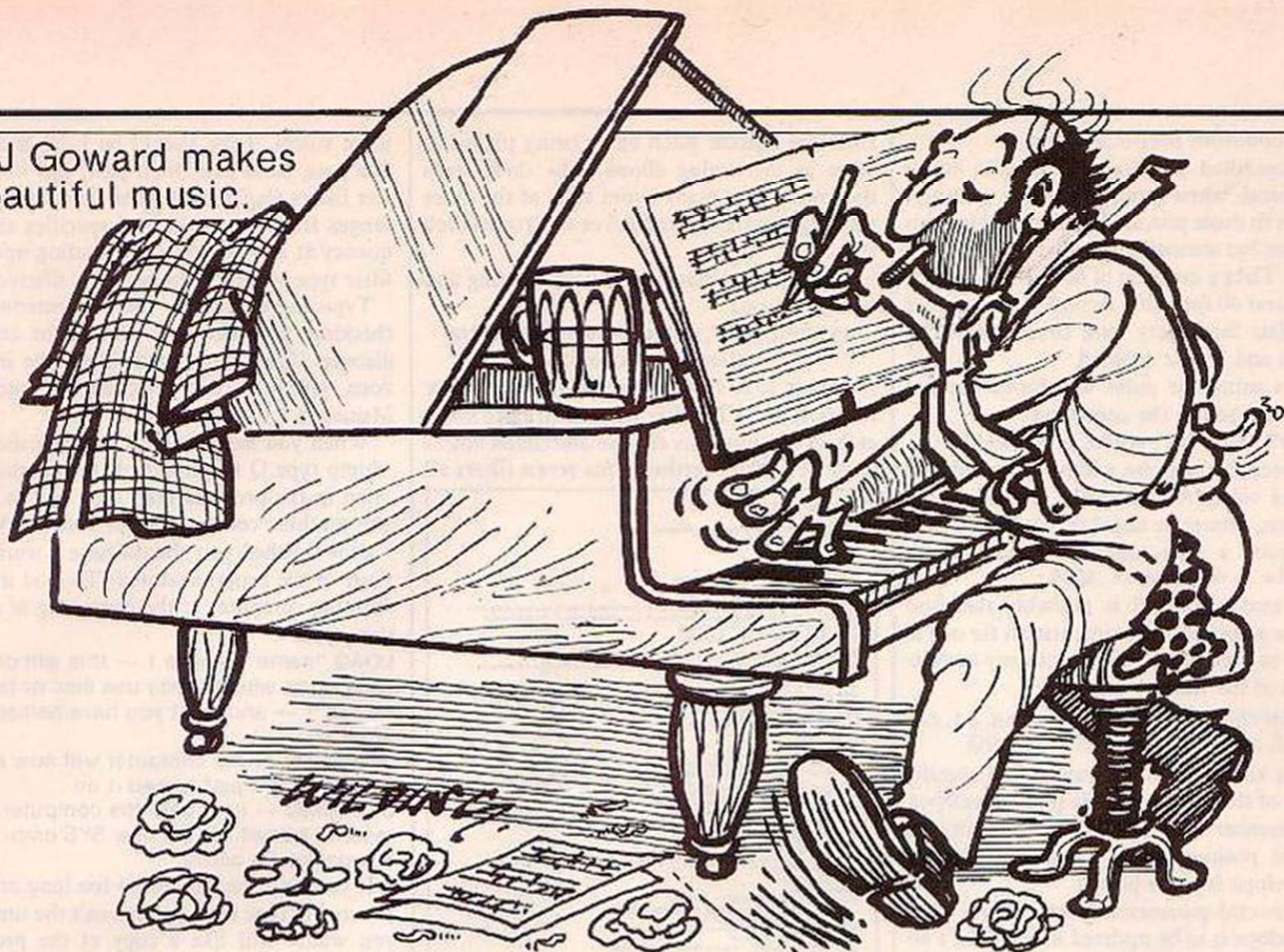
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HAVE YOU EVER tried to make a sound using the Commodore 64? If you have then you will obviously have experienced much of the frustration caused by the bewildering array of Poke commands required to activate its powerful SID chip. Even making a feeble beep is no simple matter, requiring a minimum of four pokes, that is, of course, if you can understand the poor documentation provided with the machine.

If you are one of the many people that have parted with the £50 required for Simon's Basic then you will have no doubt been disappointed with the very poor sound commands which will only allow music to be played in one voice. However, for the rest of the Basic I have few complaints.

All sounds have one main command to activate them, to relieve complications that could otherwise arise, and also, since all sound generation is controlled by microprocessor interrupts, basic programs will still continue to be executed while the sound is played. Facilities are provided for harmonies to be played in all three voices, and each voice allows four notes to be buffered and subsequently played.

Thus a duration must be specified for each note eliminating the time delays required by some computers for their sound. The commands allow for all of the musical waveforms and modulations of the chip to be used as well as the programmable filter. The width of the pulse waves generated by each voice may also be programmed.

All of the commands are of the form of an

extended SYS statement, here 380Z users will notice a similarity with RML's Call command. The routine works by redirecting every SYS statement just before it is encountered by the basic interpreter, and then, if it is of the form of an extended statement, it redirects the SYS call to the appropriate sub-routine.

A simple example is

```
SYS "VOLUME", 15
```

which sets the total output volume for all three voices, its parameter should be in the range 0 . . 15 where 0 is silence and 15 is maximum volume, any value given that is greater than 15 or negative will be scaled into the correct range. After setting the volume, and before any notes may be played on a particular voice, a SYS "ADSR" must be made. This is of the form:

```
SYS "ADSR", voice, attack, decay, sustain, release
```

and determines the volume envelope for any note following on the specified voice.

Voice should be in the range 1 . . . 3, a larger value will be scaled into this range but a zero will give an error. Attack specifies the rate at which the sound reaches its maximum volume, while decay governs the rate at which the note decreases in volume after its attack sequence sustain specifies the volume level at which the note is then maintained, and finally release governs the rate at which the note falls to zero volume after its duration has ended.

Thus

```
SYS "ADSR", 1, 0, 9, 0, 0
```

will set for voice 1 the familiar harpsichord-type envelope, while

```
SYS "ADSR", 1, 0, 0, 15, 0
```

will set for voice 1 an envelope which instantly reaches its maximum volume and when the note has finished it will instantly decay to zero volume. Each of the final 4 ADSR parameters should be in the range 0 . . . 15.

Once a voice has had its ADSR envelope set any number of sounds may be played on that voice with the command:

```
SYS "SOUND", voice, wave, envelope, frequency, duration
```

Voice may take the values 1, 3, 5, 6, 9, 11, 13, 15. 1, 3 do, as you might expect, just play on that specified channel. Five and 6 work for voices 1 and 2 respectively, and allow synchronisation of two notes on these channels.

Thus after a channel of five has been specified this note will not be played until a command to channel 6 has been executed and then these two notes will be played together. Channels 9, 11 have a similar function but synchronise three-note chords together on all three channels, 13, 15, before they play the note specified, flush the sound buffer for their respective voices, 1, 2 and 3, and the note will be played disregarding any previous note on that channel. Wave sets the sound wave to be used: 0, 3 are triangle, sawtooth, pulse, and noise waveforms.

The envelope parameter may take the values 0, 3, 0 specifies a pure note while 1, 3 are reserved for the pitch envelopes — see "envelope" command. Pitch may be varied in the range 0, 55535 in increasing frequency.

(continued on next page)

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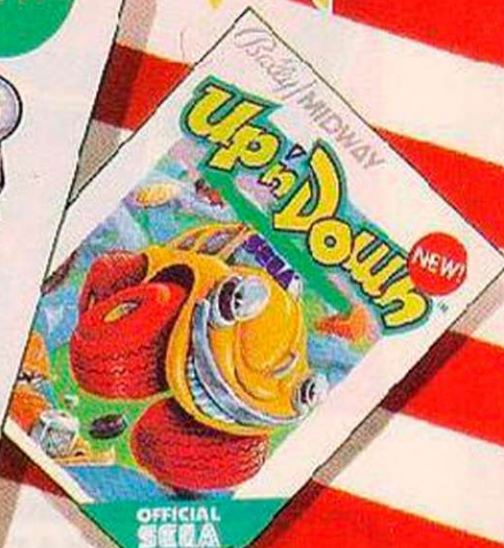
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Colin Carruthers' easy conversion program

THE INTRODUCTION of the Sinclair ZX Microdrive system offers many users fast access to programs and data. Programs which once took several minutes to load can now be available in a matter of seconds. In fact, anyone who has used a Microdrive may be discouraged from using cassette-based software.

However, there are very few commercial programs available for the Microdrive due to the difficulty in duplicating large numbers of cartridges. Few software houses seem prepared to release details on how to convert their own programs for use on Microdrive for fear of escalating the piracy problem.

This is a weak argument since anyone with two cassette recorders and a blank tape can copy any program they wish. Several houses do release details, particularly publishers of serious software such as Tasman (Tasword), Campbell (Masterfile) and Hisoft with its series of compilers and assemblers.

Why should loading material from tape and saving on Microdrive cartridge present a problem? To answer that, we need to consider certain aspects of the operation of a Microdrive. If you examine the diagram in Chapter 24 of the standard Spectrum manual showing Ram allocation, you will see that there are two areas labelled "Microdrive Maps" and "Channel Information".

Whenever any Microdrive operation is invoked, these two areas grow by 32 and 595 bytes respectively. The Map holds information about the distribution of the 512 byte long blocks on the cartridge, while the Channel contains a 512 byte buffer along with details such as file name and type — see Microdrive and Interface 1 manual, Appendix 3.

In operation, consecutive blocks are passed via the buffer from the cartridge to memory or *vice versa* — depending on whether we are loading or saving. The main point is that the Basic program and variables must be moved up by 627 — ie, 32 + 595 — bytes. To make matters worse, Interface 1 appends 58 new bytes to the existing System Variables area. Thus, the Basic program resides at an address which is some 685 bytes higher up in memory when using the Microdrive.

So, why does this present us with a problem? Well, blocks of machine code which once loaded into the free space just above the Basic area might now overwrite part of the Basic program or, worse still, part of the Microdrive Map or Channel. Either way, the system is likely to crash with the Microdrive running, leaving us no option but to unplug the Spectrum and risk corrupting the material stored on the cartridge.

Programs can be divided into three categories. Those which are easy to convert to Microdrive — by the virtue of the addresses used, those which can be loaded into a higher memory address and copied down to their proper target address before being executed, and those which need to be divided into two smaller blocks and moved around after loading.

The first category includes programs writ-



TAPE TO MICRODRIVE

ten entirely in Basic — simply break into them and save auto-start on cartridge — and programs that have machine-code blocks which start at high addresses. Any block which starts above 25000 would normally fall into this category, but this does depend on the size of the Basic loader program. Program 1 gives lots of useful information about material stored on tape such as auto-start line number for Basic programs along with length and start address of machine-code blocks.

To use, simply run it and play back the relevant tape at normal load volume and tone settings. For each block in the program you wish to convert, note down all the details or dump the screen onto a printer.

Typical output from program 1 might look like:

```
Name      : Superzap
Type      : Basic
Start     : 10
Length    : 132 bytes

Name      : Screen
Type      : Bytes
Start     : 16384
Length    : 6912 bytes

Name      : Superzap
Type      : Bytes
Start     : 32768
Length    : 32768
```

This is a fairly standard format, ie, Basic loader, title screen and main code block. Type New and Merge in the Basic loader. It might look something like this:

```
10 CLEAR 32767
20 LOAD "" CODE: LOAD "" CODE
30 PRINT USR 35000
```

It is probably best to forget the title screen. They are designed mainly to keep people amused while the main code loads. Besides, space on a cartridge is relatively expensive. Edit the program to make it load the main code from Microdrive thus:

```
10 CLEAR 32767
```

```
20 LOAD ""m":1:"Superzap.c" CCDE
30 PHIN USR 35000
```

Note that we have had to change the name of the code block since we cannot have two files with the same name on the cartridge. Save this on Microdrive to auto-run from line 10. Now do:

```
CLEAR 32767: LOAD "" CODE
```

to load in the main code from tape. Save this to cartridge by typing in, for example:

```
SAVE ""m":1:"Superzap.c" CODE
32768,32768
```

Reset the system by typing Print USR 0 and try loading in the program from Microdrive. Should there be any problems, check carefully that all addresses were typed in correctly.

We need to adopt a different strategy for programs with machine-code blocks which start below about 25000. For example, imagine a situation where the main block was 900 bytes starting at address 24000. Clearly, this would overwrite the Microdrive Channel and Basic program if we were to load it in from Microdrive to this address.

The solution is to load the code into a high address and use program 2 to generate a machine-code routine to copy it down to the correct place in memory. Program 2 does this by using the powerful — not to mention fast — LDIR instruction. To continue the above example, we would start by loading in the code from tape to — for example — 30000. Run Program 2 and enter the following values:

```
Block Start      : 30000
Block Length     : 9000
New Address      : 24000
Execute Address  : 24000
```

The execute address can be found by examining the Basic loader for that program. Program 2 places a 14 byte copy routine at "start + length", 39000 in this case. Save this

(continued on page 105)

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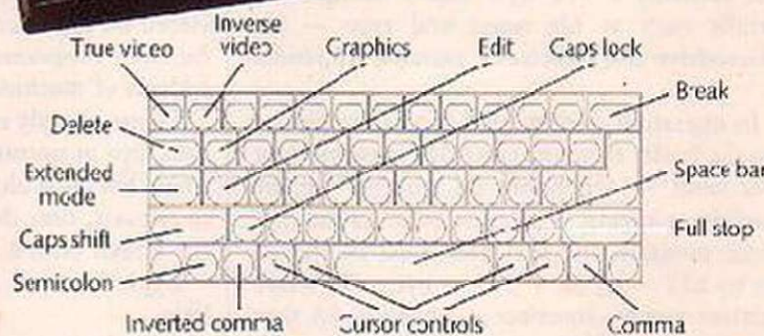
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(continued from page 103)

to cartridge with something like

```
SAVE "m";1;"File Name" CODE
30000,9014.
```

Note that the length has been extended by 14 to save both the code and the copy routine. Change the Basic loader to load in the machine-code from Microdrive, and the execute address — Print USR rrrrrr — to be the start of the copy routine. Save this auto-run on Microdrive, reset the system and try it out.

But what about machine-code blocks which are too large to re-locate using the above technique? For example, say we had a block which was 41535 bytes long starting from location 24000. This block fills the memory from the top right down to address 24000, and does not leave space for any Microdrive operations.

What we need to do here is split the block into two, load the high address part into its proper location, load the low address part into the display file and then use the copy routine provided by program 2 to move the low block up to its correct address after all Microdrive operations are over. To continue the above example, first type:

```
CLEAR 23999 : LOAD " " CODE
```

Copy the bottom 1000 bytes into the display file using a short program such as:

```
10 For x=0 TO 999
20 POKE 10386+x, PEEK (24000+x)
30 NEXT x
```

and save this block to a temporary file on tape with

```
SAVE "temp" CODE 16386,1300
```

Now do a Clear 24999 to make space for the Microdrive system and save the top part to Microdrive cartridge with

```
SAVE "m";1;"High" CODE 25000,40535
```

Reset the system, load in program 2 and then the temp code file from tape back into the display file. Start program 2 — by typing Go to 10, not Run which would clear the display file — and enter the following values:

```
Block Start      : 16386
Block Length     : 1000
New Address      : 24000
Execute Address  : 24000
```

Save this to Microdrive using

```
SAVE "m";1;"Low" CODE 16386,1014
noting once again that the length must be increased by 14 to include the copy routine.
```

Finally, alter the Basic loader so that it loads in "High" and "Low" from Microdrive before doing a

```
PRINT USR 17386
```

Save this on the same cartridge, reset the system and take a deep breath before trying it out.

One word of warning. In all cases, think carefully where the stack is — if this is overwritten by anything a system crash is certain. The position of the stack is controlled by the Clear statement so many problems like this can be avoided.

With the help of the ideas presented in this article, it is possible to convert most programs to load from Microdrive. The time spent waiting for programs to load becomes negligible which means that the Spectrum owner can spend more time playing games and less time sitting around with nothing to do.

It is probably a good idea to have a menu program on each cartridge called "run" which lists the programs available. Program 3 gives an example of the one I use, and reduces program loading to three key presses — Run, Enter and n where n is the selected program.

Program 1.

<pre>1 REM ***** 2 REM * 3 REM * Program 1 4 REM * 5 REM * Header 6 REM * 7 REM * Colin Carruthers 8 REM * 9 REM ***** 10 DATA 55 15 DATA 62,0 20 DATA 221,33,0,0 25 DATA 17,17,0 30 DATA 205,86,5</pre>	<pre>35 DATA 1,1,0 40 DATA 216 45 DATA 11 50 DATA 201 55 BORDER 0: PAPER 0: INK 7: C LS : PRINT "Header Version 2.0" 60 RESTORE : FOR x=USR "1" TO USR "n"+2: READ a: POKE x,a: NEX T x 70 POKE USR "1"+5,PEEK 23675: POKE USR "1"+6,PEEK 23676 80 DIM t\$(4,5): FOR x=1 TO 4: READ t\$(x): NEXT x 90 DATA "Basic","Data","Data", "Bytes" 110 LET l=USR USR "1"</pre>	<pre>115 IF PEEK USR "b"=0 THEN GO TO 0 110 117 IF l=0 THEN PRINT : PRINT " tape Loading Error": GO TO 150 120 PRINT : PRINT "Name :"; F OR x=USR "a"+1 TO USR "b"+2: PRI NT CHR\$(PEEK x); NEXT x: PRINT : PRINT "Type :";t\$(PEEK USR "a" +1) 125 LET b=USR "b" 130 PRINT "Start :";PEEK (b+5)+ 256*PEEK (b+6) 140 PRINT "Length:";PEEK (b+3)+ 256*PEEK (b+4);" bytes" 150 POKE 23692,255: POKE USR "b" ",0: GO TO 110</pre>
--	---	--

Program 2.

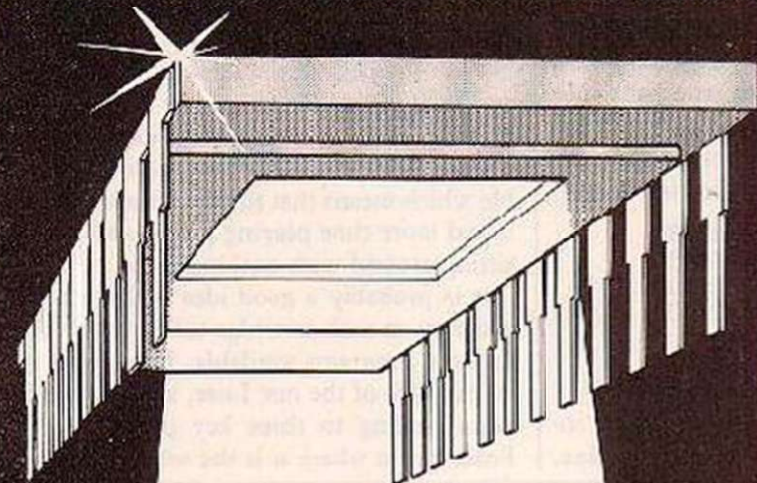
<pre>1 REM ***** 2 REM * 3 REM * Program 2 4 REM * 5 REM * - Block Copy 6 REM * 7 REM * Colin Carruthers 8 REM * 9 REM ***** 10 DEF FN l(x)=x-256*INT (x/25 6) 20 DEF FN h(x)=INT (x/256) 30 INPUT "Block Start :";st art 40 INPUT "Block Length :";le ngth</pre>	<pre>50 INPUT "New Address :";de st 60 INPUT "Execute Address:";ex 100 LET code=start+length 110 LET x=0 120 READ v 125 IF v=999 THEN STOP 130 POKE code+x,v 140 LET x=x+1 150 GO TO 120 200 DATA 33, FN l(start), FN h(st art), 1, FN l(length), FN h(length) , 17, FN l(dest), FN h(dest), 237, 17 6, 195, FN l(ex), FN h(ex) 210 DATA 999</pre>
---	--

Program 3.

<pre>1 REM ***** 2 REM * 3 REM * Program 3 4 REM * 5 REM * - Typical run File 6 REM * 7 REM * Colin Carruthers 8 REM * 9 REM ***** 10 BORDER 0: PAPER 0: INK 7: C LS 20 PRINT CHR\$(16);CHR\$(6);"C C: Vol 07 22-Mar-84" 30 PRINT : PRINT 40 PRINT "1 - Fighter Pilot" 50 PRINT "2 - Manic Miner"</pre>	<pre>60 PRINT "3 - Jet Set Willy" 480 PRINT 490 PRINT CHR\$(16);CHR\$(6);"0 - Quit" 500 IF INKEY\$="1" THEN CLS : PR INT AT 10,9;"Fighter Pilot": LOA D "m";1;"Fighter.c"CODE 30000: RANDOMIZE USR 63792 510 IF INKEY\$="2" THEN CLEAR 30 000: PRINT AT 10,10;"Manic Miner ": LOAD "m";1;"Manic.c"CODE : P RINT USR 33792 520 IF INKEY\$="3" THEN CLEAR 30 000: LOAD "m";1;"Jetset.c"CODE : CLEAR 25000: PRINT USR 33792 980 IF INKEY\$="0" THEN GO TO 10 000 990 GO TO 500</pre>
---	---

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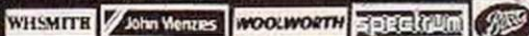
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NEWS-MONGER

Hear the latest from Fran Zym and his ZX-81.



NEWSMONGER is a menu-driven program for the ZX-81 15K to show a text in giant letters.

The menu has nine options:

- Character size 8 by 8.
- Character size 16 by 16.
- Character size 16 by 24.
- User-defined graphics.
- Fill character.
- Speed.
- Input text.
- Top line number.
- Save.

The almost entirely Basic program uses a machine-code routine held in line 0. The machine code is only 576 bytes long. The text may contain unshifted characters, inverse — shifted — function — and graphics.

The function characters plus the shifted character H represent the lower case characters. The shifted characters A, S, D, F, G, W, E, R, T, Y, 2, 3 and 4 are reserved for user defined graphics — UDGs. You can define eg., the character "!" and its inverse, which do not belong to the standard character set. When you don't like the lower case character

set, you are also able to alter this.

In total you have 26 + 13 UDG's. You can't alter the "shifted" character Q because this character is used in string input. When you are not familiar with UDG's, read the article in *Your Computer* April 1984.

The data of the standard ZX-81 character set begin in the Rom at address \$1E00 (7630 dec.) and end at address \$1FFF (8191 dec.) Only the data of the characters with code 0-53 are in the Rom.

The data of the UDGs begin at address 16760; it starts with the data of the "shifted" character Q — code 192. Then the data of the "function" characters with code 193-215, followed by the "shifted" characters with code 216-229. The data of the "function" characters M, B and T with code 64-66 are placed after the "shifted" characters.

You have the option to alter the fill character of the giant letter, the speed and the top line number. The fill character can be a "unshifted" character, a inverse — or a

graphic. Address 16690 holds the code.

PEEK(16751)/2-1

gives you the speed on a scale 0-9; 0 is fast, 9 is slow. 5 is the most "readable" speed. The top line number can vary for option 1 from 1-17, for option 2 from 1-9 and for option 3 the top line number will be 1. The program checks for invalid values.

There are different ways to save text. First you can run the program and enter your text in option 7:

"TEXT" N/L Z\$

holds your text. Returning to option 7 and typing new text the old text is rubbed out. To prevent the loss of the old string variable Z\$, you have to break out during input mode by

(continued on next page)

Hexdump.

