

Computer Magazine of the Year CTA

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POPULAR Computing WEEKLY

35p

29 March-4 April 1984 Vol 3 No 13

BRITAIN'S BEST-SELLING MICRO WEEKLY

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SEE PAGE 53

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★ STAR
Snakes
on Dragon
See page 10
GAME★

News Desk

Time lag for lending software

THE increasing number of public libraries lending out commercially produced computer cassette titles is causing concern among software houses.

At least six Local Authority libraries are already stocking software and a number of software companies are concerned that program lending represents an open invitation for the borrower to copy their software.

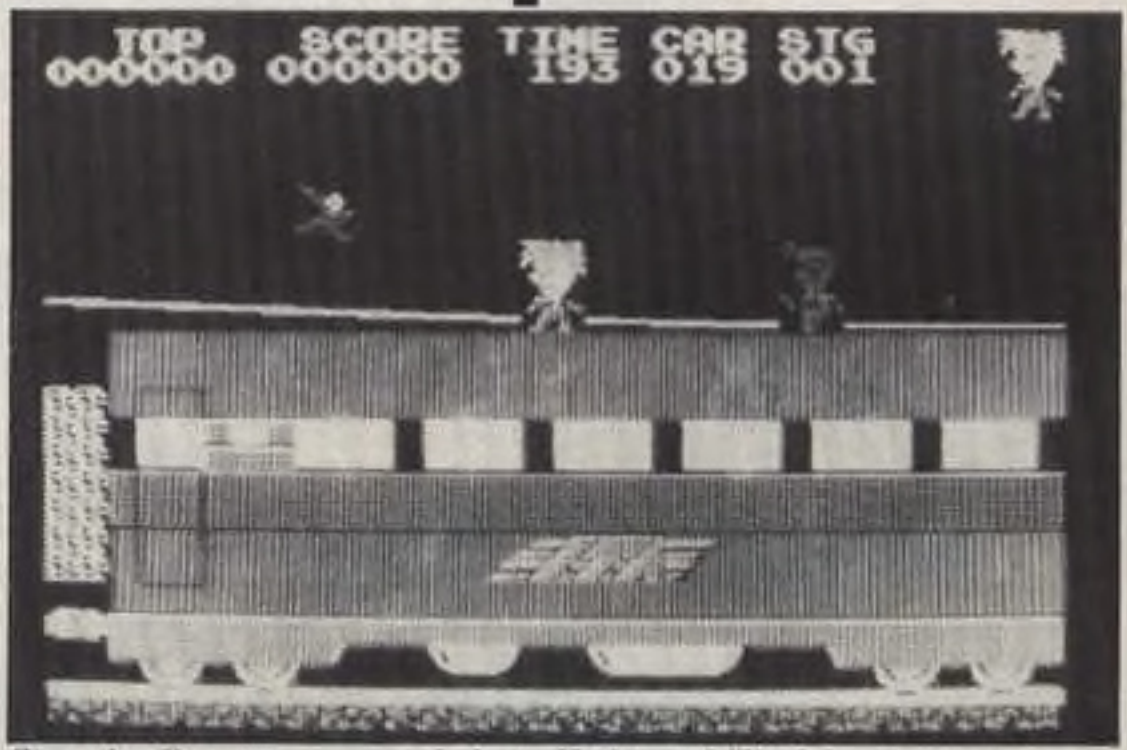
A number of companies, including CRL and A&F, have refused to supply libraries with their programs.

Faced with opposition from such companies, the Library Association last week held a seminar at which both the local authorities and the micro companies were represented.

Peter Marshall, of Bexley Public Library, put the case for the libraries, while Nick Alexander, chairman of GOSH (Guild of Software Houses) explained the situation from the software manufacturers' point of view. Geoff Crabb, from the Council for Education

continued on page 5 ▶

Express software from Japan



Stop the Express — one of three Hudsonsoft/Sinclair programs

NEXT month sees the publication in this country of the first Sinclair Spectrum games written by a Japanese software house.

The company — Hudsonsoft — has five titles to be launched in early April, three of which are being released by Sinclair as part of its latest batch of Spectrum programs.

The three Sinclair/Hudsonsoft programs are: *Eric and the Floaters*, *Stop the Express*, and *Driller Tanks*. Hudsonsoft has also reached a licensing agree-

ment with Kuma Computers in Pangbourne who will distribute more of its programs starting with *Vegetable Crash* and *Frog Shooter*.

All of the programs are for the 48K machine and feature some novel game concepts. Commented Kuma's Tim Moore, "Being Japanese the programs incorporate some different ideas, in contrast to UK programmers who tend to all think along the same lines."

Tokyo-based Hudsonsoft

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This Week

- **Reviews** Jeff Naylor examines the Sinclair flat screen tv on page 16.
- **Spectrum** The final part of Mucroid Run by D Edwards. See page 22.
- **Commodore 64** Simon Wallace shows you how to thief-proof your programs on page 24.
- **Programming** The final part of Boris Allan's discussion of the Motorola processors. See page 29.
- **New Releases** Pick of the week is Jet Set Willy, long-awaited follow-up to Manic Miner. Also featured are Pedro from Imagine Software and Constellation from Superior Software. All on page 60.

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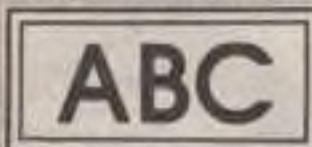
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Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

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Editorial

The best game of 1983 was undoubtedly *Manic Miner*. The music, the graphics, the flapping lavatory seat, the crumbling floors and the constantly moving walk-ways all combined to make *Manic Miner* the most enjoyable and addictive arcade game of the year.

Before you all write in, complaining that Ultimate's *Jet Pac* is far better, or that one of Jeff Minter's 'awesome' games deserves the accolade, let me say that this is a purely personal opinion. *Miner* just struck a chord that all the other games, no matter how good technically, seemed to miss.

But, of far more value than arguing over the relative merits of last year's games, is predicting what will be the best game of 1984.

While the standard of software generally has improved immeasurably since the Spectrum and Commodore 64 were first launched, no games dominate the market in quite the same way that *Space Invaders* and *Pacman* did a few years ago. Not to put too fine a point upon it, software is in a bit of a rut at the moment. Most of the current batch of games have superb graphics, but they all tend to be of the 'blob eat blob' variety.

The next generation of game will need to be different in kind as well as in quality. Dare one say it — a quantum leap is needed.

Next Thursday

Next week's Star Game is *Pole Position* for the BBC, a fast and hazardous car race. Can you complete the last lap without crashing?

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Written by: Rainbow Software

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Written by: Graham Stafford



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Written by: Martin Horsley



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Libraries

◀ continued from page 1

Technology, also detailed the present laws of copyright in relation to software and the libraries' position.

One suggestion to come out of the meeting was that there should be a six-month time lag between the release of a program title and its appearance on the local library's shelves.

Japanese games

◀ continued from page 1

was formed 12 years ago and is well known in Japan for its software for the Sharp MZ80K and MZ700 computers. The company is reputed to have got its name because its founder is a railway enthusiast and he named the company after the Hudson class of locomotive.

Recently, the company has concentrated on Spectrum games and the five programs are the first results of that work.

A Sinclair spokesman explained that there was no special relationship between Sinclair and Hudsonsoft: "They approached us with their material, some of which we liked very much."

In one of the Sinclair programs — *Stop the Express* — the railway theme is continued. The object of the game is to run along the roof of a moving train, avoiding flying obstacles.

● At the same time as the Hudsonsoft titles, Sinclair is also announcing two more Spectrum titles — *Buzz-Off* and *Zipper Flipper*.

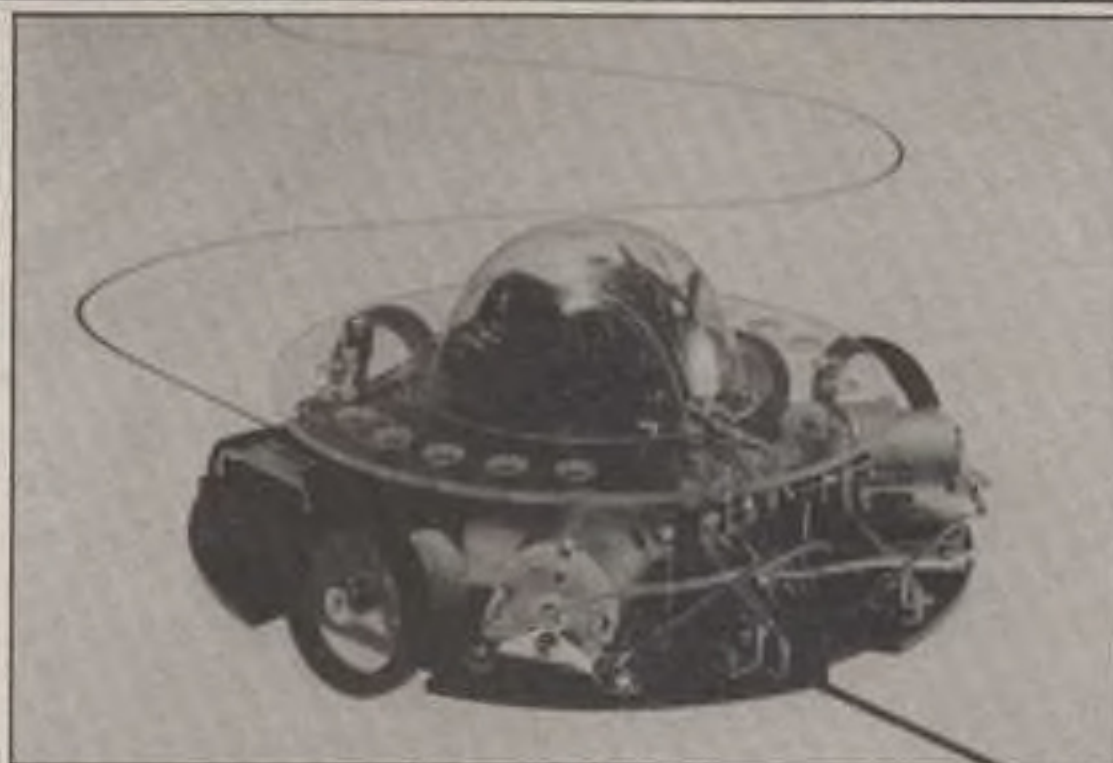
QL add-ons

THE number of companies offering peripherals for the Sinclair QL is increasing nearly as fast as the queue of customers still waiting for their machines.

The aptly named Miracle Systems in Cambridge claims its Centronics printer interface is compatible with the QL. The device plugs into the QL's RS232C port and costs £49.

Xcom Services in London is offering a range of 5¼inch disc drives for the QL. A dual-sided 40 track drive will set you back £351.

Yet, with no QL's so far sent out, what does one do with all these peripherals?



DIY robot range from Prism

PRISM has announced five new robots — called Movits — at the other end of the price scale from the £1,500 Topo. But, the big difference is that you build them yourself.

Described by Prism's Director of Developments, Graham Daubney, as 'the modern guy's Lego', the robot kits come complete with all the necessary parts and leads and an instruction leaflet. All you need to put them together is a screwdriver, a spanner and the batteries.

Prices for the five robots range from £9.99 to £34.99.

At the bottom of the range, Monkey 'hangs' from a piece of string along which it can move. It is sound sensor controlled — you stop and start it by making a sharp noise — for example by clapping.

Piper Mouse, at £19.99, also has a sound sensor, but it moves on three wheels on the floor.

Line Tracer is £17.99, and runs along a track cable, while Circular is remote controlled by a hand-held radio unit, which can activate its left and

right wheels. It costs £29.99.

The most complex robot of the five is Memocon Crawler, the only one that is truly computer-controlled. Memocon has a programmable memory which can retain up to 256 different steps. It is activated by a hand held key pad, like Circular. It is the most expensive at £34.99.



"This is really a 'fun' range of robots," says Graham Daubney, "and a lot of the entertainment and educational value comes from assembling the kit."

Further details from Prism House, 18/29 Mora Street, City Road, London EC1V 8BT.

CBM comes to Corby

COMMODORE is now well advanced with its plan to establish a major manufacturing facility for its home computers in the UK at Corby in Northamptonshire.

When the plant becomes operational in September, European manufacture of home computers will be transferred there from Commodore's West German plant in

Braunschweig, which will then concentrate on the production of the company's business computers.

The Corby factory aims initially to produce 200,000 Vic 20 and Commodore 64 micros a month — with the capacity to nearly double that rate.

By the end of this year, Commodore hopes to be employing 600 people at Corby

Commodore emulator

VIDEO Vault has been advertising a software emulator program which is said to allow most Spectrum programs to be run directly on the Commodore 64.

The device, offered by mail-order only at £13.50 is claimed to be useable with the majority of Spectrum programs, written either in Basic or machine code.

Riad Kaffar, a director of Video Vault, explained the working of the cassette program: "First you load *New Emulator* into the Commodore 64, and then the Spectrum program — the emulator changes each Spectrum Basic or machine code instruction so that the Commodore machine can understand it. The problem presented by the memory taken up by the emulator is got round because, as the Sinclair program is converted, the *New Emulator* begins to disappear, so that when the program is completely loaded there is no emulator left — just a rewritten Spectrum program."

However, Riad does not as yet have a working version of the program — that he expects some time this week — three weeks after the advertisements for the *New Emulator* first appeared.

ZX units in shops

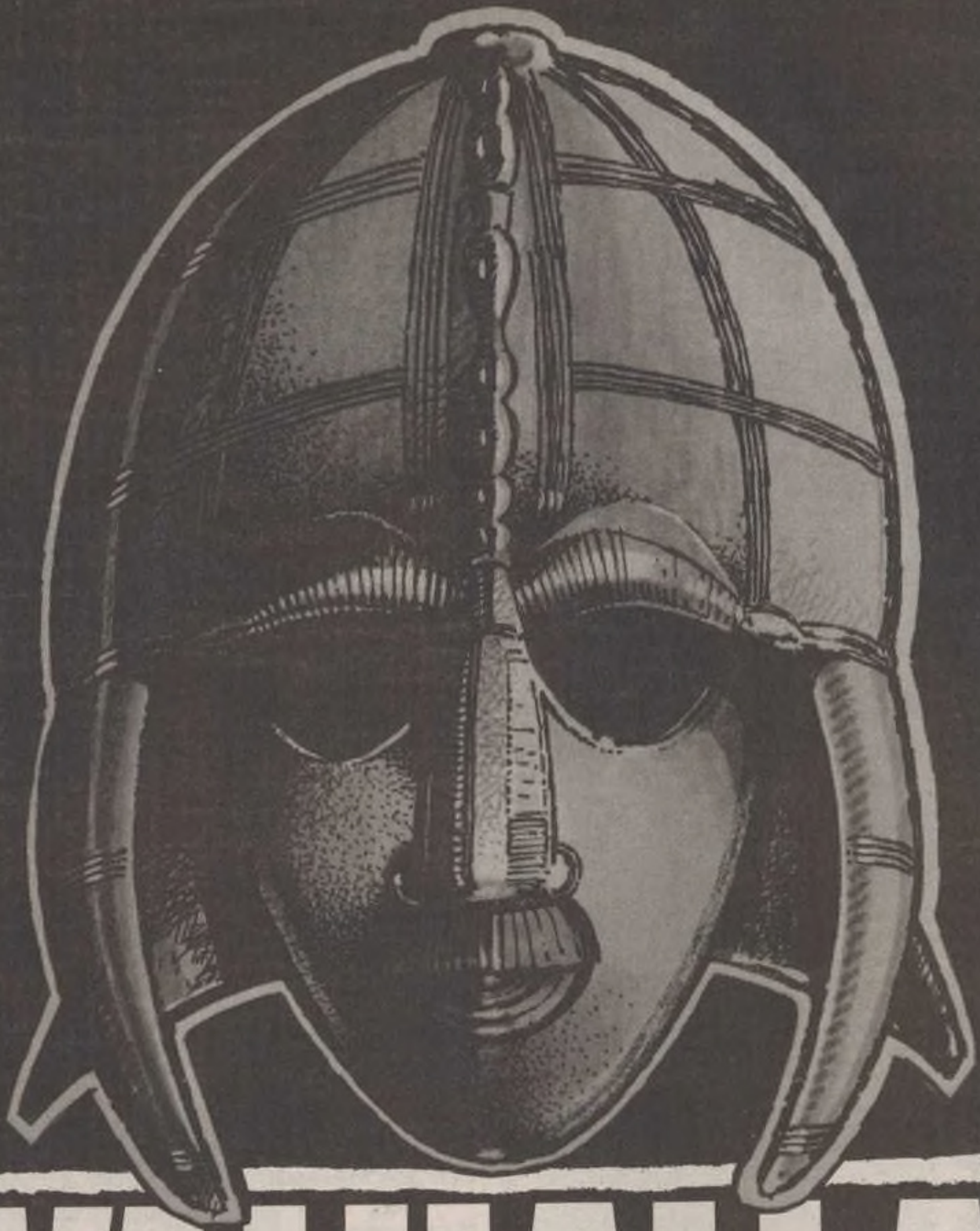
SINCLAIR'S ZX Microdrive and Interface I units for the Spectrum are soon to appear in the shops.

First deliveries of the peripherals will be made to W. H. Smiths, Boots, Menzies and other Sinclair outlets during April.

The cost of the ZX Microdrive will stay at £49.95, although the special mail-order offer on the Interface I will not apply to retail sales — the price will come up from £29.95 to £49.95. Microdrive cartridges will also be available, priced at £4.95.

with that number rising to more than 1,000 over two years.

Two thirds of the UK plant's production will be for export, to the rest of Europe, the Middle East and Australia.



WALHALLA

SOON FOR COMMODORE 64

Atmos upgrade for Oric owners

BEGINNING next month, Oric will be offering owners of its Oric I computer the chance to up-grade their machines to

the specifications of the new Oric Atmos machine.

The cost of carrying out the conversion — giving Oric I

owners the new keyboard and revised 1.1 Rom of the Atmos — has been fixed at £60. This includes a 12-month warranty and new manual.

The service is available for both 16K and 48K Oric Is, although a 16K Oric I will be converted into a 16K Atmos.

In view

VIEWBASE is a new database program for the BBC micro from Silversoft.

The program is capable of being linked to Acornsoft's View word processing program, so that files from the database can be read and incorporated into documents being prepared using the word-processor.

Viewbase is available on disc for £24.99 including a comprehensive manual.

Details from Silversoft, London House, 271-273 King Street, London.

Talking the hind leg off a sheep

ORION Data has brought out Micro Command — a hardware add-on that will enable you to do away with both joystick and keyboard.

The package for the Spectrum consists of a speech recognition unit and a microphone. Having 'trained' the Spectrum to recognise your voice and up



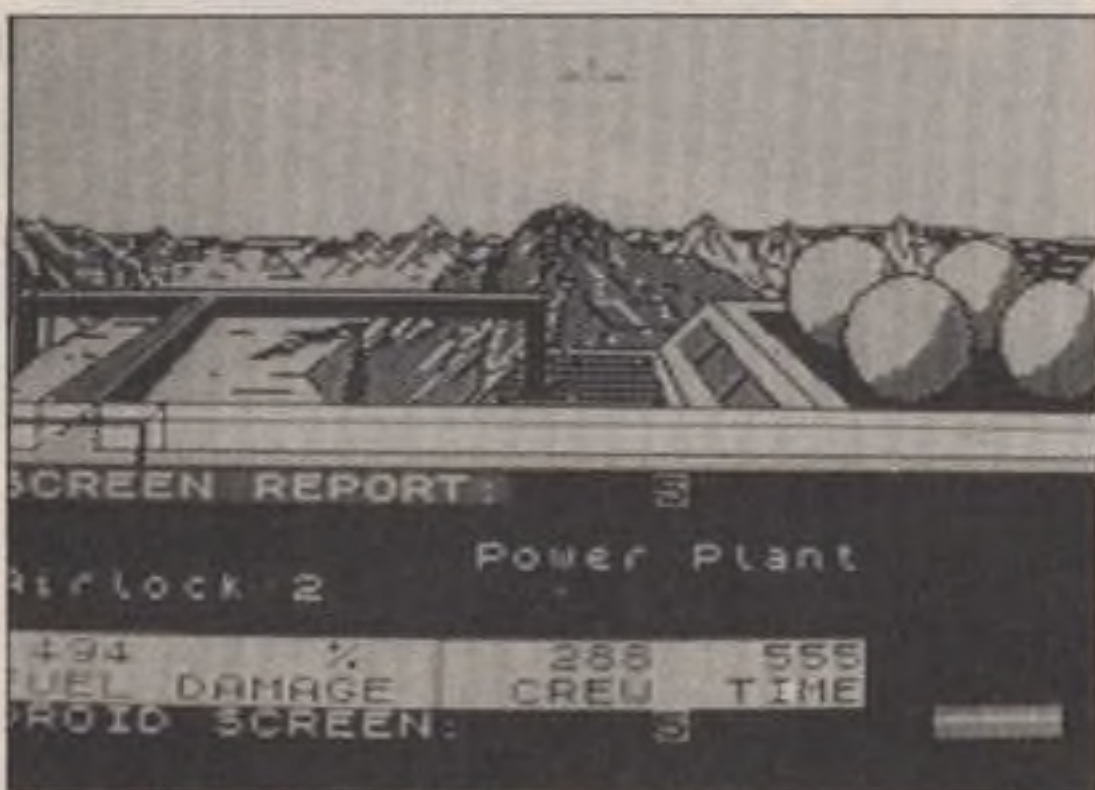
to 15 different words, such as 'up', 'down', 'left' and 'right', you can then play any game using your speech input to control movement on the screen.

The pack also contains the game *Sheeptalk* to demonstrate the working of the speech input.

Versions for the BBC and Commodore 64 are currently being developed and should be available by August this year.

Microcommand on the Spectrum costs £49.95, but the price for the other computers may vary.

Can you save Betula 5?