16514:	0000000000000000	= 0	16802:	0004040404380020	= 104
16522:	3F0D218A40221540	= 431	16810:	2438242222000000	= 196
16530:	CD1C11234E234523	= 503	16818:	3E42423E02020000	= 260
16538:	C5E5CDBB022CE1C1	= 1282	16826:	4949494936000000	= 346
16546:	C0C5E57EFE40280A	= 1112	16834:	30427C403C000000	= 374
16554:	FE412806FE422802	= 727	16842:	3C023E423E000000	= 252
16562:	180306A680322140	= 474	16850:	3C403C023C000002	= 248
16570:	CBBF060816005F21	= 558	16858:	023E42423E000000	= 258
16578:	00001910FD3A2140	= 449	16866:	3E0408103E000000	= 152
16586:	FEC0380511783F18	= 731	16874:	2214081422000000	= 118
16594:	0311001E19CDEA40	= 578	16882:	3E20202020000040	= 254
16602:	E123C10D20BA78FE	= 1058	16890:	407C42424200000E	= 400
16610:	0028A7050E0018B0	= 426	16898:	107C101010000000	= 188
16618:	ES118240D5010800	= 662	16906:	3E42423E023C0000	= 318
16626:	EDB03A2140CB7F28	= 938	16914:	3C4242423C000002	= 350
16634:	0FCB77200B118240	= 591	16922:	2020202010000000	= 156
16642:	06081A2F121310FA	= 390	16930:	2222120C04180000	= 126
16650:	0E080608C508012A	= 282	16938:	222222221E000000	= 158
16658:	0C40112200E05211	= 463	16946:	3C22222222000000	= 198
16666:	21001910FAC1227B	= 674	16954:	2222221403008000	= 253
16674:	4011210019D11ACB	= 577	16962:	00000000000000E0	= 224
16682:	7F171213D528033E	= 505	16970:	E00000000000F0F0	= 704
16690:	807712EDD1C50801	= 913	16978:	F07E7E7E7E000505	= 754
16698:	052A0440CB4620F0	= 908	16986:	0505050505050505	= 40
16706:	0D56410D6D41C110	= 944	16994:	0505050505050000	= 30
16714:	EFC10D118240D520	= 901	17002:	0000000000E00000	= 224
16722:	89D1E1C92A784023	= 1084	17010:	0505050505050505	= 40
16730:	233E08545D23011F	= 349	17018:	0505050505050010	= 46
16738:	00EDB0287023233D	= 699	17026:	1010100010000505	= 74
16746:	0818F021A00C2B7C	= 836	17034:	0505050505050024	= 66
16754:	B520FBC905050024	= 711	17042:	0024242404380505	= 178
16762:	2400000000000000	= 36	17050:	0505050505050505	= 40
16770:	3E4040403E000000	= 316	17058:	0505050505050010	= 46
16778:	7C42427C40400505	= 518	17066:	7C1010100E000040	= 250
16786:	0505050505050008	= 38	17074:	407C42427C000000	= 444
16794:	0008080808000004	= 36	17082:	7649494949002505	= 420

(continued from previous page)

rubbing out the first quote and then press "shifted" A N/L. Then you type:

```
LET AS = Z$N/L
```

and the old text is saved in the variables area. You return to the Basic program by typing:

```
GOTO 0 N/L
```

Do not use the command Run because this command will also clear the variables area, and that is what you don't want!

Second, you can break out during input mode to enter different string variables. You can use the string variables A\$-X\$ and subscripted string variables with no limitations.

You can rub out the quotes

Do not use Y\$ and Z\$ because the program uses these string variables. You can type eg.:
LET AS = "TEXT" N/L, LET BS = "TEXT" N/L, DIM AS\$(10), 0 N/L, LET AS\$(1) = "TEXT" N/L

You return to the menu by typing:

```
-GOTO 0 N/L
```

When you return to option 7, you can rub out the quotes and type eg.:

```
AS + BS N/L
```

strings which you have entered before. Z\$ holds then

```
AS + BS
```

You can also type: Text, jump over the quote and type:

+ AS N/L

Z holds then

```
"TEXT" + AS
```

When you want to save on tape the string variables or your JDGs, option 9 gives you the opportunity. After typing: 9 N/L during menu mode, the program waits for pressing a key. It gives you the time to set up the tape recorder.

When you want to break out the machine code routine during option 1-3, just press a key a while. It is advisable not to use the "break" key because then you also break out the Basic program. Then it is a habit to type: Run N/L, but then you will clear the variables

area. Use always the command Goto 0, and you will get the menu again with the variables still present.

Before you can enter the machine code, you have to make a line with a Rem containing at least 576 bytes. To create this Rem first enter line 1 with a Rem containing 91 dots. Check the number with

```
PEEK(16511) + PEEK(16512) * 256
```

The number must be 93:

```
REM + 91 dots + N/L
```

Then using the Edit alter the line number so that you become 6 lines with 91 dots. Then type:

```
POKE 16514 118 N/L
```

```
POKE 16515 118 N/L
```

```
POKE 16510 0 N/L
```

```
POKE 16511 66 N/L
```

and you have created line 0 with a Rem containing 567 bytes.

```
PEEK(16514 + 576)
```

must be 118, check this! Then enter the Basic program hex.oad. The startaddress is 16514, the endaddress 17089. Save the program on tape after entering the hexadecimal numbers. Then enter:

```
LET Z$ = "TEXT" N/L, LET L = USR 13524 N/L
```

and the program should run. Pressing a key a while will bring you back to Basic. When the program doesn't work, check the addresses 16514-17089.

Hexloader:

```

99 REM HEX _LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=5 TO F STEP 5
150 LET T=0
160 PRINT N: " - "
170 INPUT AS
180 PRINT AS: " = "
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN AS STEP 2
230 LET C = (CODE AS(K) - 55) * 16 + 50
240 AS(K+1) = Z$
250 LET T=T+1
260 POKE N+Z,C
270 LET Z=Z+1
280 NEXT K
290 IF TOT=T THEN GO TO 310
300 PRINT "ERROR - PLEASE INPUT AGAIN"
310 GO TO 150
320 NEXT N

```

Basic program.

```

1 REM *****
2 REM * (C) FRANS ZIUM *
3 REM * NEWSMONGER *
4 REM *****
5 SLOW
6 PRINT "MENU"
7 PRINT "1 CHARACTER SIZE 8x8"
8 PRINT "2 CHARACTER SIZE 16x"
9 PRINT "3 CHARACTER SIZE 16x"
10 PRINT "4 USER DEFINED GRAPH"
11 PRINT "5 FILL CHARACTER"
12 PRINT "6 SPEED"
13 PRINT "7 INPUT TEXT"
14 PRINT "8 TOP LINE NUMBER"
15 PRINT "9 SAVE"
16 PRINT AT 21,0: "YOUR OPTIONS"
17 DIM Y$(1)
18 INPUT Y$
19 IF Y$(1) OR Y$(9) THEN GO
20 TO 150
21 CLS
22 IF Y$="8" THEN GOTO 6000
23 GOSUB VAL Y$+1000
24 CLS
25 GOTO 20
26 POKE 16697,1
27 POKE 16697,33
28 POKE 16732,0
29 LET L=USR 16524
30 RETURN
31 POKE 16697,2
32 POKE 16697,16
33 IF PEEK 16556>9 THEN POKE 1
34 6555,9
35 POKE 16732,16
36 LET L=USR 16624
37 RETURN
38 POKE 16697,2
39 POKE 16675,99
40 POKE 16698,201
41 POKE 16732,201
42 LET L=USR 16524
43 RETURN
44 PRINT "YOU CAN DEFINE YOUR
45 OWN GRAPHIC."
46 PRINT "FOR UDG ARE THE ""SH
47 IFTED""
48 PRINT "CHARACTERS A S, D, F, G,
49 H, E, T, Y, 2, 3 AND 4 AVAILBLE. Y
50 U CAN ALSO"
51 PRINT "ALTER THE LOWER CASE
52 CHARACTERS."
53 PRINT "INKEY#K ARE THE ""F
54 UNCTION"" CHAR-
55 ACTERS PLUS ""SHIFT
56 ED"" H, THE"
57 PRINT "EMPTY STRING WILL RE
58 TURN YOU TO"
59 PRINT "THE MENU."
60 PRINT AT 20,0: "MATCH SHIFT
61 OF FUNCTION"
62 PRINT "CHARACTERS"
63 DIM Y$(1)

```

```

4120 INPUT Y$
4130 IF Y$="" THEN RETURN
4140 IF Y$="INKEY#" OR Y$="AT" O
4150 R Y$="AND" THEN GOTO 4160
4160 IF Y$<"AT" THEN GOTO 4100
4170 CLS
4180 LET S=0
4190 IF Y$="INKEY#" OR Y$="PI" O
4200 R Y$="AND" THEN LET S=16648
4210 LET S=S+15224+CODE Y$+S
4220 PRINT "INPUT P FOR A BLACK
4230 SQUARE THE"
4240 PRINT "EMPTY STRING FOR A S
4250 PACE A DOT"
4260 PRINT "WILL MARK THE PLACE."
4270 INPUT Q AT
4280 PRINT "THE BEGINNING OF A L
4290 INE WILL"
4300 PRINT "PLACE S SPACES IN TH
4310 E LINE."
4320 FOR I=1 TO Q
4330 PRINT TAB I,C
4340 NEXT I
4350 PRINT
4360 FOR I=0 TO 7
4370 PRINT I+1
4380 LET T=0
4390 FOR J=7 TO 0 STEP -1
4400 INPUT Y$
4410 IF J=7 AND Y$="0" THEN PRIN
4420 T " "
4430 IF J=7 AND Y$="0" THEN GOTO
4440 4300
4450 PRINT Y$
4460 NEXT J
4470 POKE S+I,T
4480 PRINT
4490 NEXT I
4500 RETURN
5000 PRINT "YOU CAN FILL THE GIA
5010 NT LETTER"
5020 PRINT "WITH A CHARACTER OF
5030 YOUR CHOISE."
5040 PRINT "THE PRESENT FILL CHA
5050 RACTER ""CHR$ PEEK 16690""
5060 PRINT "THE EMPTY STRING WIL
5070 L NOT ALTER"
5080 PRINT "THE CHARACTER."
5090 PRINT AT 21,0: "YOUR OPTIONS"
5100 GTH Y$(1)
5110 INPUT Y$
5120 IF Y$="" THEN RETURN
5130 IF Y$>"2" AND Y$<"I" OR Y$>
5140 "I" THEN GOTO 5070
5150 POKE 16690, CODE Y$
5160 RETURN
6000 PRINT "YOU CAN ALTER THE SP
6010 BED, THE"
6020 PRINT "PRESENT SPEED ON A 0
6030 SCALE 0-9, PEEK 16751/2-11"
6040 PRINT "THE EMPTY STRING WIL
6050 L NOT ALTER"
6060 PRINT "THE NUMBER."
6070 PRINT AT 21,0: "YOUR OPTION
6080 ON THE SCALE 0-9"

```

```

6050 DIM Y$(1)
6060 INPUT Y$
6070 IF Y$="" THEN RETURN
6080 IF Y$<"0" OR Y$>"9" THEN GO
6090 TO 5060
6100 POKE 16751, (VAL Y$+1)*2
6110 RETURN
6120 POKE 16418,0
6130 PRINT "YOU CAN ENTER YOUR T
6140 EXT, Z$ IS"
6150 PRINT "USED TO STORE THE IN
6160 PUT, YOU CAN"
6170 PRINT "INPUT CHARACTERS, INV
6180 ERSE"
6190 PRINT "GRAPHICS - ""SHIFTED
6200 "" - ""END""
6210 PRINT " ""FUNCTION"" - ""THE ""
6220 " ""FUNCTION""
6230 PRINT "CHARACTERS REPRESENT
6240 THE LOWER"
6250 PRINT "CASE CHARACTERS, EXCE
6260 PTION THE"
6270 PRINT " ""SHIFTED"" KEY H RE
6280 PRESENT LOWER"
6290 PRINT "CASE U, THE ""SHIFTED
6300 "" KEYS A, S,"
6310 PRINT "D, F, G, J, E, R, T, Y, 2, 3
6320 AND 4 ARE"
6330 PRINT "USED FOR LDG. SEE OPT
6340 -ON 4"
6350 PRINT "PRESS A KEY TO CONTI
6360 NUE"
6370 IF INKEY#="" THEN GOTO 7130
6380 CLS
6390 POKE 16418,2
6400 PRINT AT 21,0: "YOUR TEXT"
6410 INPUT Z$
6420 RETURN
8000 PRINT "YOU CAN CHOOSE THE P
8010 LACE OF THE"
8020 PRINT "TEXT ON THE SCREEN."
8030 PRINT "FOR OPTION"
8040 PRINT "1 THE TOP LINE CAN U
8050 ARY 1-17"
8060 PRINT "FOR OPTION 2 THE TOP
8070 LINE CAN"
8080 PRINT "ARY 1-9, FOR OPTION
8090 3 THE TOP"
8100 PRINT "LINE WILL BE 1, THE P
8110 RESENT TOP"
8120 PRINT "LINE NUMBER: PEEK 1
8130 6855, THE EMPTY STRING"
8140 PRINT "WILL NOT ALTER THE N
8150 UMBER"
8160 PRINT AT 21,0: "YOUR OPTIONS"
8170 GTH Y$(1)
8180 INPUT Y$
8190 IF Y$="" THEN RETURN
8200 IF VAL Y$<1 OR VAL Y$>17 TH
8210 EN GOTO 8100
8220 POKE 16655, VAL Y$
8230 RETURN
9000 PRINT AT 20,0: "PRESS A KEY
9010 TO RECORD UDG NO"
9020 PRINT "PRESS THE ""BREAK"" KE
9030 Y"
9040 IF INKEY#="" THEN GOTO 9020
9050 GTH
9060 SAVE "NEWSMONGER"
9070 GOTO 0

```

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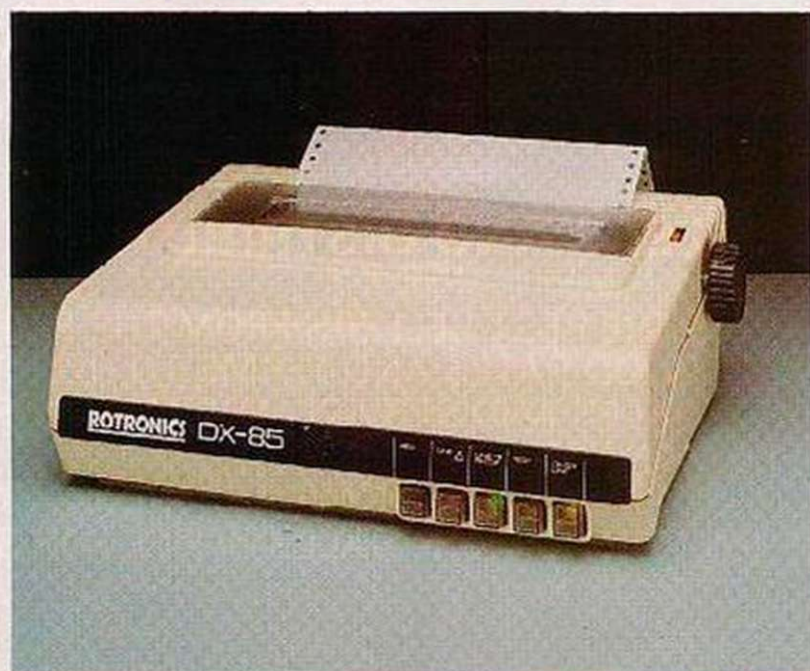
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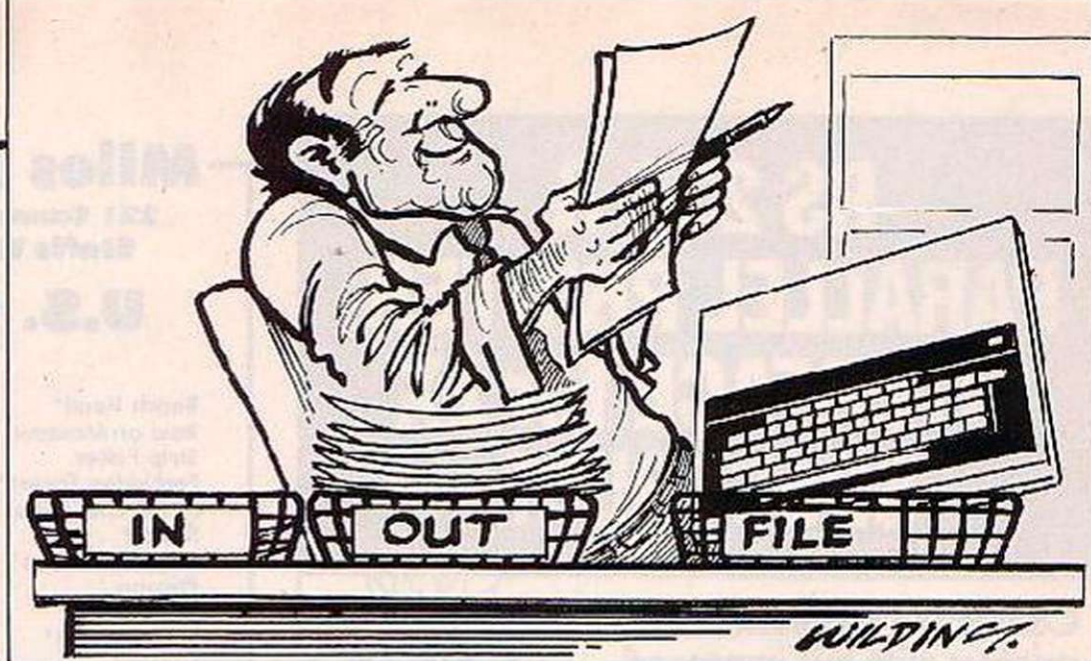
BA Naylor and DW Boyce and a BBC database.

SUPERFILE is a versatile database written for the BBC Micro 32K model. This may be used for various applications ranging from the small home-based business to the family's video cassette library. The question is often asked what a database actually is. In short, it may be described as a computerised filing cabinet that allows rapid data collection and retrieval.

Data is stored on cassette in the form of a file, each file being split up into records, each of these records being further divided into individual items of data called fields. It is advisable to become acquainted with these terms as they are used many times in this article.

Superfile has a capacity of up to 10 fields each with up to 25 characters, allowing 65 records with this configuration, or two fields with 325 records, these being the two extremes of the system. It is obvious therefore, that the number of records is calculated by dividing 65 by the number of fields entered.

Incorporated in the system is a unique Sort



SUPERFILE

which can rapidly arrange records in order alphabetically or numerically, with the user choosing the field to be sorted. Another great asset to the system is the multi function Search procedure. This allows the full use of equalities

to seek a particular item in the file.

The whole system has been very efficiently designed and programmed to aid the user and process the data as quickly as possible. On
(continued on page 117)

```
10REM SUPERFILE Database
20REM by B A Naylor and
30REM D W Boyce
70MODE7
80SE=0:ST=0:r=1:red=0:head=0
90OPT3,5
100OPT1,1
110PROCin:PROCm
120DEFPROCin:PRINTTAB(0,0);CHR#132;CHR#157;CHR#131;C
HR#141;" SUPER FILE";CHR#133;" Data Base.":PRINTT
B(0,1);CHR#132;CHR#157;CHR#130;CHR#141;" SUPER FILE
";CHR#129;" Data Base."
130PRINTTAB(0,2);CHR#132;CHR#157;CHR#131;CHR#141;"
B A Naylor & D W M Boyce.":PRINTTAB(0,23);CHR#132;C
HR#157;CHR#130;CHR#141;" B A Naylor & D W M Boyce."
:VDU20,0,21,39,3
140PROC("Set Up")
150PRINTCHR#134;"The no. of Fields :":PROC(20,3,2,"
I"):F=VAL(s#)
160PRINT:IF F>10 OR F<2 THENPROCn:PRINTCHR#129;"Field
s (2 to 10). Try again.":IN=GET:GOTO140
170R=INT(650/F)
180PRINTCHR#134;"The max no. of Records :":R
190 PRINTCHR#134;"Are you happy with this (Y/N) ?":I
N=GET#:IF IN#="N" THEN 140
200DIMA(F,R);GI(F);no(F);label(F);ITEM(F);AL(F);
MATCH(R);tot(F);f#="":FOR I%=1 TO F:SI%(I%)="S":no(I%)
=25:label%(I%)="...":NEXT:FOR I%=1 TO F:MATCH(I%)=0:NE
XT:ENDPROC
210DEFPROCm:PROC("Menu"):PRINTCHR#130;SPC(8);'(1)
Filename.":PRINTCHR#130;SPC(8);'(2) Define Field
s.":PRINTCHR#130;SPC(8);'(3) Load File.":PRINTCHR#1
30;SPC(8);'(4) Save File.":PRINTCHR#130;SPC(8);'(5)
Edit File."
220PRINTCHR#130;SPC(8);'(6) Sort.":PRINTCHR#130;S
PC(8);'(7) Search.":PRINTCHR#130;SPC(8);'(8) Dis
play File.":PRINTCHR#130;SPC(8);'(9) Printer Dump."
:PRINTCHR#130;SPC(8);'(10) Start Again.":REPEAT:IN#
=GET#:UNTIL IN#="0" AND IN#<="9"
230IFIN#="1"THENPROCf ELSEIFIN#="2"THENPROCd ELSEIF
IN#="3"THENPROClo ELSEIFIN#="4"THENPROCsa ELSEIFIN#="5
"THENPROCed ELSEIFIN#="6"THENPROCso ELSEIFIN#="7"THENP
ROCse ELSEIFIN#="8"THENPROCdi ELSEIFIN#="9"THENPROCp E
LSE:FIN#="0"THENPROCst
240PROCm
250DEFPROCf:PROC("Filename"):PRINTCHR#131;SPC(5);"F
ilename <":f#;TAB(26,3);">":IF f#="" THEN 260 ELSE 290
260PROC(16,3,10,"S")
270f#=#f
280PRINTTAB(0,6);CHR#131;"Do you wish to change the
filename (Y/N) ":IN#=GET#:IF IN#="Y" THEN 260 ELSE ENDP
ROC
290DEFPROCd(h#):CLS:PRINTTAB(16-(LEN(h#)/2),0);CHR#1
29;CHR#141;h#:PRINTTAB(16-(LEN(h#)/2),1);CHR#129;CHR#1
41;h#:PRINT:ENDPROC
300DEFPROCd:IFred>=1 THEN ENDPROC ELSE PROC("defin
e_fields"):PRINTCHR#134;"Field";SPC(2);"Type";SPC(2);"
No. chrs";SPC(4);"Label":FOR I%=1 TO F:PRINTCHR#131;TA
B(2);I%-1;TAB(9);SI%(I%);TAB(10);no(I%);TAB(27);label#
(I%);NEXT
310PRINTTAB(0,16);CHR#131;"Press (A) to edit all fie
lds or (0_";F-1;"):PROCgb:PRINTTAB(2,15);CHR#133;"S=S
```

```
tring I=Integer N=Numeric."
320IN#="GET#
330IF IN#="A" OR IN#="a"THEN F=-1:F2=F:GOTO420
340IF IN#="" ENDPROC
350F#="STR$(F-1)
360IF IN#<"0" OR IN#>F# THEN 380
370 GOTO400
380IF ASC(IN#)<>13 THEN PROCn
390GOTO310
400IF IN#="0" THEN F1=1:F2=1:GOTO420
410F1=VAL(IN#)+1:F2=F1
420head=1:FOR I%=F1 TO F2
430PROC(9,3+I%,1,"S")
440IF s#="S" OR s#="I" OR s#="N" THEN SI%(I%)=s# ELS
E PROCn:GOTO430
450PRINT(16,3+I%,2,"I")
460IF VAL(s#)>0 AND VAL(s#)<26 THEN no(I%)=VAL(s#) E
LSE PROCn:GOTO450
470PROC(27,3+I%,8,"S"):label%(I%)=s#:NEXT
480 GOTO 330
490DEFPROC(IX,YX,LX,t#)
500I%=0:s#="":red1=1:VDU 23,1,1;0;0;0;
510PRINTTAB(XZ,YX);SIKING(LZ,"")+SIKING(LZ,CHK#12
7);GOTO 530
520PROCn
530IN#="GET#:in%-ASC(IN#):IF in%-13 THEN 670
540IF in%=127 THEN 550 ELSE 560
550X=POS:IF X>X% THEN PRINTIN#:I%=I%-1:s#=LEFT$(s#,
I%):GOTO530 ELSE 520
560IF I%=LX THEN 520
570IF t#="S" THEN 620
580IF t#="I" THEN 610
590IF t#="N" THEN 600
600IF in%>39 AND in%<63 OR in%=127 THEN630 ELSE 520
610IF in%>47 AND in%<58 OR in%=127 THEN630 ELSE 520
620IF in%>31 AND in%<128 THEN 630 ELSE520
630s#=#f+IN#:I%=I%+1
640PRINTIN#:IF I%=LX THEN 530 ELSE 530
650IF s#="" THEN 520
660I%=I%-1:s#=LEFT$(s#,I%):GOTO 640
670VDU 23,1,0;0;0;0:ENDPROC
680DEFPROCn: SOUND1,-10,0,5:ENDPROC
690DEFPROCso:IF red<1THEN PROCd:ENDPROC
700PROC("Sort"):PRINTFORMZ=1TOF:PRINTCHR#132;SPC
(4);M%-1;CHR#134;label%(M%);NEXT:PRINTTAB(0,3);CHR#134
;"Field for sorting (0_";F-1;"):";CHR#132;
710PROC(27,3,1,"I"):IF s#="" THEN PROCn:GOTO710 ELS
E Field%=VAL(s#)+1:IF Field%>F THEN PROCn:GOTO710
720PRINTTAB(27,3);F:old%-1:PRINTTAB(20,S+Field%);CHR
#136;CHR#129;"SORTING":N%=F:D%=1
730D%=2*D%
740IFD%<N% THEN730
750D%=D%-1
760D%=D% DIV 2
770IFD%=0 THEN880
780I%=N%-D%
790OR I%=1 TOI%
800J%=I%
810 J%=I%+D%
820IF SI%(Field%)="S" THEN 850
830IF VAL(A#(Field%,LZ))>VAL(A#(Field%,J%)) THEN PRO
Cs:J%=J%-D%:IFJ%>0 THEN810
(jisting continued on page 113)
```

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(continued from page 111)

many options, output may be directed to the printer or to the screen. Only Parallel printers have been catered for in this version of Superfile. Options are accessed through a menu.

The great beauty of the database is its user friendliness, so that even the youngest member of the family may easily exploit the system.

(1) Filename: To enter this option simply press 1 on the keyboard, and immediately the computer will ask you to enter a filename. A filename is the label given to your data when it is stored on cassette.

If you have previously entered a filename, then you will be asked about whether you wish to change it. Pressing Y will allow you to input up to 10 characters for the filename. Any other key will return the user to the menu enabling them to use the options. If must be noted, however, that a filename is required if you wish to enter the options of Load (3) and Save (4).

(2) Define fields: This is the most essential option of the database, it must be entered before any data can be inputted via the Edit option. This is basically because it defines areas in memory for information to be stored, and

thus is the crux of the program.

There are three main items of data to be entered in each field, these are:

■ The type of data you wish to store in each field, i.e., String variables — letters and numbers, integers — whole numbers — and numerics — real numbers.

■ The maximum number of characters allowed to be stored in each field — with a maximum of 25 characters per field.

■ The label given to each field which identifies the contents of the field when displayed. The maximum number of characters allowed is eight.

To enter these important pieces of data you can either press the relevant field number or press A to enter every field. At any time pressing the space bar will return the user to the menu.

(3) Load: This option loads the previously stored data into the computer so that it may be processed. It is essential to input the correct number of fields for the file you wish to load, otherwise the computer will not accept the file, and the user will be informed. In this case, a message is displayed that tells the user to start

again via option 0, and redefine the fields to the correct value if you wish to load this particular file.

To actually enter a file, the user must press L and then the usual searching message is displayed on the screen. The normal procedure for loading a program is then observed — refer to User Guide if unsure.

When the file has been loaded, pressing the space bar will return the user to the menu.

(4) Save: Both options Load (3) and Save (4) need to have a filename entered, before you can access them, if not the 'No Filename' message will be displayed with instructions for the appropriate actions to take.

This Save option obviously stores the data on tape, and is operated by pressing S on the keyboard. After this, the "Record then Return" message is displayed, at which point a cassette must be inserted into the tape recorder. The usual procedure for saving programs is then followed.

As with most options in this database, pressing the space bar will return the user to the menu.

(continued on next page)

(listing continued from page 115)

```

048GOTO060
050IFA#(Field%,L%)>A#(Field%,J%) THEN PROCs:J%=J%-C%
:JFJ%>0 THEN810
RAWNEXT
070GOTO0760
080PROCg
090PRINTTAB(20,5+Field%);CHR#130;" SORTED ":PROC:END
DPROC
090DEFPROCed:PROCh("Edit"):IF head=0 THEN PROCn:END
PROC
Y10r=INI(r):PRINTTAB(34,2);" ":PRINTTAB(0,2);CHR#
131;"(N) for next record.":CHR#130;"(R)-RECORD.":
920IF r>R THEN PROCn:r=F:GOTO0910
930IF r<1 THEN r=1:GOTO0910
940FORI%=1TOF:PRINTTAB(0,3-I%);CHR#131;I%-1;CHR#134;
label$(I%);TAB(11,3+I%);CHR#131;"<";STRING$(25," ")ST
RING$(25,CHR#127);A$(I%,r);TAB(I%+no(I%),3+I%);">":NFX
T
950PRINTTAB(4,15);CHR#131;"(E) to erase current reco
rd":PROCg:PRINTTAB(2,16);CHR#131;"(A) to edit all fie
lds or (0);F=-1;".
960IN$=GET$
970IFIN$="V" OR IN$="n" THEN r=r+1:GOTO0910
980IFIN$="R" OR IN$="r" THEN PROC:34,2,4,"I":r=VAL
(s$):GOTO0910
990IFIN$="A" OR IN$="a" THENF1=1:F2=F:GOTO1100
1000IF IN$="E" OR IN$="e" THEN 1010 ELSE 1020
1010FORI%=1 TO F:A$(I%,r)="" :NEXT:MATCH(r)=0:GOTO0940
1020IFIN$="" THENENDPROC
1030F%=STR$(F-1)
1040IFIN$<"0"ORIN$>F%THEN1060
1050GOTO1080
1060IFASC(IN$)>13THENPROCn
1070GOTO1090
1080IFIN$="0" THENF1=1:F2=1:GOTO1100
1090F1=VAL(IN$)+1:F2=F1
1100FORI%=F1 TOF2:IF INmem<200 THEN PROCn:ENDPROC EL
SE PROC:13,3+I%,no(I%),SI$(I%):A$(I%,r)=s$
1110IF ASC(s$)=1 THEN 1:20 ELSE red=1:MATCH(r)=2
1120NFX
1130GOTO0940
1140DEFPROCnh:PROCh("Fields Undefined"):PROCn:PRINTCH
R#129;" You have not defined the fields.":PRINTCHR#12
9;SPC(5);"Please do so via option (2).":PRINT:PROC:EN
DPROC
1150DEFPROCst:PROCh("Check"):PRINTCHR#125;SPC(8);"Are
you sure (Y/N)?":IN$=GET$:IF IN$="N" THEN ENDPROC EL
S CLEAR:GOTO070:ENDPROC
1160DEFPROCnf:PROCh("Filename Undefined"):PROCn:PRINT
CHR#129;" You have not defined a filename.":PRINTCHR#
129;SPC(5);"Please do so via option (1).":PROC:ENDPRO
C
1170DEFPROCsa:IF red<1 THEN PROCd:ENDPROC ELSE IF f$=
"" THEN PROCnf:ENDPROC ELSE PROCch("Save"):PRINTCHR#133
;SPC(5);" Press (S) to save the data.":PROCg
1180IN$=GET$:IF IN$="S" THEN 1190 ELSE IF IN$="" THE
N ENDPROC ELSE 1180
1190VDU28,5,12,25,8:Z%=OPENOUT (f$):PRINT#Z%,F,R:FOR
I%=1 TO F:PRINT#Z%,SI$(I%),no(I%),label$(I%):NEXT:FOR
I%=1 TO R:PRINT#Z%,MATCH(I%);FOR N%-1 TO F:PRINT#Z%,A#

```

```

(N%,I%):NEXT N%,I%:CLOSE#Z%:VDU28,0,21,39,3:PROC:ENDP
ROC
1200DEFPROCdi:IF red<1 THEN PROCd:ENDPROC ELSE PROCch(
"Display"):PRINTCHR#130;SPC(2);"Press (RETURN) to view
each file.":VDU28,1,17,38,7:PROCps:VDU28,0,21,39,3:PR
OCr:ENDPROC
1210DEFPROCps:IF SE=1 THEN SEI=2 ELSE SEI=1
1220FOR I%=1 TO R:IF MATCH(I%)=0 OR MATCH(I%)=SEI THE
N 1300
1230IF MATCH(I%)=0 OR MATCH(I%)=SEI THEN 1300
1240IN$=GET$:IF ASC(IN$)=13 OR ASC(IN$)=32 THEN 1250
ELSE PROCn:GOTO 1240
1250IF ASC(IN$)=13 THEN CLS ELSE ENDPROC
1260PRINT CHR#129;"Record.":I%
1270FOR N%=1 TO F
1280PRINTCHR#133;label$(N%);TAB(10);" ":CHR#131;A$(N
%,I%)
1290NEXT N%
1300NEXT I%
1310PROCtot:ENDPROC
1320DEFPROCcr:PRINTTAB(0,17);CHR#131;" Press (SPACE)
To return to":CHR#129;"MENU."
1330IN$=GET$:IF IN$="" THEN ENDPROC ELSE 1330
1340DEFPROCgb:PRINTTAB(0,17);CHR#131;" Press (SPACE)
To return to":CHR#129;"MENU.":ENDPROC
1350DEFPROClo:IF f$="" THEN PROCnf:ENDPROC ELSE PROCch
("Load"):PRINTCHR#133;SPC(5);"Press (L) to load new fi
le.":PROCg
1360IN$=GET$:IF IN$="" THEN ENDPROC
1370IF IN$="L" OR IN$="1" THEN 1380 ELSE PROCn:GOTO13
60
1380PROCc:VDU28,5,12,25,8:Z%=OPENIN (f$):INPUT#Z%,F4,
R4:PROCck:IF F4<0F THEN ENDPROC
1390FOR I%=1 TO F
1400INPUT#Z%,SI$(I%),no(I%),label$(I%)
1410NEXT
1420FOR I%=1 TO R
1430INPUT#Z%,MATCH(I%)
1440FOR N%=1 TO F
1450INPUT#Z%,A$(N%,I%)
1460NEXT N%,I%
1470CLOSE#Z%
1480VDU28,0,21,39,3
1490red=1:head=1
1500PROC:ENDPROC
1510DEFPROCck:IF F4=F THEN ENDPROC ELSE VDU28,0,21,39
,3:PROCch("Mismatch"):PRINTCHR#130;"If you wish to acce
ss this file then":PRINTCHR#130;"you must redefi-ne the
no. of fields to":PRINTCHR#130;"be :":CHR#133;F4;CHR#
130;"only this will give you :";
1520PRINTCHR#133;R4:PRINTCHR#130;"records and will be
compatible with":PRINTCHR#130;"the file you wish to l
oad. Please do so":PRINTCHR#130;"via option (0).":PROC:
ENDPROC
1530DEFPROCc:FORX%=1 TO F:FORJ%=1 TO R:A$(X%,J%)="" :N
EXTJ%,X%:ENDPROC
1540DEFPROCp:IF red<1 THEN PROCd:ENDPROC ELSE PROCch("
Printer dump")
1550FX5,1
1560FX6,0

```

(listing continued on next page)

(continued from previous page)

(5) Edit file: The fifth option in the menu is the edit procedure which allows the altering and adding of data to the file. All data is initially entered via this option.

Once the user has accessed this section of the system, the fields defined will be displayed followed by the space provided for the number of characters as defined in option 2 for the field. Altering data in a particular field may be achieved by typing the field number allowing data to be entered in the space provided.

Alternatively, the whole record can be entered by pressing A. Erasing a whole record may be achieved by pressing E. To access the next record simply press N or if you wish to edit a particular record press R followed by the record number and Return. Again the space bar will return you to the menu.

(6) Sort: The sort option enables the user to put the file in order according to any of the fields defined in option 2.

If the field has been defined as numeric or integer then the order will be of the algebraic nature, otherwise the file will be ordered according to character values.

Using the sort option requires only one entry; the user must choose the field on which the sort is to be based. Once the sorting is complete the user will be able to return to the menu in the normal way.

(7) Search: This is probably the most useful facility of any database. However, Superfile has a remarkably efficient and rapid search that is enhanced by its special mixture of machine code and hybrid Basic.

Search criteria used are the widely accepted mathematical inequalities — these are as follows:

- 1 > : greater than.
- 2 < : less than.
- 3 = : equal to.
- 4 > = : greater than and equal to.
- 5 < = : less than and equal to.
- 6 < > : not equal to.

For the "equal to" sign, the user may enter part of a string/number, and then the computer will search for all occurrences of the comparison. Only one search criteria may be entered per field, but many fields can have comparisons thus performing a multisearch function.

The number of items that the computer has found which satisfy the conditions defined is printed on the screen as they are found. These records can then be seen either on the screen or in the form of a printout on the printer. Screen and printer output are explained in options 8 and 9.

(8) Display: This option is used to print the records on the screen, these may only be displayed if they contain data. Pressing Return will allow you to view the next record. When all records have been displayed, the totals of the numbers stored in the integer and numeric fields will also be printed up.

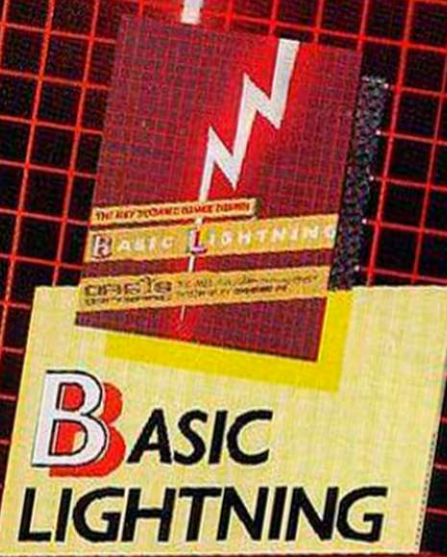
(9) Printer dump: As explained earlier, this version of Superfile can only cater for Parallel printers. We advise that you only use this option if you have a printer connected, otherwise the computer may appear to have crashed.

(0) Start again: This option is used if the user decides to change the format of the file, or if he just wishes to clear the memory. The computer asks you whether you wish to change your mind, just as a precaution before the computer clears the entire memory.

(listing continued from previous page)

```
1570PRINTCHR#131;" Press <RETURN> to view each record
":PROCg:=VDU28,0,19,39,7:CLS:VDU2
1580 IF SE=1 THEN SE1=2 ELSE SE1=1
1590FORI=1 TO R
1600IF MATCH(I%)=0 OR MATCH(I%)=SE1 THEN 1650
1610IN#:=GET$:IF IN#="" OR ASC(IN#)=13 THEN 1620 ELSE
PROCn:=GOTO1610
1620IF IN#="" THEN VDU3:=VDU28,0,21,39,3:ENDPROC
1630PRINTCHR#129;"Record:";CHR#133;I%:FORN=-1 TO F:PR
INTCHR#129;label$(N%);TAB(9);CHR#133;"":A$(N%,I%):NEX
TN%
1640PRINT
1650NEXTI%
1660PROCtot:=VDU3:=VDU28,0,21,39,3:PROCc:=ENDPROC
1670DEFPROCse:IF rec<1 THEN PROCd:=ENDPROC ELSE PROCc(
"Search"):SE=1:PRINTTAB(0,2);CHR#130;"Field";TAB(8,2);
"Equality";TAB(20,2);"Comparison"
1680FORX=1 TO F
1690PRINTTAB(0,3+X%);CHR#134;label$(X%);CHR#132;"PKIN
TTAB(12,3+X%);CHR#134;"<";SPC(no(X%));">"
1700NEXT
1710FORX=1 TO F
1720Value=0
1730PROCi(10,3+X%,2,"S")
1740IF s#="" THEN 1810
1750IF s#="<" THEN Value=1 ELSE IF s#=">" THEN Value=
2 ELSE IF s#="=" THEN Value=3 ELSE IF s#="<>" THEN Val
ue=4 ELSE IF s#="<=" THEN Value=5 ELSE IF s#=">=" THEN
Value=6 ELSE PRULn:=GOTO1750
1760IF SI$(X%)="N" OR SI$(X%)="I" THEN Value=Value+6
1770AL(X%)=Value
1780PROCi(14,3+X%,no(X%),CI$(X%))
1790IF s#="" THEN PROCn:=GOTO1780
1800ITEM$(X%)=s#
1810NEXT
1820F1=0
1830FORX=1 TO F:IF AL(X%)>=1 THEN F1=1
1840NEXT
1850IFF1=1 THEN1880
1860PROCn:=PRINTTAB(0,15);CHR#129;"You cannot search f
or any items as you":PRINTCHR#129;" have not defined a
ny comparisons."
1870PROCc:=GOTO2180
1880PRINTTAB(3,15);CHR#133;"Are you happy with this (
Y/N)?"
1890IN#:=GET$:IF IN#="N"THEN PRINTTAB(3,15);SPC(35);:F
ORIX=1 TO F:AL(I%):=0:NEXT: GOTO 1670 ELSE IF IN#="Y" T
HEN GOTO 1900 ELSE GOTO 1870
1900CLS:T=0:FAIL=0:PRINTTAB(12,6);CHR#129;CHR#141;"MA
TCHED ";T:PRINTTAB(12,7);CHR#129;CHR#141;"MATCHED ";T
1910FORX=1 TO R
1920IF MATCH(X%)=0 THEN 2110
1930FORJ=1 TO F
1940IF AL(J%)=0 THEN 2070
1950ON AL(J%) GOTO 1960,1980,2000,2010,2030,2050,1970
,1990,2000,2020,2040,2050
1960IF A$(J%,X%)<ITEM$(J%) THEN 2070 ELSE FAIL=1:GOTO
2070
1970IF VAL(A$(J%,X%))<VAL(ITEM$(J%)) THEN 2070 ELSE F
AIL=1:GOTO2070
```

```
1980IF A$(J%,X%)>ITEM$(J%) THEN 2070 ELSE FAIL=1:GOTO
2070
1990IF VAL(A$(J%,X%))>VAL(ITEM$(J%)) THEN 2070 ELSE F
AIL=1:GOTO2070
2000Z:=INSTR(A$(J%,X%),ITEM$(J%)):IF Z<>0 THEN2070 CLS
E FAIL=1:GOTO2070
2010IF A$(J%,X%)<>ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O2070
2020IF VAL(A$(J%,X%))<>VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
2030IF A$(J%,X%)<=ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
U 2070
2040IF VAL(A$(J%,X%))<=VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
2050IF A$(J%,X%)>=ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O2070
2060IF VAL(A$(J%,X%))>=VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
2070NEXTJ%
2080IF FAIL=1 THEN FAIL=0:GOTO 2110
2090MATCH(X%)=1
2100T=T+1:PRINTTAB(22,6);T:PRINTTAB(22,7);T
2110NEXTX%
2120PRINTTAB(2,17);CHR#133;"Printer or screen output
(P/S)?"
2130IN#:=GET$:IF IN#="F" OR IN#="S" THEN2140 ELSE GOTO
2130
2140 :F IN#="P" THEN PROCp ELSE PROCdi
2150FOR I%=1 TO R
2160IF MATCH(I%)>=1 THEN MATCH(I%)=2
2170NEXT
2180SE=0:FORI=1TOF:AL(I%):=0:ITEM$(I%)="":NEXT
2190ENDPROC
2200DEFPROCd:=PROCn:=PROCc("No_Data"):PRINTCHR#129;"You
can't enter this option before you":PRINTCHR#129;"hav
e inputted any data. Please do so":PRINTCHR#129;"via o
ption (S)":PROCc:=ENDPROC
2210DEFPROCc:=a=MATCH(L%):MATCH(L%)-MATCH(J%):MATCH(J%
)=m:FORK=1 TO F:S#:=A$(K%,J%):A$(K%,J%)=A$(K%,L%):A$(K
%,L%)=S#:NEXT:ENDPROC
2220DEFPROCg:=X=0:REPEAT:X=X+1:UNTIL MATCH(X%)<>2:Y
%=X-1:FOR K=1 TO (Y% DIV 2):FOR J=1 TO F:S#:=A$(J%,K
%):A$(J%,K%)=A$(J%,Y%-K+1):A$(J%,Y%-K+1)=S#:NEXT J%,
K%:ENDPROC
2230DEFPROCtot:=FOR I%=1 TO F:tot(I%):=0:NEXT I%:IF SE=
1 THEN SE:=2 ELSE SE1=1
2240FOR X=1 TO R
2250IF MATCH(X%)=0 OR MATCH(X%)=SE1 THEN 2240
2260FOR J=1 TO F
2270IF S$(J%)<>"S" THEN tot(J%)=tot(J%)+VAL(A$(J%,X
%)) ELSE 2280
2280NEXT J%
2290NEXTX%
2300CLS:PRINT:PRINTCHR#129;"TOTALS":FOR I%=1 TO F:PRI
NTCHR#133;label$(I%);TAB(11);"":CHR#131;:PROCdec:=NEXT
:ENDPROC
2310DEFNmen DIM P%-1:=HIMEM -P%
2320DEFPROCm:=PROCc("Low Memory"):PROCn:=PRINTCHR#129;
"Unfortunately you are close to the ":PRINTCHR#129;"me
mory limit. Please save file now":ENDPROC
2330DEFPROCder:=IF S$(I%)="S"THEN PRINTCHR#129"N/A":E
NDPROC ELSE PRINTtot(I%):ENDPROC
```



LIGHTNING STRIKES AGAIN



THREE HIGH POWERED GRAPHICS DEVELOPMENT SYSTEMS FOR THE COMMODORE 64

Totally dedicated to writing very fast, video games, BASIC Lightning is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled. Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.

As well as the Commodore's own 8 hardware sprites, BASIC Lightning has its own software sprites. Up to 255 can be defined with user selectable dimensions. These can even be several screens wide. They can be scrolled, spun, mirrored, enlarged or inverted with phenomenal speed and smoothness.

A Sprite Generator Program (written in BASIC Lightning) is also supplied and can be used to design, edit and store all your sprites for use in your main program.

White Lightning is a complete games writing package comprising a high level, forth based, multi-tasking games writing language, the extended BASIC (see BASIC LIGHTNING) and a powerful sprite Generator Program. Programs can even be written in a combination of forth and Commodore BASIC and the final program, which will run independently of White Lightning, can be marketed with no restrictions whatsoever.

The Basic Lightning part of this package can be used to experiment quickly and easily before the forth program is developed.

The speed of White Lightning has to be seen to be believed and a full demo is included. As with Basic Lightning, hardware sprites are supported, together with 255 software sprites which can be scrolled, spun, reflected, enlarged or mirrored.

MULTI-TASKING Without doubt, the most powerful feature of the Lightning series of languages is the multi-tasking facility. This allows two programs to be run concurrently and makes those smooth landscape scrolls etc. effortless.

The BASIC Lightning Sprite Generator Program is also included in the package.

Commodore 64 Machine Lightning is probably the most advanced games writing utility available on any micro. It comes in 4 parts:

MACRO ASSEMBLER / MONITOR / DISASSEMBLER This is probably the most comprehensive machine code development system available for the Commodore 64 with features too numerous to mention.

BASIC LIGHTNING BASIC Lightning, the multi-tasking BASIC is also provided to facilitate experimentation in preparation for later assembly.

SPRITE GENERATOR Used to develop all the graphics for the final game. The Sprite Generator has numerous functions including enlargement, rotation and reflection.

OBJECT LIBRARY This is Machine Lightning's most powerful feature. 10k of re-entrant code with more than 130 documented entry points. These are the routines that provide all the superfast graphics routines in White and Basic Lightning. They contain virtually every routine you'll ever need to write an Arcade Game and multi-tasking in Machine Lightning is covered in the comprehensive accompanying manual.



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TUTORIAL

LAST MONTH I covered the programming model of the 68008 and its addressing modes. A brief introduction to the instruction set was made and this will be expanded in this article, together with a more complex program example than the one given last month.

I will describe the instruction set under eight general headings, namely data movement, arithmetic, shift and rotate, bit manipulation, binary coded decimal, program control and system control.

The basic Move instruction was covered last month. It has several variants. Move multiple registers — MoveM — allows several registers to be moved to or loaded from memory in one instruction. Move quick — MoveQ — allows an eight bit signed number — i.e. from -128 to +127 — to be sign extended and loaded to a data register.

It is called "quick" as the whole instruction, including the number, is only one word — i.e. two bytes — long. Note there are other quick instructions in the 68008 instruction set.

Move peripheral data — MoveP — transfers data between a data register and alternate bytes of memory, and is intended to simplify the transfer of data between the 68008 and 8 bit peripheral devices. I have not found this a very useful instruction for the QL so far.

Load effective address — LEA — allows an effective address to be computed and stored in an address register. This is a much used instruction and an example will help. Suppose we have opened a channel using a QDOS system call and stored the channel ident returned by the call in a long variable labelled channel. Then to actually load the channel ident into address register a0 we will need a fragment of code such as:

```
LEA channel, a0  
MOVE.L (a0), a0
```

Push effective address — PEA — computes an effective address in a similar way to the LEA instruction, but pushes it onto the stack rather than storing it in an address register.

Exchange registers — EXG — exchanges the

contents of any register with any other register. Note that the whole 32 bit contents of each register is exchanged.

Link stack — Link — and unlink stack — UNLK — are related instructions. Link causes the current contents of an address register to be pushed onto the stack. The address register is then loaded with the updated contents of the stack pointer and a sign-extended displacement, which is a part of the instruction, is then added to the stack pointer.

This can be used to create a stack frame in which would be stored local data etc, as used in high level languages. UNLK restores the stack and appropriate address register to its state before a Link was executed by loading the stack pointer from the address register and then loading the address register from the top of the stack.