PSYTRON is a new game for the 48K Spectrum which will be released in mid-April.

The game has six levels — the object being to protect the space colony of Betula 5 from enemy saboteurs. The program fea-

tures 10 screens of graphics showing the colony.

The game is priced at £7.95 and is supplied complete with a 20-page explanatory booklet. Details from Beyond, Durrant House, 8 Herbal Hill, London.

New generation for Commodore

QUICKSILVA is to convert New Generation's range of Spectrum games for the Commodore 64.

The titles — *3D Tunnel*, *Knot in 3D*, *Corridors of Genon* and *Escape* — will be finished for the Commodore machine by mid-April.

New Generation is also converting its latest Spectrum release *Trashman* for the 64, also scheduled for mid-April.

All the Commodore 64 titles will be distributed and marketed by Quicksilva.

Two machine-code training

QL—no sign yet

PCW's QL order: Week 10. Sinclair confirms it is still on target to deliver the first batch of machines to customers by the end of March. Interest so far gained by Sinclair from our QL order is now around £4.40. With one week to go Sinclair has still not finally decided on the form of the gift to be sent to waiting customers.

programs will be the next Spectrum releases from New Generation. These should be finished by the end of April, to be followed by versions for the Commodore 64 and BBC machines.

Quest II — Fantasia

AFTER the success of *Quest Adventure*, Hewson Consultants has brought out a second adventure game, *Fantasia Diamond*, for the Spectrum 48K.

Written by Kim Topley, who also wrote *Quest Adventure*, this mission involves rescuing not only the priceless *Fantasia Diamond* itself, but also Boris the Masterspy, who has failed in his attempt to recover the gem.

Fantasia Diamond costs £7.95. Details from Hewson Consultants, Hewson House, 56b Milton Trading Estate, Milton, Abingdon, Oxon.

New venture

SIR Clive Sinclair has chosen the Venture Centre in Warwick University's Science Park as the location for his electric car project. Warwick's reputation in electric transport research and development has undoubtedly influenced this decision.

Sir Clive hopes to manufacture a 'family' of electric cars over the next three to five years. The first vehicle, a low cost car for commuter use, should be available by early 1985.

In flight

ACORNSOFT has launched a flight simulation program — *Aviator* — for the BBC computer.

The program attempts to recreate the experience of flying a Mk II Spitfire. Air Vice-Marshal Sandy Johnstone who commanded 602 Squadron at the Battle of Britain was one of the first to try out the new simulation program: "I'm thrilled with it. If you can learn to manipulate the instruments in *Aviator* you would be well on the way towards learning to fly."

The program is written by Geoffrey Crammond — who also produced *Super Invaders* for Acornsoft. It took him eight months to write and features an accurate representation of a Spitfire cockpit. Flying the



Acornsoft Spitfire, using the keyboard or a joystick, it is possible to loop-the-loop and fly under a bridge to be found in the program.

Aviator costs £14.95 on cassette or £17.95 on disc. Both versions include an instruction manual and a map.

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COMMODORE has finally come up with its answer to the government's 'micros' in schools scheme – a cut-price offer of its own. Deliberately designed to coincide with the end of the government scheme, Commodore is offering schools and colleges throughout the UK the chance to buy Commodore 64s complete with 1541 single floppy disc drives, Logo and Simon's Basic for £299.99 per package. This is a saving of £172 over the recommended retail price of £472.

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Letters

Decoding on Dragon

I am afraid that Ian Bennett's ingenious encoding program for the Dragon (*PCW* 23-9 February) is another example of the re-invention of the wheel — and a square wheel at that. You will not find the MoD beating a path to your doors for this one.

What he has produced is basically the Gronsfeld cipher of 1655, but with a variation which makes it much more vulnerable. The fact that in each case a fairly short key is used, which is repeated regularly, means that both the Gronsfeld and the Bennett ciphers are most easily attacked by looking for short repeated sections in the cryptogram. Repeated digrams (pairs of characters) are useful, and repeated trigrams are very useful, as they are likely to have come about because a common digram or trigram in the plaintext has been enciphered using the same part of the repeated key.

For example, in the message you published we find the digram 288 766 repeated with an interval of 16, the trigram 160 511 288 at an interval of 48 and 707 202 672 at an interval of 32. This correctly suggests that the numeric key length (twice the length of the key word) is 16, the highest common factor (in the plaintext the trigrams are "I" encoded with key numbers 5,7,9 and "eep" encoded with 7,2,6)

Having determined the key length, we rewrite the cryptogram in as many columns as the keylength. Each column is then encoded using the same part of the key, and we look at the characteristics of each column separately. Mr Bennett has saved us a bit of labour here, as the length of his keyword is 8 so his key number repeats in 16's, and his printing in 16 columns is just right anyway.

Now the Gronsfeld and Bennett ciphers part company, and the three hundred year old one is superior, because it adds the key number rather than multiplying by it. In Gronsfeld, at this point you have to determine

for each column by what constant amount (different for each column) you have to move up or down the alphabet in order to make sense of the letters in each column, in conjunction with its neighbours. There are many possibilities as, for example, moving back up to 9 letters from j gives any letter from a to h. This can be done and there are several techniques to help, but it is time consuming.

Bennett, however, is much easier. Even if you don't realise that the last three characters are zzz, giving $8 \star 122, 3 \star 122$ and $6 \star 122$, you can factorise the numbers in each column, and look for the common factor less than 10 which produces sensible AscII characters from the other factor for all the numbers in the column.

The whole process of decryptment using pencil and paper only, took me a little less than an hour, and that included a false start as I had wrongly thought that a Dragon was upper case only.

In short, if you have any secret deeper and darker than published poetry, don't use this cipher. There are plenty of ways of making very difficult ciphers using microcomputers, but this is not one of them.

J Marlin
Maidenhead
Berks

Something old, something new

In the *Peek & Poke* column of *PCW* 16-22 February 1984, Mr Misket asked why "Old"-ing a program on the BBC micro alters the number of the first line when it is line number 300 or more. The answer is very simple and is to do with the way in which the BBC stores line numbers in the program.

The second and third byte of each line in memory give the line number high byte then low byte. So line 300 is represented as 01, 2C in hexadecimal. When *Old* is typed the computer changes the first of these bytes in the first line to zero so 01, 2C becomes 00, 2C, ie 44.

Old is related to *New*, which

changes this byte to FF in hex and this is the way in which the computer recognises the last line of a program. *New* therefore appears to destroy the program, but apart from the byte in question it is in fact still there and is recoverable by typing *Old*. Pressing *Break* also has the same effect as *New*, so again typing *Old* will recover the program.

The mathematically minded will notice that *Old* changes the first line number by dividing by 256 and taking the remainder; ie 300 changes to 44, 650 to 138, 1000 to 232 etc.

Nigel Martin
University of Durham
Collingwood College
South Road,
Durham DH1 3LT

Cat and mouse

I read with interest the article by John Santi published in *PCW* 23-29 February, concerning the modifying of the *Cat* command so as to render files beginning with *Chr\$ (0)* visible again.

I have a tip for those who wish to protect their files from this modified *Cat* and it is based on the fact that control codes can be used in file names. For example, if a file is saved on the Microdrive with file name *Chr\$ (0) + "prog"* then the modified *Cat* would produce exactly the same file name as before, which is obviously wrong, and any attempt to *Load* this printed file name will

be met with a 'file not found' error.

It is possible to use other control codes such as *Chr\$ (13)* which would give the impression that there were two files instead of one, *Chr\$ (22)* and *Chr\$ (23)* for moving the print position, etc.

The article mentioned the fact that most of the routines seem to be relocatable. I was wondering if this includes the *Move* routine and, if so, could this routine be altered so as to make it possible to copy programs directly from one Microdrive to another instead of just data files?

Mark Purcell
University of Nottingham
University Park
Nottingham NG7 2RA

PS Glad to hear you've been awarded 'Magazine of the Year' by the CTA — you deserve it.

Which software?

I have recently acquired a ZX Interface 2, but have found there is almost no software compatible with it — not only my old programs but some recently purchased ones as well.

Could you advise me what software the ZX Interface can be used with? I am a regular reader of your magazine which I enjoy very much.

Mathew Jones
'Foxhill'
14 Greenway Road
Galmpton, nr Brixham
South Devon



"He wants his Oric I bugs back!"

We have noticed very much the same thing. Before the Interface 2 was issued the Kempston format was becoming very much the Spectrum standard. It must be regretted Sinclair did not adopt it. However, future software is very likely to be Interface 2 compatible through sheer economic pressure. It is not difficult for software houses to cater for several different standards and not to do so would be simple carelessness.

Snakes

A new game for Dragon 32 by Andrew Thompson

This program is a version of the game Snake. The player has to control a snake, using the keys A for up, Z for down, L for left and ; for right. You have to move the snake towards the food, while avoiding the snake's tail and the sides of the screen.

Every time the snake eats some food, it gets longer and the score increases. But, the food decays and disappears if the snake cannot get to it in time. When this happens, the snake increases in size, but the score stays the same.

When the food decays, a new block of food appears somewhere else on the screen.

If the speed-up *Poke* (*Poke* 65495,0) does not work on your Dragon, then delete line 80.



Star Game

```

10 *****
20 ***SNAKE***
30 *****BY*****
40 ***ANDREW***
50 ***THOMPSON***
60 *****
70 CLEAR500
80 POKE65495,0
90 PCLEAR8
100 PMODE4,1
110 PCLS0
120 PMODE4,5
130 PCLS0
140 HS=30
150 N$="THE COMPUTER"
160 E=100
170 L1=3
180 SC=0
190 C=6
200 CL=5
210 CLS0
220 L=5
230 SET(1,0,1)
240 SET(1,1,1)
250 PRINT01,"SCORE="SC,"LIVES="L1
260 POKE1055,143
270 RESET(63,0)
280 RESET(63,1)
290 X=0
300 Y=0
310 A=0
320 B=0
330 S1=1
340 S2=0
350 FORP=1 TO62
360 SET(P,3,C)
370 SET(P,30,C)
380 NEXT
390 FORP=3 TO30
400 SET(1,P,C)
410 SET(62,P,C)
420 NEXT
430 X=9+RND(44):Y=7+RND(16)
440 A=RND(3)-2
450 B=RND(3)-2
460 IFABS(A)=ABS(B)THEN440
470 GOSUB760
480 A$=INKEY$
490 IFL>6144THENL=6144
500 IFA$="A"THENB=-1:A=0
510 IFA$="Z"THENB=1:A=0
520 IFA$=";"THENA=1:B=0
530 IFA$="L"THENA=-1:B=0
540 X=X+A:Y=Y+B
550 S1=S1+1:S2=S2+1
560 IFS1>L THENS1=0
570 IFS2>L THENS2=0
580 POKE1536+S2,X
590 POKE1680+S2,Y
600 S=PEEK(1536+S1)
610 T=PEEK(1680+S1)
620 IFPOINT(X,Y)<0THEN680
630 SET(X,Y,CL)
640 RESET(S,T)
650 E=E-1
660 IFE<0THENE=100:PLAY"TZ55LZ55U3J05BAG
FEUC":L=L+RND(4):POKE1024+R1=R2*32,128+3
0SUB720
670 GOTO480
680 IFPOINT(X,Y)+830SUB760.E=100:PLAY"TZ
55LZ55U3J01EC":L=L+RND(4)+60=50+1:PRINT
02,S1,S2+1:GOTO620
690 IFPOINT(X,Y)<0THENPRINT00,"YOU HIT T
HE SIDE ELSEPRINT00,"YOU CRASHED INTO YO
UR OWN SNAKE
700 FORP=1 TO500:NEXT
710 PLAY"TZ55LZ55U3J05BAGFEUCJ04BAGFEUCJ3B
AGFEUCJ2BAGFEUCJ1BAGFEUC"
720 L1=L1-1
730 IFL1<0THENE=100:CLS0:PMODE4,1:PCLEAR8:
PMODE4,5:PCLS0:GOTO100
740 IFPOINT(X,Y)<0THEN680
750 IFPOINT(X,Y)>0THEN680
760 POKE1024+T/2+32*IN(X/2),128
770 R1=RND(30)+R2+1+RND(13)
780 IFPOINT(X,Y)<0THENPEEK(1024+R1+R2*32),2,1
0="0"THEYPOKE1024+R1+R2*32,255ELSE720
790 RETURN
800 L1=
810 PRINT054,"YOU HAVE NO LIVES LEFT!"
820 PRINT090,"YOUR SCORE IS"SC
830 IFCLHS THEN890
840 PRINT0162,"THE HIGH SCORE IS"HS
850 PRINT0220,"IT IS HELD BY "N$
860 PRINT0480,"PRESS THE SPACEBAR":
870 FORP=1504 TO1535
880 NO=PEEK(P)
890 IFNO<05 THENNO=NO+64ELSENO=NO-64
900 POKEP,NO
910 NEXT
920 A$=INKEY$
930 IFA$=" " THEN870
940 PMODE4,1
950 PCLS0
960 PMODE4,5
970 PCLS0
980 GOTO160
990 PRINT0162,"CONGRATULATIONS!"
1000 PRINT0220,"YOUR SCORE IS THE HIGH S
CORE"
1010 PRINT0290,"ENTER YOUR NAME(15 LETTE
RS):"
1020 PRINT0322," ";
1030 LINEINPUTN$
1040 IFLLEN(N$)>15THENPRINT0386,"NO MORE
THAN 15 CHARACTERS":SOUND1,5:PRINT0386:P
RINT0322,STRING$(LEN,N$),32):GOTO1020
1050 HS=SC
1060 PRINT0290
1070 PRINT0322
1080 PRINT0386
1090 GOTO840

```


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Come the revolution

David Kelly talks to the rebels at Red Shift

Wargaming is a strange art. Or is it a science. Or a sport?

Whatever it is, the word conjures up a world of small lead soldiers taking regimented steps and firing matchstick cannons across the table-top. Red Shift would have you know that that is only one facet of wargaming. After all, both *Chess* and *Go* are types of wargame.

The history of modern wargaming is a fascinating story in itself. Perhaps the first wargame to be given that name was *Kriegspiel*. This game was played in Prussia in the early 1800s on a map with pieces to represent the opposing forces and was used as a military tool for training purposes.

At the turn of this century, H G Wells wrote a book — the wargamer's bible — called *Little Wars*. In it he outlined a set of rules and conventions to make a wargame out of matchsticks and toy soldiers.

The rules became further formalised after the 2nd World War when Donald Featherstone and others laid down more detailed instructions covering movement of the pieces, what happens when they meet, and a new element, moral — how do the troops react to the outcome of the combat.

These three functions are the cornerstone of wargaming and were incorporated into a game called *Tactics 2* manufactured by Avalon Hill in 1960.

At about the same time, the burgeoning hobby split into two opposing camps (as it were). It divided into board gamers and tabletop terrain enthusiasts. The board gamers produced games like *Diplomacy* and *Risk*, adding in a political slant and concentrating more on the sophistication of the simulation than the realism of the battle.

The figure wargamers got on with checking out the accuracy of the uniforms of their soldiers and researching the strengths of the opposing forces at famous battles in order to try to prove that the good guys would always have won through.

Dungeons and Dragons was a specialist off-shoot of the figure wargaming fraternity — Gary Gygax, a Californian wargamer, decided that he wanted to try to incorporate character into the way his generals behaved.

So how do computers fit in? Wargamers were quick to take advantage of micros as a tool to take the tedium out of the conflicts — churning through the numbers and probabilities to find the outcome of each confrontation. *Dungeons and Dragons* enthusiasts also used them for similar applications.

Explains Red Shift's Julian Fuller, "Table-top rules are now so detailed that keeping track of all the bits of paper meant that we were spending more time calculating than actually deciding the moves. Board wargamers were just as frustrated, be-

cause the functions of the mathematics are so complicated that it began to slow down the play.

"The humans could no longer easily handle the model they had designed, so it seemed logical to implement that maths on a computer. It seems better than playing arcade games to me as well.

"Companies like Salamander are closer to the *Dungeons and Dragons* end, so they started off producing adventure games.

"On the other hand, Red Shift were much closer to the board wargaming side, so we started by producing strategy games.

"Me and Joe Capricorn met Woolf! who was writing for a magazine called *Miniature Wargames*. That ended up with us all producing the magazine — as we still do — and out of that also came Red Shift.

"We reckoned we could produce reasonable wargames and got stuck in, towards the middle of last year, with our first Spectrum program, *Apocalypse*."



Apocalypse is a successful board game produced by one of this country's better known independent games companies — Games Workshop. Developed by Mike Hayes in the late 1960's, the game was ideal material for conversion to the computer. It is a territorial wargame in which the object is for up to four players to take turns to deploy forces on a board — a map representing Europe.

Since its release on the Spectrum late last year, Red Shift have followed it with a number of expansion programs designed to use the same core program, yet setting the conflict in another part of the globe or in another time. Volume 1 gives a choice of locations — the USA, SE Asia, London or Artic Circle, while Volume 2 offers a choice of setting — the Fall of Rome, Napoleon's Campaigns or 1984.

At the moment, Red Shift are writing for three machines — the Spectrum, BBC and Commodore 64. Design of each program is a co-operative affair. Most of the effort goes into producing a playable game from the original idea. "It may take three weeks to go from the idea to a working version on the computer and another three months to hone it till the mechanics of playing it are just right."

The next two games on the BBC machine will be *Islandia* and *English Civil War*. *Islandia* is a military economic fantasy game — according to Julian. A naval trading game in which a number of players take to the open sea in a variety of craft to seek their fortune from the distant islands and beat off the other players whilst so doing.

English Civil War is more of a traditional wargame. The opposing forces of two players meet in wooded country and slog it out turn by turn with cavalry, pike, artillery and musket men.

Red Shift's latest release for the 48K Spectrum is *Rebelstar Raiders*. Again, it is a two-player game — raiders versus operators. The object of the exercise is for the

Red Shift rebels (left to right): Woolf, Eric the Digit, Dave the Drink, Julian Fuller (alias Dino the Zombie) and the inimitable Joe Capricorn

raiders to break into and destroy the control room and central computer Main-Comp — shown in plan form on the game display. In turn, the operators must defend the installation against attack. Like *English Civil War*, the game has two phases. A deployment phase when both opponents select where on the 'board' to place their combatants. And a movement phase when the players do battle. In *Rebelstar Raiders* each of the warriors has its own skill and endurance ratings — some of the troops perform better than others.

The Spectrum version of *Rebelstar Raiders* is already available and a Commodore 64 version is under way. Spectrum versions of *Islandia* and *English Civil War* are also on the way.

Looking slightly further ahead, Red Shift hope to convert another Games Workshop boardgame — *Battlecars* — for the Spectrum, BBC and Commodore.

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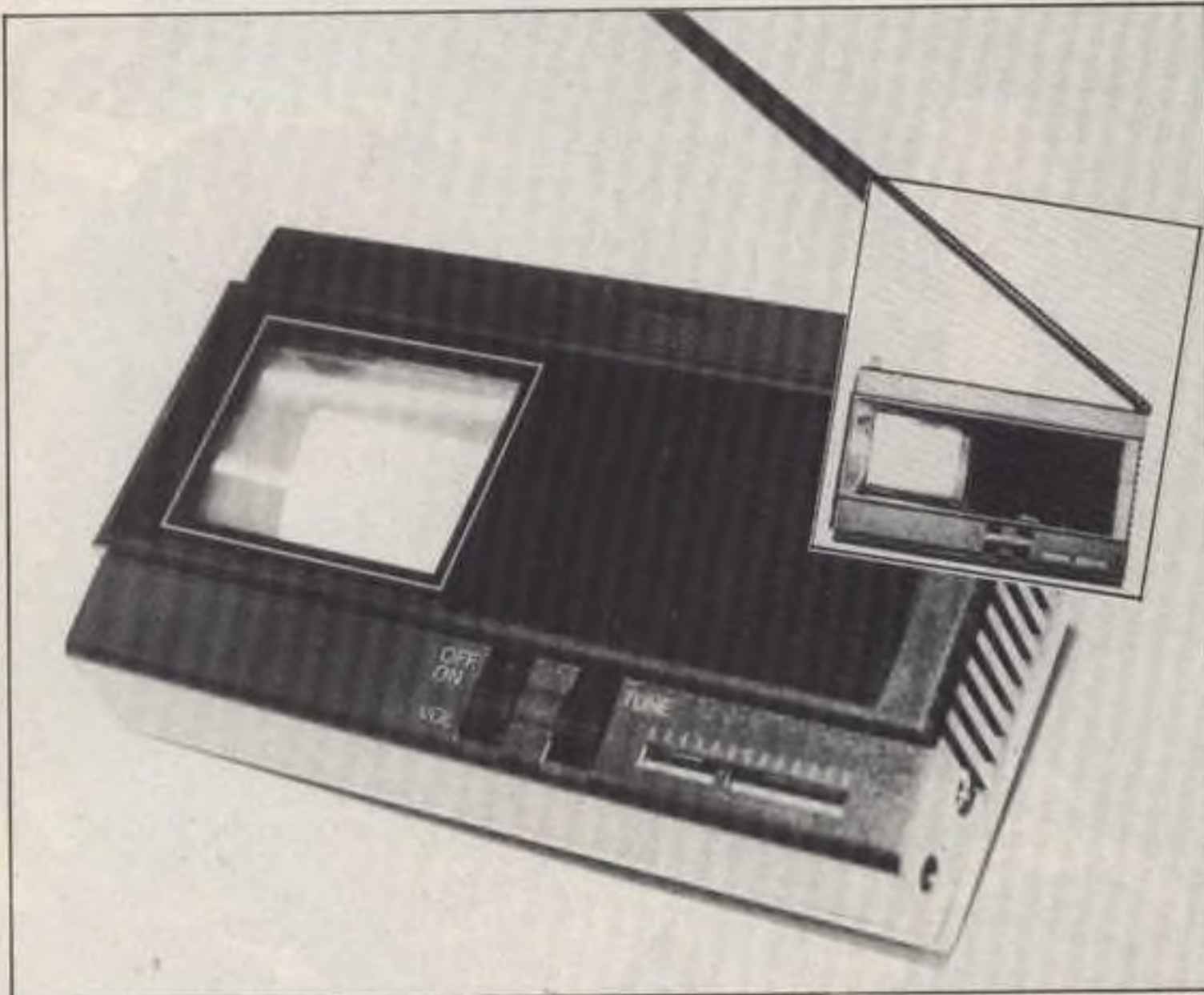
Jeff Naylor delves inside Sinclair's flat screen tv

If the casualty departments of hospitals fill up this summer, with people who have walked into lampposts and under the wheels of juggernauts, we will only have Clive Sinclair to blame. The flat screen pocket tv, long since rumoured, has finally crystalized into reality, and is sitting on the corner of my desk.