The ADD instruction adds the contents of the destination effective address to the contents of the source effective address and the result is stored in the destination effective address. The addition is binary. As an example suppose that data register d0 contains \$100 — i.e. decimal 256 — and that address register a0 points to a variable which contains \$200. Then the fragment of code

```
ADD.W (a0), d0
```

will store the result which is \$300 in d0. There are several variations on this instruction which are applicable to many other of the arithmetic instructions.

First, we can have Add.B, Add.W and Add.L producing byte, word and long results respectively. Either the destination or the source must be a data register — i.e. it is not possible to add the contents of two memory locations together without first moving one of them into a data register — but see AddX below.

The add address — AddA — instruction is similar to the Add instruction but the destination must be an address register — and so size byte is not allowed. Add immediate — AddI — specifies the source as immediate data, and add quick — AddQ — provides a "quick"

immediate add of from 1 to 8.

Add extended — AddX — performs an add of source and destination and the extend bit. It has two versions, either add register to register or add memory to memory.

The extend bit, when affected, is set to the same as the carry bit. It is unaffected by data movement instruction. Note that this allows multiple precision arithmetic.

The subtract instruction — Sub — and all its related instructions, i.e. SubA, SubI, SubQ and SubX work in exactly the same way as their equivalent Add instructions except that the source is subtracted from the destination — and in the case of SubX the extend bit is also subtracted.

Multiplication of two 16 bit numbers to produce a 32 bit result can be either unsigned — MulU — or signed — MulS. One of the multiplicands must be in a data register and the result will be placed in this same data register.

Similarly there are two divide instructions — DivS and DivU — which divide a 32 bit number in a data register by a 16 bit number. The result is a 16 bit quotient in the lower word of the data register and a 16 bit remainder in the upper word of the data register.

The compare — CMP — instruction performs a subtraction of the source from the destination, and sets the condition codes accordingly but does not change the destination. There are also similar compare address — CMPA — compare immediate — CMPI — and compare memory — CMPM — instructions.

Negate — Neg — subtracts the operand from 0 using 2's complement arithmetic. There is also a variation of this instruction using the extend bit (NEGX) for multiprecision arithmetic.

The clear instruction (CLR) clears, i.e. stores zero in, the operand. Note that, as with most instructions in the 68008 instruction set, this instruction does not work with all effective addressing modes. In particular it is not possible to CLR an address register. It is

(continued on next page)

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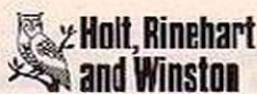
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(listing continued from page 118)

```

0016' 7402          52      mureq #2,d3      excl device
001E' 4FA 0116     53      lei scr_name,a8    point to screen
                                54      QDOS io_oper
001F' 7401          54+     moveq #io_open&FF,d8
0021' 4E42          54+     trap #io_open/$100
0021' 4100          54+     tst.l d8
0022' 6100 00F6    55      bne err_exit
                                56
                                57 #ard save scr_chan id in a5
                                58
0026' 2340          59      move.l a0,a5
                                60
                                61 #now get cartridge name and empty/good sectors
                                62
0021' 363C FFFF     63      move.w #inf,d3      timeout
0021' 284C          64      move.l a4,a8      get dir id
0021' 43FA 0106     65      lea buffer,a1
                                66      QDOS fs_wdint
0032' 7845          66+     moveq #fs_wdint&FF,c8
0034' 4E43          66+     trap #fs_wdint/$100
0036' 4A00          66+     tst.l c8
0038' 6600 00E0     67      bre err_exit
003C' 2001          68      move.l d1,d1      save empty/good sectors
                                69
                                70 #print cartridge name
                                71
003C' 343C 000A     72      move.w #10,i2     10 bytes in name
0042' 2040          73      move.l a5,a8      screen chan id
0041' 43FA 00F8     74      lea buffer,a1
                                75      QDOS io_sstrg
0043' 7007          75+     moveq #io_sstrg&FF,c8
0041' 4E43          75+     trap #io_sstrg/$100
004C' 4A00          75+     tst.l c8
004C' 6A00 00CA     76      bre err_exit
                                77
                                78 #print empty sector count
                                79
0052' 2204          80      move.l d4,d1
0054' 4041          81      swap d1
                                82      VECTOR ut_sint,i2
0056' 3470 00CE     82+     move.w ut_sint,i2
005A' 4E92          82+     jsr (a2)
005C' 4A00          82+     tst.l d8
005C' 6A00 00CA     83      bre err_exit
                                84
                                85 #print '/'
                                86
0012' 123C 002F     87      move.b # '/' ,d1
0016' 363C FFFF     88      move.w #inf,d3
                                89      QDOS io_sbyte
001A' 7805          89+     moveq #io_sbyte&FF,d8
001C' 4E43          89+     trap #io_sbyte/$100
001E' 4A00          89+     tst.l d8
001E' 6A00 00CA     90      bre err_exit
                                91
                                92 #print good sector count
                                93
0014' 3204          94      move.w d4,d1
                                95      VECTOR ut_sint,i2
0016' 3470 00CE     95+     move.w ut_sint,i2
001A' 4E92          95+     jsr (a2)
001C' 4A00          95+     tst.l d8
001E' 6600 009A     96      bre err_exit
                                97
                                98 #print line feed
                                99
0032' 123C 000A     100     move.l #1,d1
0036' 363C FFFF     101     move.w #inf,d3
                                102     QDOS io_sbyte
003A' 7805          102+    moveq #io_sbyte&FF,d8
003C' 4E43          102+    trap #io_sbyte/$100
003E' 4A00          102+    tst.l d8
003E' 6600 0088     103     bre err_exit
                                104
                                105 #start of loop
                                106
0094' 284C          107     loop   move.l a4,a8      get adv_chan id
                                108
                                109 #test for end of file
                                110
                                111     QDOS io_pend
0096' 7800          111+    moveq #io_pend&FF,d8
0098' 4E43          111+    trap #io_pend/$100
009A' 4A00          111+    tst.l d8
009C' 667A          112     bne.s loop_exit   exit if eof
                                113
                                114 #else fetch next dir record
                                115
                                116     moveq #4,d2      buffer length
009E' 7440          116     lea buffer,a1      addr of buffer
                                117
                                118     QDOS io_fstrg
00A4' 7803          118+    moveq #io_fstrg&FF,d8
00A6' 4E43          118+    trap #io_fstrg/$100
00A8' 4A00          118+    tst.l d8
00AA' 6600 00AE     119     bre err_exit
                                120

                                121 #test file and save length for B
                                122
                                123     lea.l buffer,a1      base of buffer
                                124     tst.l (a1)
                                125
                                126 #branch if file length 0
                                127
                                128     leq.s loop
0014' 670E          128     (st.w #0E(a1)
0036' 4A69 000E     129
                                130
                                131 #branch if name length 0
                                132     leq.s loop
003A' 6708          132
                                133
                                134 #calculate sector count of file
                                135
                                136     move.l a5,a8      scr_chan id in a8
003C' 2040          136     move.l (a1),d1      get length of file
003E' 2211          137     divu #12,d1      calc no of sectors
00C1' 02FC 0200     138     swap d:
                                139     swap d1
00C3' 4A41          140     tst.w d1
                                141     beq.w dir_l
                                142     add.l #10000,d1
                                143     dir_l   swap d:
                                144     sector count in d1.s
                                145 #print sector count
                                146
                                147     VECTOR ut_sint,i2   write sector count ut
00D1' 3470 00CE     147+    move.w ut_sint,i2
00D5' 4E92          147+    jsr (a2)
00D7' 4A00          147+    tst.l d8
00D7' 6600 003E     148     bre err_exit
                                149
                                150 #tab to col 4
                                151     move.w #4,d1
                                152     move.w #inf,d3      timeout
                                153     QDOS sj_tab
00E6' 7011          153+    moveq #sd_tab&FF,d8
00E8' 4E43          153+    trap #sd_tab/$100
00EA' 4A00          153+    tst.l d8
00EA' 6600 002C     154     bre err_exit
                                155
                                156 #print file name
                                157     lea buffer,a1      base of buffer back in a1
                                158     move.w #0E(a1),d2  no of bytes in name
                                159     alda #10,a1      point to start of name
                                160     QDOS io_sstrg
00F0' 7007          160+    moveq #io_sstrg&FF,d8
00F4' 4E43          160+    trap #io_sstrg/$100
00F8' 4A00          160+    tst.l d8
00F8' 6600 0016     161     bre err_exit
                                162
                                163 #print line feed
                                164
                                165     move.b #1,d1
                                166     QDOS io_sbyte
00F6' 7805          166+    moveq #io_sbyte&FF,d8
00F8' 4E43          166+    trap #io_sbyte/$100
00FA' 4A00          166+    tst.l d8
00FA' 6600 0088     167     bre err_exit
                                168
                                169 #and loop
                                170
                                171     bra loop
                                172
                                173 #routine exit
                                174
                                175     loop_exit cir.l d8      no errors
                                176
                                177 #error exit
                                178
                                179     err_exit   move.l d8,c3      err code
                                180     moveq #this_job,d1
                                181     QDOS st_frjob   remove job
                                182     moveq #at_frjob&FF,d8
                                183     trap #at_frjob/$100
                                184     tst.l d8
                                185     moveq #0,d3
                                186     rts          and ret
                                187
                                188     dir_name   dc.w 5
                                189     cc.b MDV1_
                                190     cncp 6,2
                                191     scr_name   cc.w 4
                                192     cc.b SCR_
                                193     cncp 6,2
                                194     buffer     cs.b 448
                                195     buf_end    equ buf_end+buffer
                                196     ri_buf     cs.b 118
                                197     ri_end
                                198
                                199     ri_buf     cs.b 118
                                200
                                201     end

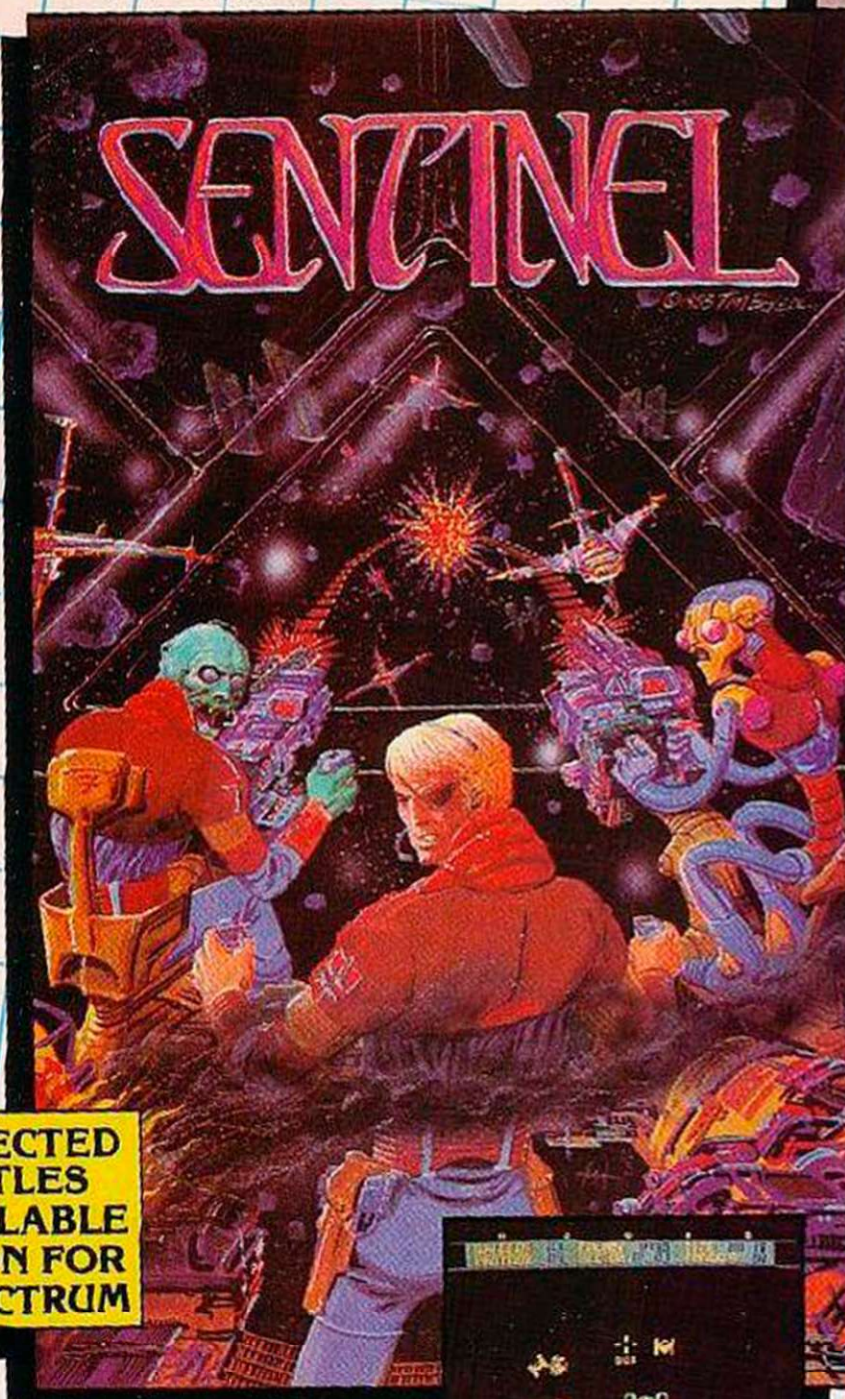
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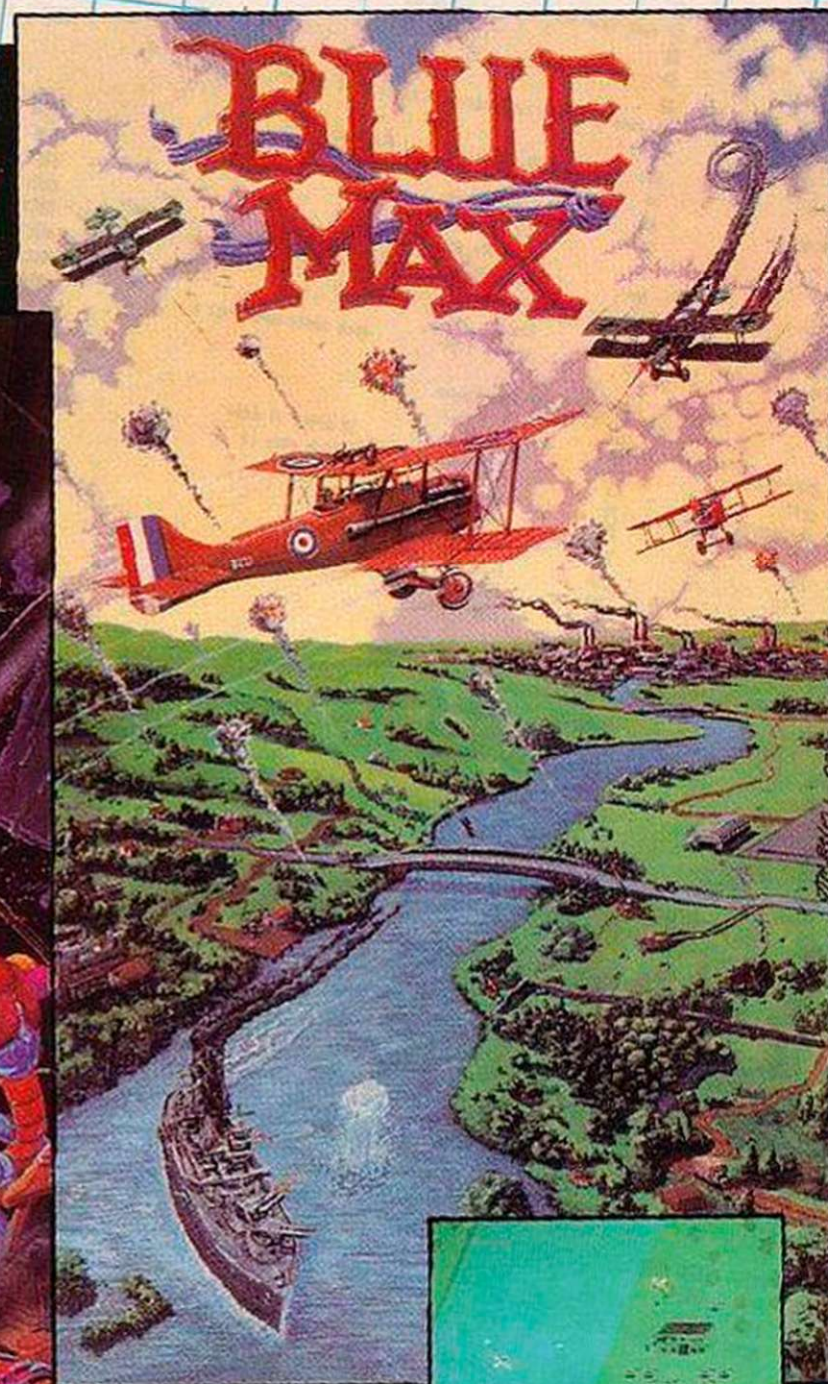
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RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

SECURITY SYSTEM

I own a Vic-20 and have just finished a program which returns information to the user when a password is entered. For security, I have included a line zero in the program, to disable the Run Stop/Restore functions. This is intended to stop a user from breaking into the program while it is running. However, when someone loads the program, Run must be typed in before the program will work. This, of course, gives the "pirate" time to list the program, and discover the password. I have heard of an automatic run sequence, such as the one on Anirog's version of *Krazy Kong*, but I cannot list the program to discover the basic idea. Please can you assist?

Timothy Carson,
Rechdale,
Lancashire.

THERE IS NO simple Poke or whatever which will give you autorun on the Vic-20, Timothy. A machine routine to do it would be some 90 to 100 bytes long. One simple thing you could do would be to 'hide' the password within the program, so it would take a lot of diligent searching to work it out. This could be done by as follows.

Don't just have a `IF A$ = "Password"` Then line in the program. Rather, hold the password as a series of character numbers, which the computer checks element by element, comparing the numbers with the ASCII codes of the entered string.

These need not be held in the same order as the password, and need not even be in a single place within the program. Every, say, third value could be a dummy, which the computer could ignore, and so on. If you make it difficult to work out the password, from an examination of the program, you increase its security to a certain extent.

MC GRAPHICS

I have a 48K Spectrum and have been learning machine-code. Most areas of machine code are well explained in books, but I have found very little on moving graphics and sprites. Could you tell me if there are any books specifically dealing with graphics?

Mark Goodacre,
Parklands,
Northampton.

ALTHOUGH, MARK, I do not know of any books specifically dealing with

the subject, I suggest the two which are most likely to be of value to you are *Supercharge Your Spectrum* by David Webb (Melbourne House, £5.95) and *Mastering Machine Code on your Spectrum* by Tony Baker (Interface Publications, £9.95). I'd be interested to hear from any publishers who have produced works dealing specifically with this area.

QL PRINTER

At present I have a ZX Spectrum, but I will be buying a QL shortly. To accompany the QL, I also intend to buy a printer. The main purpose for this is to produce a quality printout, suitable for format reports at University. However, I would also like it to be able to produce graphics. Obviously, I would need a dot matrix printer, and I gather printers such as the Brother EP44 and the Silver Reed EXD15 can produce a quality print very close to daisy-wheel quality. However, I am not sure how versatile they are with regard to graphics. Could user-define graphics be printed, for instance? If not, what kind of graphics can they print. Also, could they cope with subjects such as graphs? I intend to spend between £200 and £400.

C. J. Flint,
Wedwyn Garden City.

I HAVE USED an Epson FX80 extensively with my QL and have had no problem reproducing anything which can be held within a program line. Note that on the QL, graphics do not have the same importance as on the Spectrum. There is no built-in Basic routine for defining your own graphics, for instance. A machine-code routine is needed for this. There is also no built-in facility, like Copy, to dump the screen to the printer, although there are routines which will do this.

I often find it is better to put something like `Print CHR$(144)` within a listing, rather than just a pair of quote marks with an obscure, hard-to-decipher graphic within it. To get text output to the printer from the QL, you need to open the channel to the printer — I generally use #3 — then preface the material you want with this channel number, as in `Print #3, "Hello"`.

If program listings and straight text output form the bulk of the work you'll be doing, almost any printer will do. You can buy a very good daisy-wheel printer within your price range. Note that some printers do not allow you to control the width of the output when listing a program,

which can be a major disadvantage when including listings within other material. If this is important to you, you should check this out before you decide on a particular machine.

TOO COMPLEX?

I have a program on my Commodore 64 from one of your issues which includes several machine-code routines. I am sure it is typed in correctly. When it comes to a specific line — the same line each time I try to run it — which includes `SYS 38600`, the program goes wrong, and the message "Formula too complex" appears on the screen. The keyboard also locks up. What is wrong?

Bjorn Sundset,
Jakobsli,
Norway.

THE `SYS CALL` triggers the machine-code routine starting at address 38600. As you get an error message each time from this line, it appears that there is an error in the machine-code. The error message "Formula too complex" is not significant, as machine-code errors often trigger uncreated Basic error messages.

However, the fact that you've got a Basic error message suggests the error in your machine-code program modifies something used by the Basic program. It may, for example, take something off the stack without replacing it, so the Basic program finds the wrong values when carrying out something elsewhere in the program.

AID ON AID

I own a Vic-20 and an IOIO expansion board, with a Plus 80 16K Ram, a Commodore 8K Ram, a Programmer's Aid, and a Super Expander. When I do a `SYS 28681` to enable the Programmer's Aid, nothing happens. It works with the 16K Ram on its own, but when I add the other cartridges and try again, I get nothing. I would like to know if it is possible to get it to work with all the cartridges in it.

S. Moore,
Hull.

THE 8K CARTRIDGE and the Programmer's Aid use memory which overlaps, so you cannot run them both at once. You should have no problems with using all the others at the same time, but the PA and the 8K cannot be used at once because of the memory overlap.

SINCLAIR LATE!

Does any reader know how to get Microdrive orders executed. I placed my order eight weeks ago, and so far have received nothing. Sinclair has not even replied to my query. I am trying to contact the Office of Fair Trading to see if they can help. Has there been any action from this body over Sinclair?

Dr A G Smith,
Belfast.

SINCLAIR RESEARCH has been the target of several approaches from the Advertising Standards Authority, mostly due to its infamous 28 days delivery promise on QL's. A spokesman for Sinclair told me that, as far as he knew, no situation had arisen which meant the Office of Fair Trading had been brought into the question.

According to the records, your order was despatched seven weeks from the date of your order. If you have not received the product by the time the letter is published, let us know, and we'll send the boys over to sort it out.

CORRUPTION

I typed in a program from an earlier issue of your magazine for the Commodore 64. I had some difficulty keying it in, due I think to there being over 80 characters in some of the lines. Eventually, I managed it, and for some time after that I played the game quite often. Then, one day, at the end of Load, "Load Error" flashed up on the screen. On listing, the program looked complete. However, the game would not run, because after typing Run, parts of some lines — and all of some other lines — were deleted, or an error message was displayed, or the machine locked up. I cannot delete nor edit the offending lines because when I press Return the listing disappears, or simply returns as it was, or the machine locks up. I have tried the tape on another Commodore 64, using another recorder, and the same result occurs. How do I play the game, without retyping the whole program.

Fred Starr,
Cheadle Hulme,
Cheshire.

UNFORTUNATELY, IT sounds as if you have corrupted your tape, either by rerecording over part of it, destroying some of the information magnetically, or by stretching, or otherwise deforming the tape physically. Short of using the "load fix" options available in some extended Basics for the CBM-64, there is nothing you can do other than type in the program again.

I suggest that, this time, you make one or more security copies of the program, which are kept on a tape which you do not generally use, so if your working copy is corrupted, you'll have another copy of the program to fall back on.

By the way, you may have noticed on the Commodore 64 that programs which include sprites, such as the one you are talking about, tend to cause more problems when loading them in than non-sprite programs. This is because the machine slows down slightly to handle the extra interrupt routines demanded by the sprites and this appears to affect the quality of the save.

RETURN OF THE RING

THE RING
OF
DARKNESS
PART II

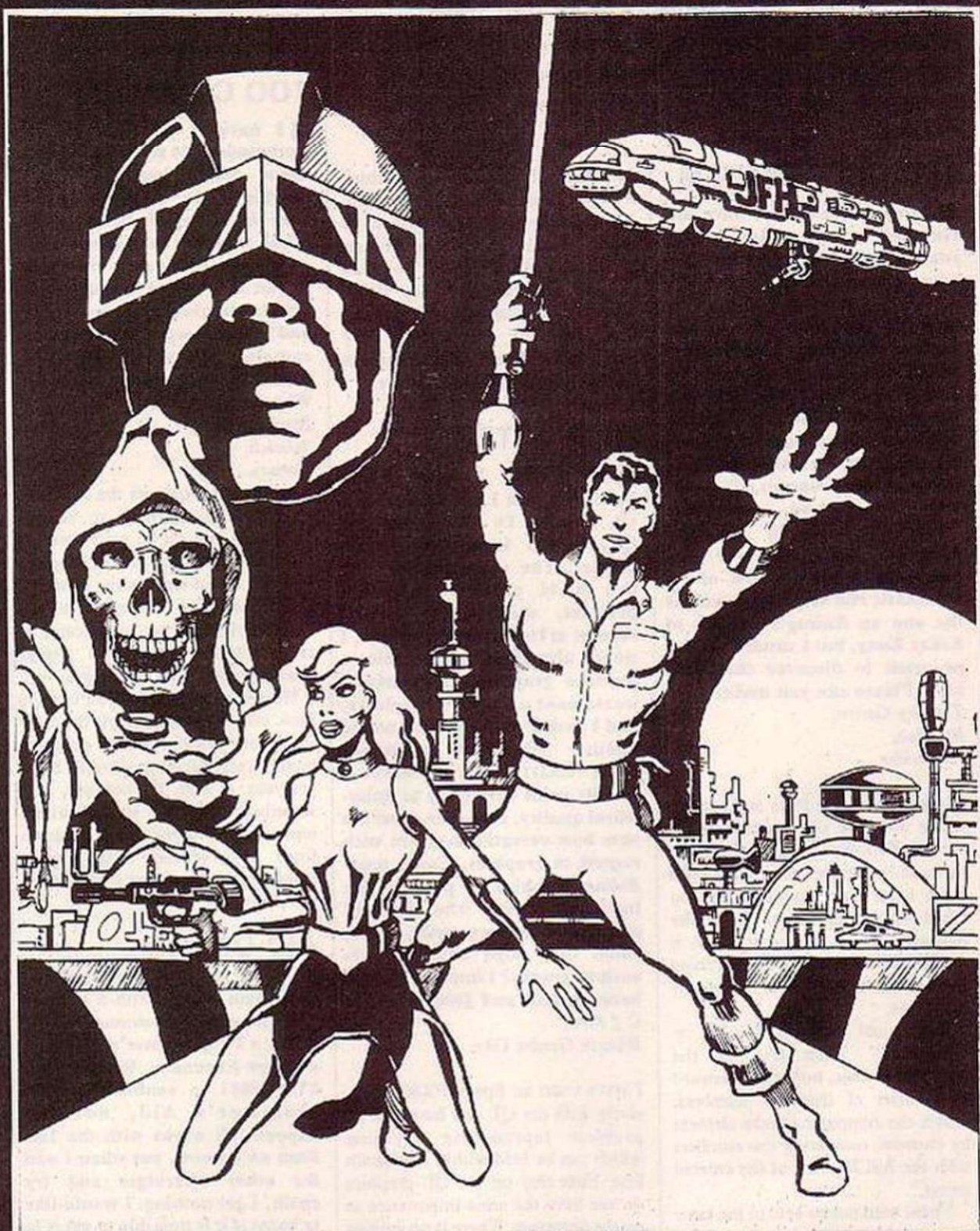
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Please note: RETURN OF THE RING is a complete adventure. You need not buy THE RING OF DARKNESS to play it.



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List enhance

D D McGarr,
Harborne,
Birmingham.



THIS PROGRAM allows you to print a selected range of Basic lines to either screen or printer. It simulates the facility List/LList — line number to line number available on other computers.

The program will run on 16K and 48K Spectrums and is Microdrive compatible. To use it, type:

RUN 9950

The program should be Merged with an existing program, or loaded before a session. Both start and end lines should exist; a message will be printed if either is absent. A message will also be printed if the start and end lines are not different.

To alter the colour of the listed line number alter line 9985, which is red at present. To change the colour of the Basic within the line alter line 9987 — blue at present.

```

9950 REM D.D.McGARR 1984
9951 INK 0: PAPER 7: BORDER 7: CLS
9952 REM LIST/LLIST START-END
9953 INPUT "FIRST LINE TO LIST ?": START
9954 INPUT "LAST LINE TO LIST ?": END
9955 IF START = END THEN PRINT "START AND END LINES MUST BE DIFFERENT": CLS
: GO TO 9952
9956 LET PROG=23635: LET VARS=23627
9957 DEF FN A(X)=256*PEEK (X+1)+PEEK X
9958 DEF FN B(X)=PEEK (X+1)+256*PEEK X
9959 LET PROG=FN A(PROG)
9960 CLS: PRINT AT 10,10:"PLEASE WAIT"
9961 LET VARS=FN A(VARS)
9962 REM FIND ADDRESS OF START LINE
9963 LET LINEADD=PROG
9964 IF LINEADD=VARS THEN CLS: PRINT "LINE ";START;" DOES NOT EXIST": STOP
9965 LET LINEEND=FN B(LINEADD)
9966 LET LINELEN=FN A(LINEADD+2)
9967 IF LINEEND=START THEN LET STLIN=LINEEND: LET STLINRADD=LINEADD: LET ENDLIN
N=LINELEN: GO TO 9971
9968 LET LINEADD=LINEADD+4+LINELEN
9969 GO TO 9964
9970 REM FIND ADDRESS OF FINISH LINE
9971 LET LINEADD=LINEADD+4+LINELEN
9972 IF LINEADD=VARS THEN CLS: PRINT "LINE ";END;" DOES NOT EXIST": STOP
9973 LET LINEEND=FN B(LINEADD)
9974 LET LINELEN=FN A(LINEADD+2)
9975 IF LINEEND=END THEN LET ENDLIN=LINEEND: LET ENDLINRADD=LINEADD: LET ENDLIN
N=LINELEN: GO TO 9980
9976 LET LINEADD=LINEADD+4+LINELEN
9977 GO TO 9972
9978 PRINT
9979 REM NOW PRINT LINES
9980 INPUT "LIST TO SCREEN OR PRINTER (S/P)?": OS
9981 CLS
9982 LET DEV=2: IF OS="P" OR OS="p" THEN LET DEV=0
9983 REM NOW DEAL WITH PRINTING CHARACTERS, JUMPING OVER NUMBER TOKENS & UNPRINT
TABLE CHARACTERS
9984 INPUT "LINE SPACING ? (1=SINGLE,2=DOUBLE ETC.):": SP
9985 PRINT #DEV: INK 2: FN B(STLINRADD): TAB 5:
9986 FOR N=STLINRADD+4 TO ENDLINRADD+2+ENDLINLEN
9987 PRINT #DEV: INK 1: CHR$ PEEK N AND (PEEK N=13 OR PEEK N>31):
9988 IF PEEK N=14 THEN LET N=N+5
9989 IF PEEK N=13 THEN FOR Z=2 TO SP: PRINT #DEV: NEXT Z: PRINT #DEV: INK 2: FN
B(N+1): TAB 5: LET N=N+4
9990 NEXT N
9991 PRINT #DEV
9992 STOP
9999 SAVE "LLIST" LINE 9950

```

Qwakers

Christopher Roche,
Sutton Coldfield,
West Midlands.



QWAKERS IS a fairground shooting game. You must shoot all the targets with a limited number of shots within the time limit. There are four levels of difficulty and four different screens

Controls are: Z — left, X — right; space bar — fire.

To load Qwakers, type in listing 1 and, without running it, save it to tape. Then key in listing 2 — again without running it — and save it. Now rewind the tape and load as if it were a single program.

Qwakers, Listing 1.

```

10 PRINT "READING MACHINE CODE"
20 FOR I=0 TO 1: CH=CHR$(PEEK I): REPR=CHR$(PEEK I+256): NEXT I: GOTO 100
30 IF CH>CHR$(255) THEN PRINT "TYPING ERROR IN LINE";PEEK(63)+256*PEEK(64): END
40 SU=SU+CH: NEXT I: SU<>24741 THEN PRINT "TYPING ERROR IN LINES 1000-1110": END
50 REM THE FOLLOWING TWO LINES WILL NEW AND LOAD THE NEXT PROGRAM ON TAPE
60 POKE63, 78: POKE62, 69: POKE63, 87: POKE64, 13: POKE65, 76: POKE66, 111: POKE67, 13
70 POKE68, 62: POKE69, 117: POKE64, 13: POKE198, 10
80
90 REM***** MACHINE CODE DATA*****
100
110
120 DATA 120, 159, 192, 141, 21, 3, 169, 13, 41, 20, 3, 88, 96, 155, 254, 200, 11
130 DATA 198, 2, 240, 3, 76, 49, 234, 173, 255, 3, 133, 2, 32, 35, 192, 92
140 DATA 75, 49, 234, 162, 0, 138, 74, 168, 189, 188, 2, 41, 127, 240, 110, 189, 195
150 DATA 130, 2, 46, 51, 133, 252, 254, 0, 208, 208, 9, 173, 16, 208, 25, 164, 147
160 DATA 122, 141, 16, 200, 109, 0, 200, 221, 228, 2, 114, 23, 120, 74, 174, 8, 173
170 DATA 173, 16, 208, 57, 164, 192, 240, 8, 189, 188, 2, 9, 128, 157, 168, 2, 129
180 DATA 198, 252, 208, 210, 76, 157, 192, 41, 127, 133, 252, 222, 0, 208, 189, 0, 161
190 DATA 228, 201, 255, 208, 11, 173, 16, 208, 57, 172, 192, 141, 16, 208, 169, 255, 186
200 DATA 221, 208, 2, 174, 20, 138, 74, 76, 3, 173, 16, 208, 57, 164, 192, 208, 249
210 DATA 189, 188, 2, 41, 127, 157, 188, 2, 158, 252, 208, 200, 232, 22, 16, 190
220 DATA 208, 131, 56, 234, 1, 2, 4, 8, 16, 32, 64, 128, 254, 253, 251, 247, 137
230 DATA 239, 223, 191, 127, 13, 13, 251, 255, 0, 3, 255, 255, 0, 0, 255, 255, 28

```

Qwakers, Listing 2.

```

13 FORN=54272054296: POKE N, 0: NEXT
23 POKE 54296, 15: LE=4000
33 POKE 5269, 0: RESTORE
43 POKE 50, 128: PRINT CHR$(8): POKE 254, 1
53 GOSUB 770: REM TITLE PAGE
63 GOSUB 1310: REM MUSIC FOR TITLE PAGE
73 GOSUB 40: REM PICK SKILL LEVEL
83 GOSUB 620: REM DRAW BOX FOR DUCKS
93 V=3248: O=1
120 POKE 2040, 192: POKE 204, 193: POKE 2042, 194: POKE 2043, 195: POKE 2044, 195: POKE 2045, 19
7
110 POKE 2046, 198: POKE 2046, 198: POKE 2047, 199
120 POKEV+39, 2: POKEV+39, 2: POKEV+40, 5: POKEV+41, 8: POKEV+42, 6: POKEV+43, 9: POKEV+44, 3
130 POKEV+46, 1: POKEV+45, 4
140 FORN=0 TO 62: READ POKE 12288+N, 0: NEXT
150 FORN=0 TO 62: READ POKE 12352+N, 0: NEXT
160 FORN=0 TO 62: READ POKE 12416+N, 0: NEXT
170 FORN=0 TO 62: READ POKE 12480+N, 0: NEXT
180 FORN=0 TO 62: READ POKE 12544+N, 0: NEXT
190 FORN=0 TO 62: READ POKE 12608+N, 0: NEXT
200 FORN=0 TO 62: READ POKE 12672+N, 0: NEXT
210 FORN=0 TO 62: READ POKE 12736+N, 0: NEXT
220 POKEV+1, 16
230 POKEV+3, 16
240 POKEV+5, 16
250 POKEV+7, 16
260 POKEV+9, 16

```

```

270 POKEV+10, 116
280 POKEV+11, 210
290 SVS40: S2
300 POKE 254, 1
310 POKE 1621, 2: POKE 2, 2
320 POKE 700, 2: POKE 701, 0: POKE 702, 2: POKE 703, 0: POKE 704, 2: POKE 705, 0: POKE 706, 2
330 POKE 707, 0: POKE 708, 2: POKE 709, 0
340 POKE 713, 0: POKE 712, 2
350 FORN=720 TO 729: D=0
360 POKE N, 0: NEXT
370 FORN=740 TO 749: B=0
380 POKE N, 0: NEXT: T1="000000"
390 POKEV, 21: POKEV+2, 65: POKEV+4, 105: POKEV+6, 145: POKEV+8, 185: POKEV+12, 222
400 REM*****
410 REM MAIN LOOP
420 REM*****
430 POKEV+21, 255: POKE 254, 0: SH=10
440 PRINT "*****PLEASE WAIT FOR DUCKS"
450 PRINT "*****GIVE INFO MUST RUN FORSDR TO 3000 NEXT"
460 PRINT "*****"
470 PRINT "*****"
480 REM MOVE GUN
490 IFN=30: G=0
500 IFN=32: THEM00=5
510 IFN=34: THEM00=5
520 IFN=36: THEM00=1533
530 CH=CHR$(PEEK 240): THEM=240
540 IF CH="S" THEN
550 POKEV+10, 0
560 PRINT "*****PRINTSPO(33)*****"
570 PRINT "*****SHOTS*****": SH=" "
580 GOT 490
590 REM*****
600 REM DRAW BOX
610 REM*****
620 POKE 5328, 0: POKE 5329, 0: PRINTN+147
630 PRINTN+137: REM
640 FORN=137: PRINT "*****"
650 PRINTN+33
660 PRINTN+33
670 PRINTN+37
680 PRINTN+38
690 PRINTN+37
700 PRINTN+37
710 PRINTN+37
720 PRINTN+37
730 PRINTN+37
740 PRINTN+37
750 RETURN
760 REM*****
770 REM TITLE SCREEN
780 REM*****
790 POKE 5328, 0: POKE 5329, 0: PRINTN+147
800 PRINT

```

(continued on next page)

SOFTWARE FILE

For each ship hit you score 50 points. The ships drop mines at random which home-in on the sub. These may be stopped by a direct hit from a torpedo or may very occasionally stop of their own free will in which case a torpedo fired at them will have been a waste of time. If a mine hits the sub, you lose a life.

If you lose five lives the game ends. Lastly, right at the beginning you are asked to input the level of difficulty. This figure sets the speed at which the Every command is called and so affects the speed of the ships across the screen.

Program notes and main variables.

Lines:

15-90 Set level of difficulty.
 100 Sets up main variables — see below.
 110 Jumps to initial screen, array for note frequency and duration, and plays tune.
 130 Useful when typing in program. Defines small Enter key to list in black on white.
 150 Sets up more variables.
 160 Jumps to main screen, windows, volume and tone envelopes and JDG definitions.

170-180 Interrupt commands.
 190-670 Main loop.
 680-1010 Interrupt routine to move ship. Also random mine generation; test for mine-hit etc.
 1020-1360 Main screen, windows etc.
 1390-1700 Primary screen, music etc.
 1750-2200 Enc of game routines.

Variables.

tim = amount of time allowed. Initially 100 — about 2½ mins.
 Lev = speed of interrupt routine — 1 to 5.

```

10 ***** c. S. EDWARDS 1984 *****
15 MODE 0:INK 0,1:INK 1,26
20 LOCATE 1,9
30 PRINT"PLEASE ENTER LEVEL:-          (1=H
ARD: 5=EASY)"
40 LOCATE 1,20
50 INPUT lev
60 IF lev<1 OR lev>5 THEN GOTO 70 ELSE GOTO 100
70 CLS:LOCATE 1,17:PRINT"TRY AGAIN":CHR$(7)
80 FOR n=1 TO 1500:NEXT n
90 RUN
100 sc=0:tim=100:l=5
110 GOSUB 1420
120 MODE 1
130 KEY 139,"node 2;border 13:ink 0,13:ink 1,0:paper 0
:pen 1:list"+CHR$(13)
150 x=1:xs=10:ox=320:oy=28:ymine=272:fired=0:mine=0
160 GOSUB 1050: REM ***** SET UP SCR
EEN ETC *****
170 EVERY lev+10,3 GOSUB 690
180 EVERY 75,2 GOSUB 970
190 DI: REM ***** AVOIDS COR
UPTING SCREEN *****
200 REM ***** MOVE SIGHTS & C
HECK FOR VALID FIRE *****
210 xs=xs-(JOY(0)=8)+(JCY(0)=4)
220 IF JOY(0)>=16 AND fired=0 THEN GOSUB 1320:fired=1
230 IF JOY(0)<16 AND fired=0 THEN GOTO 610
240 oy=oy+16
250 px=295-(oy-16)*((ox-xs2)/272)
260 PLOT px,oy
270 TAG
280 PRINT" ";CHR$(231);" ";
290 TAGOFF
300 REM ***** MINE HIT *****
310 IF px>=xmine+8 OR px<=xmine-8 AND oy>=ymine+8 OR o
y<=ymine-8 THEN GOTO 400
320 TAG
330 MOVE px,oy
340 PRINT" ";
350 MOVE px,oy-16
360 PRINT" ";
370 TAGOFF
380 fired=0:oy=28
390 ymine=272
400 IF oy<255 THEN GOTO 530
410 '
420 '
430 '
440 REM ***** SHIP HIT *****
450 '
460 '
470 IF px>=(x-4)*16 AND px<=(x+2)*16 THEN SOUND 1,500,
160,0,2,1,15:FOR n=1 TO 50:LOCATE x,9:PRINT shiphit$:N
EXT n:LOCATE x,9:PRINT" ";x=1:sc=sc+50:PRINT#1,"SCO
RE=";sc;
480 '
490 '
500 REM ***** TORPEDO OFF SCREEN ****
**
510 '
520 '
530 IF oy>=265 THEN LOCATE (INT(px/16))+2,25-(INT(oy/1
6)):PRINT" ";LOCATE (INT(px/16))+1,26-(INT(oy/16)):PRI
NT" ";fired=0:oy=28:LOCATE 20,25:PRINT CHR$(204);CH
R$(205);
540 px=295-(oy-16)*((ox-xs2)/272)
550 oy2=oy-16
560 MOVE px-32,oy2
570 TAG
580 PRINT" ";
590 TAGOFF
600 LOCATE 20,25:PRINT CHR$(204);CHR$(205);
610 IF xs<1 THEN xs=1
620 IF xs>38 THEN xs=38
630 LOCATE xs,10
640 PAPER 0
650 PRINT" ";CHR$(244);" "
660 EI
670 GOTO 190
680 REM ***** SHIP MOVE ROUT
INE *****
690 LOCATE x,9
700 PRINT" ";CHR$(240);CHR$(241);CHR$(242);CHR$(243)
710 IF ymine=272 THEN GOSUB 1350
720 IF ymine<272 THEN GOTO 730 ELSE IF INT(RND*10)+1<>
1 THEN GOTO 940
730 ymine=ymine-6
740 xmine=300-((320-xm2)/240)*(ymine-32)
750 IF ymine>25 THEN GOTO 870
760 SOUND 1,200,100,7,0,0,10
770 FOR n=1 TO 10
780 LOCATE 19,25:PRINT sub$
790 LOCATE 20,25:PRINT sub$
800 LOCATE 21,25:PRINT sub$
810 LOCATE 22,25:PRINT sub$
820 LOCATE 19,25:PRINT sub$
830 NEXT n
840 l=l-1:PRINT#3,"LIVES";l
850 IF l=0 THEN GOTO 1790
860 ymine=272:GOTO 940
870 MOVE xmine,ymine
880 TAG
890 PRINT" * ";
900 IF ymine>=257 THEN GOTO 930
910 MOVE xmine,ymine+16
920 PRINT" ";
930 TAGOFF
940 x=x+1
950 IF x=36 THEN LOCATE 36,9:PRINT" ":x=1
960 RETURN
970 SOUND 1,55,75,8,3,2,0
980 tim=tim-1
990 PRINT #2,"TIME=";tim
1000 IF tim=0 THEN GOTO 2020
1010 RETURN
1020 REM ***** VOL. & TONE EN
VELOPES : INK COLOURS SET :
SCREEN & WINDOWS DRAWN
: U.D.G'S DEFINED *****
1030 '
1040 '
1050 ENV 1,5,3,1,1,0,10,30,-1,10
1060 ENV 2,11,-1,25
1070 ENV 3,15,-1,5
1080 ENT 1,9,49,5,9,-10,15
1090 ENT 2,2,2,3,2,-2,3
1100 BORDER 0
1110 INK 0,1:INK 1,26:INK 2,11:INK 3,6
1120 FOR n=2 TO 8
1130 LOCATE 1,n
1140 PAPER 2
1150 PRINT" "
1160 NEXT n
1170 WINDOW #1,1,11,1,1:PAPER #1,3
1180 WINDOW #2,15,24,1,1:PAPER #2,3
1190 WINDOW #3,31,40,1,1:PAPER #3,3
1200 PRINT#1,"SCORE=";sc:PRINT #2,"TIME=";tim:PRINT #3
,"LIVES=";l
1210 SYMEOLE 240,0,0,0,31,4,255,127,63
1220 SYMEOLE 241,2,2,15,63,63,255,255,255
1230 SYMEOLE 242,0,0,192,255,255,255,255,255
1240 SYMEOLE 243,0,0,0,240,254,252,249,248
1250 SYMEOLE 245,0,0,86,170,0,0,0,0
1260 SYMEOLE 246,17,59,58,30,31,15,7,3
1270 SYMEOLE 247,120,65,2,4,8,16,255,255
1280 SYMEOLE 248,68,76,30,60,120,240,224,192
1290 shiphit$=CHR$(246)+CHR$(247)+CHR$(248)+" "
1300 sub$=" "+CHR$(204)+CHR$(205)+" "
1310 RETURN
1320 xs2=(xs*16)
    
```

(continued on next page)

SOFTWARE FILE

(continued from previous page)

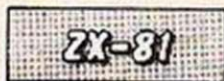
```

1330 SOUND 1,200,90,15,1,0,9
1340 RETURN
1350 xm2=(x*16)
1360 RETURN
1370
1380
1390 REM
1400 ***** MUSIC *****
1410
1420 MODE 0
1430 BORDER 11,16
1440 LOCATE 7,6:PRINT" YOU HAVE APPROX. "
1450 PRINT
1460 LOCATE 5,10:PRINT;(tim*1.5);"SECONDS"
1470 PRINT
1480 PRINT
1490 PRINT" TO SINK THE "
1500 PRINT
1510 PRINT
1520 PRINT" CONVOY "
1530 DIM notes1(25)
1540 DIM notes2(25)
1550 DIM dur1(25)
1560 DIM dur2(25)
1570 FOR a=1 TO 25
1580 READ notes1(a)
1590 READ dur1(a)
1600 NEXT a
1610 FOR a=1 TO 25
1620 READ notes2(a)
1630 READ dur2(a)
1640 NEXT a
1650 DATA 379,50,0,2,379,23,358,25,0,2,358,23,0,25,379
,25,358,25,379,25,426,25,478,25,506,75,426,25,319,50,3
58,50,379,12.5,478,12.5,358,12.5,426,12.5,319,25,358,2
5,379,50,426,50,478,75
1660 DATA 638,75,478,25,0,2,478,23,0,2,478,23,0,25,47
8,25,568,25,478,25,568,25,478,25,426,75,506,25,478,50
,506,50,638,12.5,758,12.5,506,12.5,638,12.5,478,25,568
,25,478,50,638,50,758,75
1670 FOR a=1 TO 25
1680 SOUND 17,notes1(a),dur1(a)
1690 SOUND 10,notes2(a),dur2(a)
1700 NEXT a
1710 RETURN
1720
1730
1740
1750 REM
1760
1770
1780
1790 FOR n=1 TO 3000:NEXT n:MODE 0
1800 LOCATE 10,26:PRINT" BAD LUCK "
1810 PRINT
1820 PRINT" YOU WERE DESTROYED "
1830 PRINT
1840 PRINT" BY MINES "
1850 PRINT
1860 PRINT" BUT YOU SCORED "
1870 PRINT
1880 PRINT
1890 PRINT" ";sc
1900 PRINT
1910 PRINT
1920 PRINT" POINTS "
1930 PRINT
1940 PRINT
1950 PRINT" WANT ANOTHER GO "
1960 PRINT
1970 PRINT
1980 GOSUB 2190
1990 STOP
2000
2010
2020 DI:MODE 0
2030 LOCATE 10,5:PRINT" YOUR TIME RAN OUT "
2040 PRINT
2050 PRINT
2060 PRINT" BUT YOU SCORED "
2070 PRINT
2080 LOCATE 8,14:PRINT;sc
2090 PRINT
2100 PRINT
2110 PRINT" POINTS "
2120 PRINT
2130 PRINT
2140 PRINT" WANT ANOTHER GO "
2150 PRINT
2160 PRINT" (y/n) "
2170 GOSUB 2190
2180 STOP
2190 a$=INKEY$:IF a$="" THEN GOTO 2190
2200 IF a$="y" THEN RUN ELSE IF a$="n" THEN RETURN
2210 GOTO 2190

```

The Mine

F Clancy
Manchester.



FULL INSTRUCTIONS on playing The Mine are included in the program. To save a copy of The Mine, first type in on line 1 a Rem

statement containing at least 670 characters. Next type in the standard hex loader given. Then run this program and type in the hex code given in listing 2. Then delete the hex loader, leaving line 1 intact.

Finally enter the rest of the Basic program given in listing 3 and save the finished program by entering Goto 770.