The FSTV 1 is of interest to home computer users for three reasons: it is technically very impressive, it offers an alternative to liquid crystal displays for portable computers and there is always an

interest in anything that Sir Clive gets up to. must get within six inches of it. Don't think that I am precluding the tube as a computer display though; I will expand on the possibilities later.

The obvious technical advance that the tv makes is the shape of the tube, but two other aspects must not be overlooked: the signal processing and the battery. Polaroid have developed, in conjunction with Sinclair, a flat lithium battery measuring 3 by 3⁵/₈ inches and less than an eighth of an inch thick. It fits snugly into a slot in the back of the tv, a little too snugly for people who



Clive Sinclair has become a legend in his own 28 day delivery period. The ZX81 and Spectrum have, I would guess, provided an introduction to micros for the majority of PCW readers. His products always have an exciting originality about them, even if, like the Black Watch, they don't always work properly.

The pocket tv is in statutory Sinclair black with red trim, and measures 5¹/₂ by 3¹/₂ by 1¹/₄. There are two controls - off/on plus volume and tune, accompanied by a small scale. The aerial is retractable and pivots on the top right hand corner, and a leg unclips from the back, so you can stand the tv upright.

Before I go any further, let me make it plain that buying a FSTV solely for use with a computer is a bit silly, unless you like eyestrain. The screen measures 1¹/₂ by 1¹/₈ inches and to read pages of Ceefax you

have trouble opening pickle jars. The battery should last 15 hours and a rough test showed that the FSTV drew about 100 mA, giving the battery a capacity of something in the region of 1.5 amp/hours.

At a cost of £9.95 for three batteries, viewing works out at 23 pence an hour, which puts the licence fee into perspective! There is a mains adaptor available, but as the strength of the tv is its portability, a rechargeable battery would be better (if technically impossible!).

The feature that will go unnoticed by many is the multi-standard capability. When you go abroad then take your Sinclair with you. But, there are some places that it will not work, notably France, Russia and China.

Not counting the old systems being phased out, such as our 405 line format, television transmissions are either 525 or

625 line standard. The FSTV can lock up to either with the aid of a phase locked loop and voltage controlled oscillator.

All systems but one, the French, use what is called 'negative modulation' to transmit their pictures; video that consists of black level, when modulated, creates the largest amplitude radio frequency signal. The idea behind this is that the spikes of radio noise caused by motorbikes charging up and down outside will appear as black spots, which are subjectively less obtrusive. As the FSTV decodes negative modulation, the French positive system cannot be received.

The differences in how colour information is transmitted are of no concern on a black and white set, particularly as great care has been taken to ensure that colour signals do not affect monochrome receivers.

The sound reception is where things get a bit tricky. Not only is the spacing between the vision and sound RF different between the two line standards, but the 625 system has further variations. By employing another voltage controlled oscillator and a careful choice of the intermediate decoding frequency, all but the PAL D, K and L standards can be accommodated.

Of course, all this very clever design work is not solely for the sake of our holidays abroad — it means that one design can be sold anywhere. This is important when you realise that almost the whole of the circuitry is contained on a single chip, the development of which must have cost a small fortune. Apart from the UHF tuning stage, the board contains the odd driver transistor, a few presets for lining up the picture and a collection of capacitors, resistors and coils. Everything else is inside the Ferranti IC. Its input is RF, while its outputs are audio, video and the line and field signals. It even generates the EHT voltage to drive the tube.

Like all good inventions, the design of the Sinclair flat screen is so obvious it's a wonder that it hasn't been tried before. A conventional cathode ray tube is the shape of a pyramid turned on its side — at the apex is an electron gun which fires a beam at the phosphorus coating on the inside of the base. This means we view the light emissions of the phosphorus from the weakest side.

If electrostatic deflection is used to focus and aim the beam, the pyramid needs to be of a fairly acute angle. The length of oscilloscope tubes bears witness to this. If we resort to electromagnetic deflection we can make the angle more obtuse — 110 degree tubes are not uncommon. The price paid is more powerful deflection signals and greater distortion.

The flat tube consists of a piece of glass shaped somewhat like a bathtub, with a flat plate sealing the top surface. It measures about 4¹/₂ by 1³/₄ by 3/4 inches. The right hand end contains the electron gun and

deflection assembly, while the phosphorus screen is on the bottom of the tube at the left (the plughole end?), and is viewed through the top plate. We therefore view the phosphorus from the same side as the electrons hit them, which results in a very bright picture for a relatively low beam current.

This low current, coupled with the fairly long beam path, allows electrostatic deflection to be used. If the beam were aimed directly at the screen, it would hit the phosphorus at a very sharp angle. The resolution of the picture would be dreadful and distortion problems considerable.

As the electrons are fired along the tube, parallel to the screen, what causes them to bend in order to hit the screen? The underside of the top glass plate that we look through is not all that it seems. It is coated with a transparent, conductive material which is negatively charged. The phosphorus screen is positively charged to attract the electrons, however, and the sum effect on the beam as it leaves the gun is still an attracting force at the other end of the tube.

As the beam approaches the screen, the electrostatic field between the top and bottom faces of the tube begin to act, diverting the electrons downwards onto the phosphorus. As a suitable analogy, we can imagine a fast flowing stream joining another at right angles. A canoe floating down the side stream will be swept round into the direction of the main stream — how far across it gets before it is travelling parallel will depend on its original position in the side stream.

Of course, there are still distortion problems. If there were no compensation, the picture would diverge considerably towards the far end of the tube, and straight lines would appear to curve at the edges of the picture. To reduce this, both electronic and optical correction are employed.

The electronics affect the scanning signals, cheating them to square up the picture. Obviously, the picture is less distorted the closer it is to the axis of the electron gun, so the phosphorus patch is not the normal four by three television aspect ratio, but nearer two by one. The front half of the tv's case contains a Fresnel lens that brings the picture back to normal shape.

Incidentally, two by one is the Cinema-scope aspect ratio. If the broadcasters ever forget to 'unsqueeze' a Scope film, just take the top off your pocket tv!

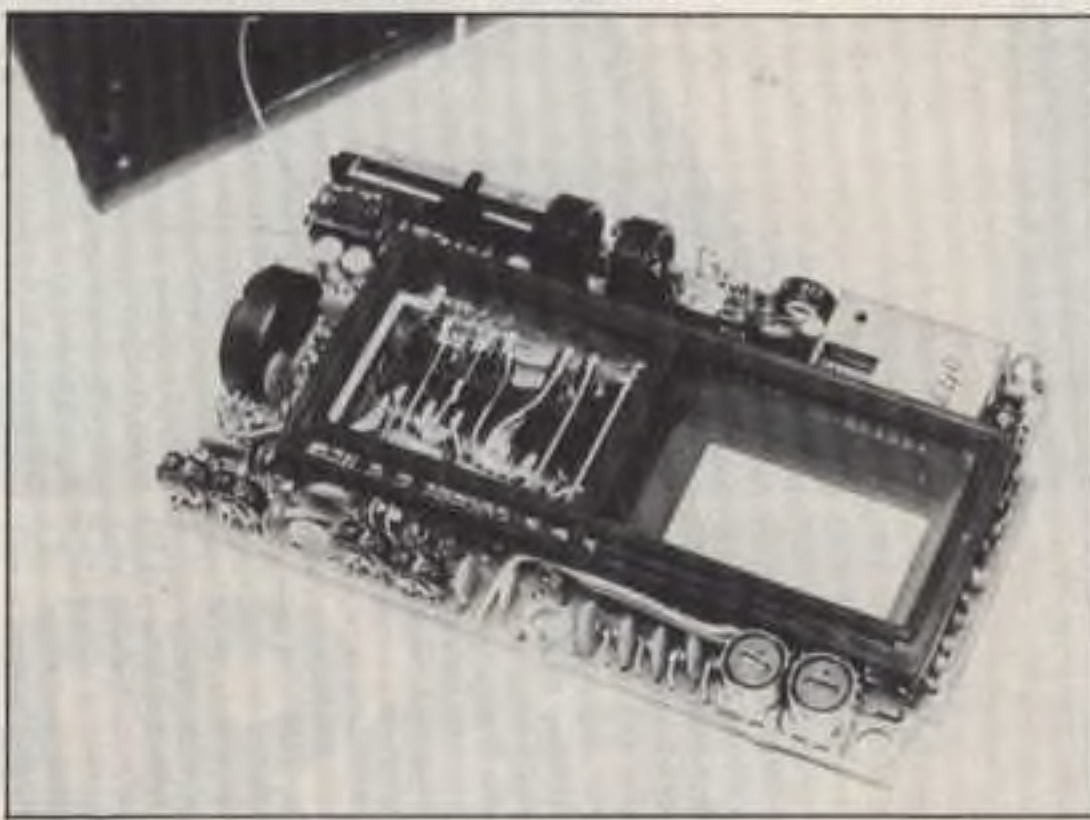
So much for the technical miracles. How does the pocket tv actually perform?

When the postman delivers one, tearing open the box will reveal the telly, a carrying pouch, earpiece, spare battery, instructions and order forms. The instruction leaflet takes two pages to ensure you get the batteries in the right way, two pages on using the tv, one page tells you not to scratch it or drop it in the bath and the last

page tells you where you can go on holiday.

Having found a battery in place, I extended the aerial, held my breath and switched on. A clear, crisp picture instantly appeared, but within a few moments went off lock. Fiddle with tuning knob. Ah, there it is... no, its gone again. Fiddle with aerial... yes — oh, no. Curse; read instructions; fiddle some more; try different station; stand on chair. No doubt about it, it wouldn't stay locked up for more than a few seconds.

If it had been my own machine it would have gone straight back, but as it had to be back by Friday anyway, I took it apart. Inside I was presented with eight possible spots to twiddle. The first one I tried was the width control. The second one needed only



a slight twist; the picture locked up and hasn't drifted off since. It was either bad luck, or someone had tweaked it already.

If you experience the same problem and are not afraid to void your guarantee, its the variable resistor nearest the volume control. Be careful, as there are some painfully high voltages inside!

Having got the telly working properly, I began some intensive field research. Watching *Dallas* on the bus, *Minder* in the pub, that sort of thing. You can see Crystal Palace through the missing slates in my loft, so I would have liked to have tried the television in a fringe reception area. In London, it was possible to receive a good picture almost anywhere (except the underground!), with remarkably little ghosting. Due to the nature of UHF signals, a small aerial movement can cause a vast change in signal level, and therefore using the Sinclair on the move, in a car or bus, was rather disturbing.

The lens restricts viewing to about 30 degrees, though two close friends might use one tv. On normal pictures, shape distortion is not obvious, but if you enjoy watching the test card, then prepare for disappointment. Horizontal lines near the edges are noticeably curved and the picture is pear shaped near the gun. The brightness and contrast are automatic, and for most pictures the set up is fine.

However, in common with most black and white televisions, black level clamping is poor. This is most apparent on low key scenes, consisting mainly of black with a few brighter patches; they are displayed as washed out shades of grey. Colour sets need good clamping to retain the colour balance, but few black and white sets seem to bother.

The sound output from the pocket tv contains rather too much hiss, and the small internal speaker does little to help. The volume was adequate for most purposes. The provision of the earpiece is a good idea, as the quality is much better than the speaker, and you need not drive the output stage into distortion in order to hear in a noisy environment.

After the battery had been used for some time, I began to notice that loud volume settings caused interference on the picture. With the sound and video circuits in the same package, the current demands of the sound output were causing the picture brightness to vary.

If these criticisms seem rather damning, they are not meant to be. Considering the technical

achievement of cramming a multi-standard, flat screen tv into such a small space, the results are remarkable.

The Sinclair pocket tv has no aerial socket, but by hooking a wire to the aerial and tuning to channel 36 you can view the output of your computer. You may need strong glasses after a few games of *Manic Miner*, though. Despite the small size, *Tasword 2's* 64 column screen was almost legible — the tube has good resolution.

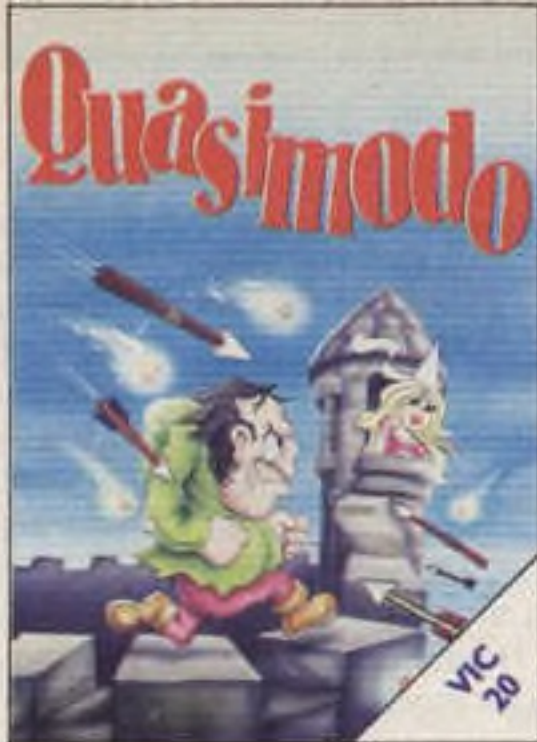
Remember that computers rarely use the whole tv screen. The Spectrum's display must have about 20 percent of wasted space in the border, so winding out the scans on the screen would certainly help. There is already a lens in front of the phosphorus patch, and this could probably be increased in strength at the cost of a reduced viewing angle.

By taking these factors into account, and producing a chip with a video input to drive the flat screen tube, Sinclair Research could have a viable display device for a hand-held computer.

Whether the flat tube finds its way into computers is a matter for conjecture. The pocket tv is definitely here, and working well. If the success of the Sony Watchman in America is anything to go by, it looks as if Sir Clive will make even more money to spend on his electric car. He is likely to get my next spare £80.



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--	--	--	--

Cutting the grass

Richard Dodd puts the finishing touches to his three part Lawn Mower game

When you have completed the first two stages, the final task is to add the finishing touches. These finishing touches in the *Lawn Mower* game are to be found in program 10.

1) **A life lost** — If the lawn mower runs into a wall, or a tree, or runs out of fuel, a life is lost:

Line 650 Plays crash sound.
 660 Takes one life off.
 670-690 Updates all the scores.
 700 Refuel mower.

710 Checks to see if you have a life left.

2) **The end of the game** — When the lawn mower has lost 3 lives, the game stops and the scores are displayed:

Line 730-750 Prints 'GAME OVER' in the middle of the screen.
 760-800 Resets all variables for next game.

810 PUT's a new screen up.
 820 Updates the high score if greater than the high score.

830 Sets the score to 0

3) **New level** — When a certain amount of the grass has been mown, you go on to the next level with a faster lawn mower to control:

Line 840 Speeds up the lawn mower, adds 1 to the level counter, clears the screen and PUT's up a new screen.

850-880 Clears all the obstacles.

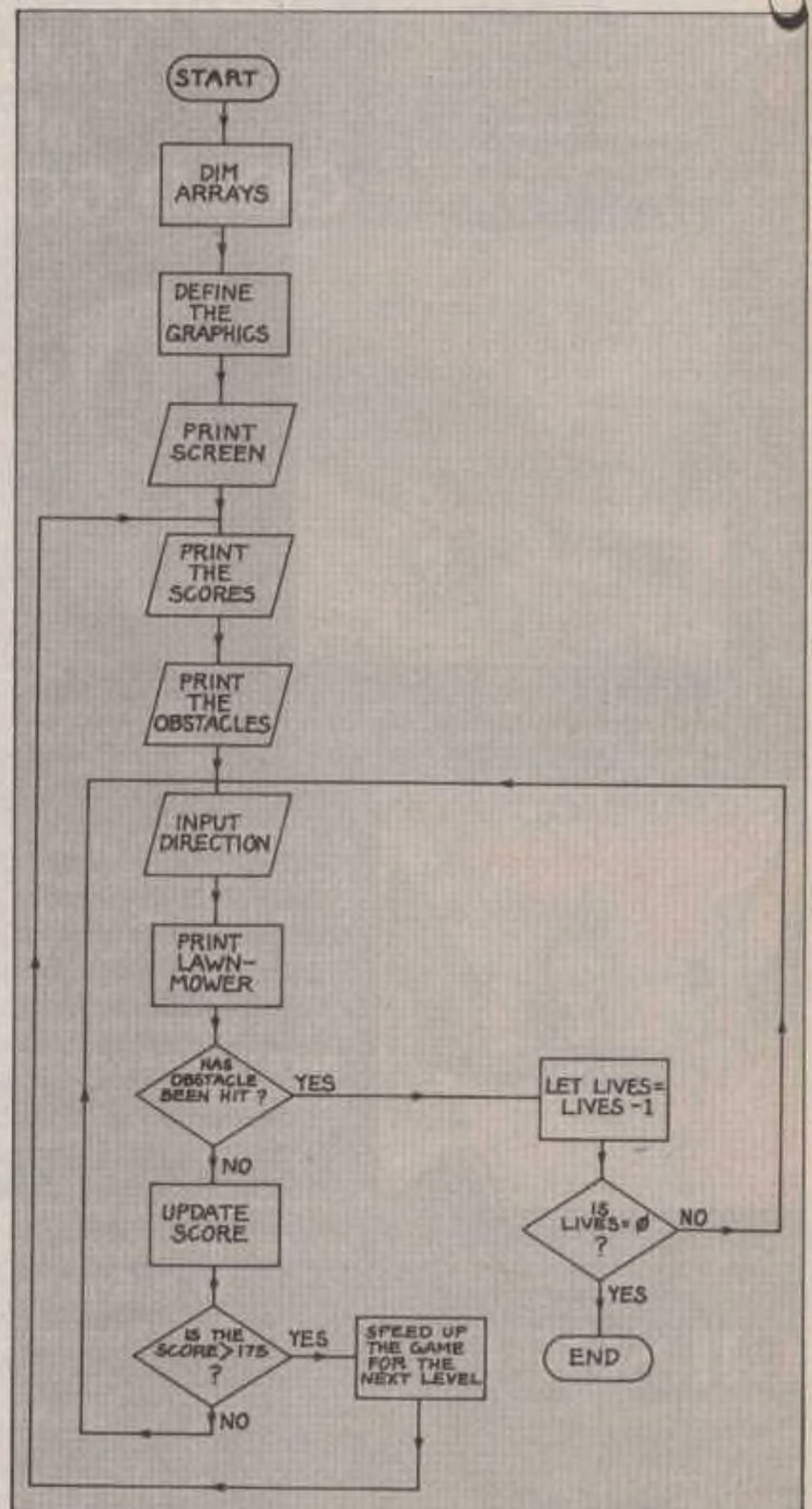
To finish off the game, enter line 20. By altering this line you can make the game as hard as you wish:

20 HI=200: LE=1: P=80: LI=3
 HI=The high score to beat
 LE=The level you are on
 P=Speed (the smaller the value of P the faster you go)
 LI=Number of lawn mowers that you have

PROGRAM 10

```

650 PLAY"T5001EEEEEE"
660 B$="":LI=LI-1
670 PR$="":Q5=5126:GOSUB 1480
680 PR$=STRING$(LI,33):Q5=5127:
    GOSUB 1480
690 PR$=STR$(SC+BN):Q5=5142:
    GOSUB 1480
700 IF F=190 THEN F=25:LINE(230,
    20)-(232,190),PSET,BF
710 IF LI=0 THEN 730
720 GOTO 480
730 LINE(56,64)-(144,104),PSET,BF
740 LINE(56,64)-(144,104),PSET,B
750 PR$="GAME OVER":Q5=2568:GOSUB
    1480:EXEC 41194
760 FOR X=0 TO 21
770 FOR Y=0 TO 14
780 P(X,Y)=0
790 NEXT: NEXT
800 B$="":LE=1:LI=3:P=70:
    SC=SC+BN:BN=0
810 PCLS 1:PUT(0,0)-(256,191),SR
820 IF SC>HI THEN HI=SC
830 SC=0:GOTO 310
840 P=P-10:LE=LE+1:PCLS 1:PUT(0,0)
    -(256,191),SR:SC=SC+BN:BN=0
850 FOR X=0 TO 21:FOR Y=0 TO 14
860 P(X,Y)=0
870 NEXT: NEXT
880 GOTO 310
    
```



MAKE MONEY WITH YOUR MICROCOMPUTER

Most people buy a micro either to play games, like 'Invaders', on it ... or to learn more about computers ... or as an educational aid for their children. But now, there is another — potentially far more exciting — way to use your microcomputer.

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- Where to get referrals ... and why they matter.
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The final conflict

D Edwards concludes his *Star Trek* program in the last of a three part series

This week we will start off by examining the function of the machine code in the game. There are three small machine code routines — two control graphics and one is responsible for sound effects.

This program uses a routine in the Spectrum's Rom, located at 949, which produces sound. All you need to do is place a number between 0 and 65536 into the DE register pair — this controls the duration — and place a value between 0 and 65536 into the HL register pair, which represents the pitch. The routine can then be called by *Call* 949 from machine code and the values of the HL and DE registers are adjusted and the process is repeated, until the B register contains 0. A listing of the program is:

```
LD B,6
PUSH BC
LD HL, pitch
LD DE, duration
PUSH HL
CALL 949
POP HL
LD DE, duration
AND A
ADC HL, DE
LD A,L
CP N
RST56
JR NZ,-20
NOP
LD DE, duration
LD HL, note
CALL 949
LD DE, duration
```

```
LD HL, 5632
CALL 949
RET
```

The program is located at 65002 and produces a sound not totally unlike that of the Martian's heat ray in George Pal's *War of the Worlds*. If the routine at 65030 is called, a 'click' is produced which is used in a loop as a separate sound effect.

The other two routines store and display a screen full of graphics. At the beginning of each game the contents of the display file are stored in another area of memory. Whenever you change sector, they are transferred back into the display file. The first routine is as follows:

```
LD HL, 16384
LD DE, 50000
LD BC, 6848
LDIR
RET
```

It uses the machine code instruction *LDIR* to perform a block move operation which transfers an amount of data (the value of which is held in the BC register pair) from the address held in the DE register pair to the address held in the HL register pair. The third machine code routine is:

```
LD HL,50000
LD DE,16384
LD BC,6848
LDIR
RET
```

This routine transfers the data created by the first graphics routine back into the display file. It works in an identical way to the first graphics routine — the number of bytes (the value of which is held in the BC register pair) is transferred back from the address held in the HL register pair to the address held in the DE register pair. And so the useful instruction *LDIR* can be summarised by:

```
LD HL, from
LD DE, to
LD BC, number of bytes
LDIR
RET
```

There are a number of ways to speed up Basic programs to a certain extent and also to make them flicker free. The first of these is that all commonly used subroutines should have low line numbers and be as near to the beginning of the program as possible. This is because every time you *Gosub*, the computer checks every line of your program from the first line until it finds the line you referred to in the *Gosub*.

The technique used to achieve flicker free graphics is simple. All you have to do is print your object at the desired X and Y positions. Then you must make 'echo' copies of these such as:

```
LET XI=X:LET Y I=Y
```

You can then adjust the values of X and Y using *Inkeys* etc, and before jumping back to the beginning of the main game loop print at the positions XI and YI the same characters that were contained in the original print statement, except that this time they must be over one. This method of programming can be seen in lines 340 to 445 in the game. Happy hunting.

```
3070 DATA "", " SUDDENLY THE GRAND MUCRON
'S", "SHIP APPEARS OUT OF THE VOID.", "HE
ATTACKS AND YOU SUFFER", "CONSIDERABLE DA
MAGE.EVIDENTLY", "ALL THE SHIPS IN HIS FL
EET ARE", "FITTED WITH A NEW CLOAKING", "D
EVICE SO THAT THEY CAN APPEAR", "FROM NOW
HERE AND ATTACK YOU.", "", " IN THE BATTLE
, THE ENTERPRISE'S", "DILITHIUM CRYSTAL (T
HE MAIN", "POWER SOURCE) IS DESTROYED.THE
", "GRAND MUCRON JUMPS INTO ANOTHER", "SEC
TOR LEAVING HIS FLEET TO", "DESTROY YOU."
, "", " PRESS ENTER TO CONTINUE", " "
```

```
3080 DATA "", " ONE SHIP IN THE GRAND MUC
RON'S", "FLEET IS CARRYING THE", "CHALLENG
ER'S DILITHIUM CRYSTAL.", "IF YOU CAN REC
OVER IT YOU WILL", "HAVE ENOUGH ENERGY TO
USE THE", "WARP DRIVE AND RETURN TO", "ST
ARBASE-4.HOWEVER YOU DO NOT", "KNOW WHICH
SHIP IN WHICH SECTOR", "HAS THE DILITHIU
M CRYSTAL.", "", " ALL THE SHIPS IN THE GR
AND", "MUCRON'S FLEET ARE PILOTED BY", "TH
E MUCROIDS HIS MUTANT SLAVES.", "", " P
RESS ENTER TO CONTINUE", " ", " THE MUCR
OIDS ARE STUPID,SO", "THEIR SIMPLE SHIPBO
ARD COMPUTERS", "(MADE BY ACORN) GIVE THE
M A", "CHOICE OF TWO BASIC FLIGHT PATHS",
""
```

```
3090 DATA " THE MUCROIDS USE THEIR CLOAK
ING", "DEVICES AND THEN MOVE FROM LEFT", "
```

```
TO RIGHT OR THE OTHERWAY AROUND.", "WHILS
T MOVING DOWNWARDS FIRING", "AT YOU.", "",
" THE GRAND MUCRON'S SHIP MAY", "ATTACK Y
OU CAUSING CONSIDERABLE", "DAMAGE.", "", "
PRESS ENTER TO CONTINUE", " ", " Y
OU MUST TRAVEL FROM SECTOR TO", "SECTOR D
ESTROYING THE MUCROIDS.", "WHEN THE MUCRO
ID SHIP CONTAINING", "THE CRYSTAL IS THER
E, YOUR", "SOPHISTICATED SHIPBOARD COMPUTE
R", "WILL TELL YOU AND YOU MAY", "ENERGISE
THE TRACTOR BEAM.", "", " PRESS ENTER
TO CONTINUE", " "
```

```
3100 DATA " YOU START WITH :", "", " 700 U
NITS OF POWER", " 20 UNITS OF TRACTOR BE
AM POWER", " AND", " 0 POWER LOSS.",
"", " YOU MAY JUMP INTO HYPERSPACE", "AND
THEN THE MUCROID WILL", "REAPPEAR IN A NE
W POSITION.YOU", "MAY USE THE SHIELDS TO
PROTECT", "THE ENTERPRISE FROM SOME DAMAG
E", "", " PRESS ENTER TO CONTINUE", "
", "", " THE MUCROIDS DROP CYCLOIDS, ", "(A
SORT OF MINE) AND IF YOU", "FIRE YOUR PLA
SMA DISRUPTORS WHEN", "A CYCLOIDS IS IN Y
OUR SIGHTS", "THE ENERGY FROM YOUR WEAPON
", "WILL BE REFLECTED AND WILL", "DAMAGE T
HE ENTERPRISE.", ""
```

```
3103 DATA " THE TRACTOR BEAM WILL ONLY L
AST", "FOR A FEW SECONDS.", "", " YOU WILL
NOW BE TOLD HOW TO", "PILOT THE ENTERPRIS
```



```

E. ", "", " PRESS ENTER TO CONTINUE", "
"
3105 RESTORE 3060: PRINT AT 18,0: FOR
g=1 TO 119: POKE 23692,-1: PRINT : READ
t$: FOR l=1 TO LEN t$: IF t$(l)=" " THE
N GO SUB 9800: CLS : PRINT AT 18,0: L
ET l=l+1
3109 IF INKEY$ =" " THEN GO TO 3115
3110 PRINT OVER 0: " "; CHR$ 8;t$(l): N
EXT l: NEXT g
3115 OVER 0: INK 0: CLS : PRINT AT 1,4:
"MOVEMENT CONTROLS ARE:": AT 3,4:"Y U
I O P": AT 5,4:"< J K > FIRE": AT 7,
4:"SHIELD POWER CONTROLS ARE:": AT 9,4:"
Q W S": AT 11,4:"J K ON"
3120 PRINT AT 13,4:"SECTOR JUMP CONTROL
S ARE:": AT 15,4:"1 2 3 4 5 6 7 8": AT 1
7,0:"JUMP INTO THE RESPECTIVE SECTORS":
AT 20,5:"PRESS ENTER TO CONTINUE": FOR p
=0 TO 21: PRINT AT p,0: OVER 1: INK 7:
": NEXT p
3125 GO SUB 9800: CLS : PRINT AT 1,4:"H
YPERSPACE:": AT 3,4:"PRESS...H": AT 6,4:
"TRACTOR BEAM:": AT 8,4:"PRESS...T": AT
11,2:"WHEN THE CRYSTAL IS PRESENT": AT 1
3,1:"ENERGISE THE TRACTOR BEAM AND": AT
15,5:"MOVE THE MUCROID SHIP": AT 17,8:"I
NTO THE SIGHTS"
3130 FOR f=0 TO 21: PRINT OVER 1: INK 7
: AT f,0:
": NEXT f: INK 7: PRINT AT 21,7:"PRESS
ENTER TO PLAY"
3135 GO SUB 9800: DIM h$(5,3): DIM h(5):
FOR g=1 TO 5: LET h$(g)="Z80": LET h(g)
=0: NEXT g
3140 REM SKILL LEVEL
3145 LET s$="ent(er) ski(11) levul": PAU
SE 50: CLS : FOR g=1 TO 4: FOR i=0 TO 7:
BEEP .01,i: PRINT OVER 0: AT 10,7: INK
i:"ENTER SKILL LEVEL": AT 13,13:"(1-5)"
: NEXT i
3150 FOR i=0 TO 40
3155 LET i$=INKEY$: IF i$ >= "1" AND i
$ <= "5" THEN LET skill=CODE i$-48: GO
TO 3175
3160 NEXT i: NEXT g: GO TO 7040
3175 PRINT AT 13,13: OVER 0: " ": FO
R g=0 TO 5: FOR i=7 TO 0 STEP -1: PRINT
AT 10,7: PAPER 6: INK i: OVER 0: " SKI
LL LEVEL:":skill: " ": NEXT i: NEXT g:
LET skill=skill+2: GO TO 10
7000 REM GIVE SCORE
7005 LET sco=INT (skill*2+(sc+(da/10))+t
/40): LET t$="YOU SCORED "+STR$ sco+"
POINTS": IF sc=0 THEN LET sco=0
7006 LET s$="y(ouu) g(0)t": PAUSE 50
7010 LET t$="YDU SCORED "+STR$ sco+" PO
INTS": PRINT AT 9,3: FOR l=1 TO LEN t
$: PRINT " "; CHR$ 8: OVER 0;t$(l): NEX
T l:
7011 LET score=0: FOR g=1 TO 5: IF sco>h
(g) THEN LET h(g)=sco: LET score=1: GO
TO 7014
7012 NEXT g
7013 DATA "EFFICENCY COMPUTERS SHOW THAT
","YOU HAVE A HIGH SCORE,WHICH IS","WHY
THE GRAND MUCRON SWEARS","TO ATOMISE YOU
. ","", "", " PLEASE ENTER YOUR INITIALS"
7014 IF NOT score THEN FOR p=0 TO 50:

```

```

NEXT p: GO TO 3140
7015 LET pcl1=3: LET pcl2=16: FOR p=1 TO
100: NEXT p: GO SUB 1000
7017 RESTORE 7013: FOR p=3 TO 9: READ t$
: FOR l=1 TO LEN t$: PRINT AT p,l: " ";
CHR$ 8: OVER 0;t$(l): NEXT l: NEXT p
7019 POKE 23658,8: LET n$="": FOR a=1 TO
3
7020 PAUSE 0: LET a$=INKEY$: IF a$=""
THEN GO TO 7020
7025 LET n$=n$+a$: PRINT OVER 0: AT 14,
14;n$: BEEP .1,12: NEXT a
7027 LET h$(g)=n$
7030 FOR p=1 TO 100: NEXT p: LET pcl1=3:
LET pcl2=16: POKE 23658,0: GO SUB 1000
7035 REM HIGH SCORE TABLE
7040 OVER 0: CLS : FOR w=1 TO 4: FOR i=1
TO 5 STEP .2: PRINT AT 1,11: INK i:"HI
GH SCORE": NEXT i: NEXT w
7041 LET s$="h(ii)gh sc(or)z": PAUSE 50
7045 FOR w=1 TO 6: PRINT AT 1+w*3,9: "
_____": NEXT w
7050 FOR w=1 TO 5: PRINT INK w+1: AT 3+
w*3,11:h$(w): AT 3+w*3,17:h(w): NEXT w
7055 FOR p=0 TO 50: BEEP .01,p: BEEP .01
,50-p: NEXT p: PAUSE 100
7060 GO TO 3140
9570 REM DRAW TITLES
9571 LET s$="mycroid run": OVER 0: INK
2: FOR X=30 TO 37:
9575 PLOT X,135: DRAW 0,30: DRAW 10,-10:
DRAW 10,10: DRAW 0,-30
9580 PLOT X+30,165: DRAW 0,-30: DRAW 20,
0: DRAW 0,30: PLOT X+80,165: DRAW -20,0:
DRAW 0,-30: DRAW 20,0
9585 PLOT X+90,165: DRAW 20,0: DRAW 0,-1
0: DRAW -10,0: DRAW 10,-20: PLOT X+100,1
55: DRAW -10,0: DRAW 0,10: PLOT X+90,155
: DRAW 0,-20
9590 PLOT X+120,165: DRAW 20,0: DRAW 0,-
30: DRAW -20,0: DRAW 0,30: PLOT X+150,16
5: DRAW 0,-30
9595 PLOT X+160,165: DRAW 25,0: DRAW 0,-
30: DRAW -25,0: DRAW 0,30:
9600 PLOT X+50,120: DRAW 20,0: DRAW 0,-1
0: DRAW -10,0: DRAW 10,-20: PLOT X+60,11
0: DRAW -10,0: DRAW 0,10: PLOT X+50,110:
DRAW 0,-20
9605 PLOT X+80,120: DRAW 0,-30: DRAW 20,
0: DRAW 0,30
9610 PLOT X+110,90: DRAW 0,30: DRAW 15,-
30: DRAW 0,30
9620 NEXT X: PRINT AT 13,10: INK 6:"@ D
.EDWARDS": FOR I=1 TO 4: FOR F=0 TO 20:
PRINT AT F,0: OVER 1: INK I:
": NEXT F: FOR F=0
TO 20: PRINT AT F,0: OVER 1: PAPER 7-I:
" ": NEXT
F: NEXT I
9625 FOR F=0 TO 20: BEEP .01,F*2: PRINT
OVER 1: AT F,0: PAPER 0: INK 4:
": NEXT F
9630 RETURN
9800 IF INKEY$ <> CHR$ 13 THEN GO TO
9800
9810 BORDER 2: BEEP .2,10: BORDER 0: RET
URN
9999 REM ZERO SOLUTION

```


Program protection

Simon Wallace shows how to thief-proof your programs

OK, so you've just finished a sure-fire best-selling program on your Commodore 64, but you know it won't sell if everyone else can Load and Save it as easily as you can. Well, a few quick Pokes should soon take care of that, so read on!

There are many tricks a programmer may use to prevent copying, listing or amendment. Usually there is little work involved in building such locks, so, firstly, I'll show you a few simple Pokes to put at the beginning of a program. The major flaw in this approach is that your changes will only take effect when the program is Run.

The second part of thief-proofing is a way to force a program to Run as soon as it is loaded by means of a Bootstrap. I'll go into more detail later, and then give you some ideas about taking it a stage further.

Vectors

Simple changes are achieved using the Commodore 64's Vector table. A Vector is a pair of bytes which guide the operating system as to which bit of its own code to use for a given command. All you have to do is swap these around a bit and the machine will no longer understand how to Save or List. However, before you change any value you should Peek its normal value and keep a note of it in case you wish to undo your change.

The List Vector is the pair of bytes 774 and 775. If this Vector is changed to the error message Vector, a strange error message will occur should anyone attempt to List your code. This is achieved with:

Poke 774,139: Poke 775,227

Alternatively, you may prefer to merely ignore the command by substituting the Warm Start Vector:

Poke 774,131: Poke 775,164

In the same way, you can lock out the Save command with:

Poke 818,139: Poke 819,227

or

Poke 818,131: Poke 819,164

The unbreakable program

This time we need to be slightly more

cunning. First, Poke in a tiny machine code routine to simply do nothing at all whenever Basic checks to see if the Run/Stop key has been pressed, and then change the Vector to go to your routine. This will make it impossible to Break-in to the program until the Vector is reset:

Poke 749,169: Poke 750, 1: Rem LDA#1

Poke 751,96: Rem RTS

Poke 809,2: Rem Change Stop Vector

To reset the Vector to its normal value:

Poke 809,246

A rather sneaky variant of this idea is to check the F7 function key instead of the Run/Stop key. This way, only you will know to use the F7 key to Break-in to the program:

Poke 749,169: Poke 750,3: Rem LDA #3

Poke 751,197: Poke 752,197: Rem CMP 197

Poke 753,96: Rem RTS

Poke 809,2: Rem Change Stop Vector

A few significant lines of program can be hidden to confuse anyone smart enough to survive the minefield of Pokes you have just put in. At the end of a line add the following —Rem"—then sufficient Delete symbols to erase the preceding characters. To get the Delete characters, put in end quote marks then backspace. Insert spaces with the Insert Key, then use the Delete key (which should look like reversed T's on the screen). Finally, overwrite the end quote marks with a space.

If you wish to prevent any further use of the 64 until it is powered on again, simply Poke 1,52. Alternatively, delete the Basic program from store with:

Poke 2049,0: Poke 2050,0: Poke 45,3: Poke 46,8

Bootstrap

A "Bootstrap" is jargon for a small program which has the sole purpose of loading in the main program required. Basic will do this for you of course, but the program does not start to Run immediately, unless Shift & Run/Stop are used to Load the program.

The accompanying program will write a Bootstrap program to: a) change the warm start Vector to ensure that the bootstrap is run, b) put instructions to Load and Run into

the keyboard buffer so that Basic thinks you have typed "Run", and c) pass control back to Basic.

Record the Bootstrap routine first on the cassette tape, then Save your main program immediately after (if you are a machine code programmer, you could also put Saved machine code routines before the main Basic program). Your main program must start with line 0 as follows:

0 Poke 45,xxx: Poke 46,yyy: Clr

where xxx and yyy are the values of bytes 45 and 46 in the program immediately prior to Saving (nb these values will change when you have typed in line 0 for the first time, so check them again and change the line accordingly).

A really smart thief will realise that your first program is only a Bootstrap, so you could extend its role to also set up some code or values without which the main program will fail. Add further Pokes between lines 40 and 100 of the Bootstrap printed in this article to set values in bytes 737 to 767 (nb no other locations can be used in this Bootstrap).

Many people have now obtained Load-Save tape copiers which can copy most code routines a piece at a time. These are often defeated by making part of the program depend on reading a data file to be found after the program. It is worth doing this even if it serves no other purpose than to protect the program.

If your entire program is in machine code, Save your routines then Save a simple Basic program to branch to your code:

0 SYS xxxxx

The Bootstrap will load as many machine code modules as you wish, until a Basic program is loaded, which will overwrite the Bootstrap's Load command.

All these tricks are designed to protect your code from unauthorised copying or meddling. No buyer will be over-enthusiastic about your attempts to thwart his curiosity, but consider the effect that these techniques will have on the presentation of your program. The user will see the 64 load and run without a sign of Basic. The screen will burst into life with your opening message, and (providing your code is error free) the system will run to its conclusion without interruption. The user will then be left with your "goodbye" screen as the computer neatly turns itself off.

```
0 REM BOOTSTRAP WRITER
1 REM THIS PROGRAM WHEN RUN WILL
2 REM SAVE A BOOTSTRAP ON CASSETTE
3 INPUT "PROGRAM NAME = " : F$
4 L=LEN(F$) : POKE 49300,L
5 FOR K=1 TO L
6 A=ASC(MID$(F$,K,1)) :
  POKE 49300+K,A
```

```
7 NEXT
9 J=679
10 READ I : IF I<0 THEN 25
20 POKE J,I : J=J+1 : GOTO 10
25 J=49152
30 READ I : IF I<0 THEN 40
35 POKE J,I : J=J+1 : GOTO 30
40 REM BOOTSTRAP CODE NOW IN PLACE
```



```

100 POKE 770,167 : POKE 771,2 : SYS 49152
110 PRINT "STOP CASSETTE & BREAKIN TWICE"
120 PRINT "IGNORE ANY FURTHER MESSAGES"
130 GOTO 130
140 REM ROOTSTRAP CODE AT LOCS 679-736
150 DATA 169,47,133,0
160 DATA 169,55,133,1
170 DATA 32,138,255
180 DATA 169,0,141,32,208
190 DATA 169,48,141,119,2
200 DATA 169,76,141,120,2
210 DATA 169,207,141,121,2
220 DATA 169,13,141,122,2
230 DATA 169,82,141,123,2
240 DATA 169,213,141,124,2
250 DATA 169,13,141,125,2
260 DATA 169,7,133,198
270 DATA 108,0,160
299 DATA -1
300 REM M/C CODE TO SAVE ROOTSTRAP
305 DATA 162,1,160,1,169,1
310 DATA 32,186,255
315 DATA 162,149,160,192,173,148,192
320 DATA 32,189,255
330 DATA 169,167,133,251,169,2,133,252
340 DATA 162,5,160,3,169,251
350 DATA 32,216,255
399 DATA 96,-1
    
```

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Taking Pictures

Simon Pithers concludes his two-part graphics art program for the BBC B

This is the second and final part of my Graphics Pad program. First, load the section of program which you entered and saved last week. Then enter the second half of the program, save the complete listing and Run.

The program will allow you to create

colourful pictures in mode 2 without having to type in masses of instructions. The pictures can then be saved to tape or disc, or dumped to a printer.

Notes:

PROCbox — This allow the user to draw a full or empty box in any colour.

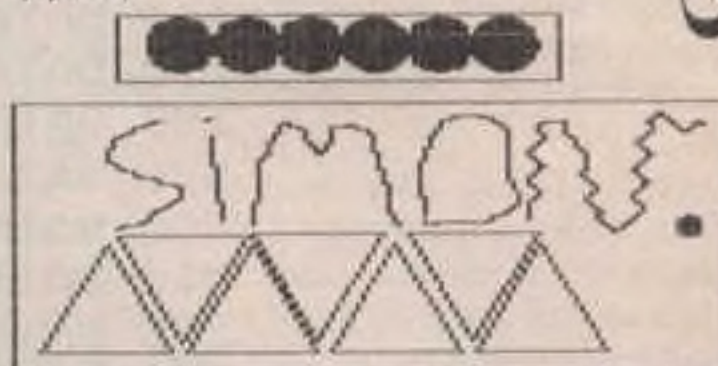
PROCTriangle — This allow the user to draw a full or empty triangle in any colour.