```

16895 - C77F0101000A0007F - 733
16896 - B5ED580C40A78082 - 111
16897 - 3EFF30017ED42309A - 114
16898 - 294520F7E7FA73032 - 987
16899 - 50050013FF14A7ED - 795
16900 - 40307A0464FE17B - 660
16901 - B0380122830B830E1 - 576
16902 - 29787E0282828FE16 - 776
16903 - B8178A0077F708A11 - 786
16904 - 2103760001187108 - 649
16905 - C3A7E0087E7E1A8E0 - 806
16906 - 0838080007836E0 - 806
16907 - 097E00026032007F - 871
16908 - E524007706006130 - 906
16909 - 08280077030037E - 904
17000 - 01320077E7E00047 - 704
17001 - 2103777E05E50008 - 649
17002 - D6072804307A1807 - 692
17003 - 2A0C40115E201906 - 806
17004 - 0705162B107E2A04 - 649
17005 - 7F3AC67730761828 - 806
17006 - 0430FA18048B2B04 - 704
17007 - 7F7E0677E6550687 - 806
17008 - A618087E0120040E - 576
17009 - 001803060340778A - 306
17010 - C07F03E300063010FE - 649
17100 - 3D7E1720023088FE - 649
17111 - 0020712E0040115E - 649
17119 - 0019060736302B10 - 649
17127 - F8C3B5400E260E21 - 649
17135 - 218640048E200736 - 704
17143 - 102800B9207510EE - 576
17151 - ED580C40211A0019 - 486
17159 - 118240E5010500ED - 606
17167 - 80C97A0009A000E1 - 738
17175 - C9 - 201

```

Listing 3.

```

10 LET A=0
20 FOR H=16514 TO 16518
30 POKE H,A
40 NEXT H
50 POKE 17100,140
60 LET D=0
70 PRINT AT 0,1;"HIGH 200000
SCORE 000000"
80 PRINT AT 0,11-LEN STR$ A:A
90 FOR F=1 TO 3
100 PRINT AT 1,14;"
101

```

Listing 1. The hex loader.

```

99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=5 TO F STEP 8
150 LET T=0
160 PRINT N;" - "
170 INPUT A$
180 PRINT A$;" - "
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+0
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GOTO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GOTO 150
310 NEXT N

```

Listing 2.

```

16519 - 2A0C401138001922 - 330
16527 - FE7F115B0019220C - 752
16535 - 7F3E0032F27F320C - 850
16543 - 7F2A0C4011580019 - 376
16551 - 22C47F3EFA32C67F - 1044
16559 - 21000022C77F2AFE - 659
16567 - 7F3F2640FEDF2006 - 804
16575 - 3A2540FEF720012B - 736
16583 - 3A2540FEF720173A - 765

```

```

16591 - 2640FEF720012311 - 688
16599 - 2100FEF72003A7ED - 966
16607 - 52FEF720011922FA - 901
16615 - 7F7E7E002819FE88 - 962
16623 - 2815FE1720080E05 - 392
16631 - 21F37F34C0E04210 - 824
16639 - 062AFE7F22FA7F2A - 832
16647 - FE7F36002AFA7F36 - 928
16655 - 1522FE7F3EB41121 - 728
16663 - 002A0A7FA7E068BE - 1647
16671 - 204A19E5A7ED58BE - 1038
16679 - 203A0600193634A7 - 354
16687 - ED3218F0E1E53AFE - 1049
16695 - 7F3020153AFF7F6C - 950
16703 - 20101922FE7F7E7E - 858
16711 - 002805E122FE7FC9 - 836
16719 - 3615E1197E7E0028 - 748
16727 - 007E152802180D3E - 422
16735 - 56064610FE00FE34 - 815
16743 - 20F718873E341121 - 650
16751 - 002AFF7F7FA7F062 - 1138
16759 - BE20040BFE18F6E1 - 1178
16767 - 220A7F2AFE7F1121 - 836
16775 - 00A7ED583E03BE20 - 773
16783 - 123AF27FE05200B - 747
16791 - 1936021C67F46CD - 712
16799 - EB420C9E0580C402A - 948
16807 - FE7F7F7ED52112100 - 817
16815 - 3EFFE0503030F8FE - 1849
16823 - 1438281970FE0938 - 985
16831 - 22FE10301E2AC77F - 750
16839 - 3E2E0E28163A3440 - 634
16847 - 10770C241030F8ED - 1099
16855 - 4B0C4021178020919 - 343
16863 - 22077F2AC77F7E7E - 1108
16871 - 3E201711210E3600 - 205
16879 - 197E7E152003368E - 961
16887 - 09FE002005382E22 - 626

```


(continued from previous page)

```

30008.dpr LDA#23:JSR&FFEE:LDA#248:JSR&FFEE:LDA#0:big]
oop LDA#0:LDY#4:.loop ROLdef1,X:BCSverander:.resume DE
Y:BNEloop:JSR&FFEE:INX:CFX#0:BNEbigloop:JMPrint
30009.verander CFY#4:BEQfour:CFY#3:BEQthree:CFY#2:BEQT
wo
30010.one CLC:ADC#3:JMPresume
30011.two CLC:ADC#12:JMPresume
30012.three CLC:ADC#48:JMPresume
30013.four CLC:ADC#192:JMPresume
30014RTS
30015.print LDA#31:JSR&FFEE:LDA#70:JSR&FFEE:LDA#71:JSR
&FEE:LDA#248:JSR&FFEE:RTS
30016: NEXT
30017ENDPROC
30018
    
```

```

30019DEFPROCPRINT (xx%,yy%,A%):LOCAL%
30020IFmode%=10Rmode%=40Rmode%=6 width%=40
30021IFmode%=0Rmode%=3 width%=80
30022IFmode%=20Rmode%=5 width%=20
30023IFmode%=30Rmode%=6:height%=25 ELSEheight%=32
30024FORQ%=1TOLENA%:def1=!(C000+8*(ASC(MID$(A%,Q%,1)
)-32)):def2=!(C000+8*(ASC(MID$(A%,Q%,1))-32)+4)
30025IFgraphics% GOT030029
30026FORZ%=0TO1:??70=xx%:??71=yy%:CALLdpr
30027xx%=xx%+1:NEXT
30028IFxx%>width% xx%=0:yy%=yy%+1:NEXT:PRINT:ENDPROC
ELSENEXT:PRINT:ENDPROC
30029FORZ%=0TO1:MOVE1279*(xx%/width%),1023-(1023*(yy%/
height%))
30030CALLdpr:xx%=xx%+1:NEXT:IFxx%>width% xx%=0:yy%=yy
%+1:NEXT:PRINT:ENDPROC ELSENEXT:PRINT:ENDPROC
    
```

Picasso's paintbrush

Matthew Sillett,
Dulwich,
London SE21.



THE TEXT FOR this program was published in January Software File without its listing. Here is the full program. Picasso's Paintbrush is a multi-feature drawing program for the BBC Micro. Impressive pictures can be created quickly and easily using the many built-in functions.

- Automatic circle, triangle, semi-circle rectangle and ellipse drawing routines
- Extensive colour mixing.
- Three cursor speeds.
- Three line thicknesses.
- Rubber band facility.
- Load and Save screens.
- Spray colour option.
- Print text anywhere on the screen.
- Colour-fill routine.
- Full MODE2 colour graphics.

The program contains full instructions of how to operate these functions and the keys involved — all 30 of them. There are three methods of colour mixing provided, all of which are very easy to use.

The first way is to fill the area involved in one of the two colours to be mixed — e.g., red — and then to overlay it with alternate pixels of the second colour — e.g., yellow. The combination of Red and yellow produces a very good orange.

The second way is the same as above, but to overlay with horizontal lines — e.g., a darker orange may be produced using this method. The final method is to use high GCOL values to produce "hatching". On pressing the specified key, you must enter this value — e.g., 198 produces a good brown, when the colour is set to white.

Copies of the program are available for £3.50 from: M. J. Sillett, 41, College Rd., Dulwich, London SE21.

```

10REM (c)AUGUST 1984 M.J.SILLETT
20:
30REM N.B. To save picture hit F8,
40REM position tape and hit RETURN
50:
60ONERRORRUN
70VDU6
80MODE2
90VDUS:VDU6
100X=633:Y=550:D=0:OX=X:OY=Y:OZ=X:OW=Y:PX1=-1:PY1=0:
PX2=-1:PY2=0:G=0:U=0:V=1:col=7
110XP=576:P=0:R=0:B=0:C=0:S=1
120E=1:A=1:W=0
130PROCscreen
140VDU24,25;98;1255;1000;
150PROCcursor(y)
160IFX<25 X=25
170IFX>1255 X=1255
180IFY<98 Y=98
190IFY>1000 Y=1000
200VDU24,25;20;1255;1000;:GCOLD,7:MOVEXP,70:PRINTCHR
#228
210IFXP>128 GCOLD,0:MOVEXP-64,70:PRINTCHR#228
220IFXP-120AND col=0GCOLD,0:MOVE1088,70:PRINTCHR#228
230VDU24,25;98;1255;1000;
240DX=X:OY=Y
250IFINKEY(-26)X=X-8
260IFINKEY(-26)AND INKEY(-1)X=X-32
270IFINKEY(-26)AND INKEY(-98)X=X-128
280IFINKEY(-122)X=X+8
290IFINKEY(-122)AND INKEY(-1)X=X+32
300IFINKEY(-122)AND INKEY(-98)X=X+128
310IFINKEY(-58)Y=Y+4
320IFINKEY(-58)AND INKEY(-1)Y=Y+16
330IFINKEY(-58)AND INKEY(-98)Y=Y+64
340IFINKEY(-42)Y=Y-4
350IFINKEY(-42)AND INKEY(-1)Y=Y-16
360IFINKEY(-42)AND INKEY(-98)Y=Y-64
370IFINKEY(-33)G=0:y=1
380IFINKEY(-114)G=0:y=0
390IFINKEY(-115)GOSUB 700
400IFINKEY(-116)GOSUB 710
410IFINKEY(-21)GOSUB 720
420IFINKEY(-117)ANDINKEY(-1)=FALSE PROCcirc(1)
430IFINKEY(-117)ANDINKEY(-1) PROCcirc(3)
440IFINKEY(-24)PROCelipse
450IFINKEY(-89)PROCcirc(2)
460IFINKEY(-72)PROCr(1)
470IFINKEY(-73)PROCr(2)
480IFINKEY(-118)GCOLD,128+col:CLG
490IFINKEY(-23)y=1:PROCwrite:GOTO150
500IFINKEY(-119)PROCSave
510IFINKEY(-120)PRULoad
520IFINKEY(-99)col=col+1:SOUND1,-15,10,1:IFcol<>16 )
    
```

```

P=XP+64:GOTO150:ELSE IF col=16col=0:XP=128:GOTO150
530IFINKEY(-97)Q=1:y=0
540IFINKEY(-88)FX=X:FY=Y:QY=Y:PROCF
550IFINKEY(-102)DX=X:A=POINT(X,Y):REPEAT:S=1:GCOLD,c
ol:C=POINT(X,Y):PROCP(X,Y):y=1:IFP=1ANDR=1:X=X+8:P=0:R
=0:UNTILB=1:E=0:X=DX:REPEAT:S=2:GCOLD,col:C=A:PROCP(DX
,Y):y=1:IFP=1ANDR=1:EX=DX-8:P=0:R=0:UNTILB=1:B=0:S=1:G
OTO680
560IFINKEY(-103)DX=X:A=POINT(X,Y):REPEAT:S=1:GCOLD,c
ol:C=POINT(X,Y):PROCP(X,Y):y=1:IFP=1ANDR=1:X=X+8:P=0:R
=0:UNTILB=1:E=0:X=DX:REPEAT:S=2:GCOLD,col:C=A:PROCP(DX
,Y):y=1:IFP=1ANDR=1:EX=DX-8:P=0:R=0:UNTILB=1:B=0:S=1:G
OTO680
570IFINKEY(-104)DX=X:A=POINT(X,Y):E=1:REPEAT:6-1:GCOL
LD,col:C=POINT(X,Y):PROCb(X,Y):y=1:IFP=1ANDR=1:X=X+8:P
=0:R=0:UNTILB=1:B=0:E=1:X=DX:REPEAT:S=2:GCOLD,col:C=A:
PROCb(DX,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILB=1:B
=0:S=1:GOTO680
580IFINKEY(-2)Q=2:y=0
590IFINKEY(-90)AND INKEY(-1)GOSUB 760:GOTO150
600IFINKEY(-90)VDU21:INPUTTAB(5,1)D:VDU6:GOSUB 780:G
OTO150
610IFINKEY(-25)GCOLD,RND(7):PLOT69,X+RND(40),Y+RND(4
0):PLOT69,X-RND(40),Y-RND(40):PLOT69,X+RND(40),Y-RND(4
0):PLOT69,X-RND(40),Y+RND(40)
620IFINKEY(-121)GCOLD,col:PLOT69,X+RND(40),Y+RND(40)
:PLOT69,X-RND(40),Y-RND(40):PLOT69,X-RND(40),Y-RND(40)
:PLOT69,X-RND(40),Y+RND(40)
630*FX15,0
640IFY<98GOTO:50
650IFINKEY(-74) ANCPX1<0GOSUB730:SOUND1,-15,50,2:GOT
O150
660IFINKEY(-74) ANCPX2<0 GOSUB740:SOUND1,-15,75,2:GOT
O150
670IFINKEY(-74) GOSUB750:SOUND1,-15,100,2:GOTO150
680GOTO150
690END
700OZ=X:OW=Y:y=1:G=1:GCOLD,col:MOVEX,Y:DRAWX,Y:RETUR
N
710GCOLD,col:MOVEUZ,UM:DRAWX,Y:RETURN
720GCOLD,0:MOVEOZ,OW:DRAWX,Y:RETURN
730GCOLD,col:MOVEV,Y:DRAWX,Y:PX1=X:PY1=Y:RETURN
740GCOLD,col:MOVEV,Y:DRAWX,Y:PX2=X:PY2=Y:U=1:RETURN
750GCOLD,col:MOVEV,Y:DRAWX,Y:PX2=X:PY2=Y:U=1:RETURN
PX1=-100:PY1=-100:PX2=-100:PY2=-100:RETURN
760*FX9,0
770RETURN
780*FX9,25
790RETURN
800DEFPROCscreen
810GCOLD,7:MOVE10,5:DRAW1270,5:DRAW1270,10:4:DRAW10,
10:4:DRAW10,5:MOVE15,10:DRAW1265,10:DRAW1265,1009:DRAW
15,1009:DRAW15,10
820VDU4:COLOUR7:PRINTTAB(1,30)CHR#225:FORF=0TO15:COL
    
```

SOFTWARE FILE

```

OURF:PRINTTAB(2+F,30)CHR#227:NEXT:VDU5:MOVE15,85:DRAW1
265,85:MOVE15,90:DRAW1765,90
830ENDPROC
840DEF PROCcursor(x)
850GCOLD,7:FJRF=1T04:MOVEX+24,Y:DRAWX-24,Y:MOVEX,Y+2
4:DRAWX,Y-24:NEXT
860IFX=1 ENDPROC
870IFX=OX AND Y=OY ENDPROC
880GCOLD,col
890IFQ=0 MOVEOX,OY:DRAWX,Y
900IFQ=1 MOVEX-26,Y+12:PRINTCHR#224
910IFQ=2 MOVEX-14,Y+4:PRINTCHR#226
920ENDPROC
930DEFPROCcirc(N)
940*FX15,1
950VDU21:INPUTTAB(5,1)S:VDU6:MOVEX,Y:GCOLD,col:IF N=
1FOR IX=0T0360 STEP10:MOVEX,Y:PLOT85,COSRAD(IX)*(10+S)
+X,SINRAD(IX)*(10+S)+Y:NEXT
960IF N=2FOR IX=0T0180 STEP10:MOVEX,Y:PLOT85,COSRAD(
IX)*(10+S)+X,SINRAD(IX)*(10+S)+Y:NEXT
970IF N=3MOVECOSRAD(0)*(10+S)+X,SINRAD(0)*(10+S)+Y:F
ORI:=0T0360:DRAWCOSRAD(IX)*(10+S)+X,SINRAD(IX)*(10+S)+
Y:NEXT
980VDU26
990ENDPROC
1000DEFPROCellipse:VDU21:INPUTTAB(0,5)X%:INPUTTAB(0,5)
Y%:VDU6:GCOLD,col:MOVEX,Y:FORIX=0T0360STEP2:MOVEX,Y:PL
OT85,ETN:RAD(IX)*X%,COS(RAD(IX))*Y%+Y:NEXT:ENDPROC
1010DEFPROCr(H)
1020*FX15,0
1030VDU21:INPUTTAB(0,5)U:INPUTTAB(0,5)V:VDU6:GCOLD,col
1:IFH=1MOVEX+U,Y-V:DRAWX+U,Y+V:DRAWX-U,Y+V:DRAWX-U,Y-V
:DRAWX+U,Y-V
1040IFH=2MOVEX+U,Y-V:DRAWX+U,Y+V:PLOT85,X-U,Y+V:DRAWX
-U,Y-V:PLOT85,X+U,Y-V
1050ENDPROC
1060DEFPROCwrite
1070*FX15,0
1080GCOLD,col
1090A$=GET$:MOVEX-6,Y+12:PRINTA$:X=X+64:ENDPROC
1100DEFPROCsave
1110VDU24,25;20;1255;1000;:GCOLD,0:MOVE XP,70:FRINTCH
R#228:XP=576:col=7:GCOLD,7:MOVE XP,70:PRINTCHR#228:VDU
24,25;90;1255;1000;
1120*SAVE SCREEN 3000 8000
1130ENDPROC
1140DEFPROCload
1150*LO. SCREEN
1160VDU24,25;20;1255;1000;:GCOLD,0:MOVE XP,70:FRINTCH
R#228:VDU24,25;90;1255;1000;
1170Y=1:X=633:Y=505:XP=576:col=7
1180ENDPROC
1190DEFPROCb(x,y)
1200B=E
1210Q=Y:Z=Y
1220IFS=1 IFPOINT(X+8,Y)<>C 0=1
1230IFS=2 IFPOINT(X-8,Y)<>C 0=1

```

```

1240REPEAT
1250IFPOINT(X,Q+4)<>C:P=1
1260IFPOINT(X,Z-4)<>C:R=1
1270IFC=Y AND E=2 ANDINKEY(-74)=FALSE MOVE X,Y:PLOT69
,X,Y
1280IFP=0ANDE=1:MOVE X,Q:PLOT69,X,Q+4
1290IFR=0ANDE=1:MOVE X,Z:PLOT69,X,Z-4
1300Q=Q+4:Z=Z-4
1310IFINKEY(-74)P=1:R=1:O=1
1320E=E+1:IFE=3 E=1
1330UNTILP=1 AND R=1
1340IFC=1 C=2
1350IFB=2 E=1
1360IFO=1 B=1:O=0
1370ENDPROC
1380DEFPROCf
1390GCOLD,col
1400REPEAT
1410PLOT77,FX,FY
1420FY=FY+4
1430UNTILPOINT(FX,FY)<>0
1440REPEAT
1450PLOT77,FX,QY
1460QY=QY-4
1470UNTILPOINT(FX,QY)<>0
1480ENDPROC
1490DEFPROC(x,y)
1500Q=Y:Z=Y
1510IFS=1 IFPOINT(X+8,Y)<>C 0=1
1520IFS=2 IFPOINT(X-8,Y)<>C 0=1
1530REPEAT
1540W=W+1
1550IFP=0AND W=1 MOVE X,C:PLOT69,X,Q
1560IFR=0AND W=1 MOVE X,Z:PLOT69,X,Z
1570IFPOINT(X,Q+4)<>C:P=1
1580IFPOINT(X,Z-4)<>C:R=1
1590Q=Q+4:Z=Z-4
1600IFINKEY(-74)P=1:R=1:O=1
1610IFW=2W=0
1620UNTILP=1 AND R=1:W=0
1630IFU=1 B=1:U=0:E=2
1640ENDPROC
1650DEFPROCp(x,y)
1660Q=Y:Z=Y
1670IFS=1 IFPOINT(X+8,Y)<>C 0=1
1680IFS=2 IFPOINT(X-8,Y)<>C 0=1
1690RFPFAT
1700W=W+1
1710IFP=0MOVE X,Q:PLOT69,X,Q
1720IFR=0MOVE X,Z:PLOT69,X,Z
1730IFPOINT(X,Q+4)<>C:P=1
1740IFPOINT(X,Z-4)<>C:R=1
1750Q=Q+4:Z=Z-4
1760IFINKEY(-74)P=1:R=1:O=1
1770UNTILP=1 AND R=1
1780IFO=1 B=1:O=0:E=2
1790ENDPROC

```

Artist

John McHale,
Sligo,
Eire.



THIS PROGRAM USES the CBM-64's hi-resolution graphics facilities and enables you to draw impressive pictures on screen with the added bonus of being able to save any picture created, to tape with the touch of one key.