PROCvdu — This allow the user carry out most of the VDU command on the BBC.

PROCprogramdetails — This lists the general details on the program.

PROCend — This carries out the ending routine.

PROCprinter — This dumps your picture onto a printer (Epsom).



```

2390
2400 DEF PROCbox
2410 PROCclsinfospace
2420 CLS
2430 VDU 28,0,31,19,0
2440 COLOUR2
2450 PRINT TAB(0,26);"Enter"
2460 PRINT TAB(0,27);"the boxes"
2470 PRINT TAB(0,28);"length by"
2480 PRINT TAB(0,29);"width"
2490 VDU 28,10,31,19,26
2500 CLS
2510 PRINT"Length="
2520 INPUT L
2530 CLS
2540 PRINT"Width="
2550 INPUT W
2560 CLS
2570 PRINT"Colour="
2580 INPUT C
2590 CLS
2600 PRINT"Filled or"
2610 PRINT"not Y/N"
2620 INPUT FI#
2630 IF FI#="Y" OR FI#="y" THEN PL=81 ELSE PL=1
2640 CLS
2650 MOVE X%,Y%;MOVE X%,Y%
2660 GCOL 0,C
2670 PLOT PL,L,0
2680 PLOT PL,0,W
2690 PLOT PL,-L,0
2700 PLOT PL,0,-W
2710 PROCclsinfospace
2720 PROCkeywords
2730 ENDPROC
2740
2750
2760 DEF PROCTriangle
2770 PROCclsinfospace
2780 CLS
2790 VDU 28,0,31,19,0
2800 COLOUR2
2810 PRINT TAB(0,26);"Enter the"
2820 PRINT TAB(0,27);"triangles"
2830 PRINT TAB(0,28);"side"
2840 PRINT TAB(0,29);"length."
2850 VDU 28,10,31,19,26
2860 CLS
2870 COLOUR6
2880 PRINT"Length="
2890 INPUT L
2900 CLS
2910 PRINT"Colour="
2920 INPUT C
2930 CLS
2940 PRINT"Filled or"
2950 PRINT"not Y/N"
2960 INPUT FI#
2970 IF FI#="Y" OR FI#="y" THEN PL=81 ELSE PL=1
2980 CLS
2990 GCOL 0,C
3000 CLS
3010 MOVE X%,Y%;MOVE X%,Y%
3020 PLOT PL,L,0
3030 PLOT PL,-(L/2),L
3040 PLOT PL,-(L/2),-L
3050 CLS

```

```

3060 PROCclsinfospace
3070 PROCkeywords
3080 ENDPROC
3090
3100
3110 DEF PROCvdu
3120 PROCclsinfospace
3130 CLS
3140 VDU 28,0,31,19,0
3150 COLOUR3
3160 PRINT TAB(0,26);"Enter the"
3170 PRINT TAB(0,27);"VDU no."
3180 PRINT TAB(0,28);"and then"
3190 PRINT TAB(0,29);"following"
3200 PRINT TAB(0,30);"nums (5)"
3210 VDU 28,10,31,19,26
3220 CLS
3230 PRINT "Enter VDU"
3240 PRINT "number"
3250 INPUT VN
3260 CLS
3270 PRINT"Enter the"
3280 PRINT"Following"
3290 PRINT"5 numbers"
3300 INPUT N1,N2,N3,N4,N5
3310 CLS
3320 VDU VN,N1,N2,N3,N4,N5
3330 PROCclsinfospace
3340 PROCkeywords
3350 ENDPROC
3360
3370
3380 DEF PROCprogramdetails
3390 PRINT TAB(7);CHR#141;CHR#134;"BBC GRAPHICS PAD"
3400 PRINT TAB(7);CHR#141;CHR#134;"BBC GRAPHICS PAD"
3410 PRINT
3420 PRINT" This program is design to allow the"
3430 PRINT" user to create colourful pictures in"
3440 PRINT" Mode 2 without having to type in"
3450 PRINT" loads of instructions."
3460 PRINT
3470 PRINT" The main Keywords used in the program"
3480 PRINT" are as follows:-"
3490 PRINT
3500 PRINT" Save - This allows you to save your"
3510 PRINT" picture on tape or disc."
3520 PRINT
3530 PRINT" Load - This allows you to load your"
3540 PRINT" picture back to continue development"
3550 PRINT" or just look at."
3560 PRINT
3570 PRINT" Circle - This allows you to draw a"
3580 PRINT" circle on the screen in any colour"
3590 PRINT
3600 PRINT " Please press any key to continue."
3610 A=GET
3620 CLS
3630 PRINT TAB(7);CHR#141;CHR#134;"BBC GRAPHICS PAD"
3640 PRINT TAB(7);CHR#141;CHR#134;"BBC GRAPHICS PAD"
3650 PRINT
3660 PRINT" Box - This allows you to draw a"
3670 PRINT" box with any length and width and in"
3680 PRINT" any colour on the screen."
3690 PRINT
3700 PRINT" Triangle - This allows you to draw a"
3710 PRINT" triangle with any length sides in any"
3720 PRINT" colour on the screen."

```



```
3730 PRINT
3740 PRINT" Vdu - This allows you to do most of"
3750 PRINT" the useful Vdu's."
3760 PRINT
3770 PRINT" Move-cursor - This allows you to move"
3780 PRINT" the screen cursor around either with"
3790 PRINT" the pen on or off. The pens colour can"
3800 PRINT" be change by pressing 'C' aswell"
3810 PRINT
3820 PRINT" Please press any key to continue"
3830 A=GET
3840 CLS
3850 PRINT TAB(7);CHR#141;CHR#134;"BBC GRAPHICS PAD"
3860 PRINT TAB(7);CHR#141;CHR#134;"BBC GRAPHICS PAD"
3870 PRINT
3880 PRINT" USE THE KEYS BELOW TO MOVE CURSOR:-"
3890 PRINT
3900 PRINT" Z=Left      X=right  "
3910 PRINT" :=Up        /=Down"
3920 PRINT
3930 PRINT" S for Stop"
3940 PRINT" C to Change colour"
3950 PRINT" 1 to turn pen on"
3960 PRINT" 2 to turn pen off"
3970 PRINT
3980 PRINT" All shapes eg. box,triangles etc may"
3990 PRINT" be filled in with any colour."
4000 PRINT
4010 PRINT" Also at the end of saving a screen"
4020 PRINT" or when you end the program, you"
4030 PRINT" will be given a chance to do a screen"
4040 PRINT" dump to a printer. (Works with most)"
4050 PRINT
4060 PRINT" Please press any key to start"
4070 A=GET
4080 CLS
4090 ENDPROC
4100
4110
4120 DEF PROCend
4130 PROCclsinfospace
4140 CLS
4150 PRINT"Do You"
4160 PRINT"want"
4170 PRINT"a Printed"
4180 PRINT"dump to a"
4190 PRINT"printer"
4200 A#=GET#
4210 IF A#="Y" OR A#="y" THEN PROCprinter
4220 VDU 22,2
4230 COL=1
4240 COL1=130
4250 FORX=1TO25
4260 COLOURCOL
4270 COLOURCOL1
4280 PRINT"GOOD BYE....."
4290 COL1=COL1+1
4300 IF COL1=136 COL1=128
4310 COL=COL+1
4320 IF COL=8 COL=1
4330 NEXT
4340 END
4350 ENDPROC
4360
4370
4380 DEF PROCprinter
4390 CLS
4400 PRINT"Please turn"
4410 PRINT"on your"
4420 PRINT"printer"
4430 PRINT"and press"
4440 PRINT"return"
4450 INPUT RE
4460 CLS
4470 VDU29,0;0;
4480 VDU2,1,10,1,10,1,10
4490 VDU1,27,1,65,1,8
4500 FORYZ=1023TO150STEP-32:VDU1,27,1,75,1,64,1,1:FORXX=0TO1279STEP4:AX=0
4510 FORBZ=0TO31STEP4:AZ=AZ*2:IFPOINT(XZ,YZ-BZ)>0 THEN AZ=AZ+1
4520 NEXT:VDU1,AZ:NEXT:VDU1,10:NEXT
4530 VDU1,27,1,50
4540 VDU1,27,1,70
4550 VDU1,12,1,7,3
4560 PROCend
4570 ENDPROC
```


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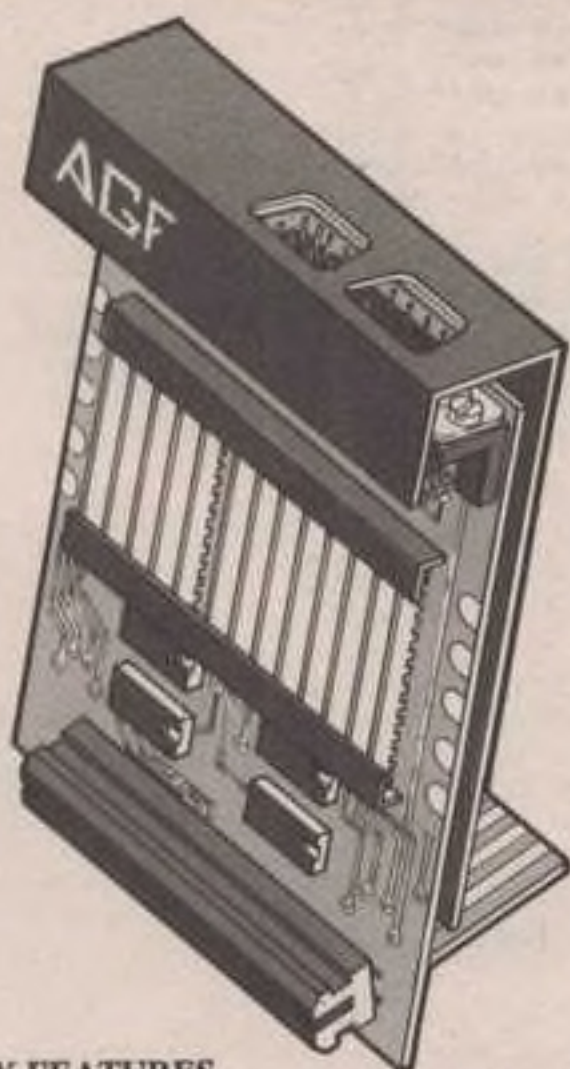
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Jump to it...

Boris Allan looks at instructions and addresses on the Motorola MC68000 microprocessors in the final part of his series.

The Zilog Z80 microprocessor (used on the Spectrum) has about 156 different machine code instructions, whereas the MOS Technology MCS6502 has only 52 different instructions. One reason for this disparity is that the Z80 has a much 'messier' instruction set.

The greater the number of the instructions does not necessarily mean the greater the power of the processor. For example, the most powerful of 8-bit chips (the Motorola MC6809) has 71 basic machine code instructions. The MC6809 also has many different addressing modes giving well over 1000 variations.

The Motorola MC68000/68008 (used on the QL and Apple Lisa) has only 56 basic instructions, which is only slightly more than the number for the MCS6502, and about a third as many as the Z80. The MC68000 instruction set is very powerful, and the power comes from simplicity

has nine, the MC6809 has 11, the MCS6502 has eight, and the Z80 has almost six(?). Note that each of the MC68000 instruction types may have up to 14 manifestations.

An MC68000 instruction occupies from one to five words in memory (a word is two 8-bit bytes), and despite the QL's MC68008 processor only having an 8-bit data bus, the instructions are still measured in words.

The first word is the operation-code word (usually termed the 'op-word'), and this contains the binary bit pattern used by the MC68000 to decode the instruction type, operand addressing mode(s), and the length of the instruction (the 'operand' is the item upon which the instruction operates).

The additional words (not always necessary) are 'extension words' which can be used for operand addressing modes that use constants (ie 'immediate' values), or absolute addresses, or displacement

words, or long words, can be copied from any memory location to any other location without affecting any of the registers. Two of the most powerful instructions are *Link* and *Unlink*, which enable the programmer to allocate and deallocate data on the system stack for nested subroutines, linked lists, and similar items. *Link* sets the stack pointer to just past the data area, with an address pointer to the data area: on *Unlink* the sequence is reversed.

Group two are the integer arithmetic instructions. Included in this group are single and multiple precision arithmetical operations on signed and unsigned numbers. Apart from standard 8-bit operations such as add, subtract, negate, and compare, there are the signed and unsigned divide and multiply operations previously noted.

Group three are the standard logical operations *And*, *Or*, and *Eor* (ie, Exclusive *Or*), all of which can operate on bytes, words, or long words (except for two immediate instructions).

Group four contains the shift and rotate instructions, most of which (apart from instructions whose destination are 'memory alterable') can be either byte, word, or

← continued from page 29

CMP	Compare	NOT	One's complement
DBCC	Test condition, decrement, branch	OR	Logical Or
DIVS	Signed divide	PEA	Push effective address
DIVU	Unsigned divide	RESET	Reset external devices
EOR	Exclusive Or	ROL	Rotate left without extend
EXG	Exchange registers	ROR	Rotate right without extend
EXT	Sign extend	ROXL	Rotate left with extend
JMP	Jump	ROXR	Rotate right with extend
JSR	Jump to subroutine	RTE	Return from exception
LEA	Load effective address	RTR	Return from restore
LINK	Link stack	RTS	Return from subroutine
LSL	Logical shift left	SBCD	Subtract decimal with extend
LSR	Logical shift right	SCC	Set conditiona;
MOVE	Move	STOP	Stop
MOVEM	Move multiple registers	SUB	Subtract
MOVEP	Move peripheral data	SWAP	Swap data register halves
MULS	Signed multiply	TAS	Test and set operand
MULU	Unsigned multiply	TRAP	Trap
NBCD	Negate decimal with extend	TRAPV	Trap on overflow
NEG	Negate	TST	Test
NOP	No operation	UNLK	Unlink



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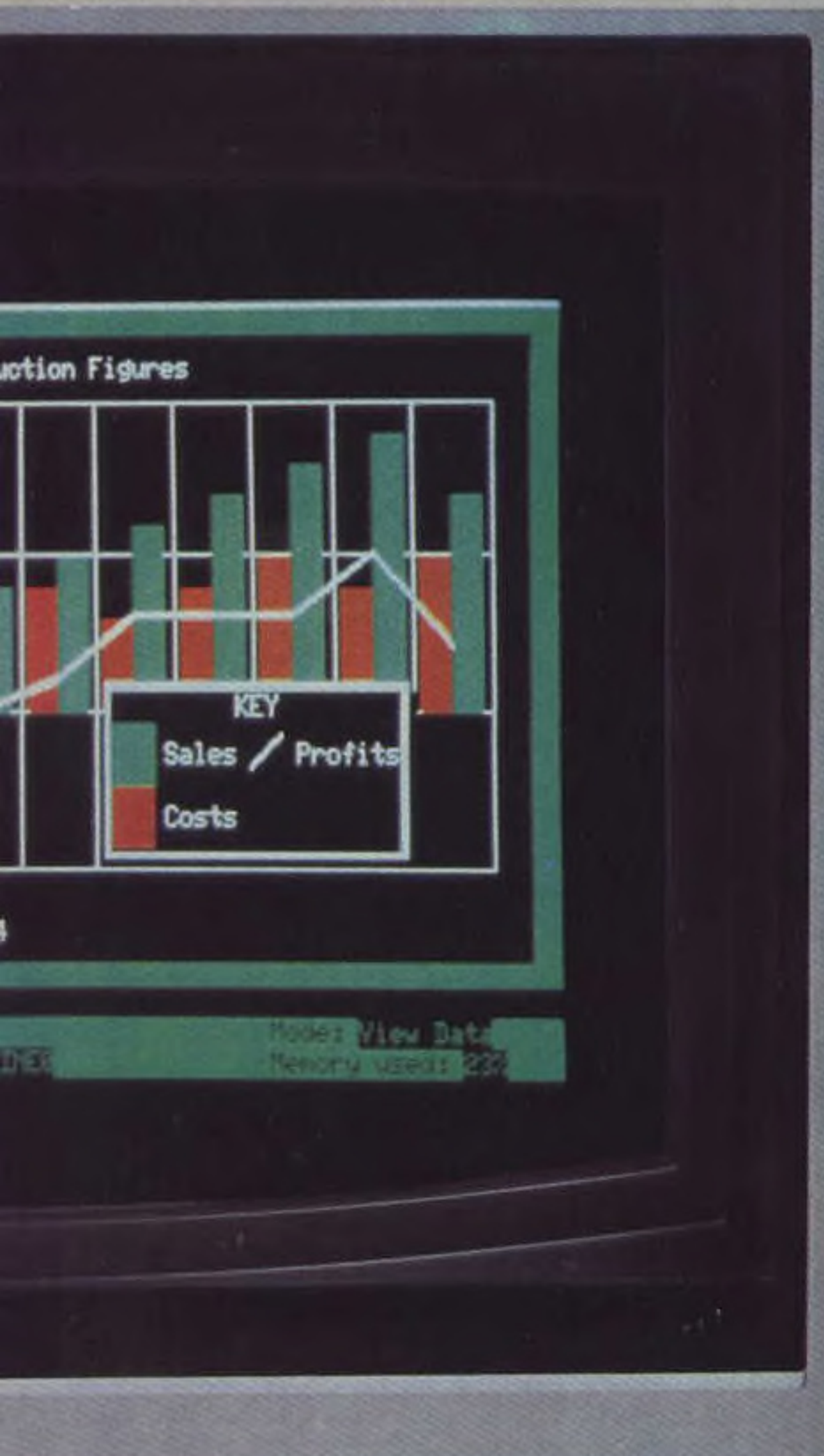
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It's not just a bit better than this, or a bit cheaper than that – it's a computer that's very hard to compare with anything. Just check the features below – and if you don't agree, take up the challenge at the end of the advertisement.

If you do agree, there's only one course of action you can take... get yourself a Sinclair QL at the earliest possible moment.

The Sinclair QL has 128K RAM. Big deal?

Several micros offer 128K RAM, or more, as standard. The 'What Micro?' table for December 1983 lists over 50 of them – but 40 of the 50 micros listed cost over £2,500!

The Sinclair QL offers you 128K RAM for under £400, and an option to expand to 640K. That's a lot of bytes to the pound!

The Sinclair QL has a 32-bit processor. Who else?

Under £2,700, nobody. Even the new generation of business computers, such as the IBM PC, are only now beginning to use 16-bit processors.

At prices like this, the Motorola 68000 family – widely regarded as the most powerful microprocessors available – will remain a luxury.

Yet with the Sinclair QL, the 32-bit Motorola 68008 is available for less than £400.

You can also be sure that the QL will not become outdated. 32-bit architecture is future-proof.

32-bit processor architecture, 128K RAM, and QDOS combine to give the QL the performance of a mini-computer for the price of a micro.

Exclusive: new QDOS operating system

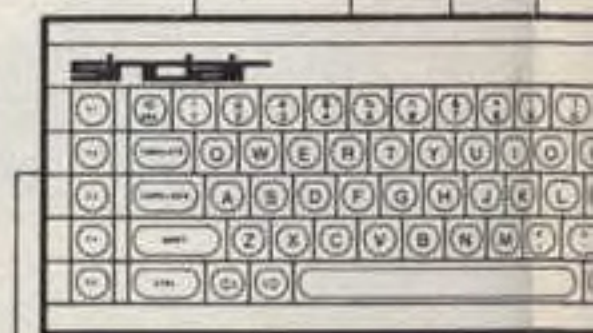
No competition! QDOS sets a new standard in operating systems for the 68000 family of processors, and may well become the industry standard.

QDOS is a single-user, multi-tasking, time-sliced system using Sinclair's new SuperBASIC as a command language.

One of its most significant features is its very powerful multi-tasking capability – the ability to run several programs individually and simultaneously. It can also display the results simultaneously in different portions of the screen. These are features not normally available on computers costing less than £7,000.

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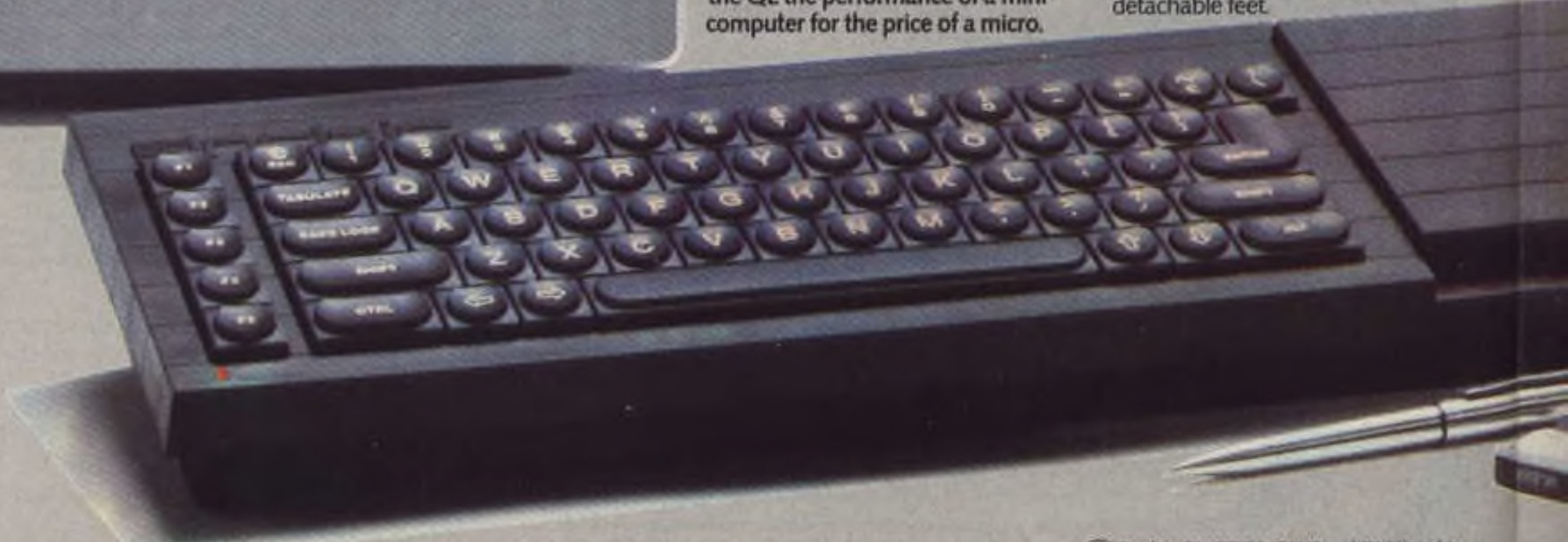
Expansion slot

New professional keyboard

The QL keyboard is designed for fast input of data and programs.

It is a full-size QWERTY keyboard, with 65 keys, including a space bar; left and right-hand shift keys; five function keys; and four separate cursor-control keys – key action is positive and precise.

A membrane beneath the keyboard protects the machine from dust (and coffee!), and for users who find an angled keyboard more comfortable, the computer can be raised slightly at the back by small detachable feet.



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Advanced new friendly language – Sinclair SuperBASIC

The new Sinclair SuperBASIC combines the familiarity of BASIC with a number of major developments which allow the QL's full power to be exploited.

Unlike conventional BASIC, its procedure facility allows code to be written in clearly-defined blocks; extendability allows new procedures to be added which will work in exactly the same way as the command procedures built into the ROM; and its constant execution speed means that SuperBASIC does not get slower as programs get larger.

Included – superb professional software

The suite of four programs is written by Psion specially for the QL and incorporates many major developments. All programs use full colour, and data is transportable from one to another. (For example, figures can be transferred from spreadsheet to graphics for an instant visual presentation.)

Word-processing

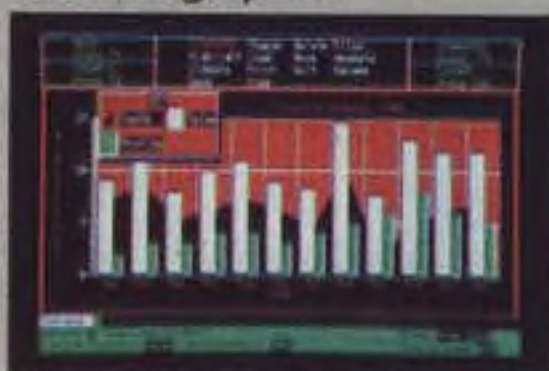


Certain to set a new standard of excellence, QL Quill uses the power of the QL to show on the screen exactly what you key in, and to print out exactly what you see on the screen.

A beginner can be using QL Quill for word-processing within minutes.

QL Quill brings you all the facilities of a very advanced word-processing package.

Business graphics



QL Easel is a high-resolution colour program so easy to use you probably won't refer to the manual! It handles anything from lines, shaded curves or histograms to overlapping or stacked bars or pie charts. QL Easel does not require you to format your display before entering data; it handles design and scaling automatically or under your control. Text can be added and altered as simply as data.

Spreadsheet



QL Abacus makes simultaneous calculations and 'what if' model-construction easier than they've ever been. Sample applications are provided, including budget-planning and cash-flow analysis. QL Abacus allows you to refer to rows, columns and cells by names, not just letters and numbers. Function keys can be assigned to change a variable and carry out a complete 'what if' calculation with a single key-stroke.

Database management



QL Archive is a very powerful filing system which sets new standards, using a language even simpler than BASIC. It combines ease of use for simple applications – such as card indices – with huge power as a multi-file data processor.

An easy-to-use labelling facility means that you don't have to ask for your file by its full name – a few letters are enough.

New – the Sinclair QLUB

The QLUB is the QL Users Bureau. Membership is open to all QL owners. For an annual subscription of £35, QLUB members receive one free update to each of the four programs supplied with the QL, and six bi-monthly newsletters. Sinclair has also made exclusive arrangements for QLUB members to obtain software assistance on QL Quill, Abacus, Archive or Easel by writing to Psion.

The Sinclair QL challenge

If you're seriously considering any other computer, post the coupon for a blow-by-blow comparison. We'll take a published comparison chart for the machine you're considering (not one we've created ourselves) and give you the Sinclair QL figures, detail by detail.

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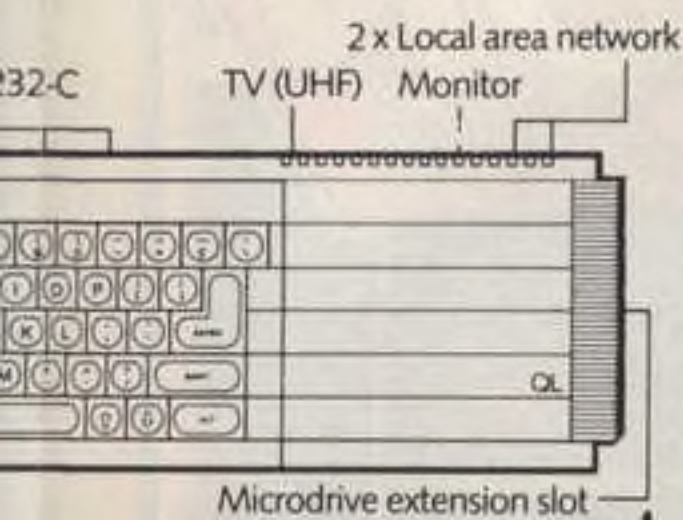
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For more information

Phone Camberley (0276) 686100, or use the coupon to get a QL brochure. Due to demand, delivery may take more than 28 days. Your order will be acknowledged immediately with an expected shipment date. Remember that Sinclair offers a 14-day money-back undertaking.



Two 100K microdrives built in

The Microdrives for the Sinclair QL are identical in principle to the popular and proven ZX Microdrives, but give increased capacity (at least 100K bytes each) and a faster data-transfer rate. Typical access speed is 3.5 seconds, and loading is at up to 15K bytes per second. The Sinclair QL has two built-in Microdrives. If required, a further six units can be connected.

Four blank cartridges are supplied with the machine.



Send to: Sinclair Research Ltd, Computer Division, FREEPOST, Camberley, Surrey, GU15 3BR.

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The *Psytron* controls the massive Betula 5 Installation. When the attack comes, it will cope with defensive demands which would leave a human brain unhinged, computer circuits scrambled. Damage in any sector of the base must be assessed and its effect on the fabric of the installation calculated immediately. Human lives will be expended as necessary but if the *Psytron* ever goes down.

The Sinclair Spectrum has always attracted the best programmers. It's always had the most innovative software: Psion Scrabble, The Hobbit, Jet Pac and now...

PSYTRON

Ten screens of stunning graphics, animation which makes other programmers gasp, a 20 page booklet of hints, tips and help with the discovery of each of six levels of play.

"How long can you survive the Final Conflict? A true *Psytron* would last an hour and a Sinclair Q.L. goes to the first person to match that feat."



Open Forum

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Rates

on Spectrum

It is interesting to wonder what would be needed to invest as a lump sum in order to pay rates for a set period. This gives some idea of the wealth actually lost by such means. Apart from the Rems, the program given is a bare bones type of program to discover this needing the shortest possible time to type in. (Don't, of course, type in the Rems!)

You will need to decide your own figure

for the average increase in rates. The interest rate chosen for the investment of the lump sum was 8%, which is roughly what one gets after basic rate tax from a building society. (Building societies do pay tax — it is just that interest rates are always quoted after tax, which is not reclaimable by individuals who don't otherwise pay it.) If using an investment where interest is paid without deduction of tax, then don't forget to deduct tax before applying the rate of interest to this program.

Of course, the program can be used for other expenses, such as electricity or

telephone bills. This would be useful when considering whether to buy equipment designed to reduce these bills. The analysis of rates in this way is useful when one may be considering moving to a smaller house in order to pay less rates. The costs of moving (£5,000 including VAT for the average move) can then be compared against the saving in rates.

Program notes:

Line 80 Defines the first guess at the capital
Line 90 Defines the other parameters
Line 95 Converts percentages to decimals
Line 96 Stores the capital at start of cycle
Line 100 to 105 Sets up further parameters and header
Line 110 to 150 Works out interest and bills for period
Line 155 to 157 Prints result and decides whether finished
Line 160 Works out new capital to try

Rates 2

(c) John de Rivaz 1983

```
80 LET ca=10000: REM      First
guess at capital to be invested
to pay ny years of rates.
90 LET inp=8: LET ra=280: LET
rip=17: REM interest per cent,
rates (current year), rates incr-
ease per cent, obtained from
RATES program PCW Vol2 no13.
95 LET in=inp/100: LET ri=rip/
100
96 LET cs=ca
100 LET ny=30: LET y=1983
105 PRINT "Year";TAB 5;"Capital
";TAB 15;"Interest";TAB 25;"Rate
s"
110 FOR f=0 TO ny
120 PRINT y+f;TAB 5;INT ca;TAB
15;INT (ca*in);TAB 25;INT ra
130 LET ca=ca+ca*in-ra
140 LET ra=ra*(1+ri)
150 NEXT f
155 PRINT "remaining capital ";
ca
157 IF INT ABS ca=0 THEN PRINT
"Starting capital ";INT cs: STO
P
160 LET ca=cs-ca/11
970 GO TO 90
```

Rates

by John de Rivaz

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Open Forum

Bitmap

on Commodore 64

This Program is a tool for the Commodore

64. The Program clears the area of memory from 8192 to 16191. This area of memory is used by *Bitmap* mode. I first wrote the Program in basic and found it too slow so I rewrote it in machine code. When you write

a Program in bitmap mode, type my Program at the start and when you want to clear bitmap mode type SYS49152. There are two listings for this Program; the second one shows the Program in machine code.

```
PROGRAM TO CLEAR BITMAP MODE COMMODORE 64
5 PRINT"MY DAVID SELWOOD"
10 FORA=49152TO49184:READB:POKEA,B:NEXT
100 DATA160,0,169,32,132,251,133,252,169,0,160,0,145,251,
    192,63,208,6,166
110 DATA252,224,63,240,8,200,208,241,230,252,76,12,192,96

ASSEMBLER LIST
1000 *=$C000 ! 49152
1100 LDY # $00 ! LOW CLEAR MAP
1110 LDA # $20 ! HIGH
1120 STY $FB
1130 STA $FC
1140 LDA # $00 ! BYTE IN MODE
1150 LDY # $00
1160 LOOPQ3 STA ($FB),Y
1170 CPY # $3F
1180 BNE LOOPQ1
1190 LDX $FC
1200 CPX # $3F
1210 BEQ LOOPQ2
1220 LOOPQ1 INY
1230 BNE LOOPQ3
1240 INC $FC
1250 JMP LOOPQ3
1260 LOOPQ2 RTS
READY.
```

Bitmap
by David Selwood

Robot

on Spectrum

This is a game for one player, in which the player's 'man' is pursued by evil robots. These metallic men will stop at nothing—short of your death. Fortunately you can defeat them by luring them onto the deadly

anti-matter mines. This task is not as easy as it sounds because the mines are also lethal to your touch.

Dangerous yellow mines also appear on the screen, which do not affect the alien hordes, but will destroy you if stepped on. Your score, number of men remaining and number of robots still alive this sheet, are all displayed on the screen. There can be up to 100 robots on the planet at one time, all of

which are deadly to the touch (of course).

If you move into these things you lose a life:—

- 1 A robot
- 2 Any mine
- 3 The fence around the perimeter
- 4 The score
- 5 The number of robots remaining
- 6 The number of men

My high score is about 41,000 but this could be beaten with a bit of practice.

```
LS 0>BORDER 0: PAPER 0: INK 7: C
1 REM R.Holmes 1982 Leeds.
2 FOR j=144 TO 147
3 FOR k=0 TO 7
4 READ z: POKEUSR (CHR$ j) +k
5 NEXT k: NEXT j
6 LET hs=0
7 DATA 16,56,16,56,84,16,40,4
0,0,36,24,24,36,0,0
8 DATA 42,65,127,73,28,34,34,
99,161,16,64,156,5,60,72,221
9 CLS
10 GO SUB 20
11 GO SUB 3000
12 GO TO 40
20 RESTORE 30
21 FOR i=1 TO 8: READ h,j: BEE
P h,j
22 NEXT i
23 FOR k=.1 TO 0 STEP -.01: BE
EP k,20: NEXT k
24 RETURN
30 DATA .1,11,.1,11,.6,16,.05,
11,.05,16,.05,11,.05,16,1,20
31 REM Moon Cresta Music Subro
utine © Ron Smith (PCW) 9/9/82
100 LET n=2
110 LET s=0: LET ms=3
120 GO SUB 500
130 IF n<100 THEN LET n=n+(11-q
)
140 DIM a(n)
150 DIM b(n)
160 FOR f=1 TO n
170 LET a(f)=INT (RND*20)+1
180 LET b(f)=INT (RND*30)+1
185 BEEP .005,a(f)
190 IF (a(f)=10 OR a(f)=11 OR a
(f)=12) AND (b(f)=14 OR b(f)=15
```

```
OR b(f)=16) THEN GO TO 170
200 NEXT f
210 LET x=10: LET y=15
220 LET d=0
230 PRINT AT 0,3: INK 6;"Score:
"
231 PRINT AT 21,13: INK 4;"Men:
": INK 6;ms
235 PRINT AT 0,20: INK 6;"Robot
s:"
240 FOR f=1 TO n
241 IF d=n THEN GO TO 1000
245 IF a(f)=0 AND b(f)=0 THEN G
O TO 360
250 PRINT AT a(f),b(f);" "
260 PRINT AT x,y;" "
265 PRINT AT 0,9: INK 6;s
266 PRINT AT 0,27: INK 6;n-d;"
"
270 LET x=x+(INKEY$="v")-(INKEY
$="t")
280 LET y=y+(INKEY$="g")-(INKEY
$="f")
290 LET a(f)=a(f)+(a(f)<x)-(a(f
)>x)
300 LET b(f)=b(f)+(b(f)<y)-(b(f
)>y)
310 IF ATTR (x,y)=4 THEN GO TO
2000
311 IF ATTR (x,y)=6 THEN GO TO
2000
312 IF ATTR (x,y)=2 THEN GO TO
2000
320 IF ATTR (a(f),b(f))=4 THEN
LET s=s+(10*n): PRINT AT a(f),b(
f); INK 2;"X": LET d=d+1: BEEP
,
5,-7: BEEP .2,28: PRINT AT a(f),
b(f); INK 4;"X": BEEP .2,-29: LE
T a(f)=0: LET b(f)=0: GO TO 360
330 BEEP .01,-15: BEEP .005,-17
340 FOR u=1 TO 5: PRINT AT x,y;
INK 5;"$": PRINT AT a(f),b(f);
continued on page 39
```


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Open Forum

← continued from page 37

```

INK 2;"X": NEXT U
350 IF ATTR (X,Y)=2 THEN GO TO
2000
360 NEXT f
370 GO TO 240
499 STOP
500 CLS : INK 4
510 FOR f=0 TO 31: PRINT AT 0,f
;" / "; AT 21,f;" / ": NEXT f
520 FOR f=0 TO 21: PRINT AT f,0
;" / "; AT f,31;" / ": NEXT f
530 FOR f=1 TO (q#5): LET f1=INT
(RND#20)+1: LET f2=INT (RND#30
)+1: PRINT AT f1,f2;"x": NEXT f
535 FOR f=1 TO (11-q)#2: LET f1
=INT (RND#20)+1: LET f2=INT (RND
#30)+1: PRINT AT f1,f2: INK 6;"+"
: NEXT f
540 INK 7: RETURN
1000 CLS : FOR U=7 TO 0 STEP -1:
BEEP .01,(U#7): BORDER U: NEXT
U: PRINT AT 0,10;"YOU WIN": PRIN
T AT 10,10;"Score:";s: GO SUB 20
: CLS : GO TO 120
1008 LET n=q
2000>PRINT AT X,Y: INK 2;"X": PA
USE 200: CLS : PRINT AT 10,5;"Yo
u Are Dead!!"
2001 FOR v=10 TO -10 STEP -1: BE
EP .05,v: BEEP .05,v#2: NEXT v
2002 LET ms=ms-1: IF ms=0 THEN G
O TO 2010
2003 INPUT ..... "Sta
rt ?" ;k$
2004 GO TO 120
2010 CLS : PRINT "All your men a
re now DEAD!!": PRINT "You score
d ";s;" points"
2011 IF s>hs THEN PRINT "You got
the highscore": LET hs=s

```

```

2012 IF hs<>s THEN PRINT "You we
re not good enough to get the hi
ghscore"
2013 PRINT : PRINT INK 5; FLASH
1; AT 6,5;"High"; FLASH 0;" "; FL
ASH 1;hs
2020 INPUT "AGAIN";a$
2030 IF a$="n" THEN STOP
2040 GO TO 9
3000 PRINT " Robot Chase"
3010 PRINT : PRINT " Oh no not a
nother robot ruled game? Well ye
s it is. You are the unfortunate
being who is pursued by the kille
r robots on an alien planet. Your
only means of escape is to lure t
he robot hordes into the lethal a
nti-mat mines."
3020 PRINT : PRINT " But you mus
t not step on these mines yourse
lf or you will die."
3030 PRINT : PRINT "GOOD LUCK BR
AVE HUMAN"
3040 PRINT : PRINT " # - You"
3050 PRINT " x - Mine"
3060 PRINT " # - Robot"
3070 PRINT : PRINT "Guiding Robo
ts into mines also scores points"
3071 PRINT "Use the 'T,F,G,U' ke
ys to move"
3072 PRINT : PRINT "Watch out fo
r dangerous yellow mines '+', wh
ich don't effect robots."
3080 INPUT "Level 1(hard)-10(eas
y)";q
3090 IF q>10 OR q<1 THEN PRINT :
PRINT "Are you a dopper or do y
ou just train to be one?": GO T
O 3080
3100 CLS : RETURN

```

Robot
by Russell Holmes

Lunar Man

on BBC

You control a Lunar Man who must fly

around space collecting satellites but avoiding the space mines. If you take too long to collect a satellite it will move.

Program notes

10 - 230 Sets up the screen display.

240 - 3360 Main game loop.
370 - 410 User defined graphics.
470 - 580 Mines.
590 - 600 Satellite.
610 - 770 Have you hit a satellite?
780 - 810 Prints score at end.
860 - 900 Instructions.

```

10 *KEY 10"OLD!MRUN!M"
20 ON ERROR RUN
30 REM BY PHILIP WOODLEY FEB/84
40 MODE7
50 PROCINSTRUCTIONS
60 IF ADVAL(0) THEN 70 ELSE 60
70 SC=0
80 MODE 2:VDU5:LIVES=3:SATELITE=0:PROCVAR:PROCSATELITE:GCOL 0,7:SAT=0
90 GCOL 0,3:PROCMINES:GCOL 0,7
100 FOR STARS=1 TO 100:Y=RND(1024):X=RND(1280):MOVE X,Y:PLOT 69,X,Y:NEXT
110 MOVE 0,0:DRAW 300,200:PLOT 85,1200,0
120 DRAW 900,200
130 DRAW 1200,0:PLOT 85,300,200
140 GCOL 0,0:PRINTTAB(7,30)"NASA":GCOL 0,1
150 IF ADVAL(0) THEN 160 ELSE 150
160 MOVE 450,200:GCOL 0,0:DRAW 750,200
170 SOUND 1,-10,40,1
180 GCOL 0,7:DRAW 750,300:MOVE 450,200:DRAW 450,300
190 FOR T=1 TO 2000:NEXT T:GCOL 0,0
200 DRAW 450,200:MOVE 750,300:DRAW 750,200
210 GCOL 0,7:DRAW 850,300:MOVE 450,200:DRAW 350,300:SOUND 1,-10,40,1
220 TIME=0
230 X=10:Y=20
240 REPEAT
250 GCOL 0,7:PRINTTAB(X,Y)CHR#226:PRINTTAB(X,Y-1)CHR#225:GCOL 0,0:PRINTTAB(X,Y
)CHR#226:PRINTTAB(X,Y-1)CHR#225
260 A=ADVAL(1) DIV 64
270 B=ADVAL(2) DIV 64
280 IF A<300 X=X+1:IF X>30:X=30
290 IF A>800 X=X-1:IF X<1:X=1

```

continued on page 41 ▶



POOLSWINNER

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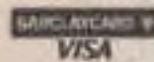
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Open Forum

← continued from page 39

```
300 IF B>800 Y=Y-1:IF Y<1:Y=1
310 IF B<300 Y=Y+1:IF Y>25:Y=25
320 IF X=SX AND Y=SY OR X=SX AND Y-1=SY THEN SATELITE=1:SOUND 1,-15,100,1:SOUND
D 1,-15,120,2
330 PROCHECK
340 IF TIME>600 THEN SOUND 1,-15,10,1:GCOL 0,0:PRINTTAB(SX,SY)CHR#230:GCOL 0,6
:PROCSATELITE:TIME=0
350 IF LIVES=0 THEN PROCEND
360 UNTIL SATELITE=1 AND X>5 AND X<15 AND Y>24:SATELITE=0:FOR Q=1 TO 150 STEP
4:SOUND 1,-15,Q,.5:NEXT:GCOL 0,0:PRINTTAB(SX,SY)CHR#230:GCOL 0,6:PROCSATELITE:SC
=SC+10:GOTO 230
370 DEFPROCVAR
380 VDU 23,225,28,62,62,28,12,15,255,255
390 VDU 23,226,15,15,15,28,28,56,56,96
400 VDU 23,230,0,73,42,28,28,28,42,73
410 ENDPROC
420 DEFPROCMINES
430 PRINTTAB(10,10)"X"
440PRINTTAB(3,5)"X"
450PRINTTAB(8,2)"X"
460PRINTTAB(9,7)"X"
470PRINTTAB(3,15)"X"
480PRINTTAB(5,18)"X"
490PRINTTAB(2,10)"X"
500PRINTTAB(7,11)"X"
510PRINTTAB(18,3)"X"
520PRINTTAB(15,15)"X"
530PRINTTAB(19,12)"X"
540PRINTTAB(4,14)"X"
550PRINTTAB(18,18)"X"
560PRINTTAB(7,17)"X"
570PRINTTAB(9,9)"X"
580 ENDPROC
590 DEFPROCSATELITE SX=RND(18):SY=RND(15):GCOL 0,6:PRINTTAB(SX,SY)CHR#230
600 ENDPROC
610 DEFPROCHECK
620 IF X=3 AND Y=5 OR X=3 AND Y-1=5 PROCEXPL
630IF X=8 AND Y=2 OR X=8 AND Y-1=2 PROCEXPL
640IF X=9 AND Y=7 OR X=9 AND Y-1=7 PROCEXPL
650IF X=3 AND Y=15 OR X=3 AND Y-1=15 PROCEXPL
660IF X=5 AND Y=18 OR X=5 AND Y-1=18 PROCEXPL
670IF X=2 AND Y=10 OR X=2 AND Y-1=10 PROCEXPL
680IF X=7 AND Y=11 OR X=7 AND Y-1=11 PROCEXPL
690IF X=18 AND Y=3 OR X=18 AND Y-1=3 PROCEXPL
700IF X=15 AND Y=15 OR X=15 AND Y-1=15 PROCEXPL
710IF X=4 AND Y=14 OR X=4 AND Y-1=14 PROCEXPL
720IF X=19 AND Y=12 OR X=19 AND Y-1=12 PROCEXPL
730 IF X=9 AND Y=9 OR X=9 AND Y-1=9 PROCEXPL
740IF X=7 AND Y=17 OR X=7 AND Y-1=17 PROCEXPL
750IF X=10 AND Y=10 OR X=10 AND Y-1=10 PROCEXPL
760IF X=18 AND Y=18 OR X=18 AND Y-1=18 PROCEXPL
770ENDPROC
780 DEFPROCEXPL
790 LIVES=LIVES-1
800 GCOL 0,1:FOR V=15 TO 1 STEP-1:SOUND0,-V,6,3:NEXT V
810 FOR T=1 TO 2000:NEXT:GOTO 230
820 DEFPROCEND:CLS
830 GCOL 0,2:PRINTTAB(3,10)"YOU SCORED ";SC
840 IF ADVAL(0) RUN ELSE 840
850 ENDPROC
860 DEFPROCINSTRUCTIONS
870 PRINTTAB(10,2)CHR#141CHR#131"LUNAR MAN":PRINTTAB(10,3)CHR#141CHR#131"LUNAR
MAN"
880 PRINT"" You must control LUNAR MAN using a joystick and fetch the
blue satalite back to your shuttle while avoiding the yellow mines.Press the fi
re button to open the shuttle bay doors."
900 ENDPROC
```

Lunar Man
by Philip Woodley

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Open Forum

Standard Deviation

on Commodore 64

Quite simply, this program works out standard deviation.