```

0 REM * BASIC LOADER FOR MACHINE CODE *
1 REM *****
2 REM * JOYSTICK ART. *
3 REM * FOR THE CBM 64 *
4 REM * WRITTEN BY *
5 REM * JOHN MC HALE *
6 REM * SLIGO,EIRE....*
7 REM *****
8 PRINT"THIS PROGRAM USES A JOYSTICK IN PORT 2." :FOR T=0T02000:NEXT
10 C=C+1 IFC=2THENSYS49588
20 PRINT"PLEASE WAIT , LOADING 'ARTIST CBM 64' "
30 FOR T=0T02000:NEXT
40 LOAD"*.1,1

```

```

10 REM * PROGRAM 2 , HEX CODE LOADER *
12 60SUB500
100 ADI=49152:TL=0 :PRINT"PLEASE WAIT , LOADING MACHINE CODE NOW ."
110 KENDX$=IFHX$="XX" THENZ00
120 FORT=0T07
130 H=RSC(MID$(HX$,T+1,1))-48:IFH>9"HEM#H-7
140 L=RSC(MID$(HX$,T+2,1))-48:IFL>9"HEM#L-7
150 FORADD+T.H+16+L TL+TL+H*16+L:HCK:NEP:000:GOTO110
200 IFADD<50072THENPRINT"INSUFFICIENT DATA 1":STOP
210 IFTL<124700THENPRINT"ERROR IN DATA INPUT":STOP
220 PRINT"THE DATA HAS BEEN SUCCESSFULLY ENTERED ."
230 PRINT"AND HAS BEEN LOADED INTO MEMORY FROM ."
240 PRINT"49152 ($C000) ONWARDS ."
250 PRINT"YOU NOW HAVE THE FOLLOWING OPTIONS : "
260 PRINT:PRINT"1. SAVE THE MACHINE CODE TO TAPE"
270 PRINT:PRINT"2. END THIS PROGRAM"
280 PRINT:PRINT
290 INPUT"OPTION NO. ",OPT
300 IFOPT<1ANDOPT<2THENZ90
310 IFOPT=1THENZ00
320 PRINT"HAS THE MACHINE CODE BEEN SAVED (Y/N)"
330 PUKE197,64:GETANE:IFAN$=""THENZ300
340 IFAN$<"Y"THENZ20
350 SYS64738

```

```

500 PRINT"SAVING MACHINE CODE TO TAPE: "
510 PRINT"NOTE: YOU SHOULD SAVE THE MACHINE CODE"
520 PRINT"ON THE SAME TAPE AS PROGRAM 1. IE. THE"
530 PRINT"THE BASIC LOADER, MAKING SURE TO WIND"
540 PRINT"THE TAPE FORWARD A FEW TAPE COUNTS FIRST"
550 PRINT"THE END OF PROGRAM 1. IN ORDER TO AVOID"
560 PRINT"ANY OVERLAP WHICH CAN CAUSE LOAD ERRORS"
570 PRINT:PRINT"PLEASE PLACE CASSETTE IN SPINRFR."
579 GOTO630
580 FORT=0T051:READMC:PUKE50176+T,MC:NEXT
585 RETURN
590 DATA169,0,133,248,169,192,133,249,169,160,133,250,165,195
600 DATA133,251,169,1,170,168,32,186,255
610 DATA169,10,162,42,160,196,32,189,255
620 DATA166,250,164,25,169,248,32,216,255,96,65,82,84,70,83,84,45
630 PUKE788,52:PRINT"PRESS 'F1' TO CONTINUE WITH SAVE. ANY"
635 DATA52,54,46
640 PRINT"OTHER TO ABANDON OPTION 1"
650 GETANE:IFANE=""THENZ00
660 IFAN$<"Y"THENZ20
670 SYS0176:GOTO220
959 REM * SPRITE DATA *

```

(continued on next page)

SOFTWARE FILE

(continued from previous page)

```

1000 DATA00000000000000000000
1001 DATA00022000000000000000
1002 DATA00000000000000000000
1003 DATA00000000000000000000
1004 DATA00000000000000000000
1005 DATA00000000000000000000
1006 DATA00000000000000000000
1007 DATA00000000000000000000
1008 REM *****
1009 REM * MACHINE CODE DATA *
2000 DATA2408DFFBF9D3F03
2001 DATA4A0F760A9000DFC
2002 DATA4CF8DFFCFA000C4H
2003 DATA005A0018CFEFC4H
2004 DATA005A0028CFEFC4H
2005 DATA005A0038CFEFC4H
2006 DATA005A0048CFEFC4H
2007 DATA005A0058CFEFC4H
2008 DATA005A0068CFEFC4H
2009 DATA005A0078CFEFC4H
2010 DATA005A0088CFEFC4H
2011 DATA005A0098CFEFC4H
2012 DATA005A00A8CFEFC4H
2013 DATA005A00B8CFEFC4H
2014 DATA005A00C8CFEFC4H
2015 DATA005A00D8CFEFC4H
2016 DATA005A00E8CFEFC4H
2017 DATA005A00F8CFEFC4H
2018 DATA005A0108CFEFC4H
2019 DATA005A0118CFEFC4H
2020 DATA005A0128CFEFC4H

```

```

2019 DATA005A0138CFEFC4H
2020 DATA005A0148CFEFC4H
2021 DATA005A0158CFEFC4H
2022 DATA005A0168CFEFC4H
2023 DATA005A0178CFEFC4H
2024 DATA005A0188CFEFC4H
2025 DATA005A0198CFEFC4H
2026 DATA005A01A8CFEFC4H
2027 DATA005A01B8CFEFC4H
2028 DATA005A01C8CFEFC4H
2029 DATA005A01D8CFEFC4H
2030 DATA005A01E8CFEFC4H
2031 DATA005A01F8CFEFC4H
2032 DATA005A0208CFEFC4H
2033 DATA005A0218CFEFC4H
2034 DATA005A0228CFEFC4H
2035 DATA005A0238CFEFC4H
2036 DATA005A0248CFEFC4H
2037 DATA005A0258CFEFC4H
2038 DATA005A0268CFEFC4H
2039 DATA005A0278CFEFC4H
2040 DATA005A0288CFEFC4H
2041 DATA005A0298CFEFC4H
2042 DATA005A02A8CFEFC4H
2043 DATA005A02B8CFEFC4H
2044 DATA005A02C8CFEFC4H
2045 DATA005A02D8CFEFC4H
2046 DATA005A02E8CFEFC4H
2047 DATA005A02F8CFEFC4H
2048 DATA005A0308CFEFC4H

```

```

2049 DATA005A0318CFEFC4H
2050 DATA005A0328CFEFC4H
2051 DATA005A0338CFEFC4H
2052 DATA005A0348CFEFC4H
2053 DATA005A0358CFEFC4H
2054 DATA005A0368CFEFC4H
2055 DATA005A0378CFEFC4H
2056 DATA005A0388CFEFC4H
2057 DATA005A0398CFEFC4H
2058 DATA005A03A8CFEFC4H
2059 DATA005A03B8CFEFC4H
2060 DATA005A03C8CFEFC4H
2061 DATA005A03D8CFEFC4H
2062 DATA005A03E8CFEFC4H
2063 DATA005A03F8CFEFC4H
2064 DATA005A0408CFEFC4H
2065 DATA005A0418CFEFC4H
2066 DATA005A0428CFEFC4H
2067 DATA005A0438CFEFC4H
2068 DATA005A0448CFEFC4H
2069 DATA005A0458CFEFC4H
2070 DATA005A0468CFEFC4H
2071 DATA005A0478CFEFC4H
2072 DATA005A0488CFEFC4H
2073 DATA005A0498CFEFC4H
2074 DATA005A04A8CFEFC4H
2075 DATA005A04B8CFEFC4H
2076 DATA005A04C8CFEFC4H
2077 DATA005A04D8CFEFC4H
2078 DATA005A04E8CFEFC4H

```

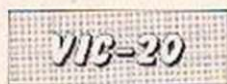
```

2079 DATA005A04F8CFEFC4H
2080 DATA005A0508CFEFC4H
2081 DATA005A0518CFEFC4H
2082 DATA005A0528CFEFC4H
2083 DATA005A0538CFEFC4H
2084 DATA005A0548CFEFC4H
2085 DATA005A0558CFEFC4H
2086 DATA005A0568CFEFC4H
2087 DATA005A0578CFEFC4H
2088 DATA005A0588CFEFC4H
2089 DATA005A0598CFEFC4H
2090 DATA005A05A8CFEFC4H
2091 DATA005A05B8CFEFC4H
2092 DATA005A05C8CFEFC4H
2093 DATA005A05D8CFEFC4H
2094 DATA005A05E8CFEFC4H
2095 DATA005A05F8CFEFC4H
2096 DATA005A0608CFEFC4H
2097 DATA005A0618CFEFC4H
2098 DATA005A0628CFEFC4H
2099 DATA005A0638CFEFC4H
2100 DATA005A0648CFEFC4H
2101 DATA005A0658CFEFC4H
2102 DATA005A0668CFEFC4H
2103 DATA005A0678CFEFC4H
2104 DATA005A0688CFEFC4H
2105 DATA005A0698CFEFC4H
2106 DATA005A06A8CFEFC4H
2107 DATA005A06B8CFEFC4H
2108 DATA005A06C8CFEFC4H

```

Lander

David Hodggets,
Tipton,
West Midlands.



LANDER is a game for the unexpanded Vic-20 and a joystick. The game comes in six parts, the first is a loading screen, the next four are for the machine code and graphics, and the last part is the actual game.

The idea of the game is to guide your landing craft through an asteroid belt and land it safely on the pad below. To make things more

difficult there is a time limit which is displayed at the bottom of the screen, try and be as fast as possible as your score is based on how much time you have left after landing your craft. As you drop the speed of your craft increases, so if you want to slow your descent you can thrust by pulling back the joystick, but you cannot go upwards.

At the start of the game there is a title page with two options, F1 for the start velocity of the landing craft, and F3 for the asteroid speed. As the levels get higher the asteroids get faster, but the start velocity of your craft

remains constant.

Type in and save each of the programs, in order, one after the other, and load using shifted run-stop. Each of the data programs has a check sum to make sure that the data is correct, as if there is a mistake in the data it could cause the program to crash, so if you get a data error re-check the data and re-save the corrected version.

If there are no data errors then each program will load the next. After each part has finished loading then the border colour of the screen will change.

Program 1.

```

10 POKE36879,8:PRINT"VIC"
20 PRINT"*****LANDER*****:PRINT"BY DAVID HODGETTS"
30 PRINT"*****"
40 PRINT"PLEASE WAIT..."
50 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9

```

Program 2.

```

100 S=7168:FORI=S+5:11:REMX:C=C+X:POKEI,X:NEXT
110 IFCC>365:11THENPRINT"DATA ERROR!!":END
120 DATA3,15,31,50,50,63,50,18
130 DATA152,240,248,76,76,252,76,72
140 DATA31,7,13,25,49,49,49,49
150 DATA248,224,176,152,140,140,140,140
160 DATA34,4,17,4,0,0,0,1
170 DATA132,16,64,8,160,0,128,0
180 DATA0,1,7,31,60,57,123,127
190 DATA0,160,248,223,158,160,230,199
200 DATA125,239,231,247,127,121,29,7
210 DATA255,207,190,250,242,228,216,48
220 DATA16,58,127,255,255,255,255,255
230 DATA255,255,255,255,255,255,255,255
240 DATA12,16,38,72,147,164,41,10
250 DATA48,8,100,18,201,37,148,80
260 DATA10,41,164,147,72,38,16,12
270 DATA80,148,37,201,18,100,8,48
280 DATA24,24,60,36,60,36,90
290 DATA102,66,126,66,255,129,255,255
300 DATA0,0,0,0,0,0,0,0
310 DATA0,0,0,0,0,0,0,0
320 DATA0,0,0,0,0,0,0,0
330 DATA0,0,0,0,0,0,0,0
340 DATA0,0,0,0,0,0,0,0
350 DATA0,0,0,0,0,0,0,0
360 DATA0,0,0,0,0,0,0,0
370 DATA0,0,0,0,0,0,0,0
380 DATA0,0,0,0,0,0,0,0
390 DATA0,0,0,0,0,0,0,0
400 DATA0,0,0,0,0,0,0,0
410 DATA0,0,0,0,0,0,0,0
420 DATA0,0,0,0,0,0,0,0
430 DATA0,0,0,0,0,0,0,0
440 DATA0,0,0,0,0,0,0,0
450 DATA255,0,0,0,0,0,0,255
460 DATA255,0,128,128,128,128,0,255
470 DATA255,0,192,192,192,192,0,255
480 DATA255,0,224,224,224,224,0,255
490 DATA255,0,240,240,240,240,0,255
500 DATA255,0,248,248,248,248,0,255
510 DATA255,0,252,252,252,252,0,255

```

```

520 DATA255,0,254,254,254,254,0,255
530 DATA255,0,255,255,255,255,0,255
540 DATA0,0,0,0,0,0,0,0
550 DATA0,0,0,0,0,0,0,0
560 DATA0,0,0,0,0,0,0,0
570 DATA0,0,0,0,0,0,0,0
580 DATA0,0,0,0,0,0,0,0
590 DATA0,0,0,0,0,0,0,0
600 DATA0,0,0,0,0,0,0,0
610 DATA0,0,0,0,0,0,0,0
620 DATA0,0,0,0,0,0,0,0
630 DATA0,0,0,0,0,0,0,0
640 DATA160,0,169,10,153,206,31,169
650 DATA5,153,206,151,152,201,5,144
660 DATA10,169,41,153,228,31,169,2
670 DATA153,228,151,200,192,22,208,226
680 DATA96,0,0,0,0,0,0,0
690 DATA0,0,0,0,0,0,0,0
700 DATA162,0,254,44,150,189,44,150
710 DATA41,8,240,5,169,1,157,44
720 DATA150,232,224,110,208,236,96,169
730 DATA23,133,55,133,52,96,169,255
740 DATA141,5,144,169,8,141,15,44
750 DATA96,0,0,0,0,0,0,0
800 POKE36879,10:PRINT"*****"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9

```

Program 3.

```

100 S=6656:FORI=S+5:11:REMX:C=C+X:POKEI,X:NEXT
110 IFCC>5000:2THENPRINT"DATA ERROR!!":END
120 DATA160,0,177,1,201,5,176,15
130 DATA200,192,2,208,245,160,22,177
140 DATA1,201,6,176,13,200,192,24
150 DATA200,245,96,201,32,240,230,76
160 DATA82,26,201,32,240,239,76,82
170 DATA26,96,160,0,169,32,145,1
180 DATA200,145,0,160,22,145,1,200
190 DATA145,1,173,53,3,240,18,160
200 DATA44,173,54,3,145,1,173,55
210 DATA3,200,145,1,169,0,141,53
220 DATA3,96,141,56,3,201,11,200
230 DATA15,56,165,1,233,22,176,2
240 DATA198,2,133,1,32,172,26,234
250 DATA120,162,0,91,160,234,142,20,3
250 DATA140,21,3,88,96,173,53,3
270 DATA240,13,160,44,173,54,3,145
280 DATA1,200,173,55,3,145,1,160
290 DATA0,169,12,145,1,152,2,32
300 DATA226,27,200,169,13,192,2,208
310 DATA242,160,22,169,14,145,1,162
320 DATA2,32,226,27,200,169,15,192

```


SOFTWARE FILE

(continued from page 133)

permission. Now a short description of these options.

Analyse Memory: This gives the address you have chosen, the decimal value, the hexadecimal value and the character — where printable — in the address. You can choose the first address by Randomise no:USR! — address. All the following addresses are printed until the screen is full. The Scroll? message is then printed. If you press n you are back in Basic, but it is possible to get the menu back if you have put the instruction:

RANDOMIZE USR 64360 in a Basic line

The options Memory free, Proglength, Varlength, Pro. + vars do not need any explanation. Neither does the option Ramtop. You have only to press the letter behind these options to see the value of these parameters printed on the screen.

The second option in the menu is Frames + sound. This is not a very useful routine but more something like a demonstration that Spectrum does have a clock inside.

You can get back to the menu by pressing Z. Z is also used to get back to Basic. That is the way to get into Basic without Caps Lock, because the machine-code is programmed to be used with capitals. It has other features, which I hope you will like: Paper and Border blue, Ink white and a more audible sound from the keyboard. These are permanent in Basic until you change them back. With Interface 1 connected CLS # will change the colours to black and white.

Breaking out of the machine-code with Caps Lock-Break is possible too. There are three other options which I didn't mention. Line address, UDG, and 3. The first is quite straightforward. Put the cursor in a Basic line, and L will tell you the address of the first character the cursor points to. Easy to see where a Basic program ends. UDG again uses the variable Seed. If you have your own UDGs somewhere in memory, e.g. 40000, use Randomize 40000, go to the menu and press U. To get back to the Spectrum UDGs you can use the S.

The last option is pressing 3. This is not mentioned in the menu. It sets the Microdrive variables — with Interface 1 connected — and gives a yellow flashing Border when Saving etc on Microdrives.

Now for the Basic program. The machine-code is exactly 1000 bytes long. Each Data statement is one hundred bytes. Type it in and run it. Three things can happen. You have all the numbers typed in correctly — congratulations, I never succeed in doing that. Then the program will run to the end. If on the other hand you forget a number or type more than 100 numbers in one statement you can expect the Spectrum to give the somewhat unfriendly message "Nonsense in Basic", because it is reading a numerical Data instead of a string variable. Another possibility is typing a wrong number.

The program then gives the Line in which the error has occurred. It contains no safeguards against typing two or more faulty numbers, if the sum is the same as that of the

```

1 REM Toolkit combination by
  H. Geradts, The Hague,
  The Netherlands
  This program contains
  several routines from
  "SUPERCODE" BY
  CP SOFTWARE ENGLAND
2 CLEAR 64359
3 RUN 1000
50 DATA 205,164,253,24,9,225,1
28,35,229,167,200,218,24,247,175
59,60,92,205,109,251,17,2,16,7
65,110,97,108,121,115,101,32,109
101,109,111,114,121,115,30,32,55,13
70,114,97,109,101,115,43,115,11
1,117,110,100,58,32,70,43,81,10
62,202,97,100,100,114,101,115,11
5,58,6,75,13,77,101,100,111,114
121,32,102,114,101,101,58,6,77,1
3,30,114,111,103,108,101,110,123
116,104,58
51 DATA "5692"
52 DATA 5,80,13,60,114,111,103
32,43,32,118,37,114,115,68,6,84
13,82,97,109,116,111,112,58,6,8
2,13,86,97,114,108,101,110,103,1
16,104,58,6,86,13,65,68,71,58,24
9,16,32,13,97,109,100,114,101,115
116,6,85,13,85,68,71,3,83,121
101,99,118,114,1,7,109,6,83,121
3,72,101,120,45,62,68,6,72,69,16
8,101,99,45,62,72,58,68,13,69,12
0,105,116,40,108,48
53 DATA "7849"
54 DATA 99,97,115,101,41,58,6
90,22,14,10,18,1,62,62,0,219,175
52,8,216,175,17,156,0,33,100,0
205,181,3,253,203,1,174,253,203,0
1,110,42,250,58,8,92,211,63,254,4
90,202,172,252,254,76,202,32,254,3
254,72,202,254,254,254,254,254,19
7,253,254,65,202,165,254,254,60,19
40,98,254,77,40,108,254,51,204,1
51,254,254,82,202,24,253,254,86,
40,108,254,04,40,62,254,65,40
55 DATA "12829"
56 DATA 34,254,83,40,39,254,70
40,108,197,205,142,2,193,33,32,
30,167,237,92,40,11,24,173,245,1
75,50,136,92,24,195,96,253,225,1
201,42,110,92,34,123,92,215,24,1
30,42,180,92,17,167,0,237,82,34,1
123,42,215,106,66,252,208,153,25
3,42,89,92,237,91,83,92,237,82,22
4,80,205,153,253,42,76,92,237,91
83,42,237,82,24,66,205,153,253,
42,178,92,237,91,101,92,237,82,2
4
57 DATA "12319"
58 DATA 52,205,153,253,237,91,
75,92,42,89,92,237,82,24,38,210,1
205,154,253,42,101,92,245,126,210,1
1,63,241,170,120,92,24,21,205,110,1
253,42,170,92,24,13,205,153,253,3
42,73,92,205,112,25,35,35,35,35
1,240,216,205,105,253,1,24,38,210,1
205,105,253,1,58,253,205,10,205,10
3,246,255,205,105,253,1,25,35,35
3,205,105,253,253,203,1,110,40,2
30,58,8,92,254,70,40,176,254,31,
202,10
59 DATA "13363"
60 DATA 255,195,66,252,253,30,
50,92,225,241,251,207,255,75,9,0
60,56,252,237,66,61,198,48,229,2
05,131,254,33,249,91,62,42,249,9
1,205,144,253,225,201,237,75,54,
92,30,0,111,41,41,41,69,235,201,1
6,8,25,19,36,19,16,250,201,215,
33,205,72,34,249,91,33,0,0,201,8
2,5,50,06,92,62,58,62,57,99,104,8
1,211,254,62,15,50,141,92,50,72,2
92,211,127,205,107,13,82

```

correct ones. So it is advisable to Save the Basic program before trying the machine code. Once the machine code works as expected, you can New the program, but make sure first that machine code is Saved. Never try to load the machine-code before lowering Ramtop — Clear 64359.

Amstrad Drums.

```

5 s=1
10 drums **** S.Paine 4/11/84
15 MODE 0
20 CLS:LOCATE 8,1:PRINT "DRUMS"
30 ENT -1,1,127,1,5,24,1
40 ENV 1,1,15,1,5,-3,2
50 ENV 2,15,-1,10
60 FOR t=1 TO 4
65 IF s>2 THEN s=1
66 IF s=1 THEN ch=1
67 IF s=2 THEN ch=4
70 FOR y=1 TO 3
80 FOR o=0 TO 100:NEXT o
90 TOo=(t+4)*54
100 SOUND ch,ton,6,0,1,1,1
110 NEXT

```

Drums

Stephen Payne,
Ipswich



THIS PROGRAM simply plays a drum rhythm. Realistic effects have been achieved by using the Erv commands.