Program notes
1-2 Clear screen, turn on sound and

3-46 Input numbers.
50 Work out mean.
60-90 Calculate
100-140 Calculate standard deviation and display the answer.
150-160 Return to beginning when a key is depressed.
200-270 Programming instructions. The program is listed on the 1520

printer/plotter which cannot handle the usual control characters.

Variables

NO Total number of numbers.
S(I) Array to hold numbers.
T The total of all the numbers added together.
M The mean of the numbers.
ED Holds the value for the top half of the standard deviation equation.
D(I) Is the mean minus a number.
SD Is the standard deviation — i.e. the answer.

```

0 REM STANDARD DEVIATION BY SARAH COTTON
1 DIMS(50):DIMD(50):POKE36878,15
2 PRINT"s":POKE36879,27
3 PRINT"SDXXXXXXXXXXSTANDARD DEVIATION
"
4 FORTT=1TO1500:NEXTTT
10 PRINT"XXXXXXXXXXTOTAL NUMBER OF NO'S"
11 PRINT"XTO BE ANALYSED."
12 INPUT"Xp":NO:IFNO>50 THEN10
13 PRINT"s"
14 PRINT"XXXXXXXXXX PLEASE INPUT NO'S"
15 FORTT=1TO1500:NEXT
20 FORI=1TONO
30 INPUT"XXXXXXXXXXXXXXXXXXXX":S(I)
31 POKE36876,200
35 T=T+S(I)
36 POKE36876,0
40 NEXT
45 PRINT"XpXXXXXXXXXXXXXXXXXXXXXTHANK YOU."
48 FORTT=1TO1000:NEXT
50 M=T/NO
60 FORI=1TONO
70 D(I)=M-S(I)
80 ED=ED+(D(I))^2
90 NEXT
100 SD=(ED/NO)^.5
110 PRINT"XXXXXXXXXXSTANDARD DEVIATION
IS:"
120 PRINT"XXXXXXXXXX+SD
130 PRINT"XXXXXXXXXX-SD
140 PRINT"XXXXXXXXXXHIT ANY KEY"
150 GETA$:IFA$=""THEN150
160 GOTO10
200 REM PROGRAMMING INSTRUCTIONS
(NO NEED TO TYPE THESE IN).
210 REM "s"=CLR
220 REM "S"=HOME
230 REM "q"=CRSR DOWN
240 REM "j"=CRSR RIGHT
250 REM "p"=BLACK
260 REM "t"=PURPLE
270 REM "f"=RED

READY.

```

Standard Deviation
by Sarah Cotton

Microradio

GW6JJN



Futurology

This week I thought we'd swap the technology for a bit of futurology.

Each time I go on the air, the conversation inevitably turns to computers, and it seems to take two distinctive directions. The first is the person who, like me, is excited about the possibilities of computers in radio and the prospect of reliable digital communications around the world. The second is the old argument about what is the point of it all, we'll end up with computers talking to computers and we humans will be left in the cold. I cannot help thinking that this is the ostrich-

eye view of technology.

The odd thing is that people with this latter point of view have often recently bought the latest all-singing, all-dancing Japanese transmitter with bells on. When I mention the fact that their transceiver is run by a microprocessor and that the majority of its circuits are digital, I am faced with disbelief.

Digital technology in radio is now a fact of life. Without it there would be hardly any repeaters and no satellites. Radios that today cost a few hundred pounds and consist of scanning circuits, digital displays, etc, were undreamed of just a few years ago. Already the new technology has brought tremendous benefits.

Many people write to me about the implementation of Morse code or RTTY on their computer, and this is a good use of the machine, but it is not the best use. Radio Hams have always been in the forefront of communications technology —

in fact, amateur radio is responsible for many of the things that are now taken for granted; yet to many, now it has all been done. There are no new countries to contact, nothing new under the sun.

I feel very strongly that we are now at a beginning, not an end. Cheap digital technology has given us the means to experiment. A home computer is a very powerful tool and all that is needed is the imagination to utilise it.

A few weeks ago I wrote about packet radio (and I shall do so again) in which digital instead of analogue signals were transmitted. This kind of advance fills me with enthusiasm. Think of what can be encoded in a digital form. Graphics, television pictures, games and audio to name but four. Look in your local record shop, you will see long play records marked 'Digital Recording'. The sound they produce is more accurate than

analogue. If Beethoven can be encoded in binary and come out just as it went in then the mind boggles.

Using satellites and/or microwave repeaters we could send both audio and pictorial information suitably encoded wherever we wish. Ever fancied playing chess in real time with a Russian, Backgammon with a Greek or Blackjack with an amateur in Las Vegas? Anything is possible. The technology is here. All that is required is all that has ever been required — the vision to see beyond the technology and the determination to make a dream come true.

Ray Berry GW6JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to: Ray Berry, Microradio, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.

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by John Billingsley

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He is a member of several IEE committees, leads a team researching into robotics and is well known as the organizer of the Euromouse Maze contest.

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Peek & Poke



EIGHT WAY MOVEMENT

Raymond Elliot of Corslet Crescent, Currie, Midlothian writes:

Q Could you tell me if the Triga command Joystick has eight directional movement and whether I could use it in conjunction with the Stonechip programmable interface. If it does not could you suggest a joystick which is?

A Both use the common 'Atari' type interface, and so yes they are compatible with each other.

AFTER YOU CESIL

Mr D Capstick of Barton Park, Seely Oak, writes:

Q I buy several computer magazines fairly regularly, and PCWk every week. Over the last half year or so I have noticed increasing references to a computer language, *Cesil*. Yet although it has been referred to in passing, and treated knowingly by the magazines, I have never seen an explanation of what it is or what it does. Can you help?

A I must admit that I have never dealt with *Cesil*, and do not know anyone who has, despite knowing several school teachers. Like every other word in the computer world *Cesil* is an acronym, in this case standing for 'Computer Education In Schools Instruction Language'.

As far as I know, and no doubt someone will write and tell me if I'm wrong, there are no *Cesil* compilers for the common home micros, its use being

mainly on mini computers, some of which have been in the more forward schools for quite a while. The aim of the language, is to help pupils to get to grips with lower level programming techniques.

INVERSE VIDEO

N Stacey of Regent Street, Sutton-in-Ash, Notts, writes:

Q Some programs I would like to put into my Spectrum contain lines which have words or letters printed inside black blocks. Could you tell me how to achieve such lines. One program that uses them is *Aliens* (PCW, 19-25 January 1984).

A The two commands you need to use are the 'True video' which is Shift/3, and *INVERSE Video* which is Shift/4. What these commands do is place a token in the screen memory to tell the computer to reverse its video output. This will remain in effect until the command is changed. So if you want a line printed Inverse then after you have opened your inversed commas press Shift and 4 at the same time. You will see no change until you enter your next character, which will be inverted. Everything you do from now on will remain inverted until you enter *True video* (Shift and 5). Using this technique it is quite possible to change parts of a single program line. I have seen it used once on all command words.

REFRESHING SPECTRUM

Bob Pearson of Bronwen Court, London, NW8 writes:

Q Your page, (Issue Oct 27 to Nov 2) is the second statement I have seen saying that the Spectrum spends a lot of time refreshing memory.

As I understand it, refreshing is done during the fetch stage of every instruction execution, and thus consumes no useful time at all. Refreshing is not done during the Interrupt keyboard scan and keyboards update.

Poor maligned Spectrum, in machine code it is so good and

so fast, that the system is used in computers costing over £6000! Nearly a million adds a second isn't bad. By the way, I'm interested to know how the Z80a compares with the IBM 360/30, I started on nearly fifteen years ago, any ideas?

A You're right and wrong. Refreshing is done after any memory operation. A lot of the time the chip is working is spent dealing with the refresh cycle. However in effect you are right. Any computer using dynamic Ram has the same problem. A 6502 based system, is no better off. The 6502 needs an extra chip to refresh the Ram, yet when this is being done the Ram is inaccessible to CPU. So regardless of the computer, there is a lot of time when the CPU of whatever type, cannot access the RAM.

As you say, the Z80 is a very fast chip, usually running faster than 6502s, it has the further advantage that an extra chip is not needed to implement the refresh cycle. Only when static Ram, which does not need refreshing, is used do real advantages in this area become apparent, and like anything else these are off-set by other factors.

As for a comparison with the IBM. It is a compliment that the Spectrum should ever be mentioned in the same context as one of its bigger brothers. As I do not know the computer I really cannot say anything about how they compare. Any readers got any ideas on this?

SECOND LANGUAGE

Paul Thompson of Garfield Walk, Croydon writes:

Q I know that Jupiter have been liquidated, and I was, like many other people, considering the advantages of the ACE to learn a second language, ie Forth. I am sure that I read somewhere that ACEs were still available at a reduced

price. Is this true? If so could you give me details. Failing this do you know of a Forth package for my Commodore 64?

A The remaining ACE stocks have been taken over by Boldfield Ltd who can be contacted at Sussex House, Hobson Street, Cambridge. The price is £29.95+3.45 P&P. The Ram pack (16K) is another £23. If you are serious about learning Forth this might well be the best way to go about it. Despite its failure in the marketplace the ACE is an excellent little computer. To date I do not know of a Forth package for the Commodore 64 though I would now expect to see one sooner rather than later.

WARNING CARTRIDGE

John A Peake of Surrey Drive, Congleton, Cheshire writes:

Q I own a Dragon 32, and a friend of mine who has the same machine damaged it by plugging a Rom Cartridge in with the power switched on. Could you please tell me why this should do damage. Is there an interface that allows one to connect cartridges safely with the computer switched on?

A The problems with the Dragon Cartridges are caused by power surges. It happens almost all of the time, but is usually unnoticed. The surge of power usually lasts just a few milliseconds, but can put double or even treble voltage levels through the system. The various chips-on-board the computer are protected, but adding additional protection to each and every cartridge would be hideously expensive.

As for a mother board of the type you suggest. I do not know of one, though it would seem to be a good idea. However, the expense for what is really a very minor modification would probably be prohibitive.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, PCW, 12-13 Little Newport Street, London WC2R 3LD.

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"Lords of Time. This program, written by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue . . . As we have come to expect from Level 9, the program is executed with wonderful style — none of those boring "You can't do that" messages! Highly recommended." — *PCW, 1st Feb 84*

Tony Bridge's Adventure Corner



Snap judgement

Talking of Solarsoft (see last week) reminds me of an adventure from Alligata called *Here comes the Sun*. I have to say that I was not taken with this one. Although after my experience with Phipp's *Knight's Quest*, which only dawned on me some considerable time after its initial, rather off-putting, impression, I am wary of making snap judgements on any adventure. *Here comes the Sun* is another of those interminable *Wumpus* spin-offs, and at least the first few locations are just spent going round and round trying not to get unceremoniously bumped off. However, I must say that the music (such as it is on a Spectrum) is quite well thought out, with a great version of Monty Python's 'I'm a Lumberjack' among other oddities!

Some of the humour is rather lavatorial (quite literally so! — this is the first adventure in which you have to look after bodily functions), and the author has taken the trouble to redefine the character set. If he had taken similar trouble in catching the spelling and grammar mistakes, and providing an interesting introduction to the whole thing, I would have quite enjoyed this one. Let me have a hint sheet, Alligata, and we'll have another look in a few weeks.

Finally, Ian closes by saying: "I do not mind reviews of games on your page, but must you review games like *The Warlock of Firetop Mountain* as this is not a true adventure game. But have you gone completely mad — since when has the Korth Trilogy of arcade games been classed as an adventure game entitled to a review on an adventure page?"

Warlock comes as part of a package, which also includes the wonderful book, by Jackson and Livingstone. This is described as "a fighting fantasy" — I'm quite happy to include fantasies in the genus adventure, although I am aware that *Twofm* is stretching the term, as it is really a zap game! However, if people are looking for a text adventure, they now know that this program is not for them.

Similarly, with the Korth Trilogy, these three packages are described on the



sealed covers as "Adventures". Good though I found the programs, they are not adventures! Actually, some of the games contained within come close to being good strategy games, and will please younger players — and, quite incidentally, some of them, too, have more merit than many adventure games!

As well as reviewing adventures, I must also have a look at programs passing themselves off as adventures, and report on them — after that, the reader can make up his own mind.

News this week of a couple of new products from Melbourne House. Well, actually, three new products!

The first can be dealt with pretty quickly. *Sherlock* will be the eventual follow-up to MH's classic: "eventual", because it is, say Melbourne House, still "in preparation" and will be with us in a few months. You can bet that it will be worth the wait!

To keep us happy in the meantime, Melbourne House has been working on *Mugsy*, a text and graphic adventure which takes place in Chicago, during the Prohibition days.

If all this adventuring has worn you out, you may want to fall back in a chair and read a good book. If so, Melbourne House can supply you with a couple of good'uns. The first has been out for a month or so, and comes from Keith Campbell. He writes an adventure column in *C&VG* and his *Book of Adventure* is a good read. It covers the history of adventure games, and goes on to show how you can write a program, versions of which are given for several popular machines.

There's just enough time left this week to tell you of a new adventure that has just come into the office. Its' author, Jack B N Storrock, spoke to me over the phone:

"The adventure, which is called *Plorafoil*, is going to wipe the floor with *The Hobbit*

and *Valhalla*. In fact, if you can imagine a combination of the former's intricate puzzles, and the latter's animated graphics, you will have an inkling of what it is like to play. There is also a fantastic arcade sequence which makes *Manic Miner* look, frankly, old-fashioned!

"The program will be available for machines such as the Spectrum, ZX81, IBM PC, and CBM 64 as well as the Souffle — sorry, Flan — and QL. The last two options will give us plenty of time to actually write the versions!

"The adventure concerns the exploits of Sir Hubert the Ever Ready, in the fabled land of Plorafoil. It comes complete with dragons, unicorns — in fact the list of monsters is staggering! The unique thing about our adventure is that the player doesn't actually have to do anything — the animation is so good that you can actually sit back and watch everything happen. Unlike *Valhalla*, no input is required on the part of the player, thus making the adventure fun to play, and easy for experienced and novice player alike. *Plorafoil* has to be seen to be believed!"

The new program will be released this weekend. Mr Storrock has given the readers of his favourite column a special, preview clue to help them on their way: Look at Sunday's date and you will find that understanding will not be far behind!

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further write to: Tony Bridge, Adventure Corner, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

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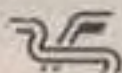
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Micro: BBC Model B

Adventure: Snowball

Problem: Of what use is the Hospital Gown. What do I do with the Linedrives and the Screwdriver. How do I get the woman out of the Coffin?

Name: Bob Aitken

Address: 42 Lochbrae Court, Lochbrae Drive, Rutherglen, Glasgow, Scotland.

Micro: Commodore 64

Adventure: The Hobbit

Problem: I have numerous keys, magic ring but cannot get past either the Bog (ISINK) or the elf clearing. I have Thorin with me. PS. I am playing from a "saved" game in which I have got to Spiders Web, is it possible that bugs could creep in and these have been "saved"?

Name: Dr Carl N. Martin

Address: 34 The Gallops, York YO2 3NF.

Micro: BBC Model B

Adventure: Sphinx Adventure (Acornsoft)

Problem: Having collected various objects, (wand, carrot, etc, etc.) in stock. When I say "Wave wand" the reply is "nothing obvious happens!"

Name: Neil Barnes

Address: 184 South Road, Bretherton, Preston, Lancs PR5 7AH.

Micro: Vic 20

Adventure: Voodoo Castle (Scott Adams)

Problem: Can not find stand or camp. As in with knife in hand you take a "STAND" circle the coffin and wave the stick and hold the "CAMP" etc, etc.

Name: Mr G. Rees

Address: 117 Regents Park Road, Shirley, Southampton, Hants SO1 3NZ.

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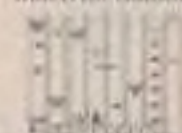
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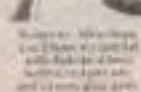
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Boris Allan develops routines in Acorn soft Forth to demonstrate a) how easy it is to write in Forth and b) that the programs are fast enough to dispense with the need for machine code.

ISBN: 0 946408 04 1

Programming for Education

The book, written by teachers, is aimed at showing younger children how the various features of the BBC Computer can be used to their best advantage. ISBN: 0 946408 10 6

programming
for education
on the BBC computer



Graphic Art

The graphics in this book match the style and sophistication of the BBC computer and its Basic language. Boris Allan shows what can be achieved with Turtle graphics.

ISBN: 946408 08 4

DIY Robots and Sensors

Make your own joystick, robot, eye or whatever you like. The book gives you step-by-step instructions on how to construct a wealth of gadgetry for use with your BBC computer (Pub. 28th October). ISBN: 946408 13 0

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FALCON PATROL.....	HOBBIT.....
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SPACE PILOT.....	BUGA BOO.....
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COLCHESTER CO7 0RX.

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STATE MACHINE FOR PROMPT DELIVERY

DIG THIS

Pedro, manic gardener, has arrived; simultaneously released for the Dragon, Commodore 64 and Spectrum by Imagine.



Pedro is a mexican farmer trying to scratch an honest living from the soil — however, his plants are being decimated by a host of unlikely creatures and a recalcitrant tramp who appears to eat seeds.

Pedro must keep planting seeds and use bags of compost and bricks to build a wall to keep out the pests. The view is a kind of edge-on diagonal of the garden — three dimensional if you stretch credibility a bit.

The graphics are reasonable and the game itself is very addictive — expect to see this one in more than one chart pretty soon.

Program *Pedro*
Price £5.50
Micro Spectrum/Dragon/
CBM 64
Supplier Imagine Software
5 Sir Thomas Street
Liverpool
Merseyside L16 BW

BOWLED OVER

Alley Oops is an arcade game for the Commodore 64 which is only vaguely to do with bowling and bowling alleys.

Although the game does feature a bowler and bowling balls, the real skill of the game involves avoiding various obstacles — especially nasty

gum spots that will stick both you and the ball to the floor.

True to arcade convention there are several screens of increasingly difficult action — the eighth level is supposed to be close to impossible.

Program *Alley Oops*
Price £7.99
Micro Commodore 64
Supplier Allrian software
1000a Uxbridge Road
Hayes
Middlesex

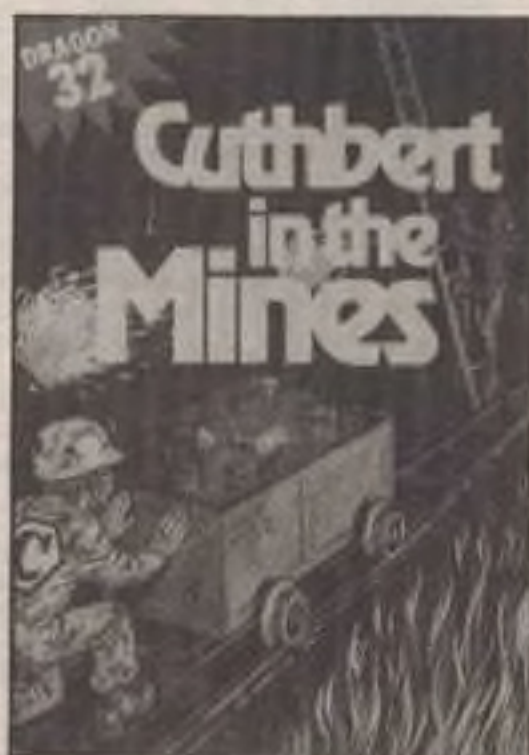
FIREBALLS

Cuthbert in the Mines is the latest in Microdeal's *Cuthbert* saga. Most of the other *Cuthbert* games were very good, although I can't help finding the attempt to build *Cuthbert* up as a sort of *Horace* rival a bit contrived.

Here, the game is basically of the run up and down ladders avoiding obstacles genre as you try to avoid trucks, fireballs and demons and guide *Cuthbert* out of a mine (someone has left him there and I don't blame them.)

However, fair's fair, Microdeal are almost the only company that have consistently issued good quality machine code arcade games for the Dragon and a lot of Dragon owners should find this well up to the usual standard.

Program *Cuthbert in the Mines*
Price £8.00
Micro Dragon 32
Supplier Microdeal
41 Truro Road
St Austell
Cornwall
PL25 5JE



MASOCHISM

Epic Software has strong support among adventurers of the "well even though we've tried three hundred different ways to solve this problem we can't let it beat us" school of masochism.

One secret to a convincing text adventure is a flexible response to the players input. Epic's latest adventure is *Wheel of Fortune* and it can accept sentences like "Take the biscuits and eat them but don't eat the cakes or drink the tea" and make sense of them.

There are teletext graphics to illustrate each of the 250 locations and the function keys can be programmed with commonly used sentences and phrases like 'help' and 'kill vicious tharg with trowel'.

The plot involves a magical *Wheel of Fortune* which transports you to a bizarre world of the future — the difficulty is getting back.

Program *Wheel of Fortune*
Price £9.95
Micro BBCB/Electron (no graphics)
Supplier Epic Software
10 Gladstone St
Kibworth Beauchamp
Leicester
2EB0HL

TOUGH GOING

Acornsoft's *Adventures* are probably the most successful programs it has released. People still mutter darkly about the problems to be found in *Philosopher's Quest* and *Sphinx Adventure*.

Good news for adventure fans — Acornsoft have just released a new adventure *Kingdom of Hamil*. It's impossible to do justice to any adventure in a small space like this, but drawing conclusions from the enclosed book of hints and answers. I would say that this one is pretty tough; although all the solutions are reasonable, in retrospect anyway.

Other than that, it is a standard text adventure accepting

the usual two word instructions — unsophisticated but functional.

Program *Kingdom of Hamil*
Price £9.95
Micro BBCB
Supplier Acornsoft
4a Market Hill
Cambridge
CB23NJ

PUB CRAWL



Whilst there are many who would agree that getting back from the pub after a night out is often a hazardous experience, few would have dreamt the ramifications to be found in *Pub Quest* by Dream Software.

Getting home, after losing your money in the gutter, is the simple objective of this real time text adventure.

The settings may not be as glamorous as in conventional adventure games — you are more likely to die from being run over by the traffic whilst in an alcoholic stupor than burnt by a mighty fire-breathing Dragon — but solving the adventure is every bit as tough.

Program *Pub Quest*
Price £5.95
Micro Commodore 64
Supplier Dream Software
PO Box 64
Basingstoke
RG21 2LB

QUIZ TIME

Test Yourself is a range of modular design educational programs for the Spectrum. Using the system, the programs designers Datek aim to

Pick of
the week

Jet Set Willy is here. The long awaited follow up to *Manic Miner* has taken ages but it's certainly worth the wait — I think it's quite possibly even better than the original!



BETTER THAN THE ORIGINAL

With a success like *Miner*, the temptation to do exactly the same again must have been strong and, indeed, why radically alter a winning formula.

In terms of 'plus ça change plus c'est la même chose' I think the balance in *Jet Set* is about right. Controls are left, right, jump and the various screens contain the usual bizarre animals, people, weird inanimate objects and other horrors.

Different elements include the much wider variety of screen layouts, the chance to go through the rooms in more or less any order and special obstacles like swinging ropes. It's technically brilliant, funny and of course, completely addictive. Work halted for several hours in the office when it arrived.

Two points of random interest — the music which plays continuously through the game is *If I were a rich man* and in

one of the rooms Willy turns into a flying pig for no apparent reason. Is this deliberate or not? I think we should be told.



Incidentally, did anyone see *Saturday Superstore* recently in which *Manic Miner* was criticised for its continuous sound? — I think someone should have told them you can switch the sound off.

Program *Jet Set Willy*
Price £5.95
Micro *Spectrum*
Supplier *Software Projects*
Bear Brand Complex
Allerton
Woolton
Merseyside

produce tapes to test everything from 'O' level physics to road signs.

The master program organises the data on the various subject modules. The questions can be asked either against the clock, worked out with the answers, or as a test with no time limit. Scores can be kept and mistakes analysed.

The master program also comes with a utility to help you compose your own questions and a free physics 'O' level data tape.

Program *Test Yourself*
Price £7.95
Micro *Spectrum 48K*
Supplier *Datek computing*
133 Chiswick Village
London W4 3DQ

STAR-GAZING

Constellation is a neat program from Superior Software which lets you view the stars in the comfort of your own living room — or wherever you keep your micro.

The screen becomes an imaginary telescope that can be used to view up to 50 constella-

tions — a total of 455 stars.

You can move up, down, left or right and zoom in and out of the picture. Stars can be displayed by magnitude or constellation. The program is one of a batch of new releases for the new Acorn machine issued by the company.

Program *Constellation*
Price £7.95
Micro *Electron*
Supplier *Superior Software*
Dept EV4 Regent House
Skinner Lane
Leeds 7

DUELLING

Sword Master is a duelling simulation for the Acorn Electron in which you control a knight engaged in combat with another.

The graphics are well done, being both slickly animated and suitably medieval. As you become more adept with the sword so your knight ascends through the ranks from greenhorn to Sword-master.

Your strength in the fight is represented by another knight, whose sword gradually sags.

Another neat touch is a high score table which can be saved to tape so that particularly stirring performances can be retained to impress your friends.

Program *Sword Master*
Price £7.95
Micro *Electron*
Supplier *Micrograf*
120 Oxford Road
Reading
Berkshire
RG1 7NL

MOONSCAPE

A couple of years ago, everybody's favourite arcade game from a quality of graphics point of view was *Moon Buggy*, where you had to move a rover over increasingly difficult terrain, fighting off baddies and avoiding bumps and dips as you went.

Rabbit Software have now brought out a fairly accurate version of the original for the Commodore 64. The graphics are every bit as good as the original, even down to the tyres which bounce off whenever disaster strikes. It's

cheap for a Commodore 64 game too.

Program *Troopatruck*
Price £5.99
Micro *Commodore 64*
Supplier *Rabbit Software*
The Warren (Unit 11)
Forward Drive
Wealdstone
Middlesex
HA3 8NU



VIRAL LOGIC

Fans of *The Andromeda Strain* may find the subject matter of *Molecule* intriguing. Like the scientists in that film, you have to discover the structure of a dangerous virus.

In essence, the program is a puzzle involving logic — you must discover the structure from various diverse pieces of evidence. Presumably, the game mimics some actual reasoning involved in such analysis — it was written by a research scientist. If you enjoy puzzles, it's very addictive.

Program *Molecule*
Price £6.90
Micro *BBC B*
Supplier *Bridge Software*
36 Fernwood
Marple Bridge
Stockport
Cheshire SK6 5BE

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 12-13 Little Newport Street, WC2R 3LD.

- Vic 20**
- (-) Flight 015 (Ferranti Davenport)
 - (2) Crazy Kong (Interceptor)
 - (-) Emmet Attack (Commodore)
 - (-) Snooker (Visions)
 - (-) Choc-o-Bloc (Paramount)
 - (-) Snowman & Maths Maze (Commodore)
 - (1) Wizard and the Princess (Melbourne House)
 - (-) Megagalactic Llamas... (Llamasoft)
 - (6) Jetpac (Ultimate)
 - (-) The Count (Commodore)*
- * Cartridge.

- Commodore 64**
- (1) Manic Miner (Software Projects)
 - (-) Colossus Chess (Microsyf)
 - (-) Hideous Bill (Virgin)
 - (-) Crazy Kong (Interceptor)
 - (-) Introduction to Basic Pt 1 (Commodore)
 - (-) Outback (Paramount)
 - (-) Bumping Buggies (Bubble Bus)
 - (-) Basic Adventure 2 (Honeyford)
 - (-) Flying Feathers (Bubble Bus)
 - (5) Chinese Juggler (Ocean)

- Dragon**
- (-) Chuckie Egg (A&F)
 - (-) Kriegspiel (Beyond)
 - (-) North Sea Oil (Shards)
 - (-) Chocolate Factory (Minit)
 - (-) Pedro (Imagine)
 - (-) Mystery of the Java Star (Shards)
 - (3) Eightball (Microdeal)
 - (-) Ugh! (Softak)
 - (-) Up Periscope! (Beyond)
 - (6) Hungry Horace (Melbourne House)
- (Figures compiled by Boots/Websters)

- ZX81***
- (4) Crazy Kong (PSS)
 - (-) Asteroids (Quicksilva)
 - (-) Skramble (Quicksilva)
 - (-) Defender (Quicksilva)
 - (-) Invaders (Quicksilva)
 - (1) Flight Simulator (Psion)
 - (-) Vu-file (Psion)
 - (-) Vu-calc (Psion)
 - (5) Hopper (PSS)
 - (2) Football Manager (Addictive Games)
- * All 16K
(Figures compiled by Boots/Websters)

- Books**
- (5) Mastering Machine Code on your ZX Spectrum, Baker (Interface)
 - (-) Interfacing Projects for the BBC Micro, Smith (Addison Wesley)
 - (1) BBC Micro Disc Companion, Latham (Prentice-Hall)
 - (-) Beyond Basic, Freeman (BBC)
 - (2) Commodore 64 Programmers reference Guide, Commodore (Commodore)
 - (8) Advanced user Guide for the BBC Micro, Bray (Cambridge Micro Centre)
 - (-) Advanced Programming Techniques on the Commodore 64, Lawrence (Sunshine)
 - (6) Advanced Programming Techniques for the BBC Micro, McGreggor and Watts (Addison Wesley)
 - (-) 68000 Microprocessor Handbook, Kane (Osbourne)
 - (4) Commodore 64 Getting the Most from It, Onosko (Prentice Hall)
- (Figures compiled by Watford Technical Books, Watford 0923 23324, Prestel 26844)
(Last week's position in brackets)

- Spectrum**
- (1) Chequered Flag (Psion)
 - (2) Atic Atac (Ultimate)
 - (10) Scuba Dive (Durrel)
 - (5) 3D Ant Attack (Quicksilva)
 - (4) Lunar Jetman (Ultimate)
 - (-) Jet Pac (Ultimate)†
 - (3) Flight Simulation (Psion)
 - (8) The Hobbit (Melbourne House)
 - (-) Stonkers (Imagine)
 - (-) Pool (CDS)

† 16K only.
(Figures compiled by W. H. Smith and Son, London)

- BBC***
- (2) Planetoids (Acomsoft)
 - (1) Hopper (Acomsoft)
 - (3) Rocket Raid (Acomsoft)
 - (5) 747 Flight Simulator (Microdeal)
 - (4) Killer Gorilla (Program Power)
 - (6) White Knight Mk II (BBC)
 - (8) Disc Doctor (Acomsoft)
 - (7) Transistor's Revenge (Computer Concepts)
 - (9) Sphinx Adventure (Acomsoft)
 - (10) Starship Command (Acomsoft)

* All Model B
(Figures compiled by Micro Management, Ipswich 0473 59181)

- Atari**
- (1) Rally Speedway (Adventure International)*
 - (3) Warlock (Calisto)‡
 - (2) Savage Pond (Starcade)
 - (-) Planet Fall (Infocom)†
 - (4) Slinky (Cosmi)
 - (5) Saga 5 The Count (Adventure International)
 - (9) Saga 4 Voodoo Castle (Adventure International)
 - (-) O'Riley's Mine (Datsoft)
 - (-) Firefleet (English)‡
 - (-) Zaxxon (Datsoft)

* Cartridge ‡ 32K cassette † 32K disc
(Figures compiled by Callisto Computers, Birmingham 021 632 6458)

WHICH MICRO?

Choosing and using a Micro-computer is a useful book that attempts to answer the classic question 'which micro should I buy?'

The main micros are summarised, the advantages of different types of system explained, and some of the worst computer jargon is unravelled.

To get you started there is an appendix of 18 programs at the end of the book, which, working as they do on more or less any micro, are inevitably nothing to write home about.

Book *Choosing and using a Microcomputer*

Price £2.50

Micro General

Supplier Fontana Paperbacks 8 Grafton Street London W1

ASININE LAW

We all know that the law is an ass, but in the area of computer software more than any other areas, the law is a particularly confused ass.

Questions of who owns what and why, usually clear cut outside the courts, become dauntingly complicated once disagreements come to court. One of the reasons for so few cases of software piracy coming

to court is the difficulty of proving the case.

Colin Trapper's *Computer Law* is the only book I know that attempts to cover current law with particular reference to specific cases.

Book *Computer Law*

Price £9.50

Micro General

Supplier Longman House Burnt Mill Harlow Essex CM20 2JE

COMPLETE

It looks as though Prentice Hall was caught on the hop by the announcement of the Oric Atmos since its book *Understanding Oric* has a hasty sticker saying Oric 1 and Oric Atmos on the front — all the illustrations are of the earlier model.

Diagrams notwithstanding, there isn't much information in the book that is wrong for the Atmos and it's basically a very complete guide to Oric Basic. It gives you all the information the manual should have provided in the first place.

Book *Understanding Oric*

Price £7.95

Micro Oric 1/Atmos

Supplier Prentice Hall 66 Wood Lane End Hemel Hempstead Herts HP2 4RG

This Week

Program	Type	Micro	Price	Supplier
Checkout	Arc	BBC	£7.95	Virgin
Identikit	Ed	BBC	£7.95	Stall
Jungle Jive	Arc	BBC	£7.95	Virgin
Test Match	S	BBC	£7.95	CRL
Turbo	Ut	BBC	£9.95	Salamander
Confrontation	S	BBC B	£7.95	Lothlorien
Ghouls	Arc	BBC Micro	£7.95	Micro Power
Jet Power Jack	Arc	BBC Micro	£7.95	Micro Power
Ambush	Arc	Commodore 64	£7.95	Virgin
Identikit	Ed	Commodore 64	£7.95	Stall
Maths Invaders	Ed	Commodore 64	£7.95	Stall
Megahawk	Arc	Commodore 64	£6.95	Big G
Omega Run	S	Commodore 64	£7.95	CRL
Zodiac	Ad	Commodore 64	£7.95	Anirog
Zylogon	Arc	Commodore 64	£6.95	Big G
3D Seiddab Attack	Arc	Dragon	£7.95	Hewson
If I Had A Million	S	Dragon	£9.95	Phoenix
City Bomber	Arc	Dragon 32	£3.75	Pegasus
Johnny Reb	S	Dragon 32	£6.95	Lothlorien
Bugs	Arc	Electron	£7.95	Virgin
Battle Flight	Arc	Oric	£4.95	Stour
Flight Simulator	S	Oric	£6.95	Quark Data
Mystery Tower	Ad	Oric	£6.95	Quark Data
Oric	S	Oric	£6.95	Quark Data
Quark 3D Invaders	Arc	Oric	£6.95	Quark Data
Space Crystal	Ad	Oric	£6.95	Quark Data
Atlas Assignment	Ad	Spectrum	£5.95	Virgin
Blade Alley	Arc	Spectrum	£5.95	PSS
Fure	Arc	Spectrum	£5.50	Strange Loop

GT Detective	Arc	Spectrum	£5.95	CRL
Grid Patrol	Arc	Spectrum	£5.95	Lothlorien
Landscapes	Ut	Spectrum	£4.00	James
Millionaire	Arc	Spectrum	£5.50	Incentive
Mummy Mummy	Arc	Spectrum	£5.95	Lothlorien
Nosferatu	Ad	Spectrum	£6.00	Odyssey
Olympics	S	Spectrum	£5.95	CRL
Olympmania	Arc	Spectrum	£6.00	Automata
Pandemonia	Arc	Spectrum	£5.95	CRL
Sorcery	Ad	Spectrum	£5.95	Virgin
Temple of Vran	Ad	Spectrum	£5.50	Incentive
The Waster	Ad	Spectrum	£5.50	Hardata
Time bomb	Arc	Spectrum	£5.95	CDS
Trashman	Arc	Spectrum	£5.95	New Generation
Two Gun Turtle	Arc	Spectrum	£5.95	Lothlorien
Wheelie	Arc	Spectrum	£5.95	Microsphere
Bounty Hunter	Arc	Vic 20	£5.95	Micromicon
Gotcha	Arc	Vic 20	£5.95	Micromicon
High Resolution Graphics	Ut	ZX81	£5.95	Odyssey

Key: Ad — adventure/Arc — arcade/Ed — education/S — strategy-simulation/Ut — utility

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD.



Video nasties

The latest half-baked idea to come out of the House of Commons is the inclusion of video games in the censorship system set-up by the Video Recordings Bill.

The Bill — sometimes called the Bright Bill, after Graham Bright, the MP who put it forward — means that, just like cinema films, videos will have to have a certificate from a board of censors before they can be hired out or sold. Videos will be graded — U, PG, 15, 18 and 18R (the 'R' means they can only be supplied by 'sex shops') and you won't be able to buy or hire, for example, an '18' graded video, if you are under 18. The idea is to stop children buying unsuitable films — 'video nasties' — and to give their parents some idea of what they are watching.

Originally, all video games were completely excluded from the Bill. But now MPs have decided the only video games excluded will be those which don't show, stimulate or encourage sexual or grossly violent acts. MPs were apparently swayed by a campaign which the *Sun* newspaper has been running to get Harrods to stop selling Artic's *Ship of Doom*, which recognises and responds to the idea of a sexual act or attack. They were also influenced by advertisements for softporn adventure games in the *Maplin Guide to Electronic Components and Home Computers*.

But they clearly haven't thought it through. The

Bill will result in a lot of uncertainties and absurdities for the computer games industry. How could a censor be certain of finding all the possible options in an adventure game? What games will need certificates — a software house will have to decide whether it needs to go to the time, trouble and expense of getting a certificate or risk a possible stiff fine. Many games on the market could in a sense be said to encourage gross violence — after all, what could be more horrifically violent than a game, like Red Shift's *Apocalypse*, based on nuclear war? And the infamous *Bomb Buenos Aires*, by Llamasoft? Or Dk'Tronics' *Who dares wins*, where the player has to shoot the terrorists, rather than the hostages, as they appear at the window? Will they need a certificate?

Moreover, you could have a crazy situation where the video game of *Apocalypse* needed a certificate — and was possibly restricted to those over a certain age — yet the board version would neither need one, nor be restricted. And there would appear to be nothing to stop a magazine printing listings of the game.

I intensely dislike the 'zap and pow' approach of many computer games, with their mindlessly violent themes. I hate the way the games are almost all aimed at boys, not girls, and the females who do occasionally crop up, are just there to be weak, feeble and rescued. The more explicitly violent or sexual games stem directly from these attitudes. But the attitudes won't be attacked by this Bill: *Donkey Kong* will reign undisturbed.

Censorship systems too easily reflect the prejudices of the censors. If censorship were really likely to result in healthier attitudes, I might welcome it. But it won't. And the danger is that the structure would be there for the Government to use to influence the kind of films we see and the games we play. And governments can be very partisan and selective in the kinds of things they don't like. The BBC isn't government controlled, but look at the way the anti-nuclear film *The War Game* has never been shown. Could anti-nuclear games like *Base Invaders* be too topical for the Government's comfort?

No one will know until the system is actually in operation. And by then it will be too late. As old Chinese proverb says: 'He who ride tiger, cannot dismount.'

Gail Counsell

Line for line

Puzzle No 100

I called in at the local shop to buy a new colour television.

"And a very wise choice, sir!" exclaimed the salesman, "One of our most popular lines."

"625 lines I hope," I remarked, making a joke that didn't come off.

"You might well laugh," replies the salesman, grimacing, "but I happen to know that the company has sold exactly £1,111,111s worth of these televisions."

"Mazing in it?"

As I knew how much I had paid for the television — which was an exact number of pounds — I was able to work out the number of tvs sold.

But can you?



Solution to Puzzle No 95

There is only one arrangement of all 9 digits — in ascending order, 123456789 but this is not a perfect square, so the answer must have eight digits or less. Thus, only the squares of numbers from 4 to 4843 need be tested.

```
10 FOR N = 4 TO 4843
20 LET I = N * N
30 LET IS = STR$ I
40 FOR F = 1 TO LEN IS
50 IF IS(F) >= IS(F+1) THEN GOTO 80
60 NEXT F
70 PRINT N, IS
80 NEXT N
```

The largest possible square with digits in ascending order is 134689 — the square of 367. Apart from 134689 and the squares listed in the original question (16, 25, 36, 49, 169, 256, 289) the only other squares with this property are 13456 (116²) and 13689 (117²).

Winner of Puzzle No 95

The winner is: Larry Wilkinson, Queen's Drive, Sedgefield, Stockton-on-Tees, Cleveland, who receives £10.

This Star Trek game isn't very realistic... let's go down the PUB



Captain's log: Stardate unknown. We have just been menaced by a Giant figure, which disappeared as it suddenly appeared. We are remaining on Yellow Alert...