```

120 s=s+1:NEXT:ch=5:s=1
130 FOR t=0 TO 90:NEXT
140 SOUND 2,0,150,15,2,0,1
150 FOR p=1 TO 3
160 SOUND ch,486,6,15,1,1,2
170 FOR t=0 TO 360:NEXT
180 SOUND ch,300,6,0,1,1,2
190 FOR t=0 TO 180:NEXT
200 SOUND ch,300,6,0,1,1,2
210 FOR t=0 TO 180:NEXT
220 SOUND ch,486,6,15,1,1,2
230 FOR t=0 TO 360:NEXT
240 SOUND ch,300,6,0,1,1,2
250 IF p<3 THEN FOR t=0 TO 360:NEXT
260 IF p=3 THEN FOR t=0 TO 240:NEXT
270 NEXT p
280 GOTO 62

```

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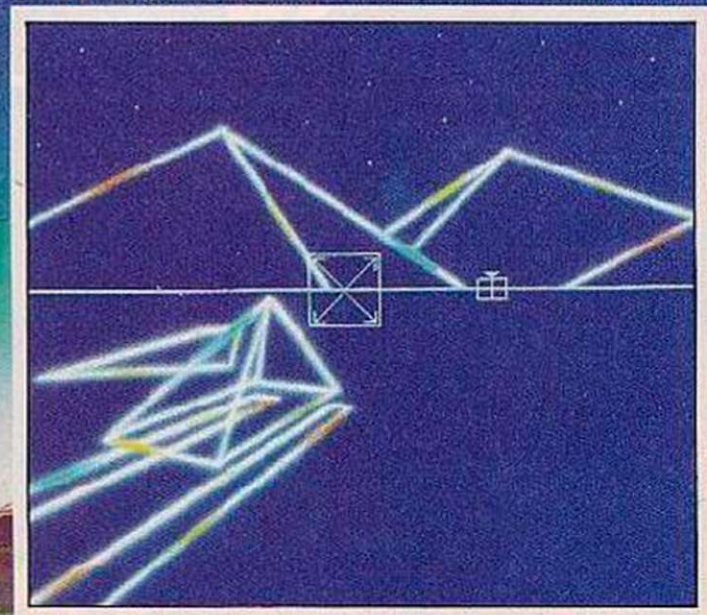
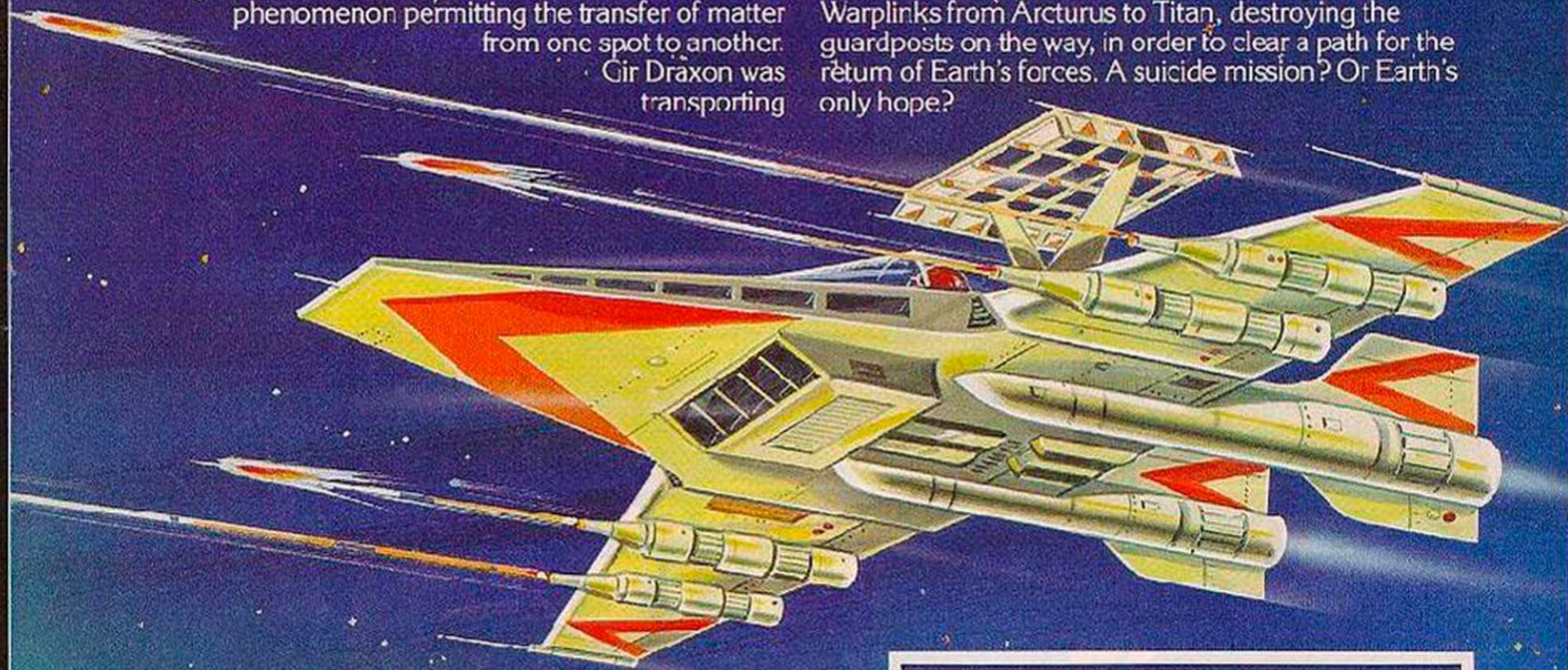
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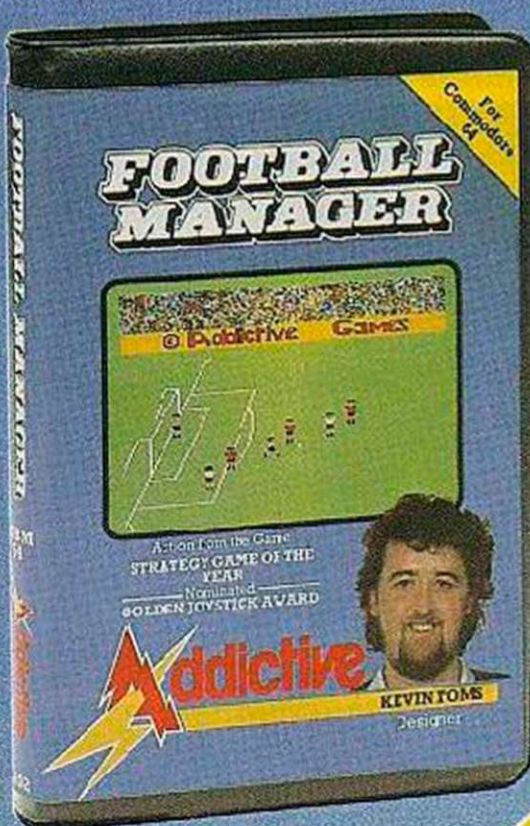
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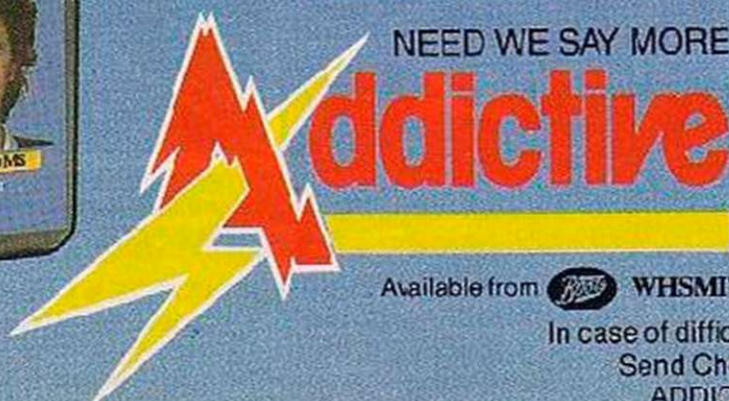
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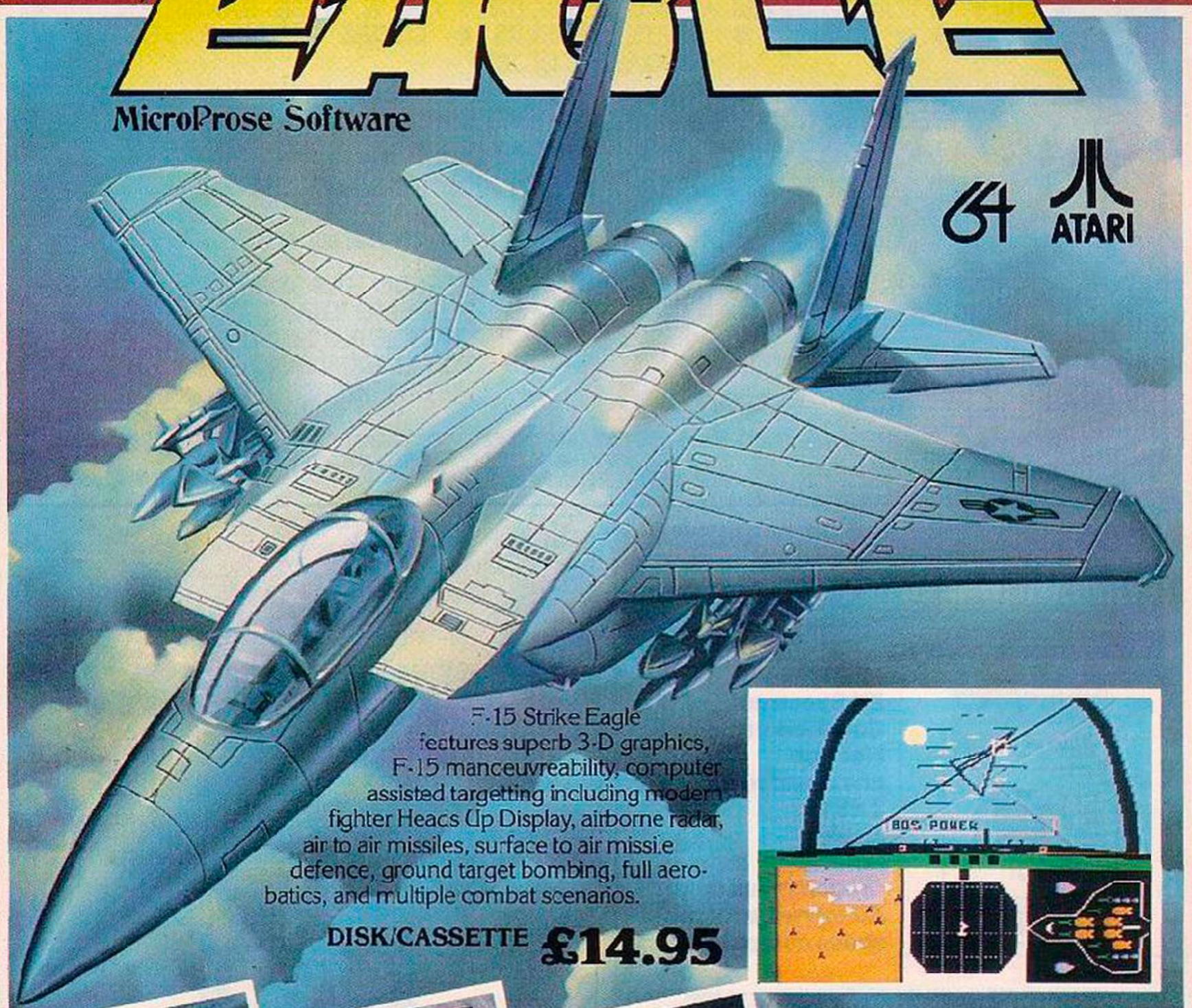
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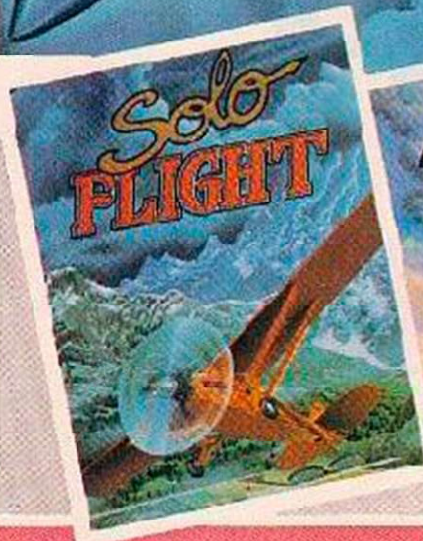
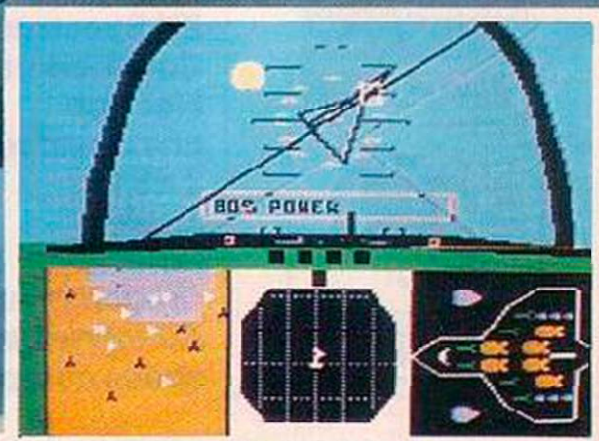
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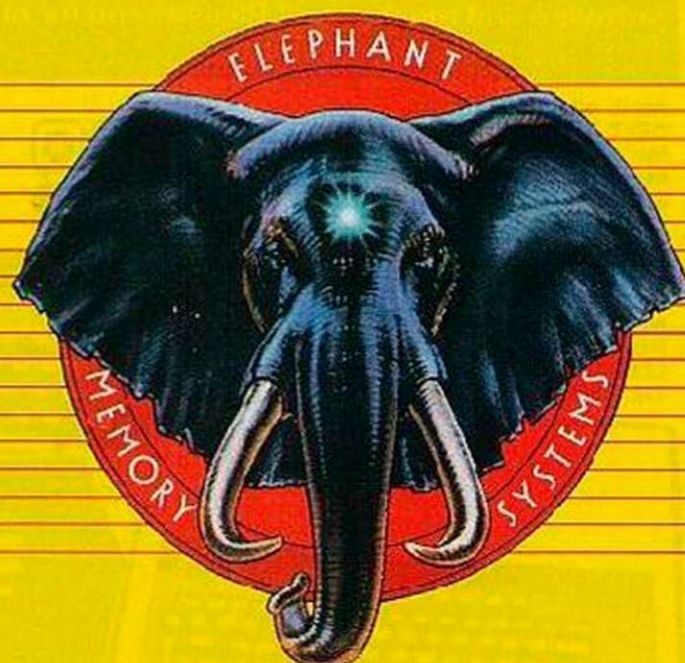
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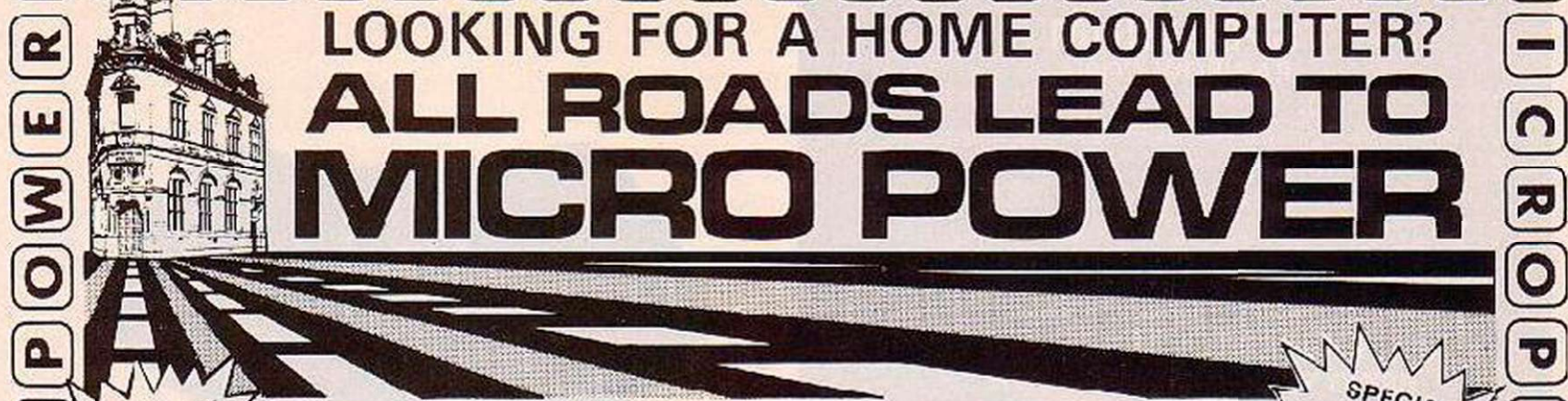


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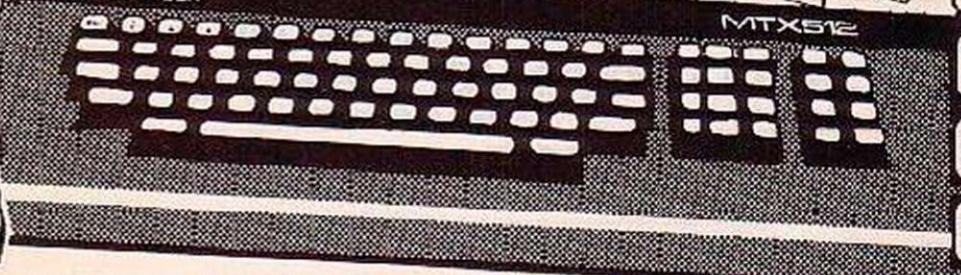
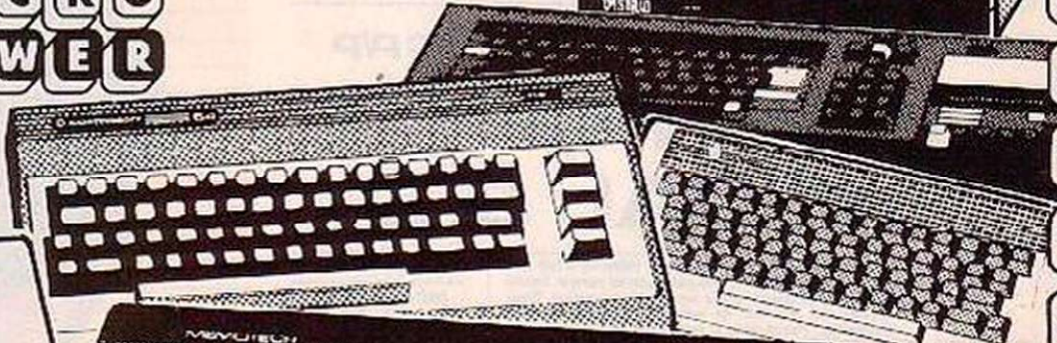
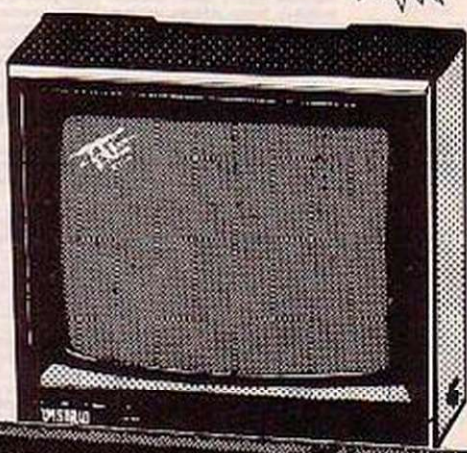
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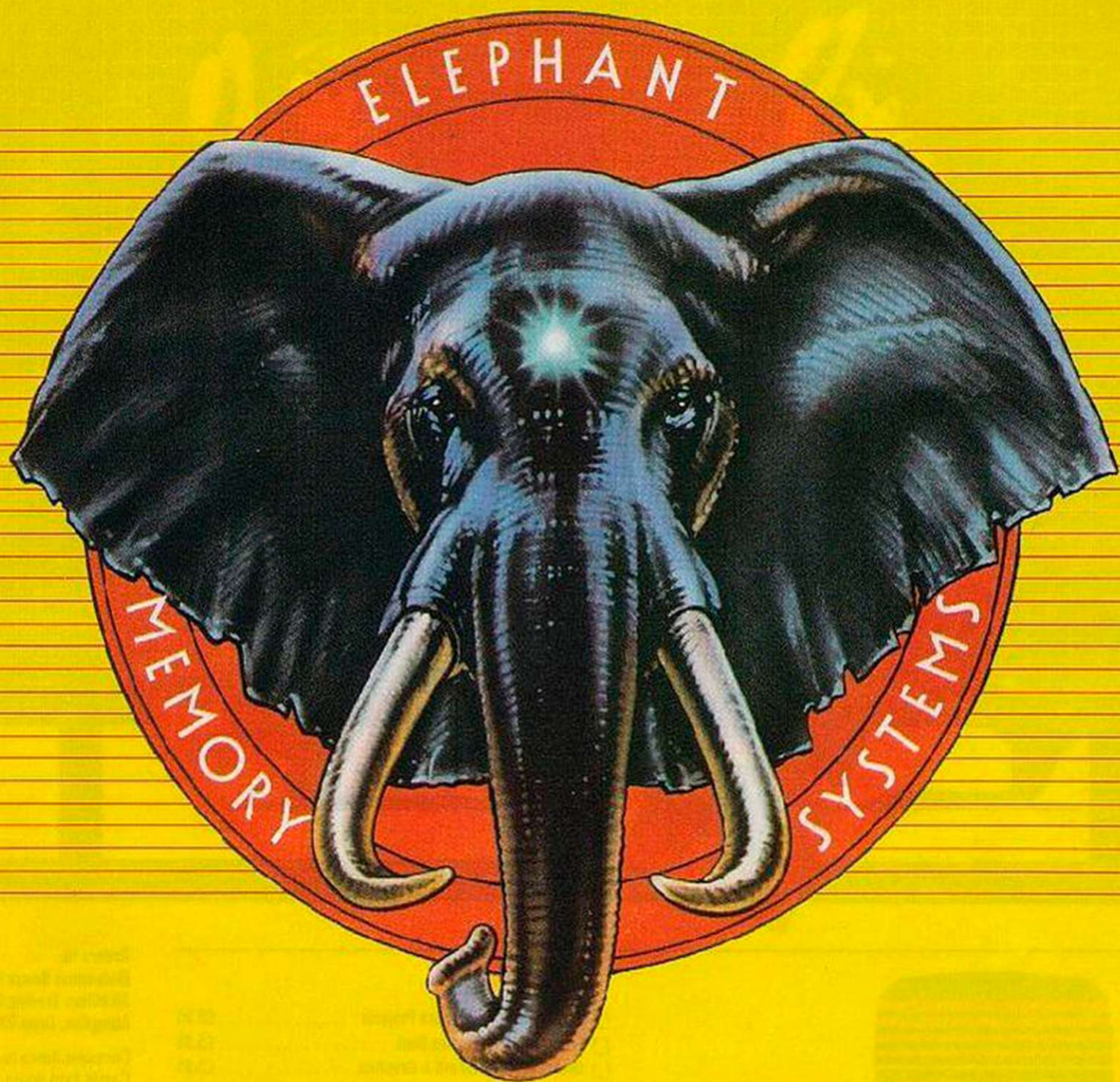
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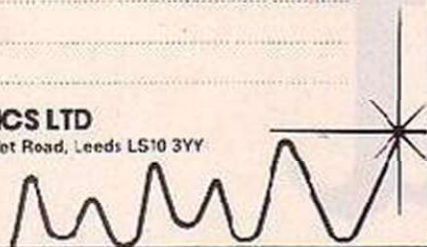
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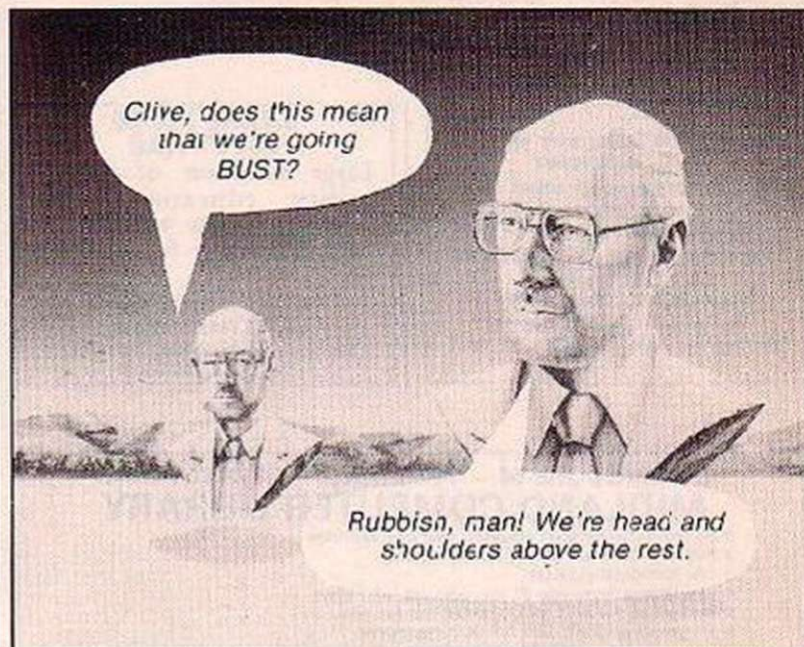
Local, national and international micro events are updated here. To publicise your event, phone Paul Bond on 01-661 3472.

LET

Short for International Trade Show for Home Computers, Software and Leisure Electronics. From February 17-19 at Olympia. Phone Rickmansworth (0923) 777000 for more information.

Microprocessor Development Show

You'll need a business card or a persuasive dad to get into this in-depth hi-tech expo. At Wembley Conference Centre from February 12-14. Details from Project Presentations Ltd. 01-242 3621.



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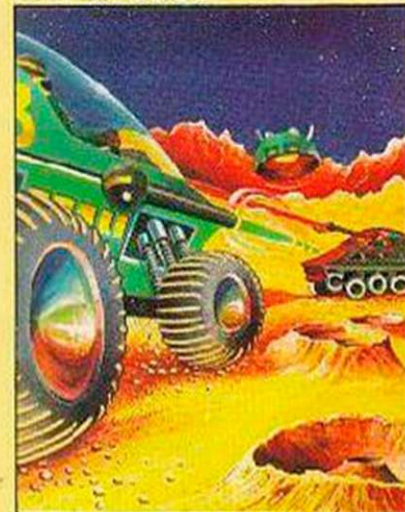
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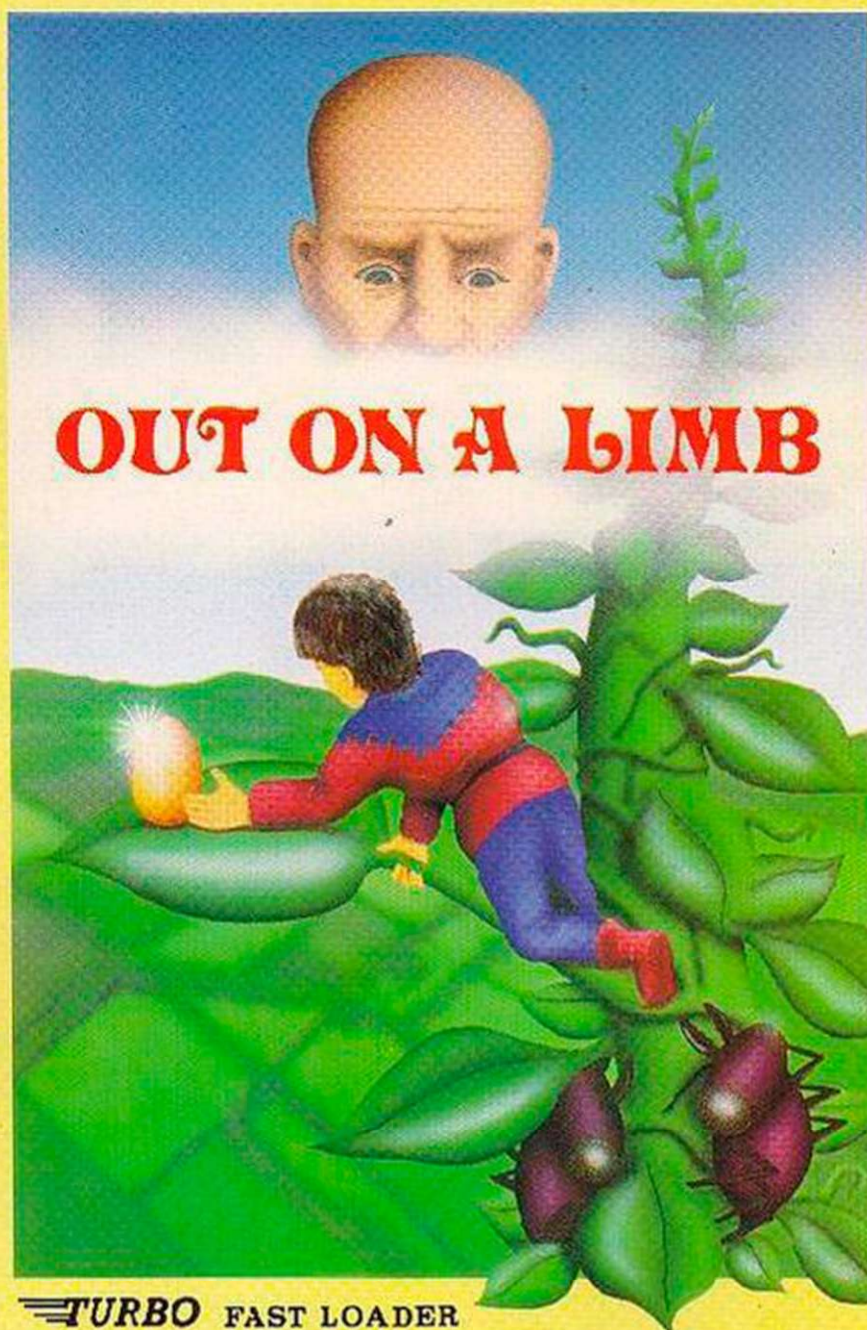
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